MEDICINES,

THEIR USES AND MODE OF ADMINISTRATION.

7

MEDICINES,

THEIR

USES AND MODE OF ADMINISTRATION;

BY

J. MOORE NELIGAN, M.D.

Sixth Edition,

INCLUDING

A COMPLETE CONSPECTUS OF THE BRITISH PHARMACOPŒIA, AN ACCOUNT OF NEW REMEDIES, AND AN APPENDIX OF FORMULÆ;

EDITED BY

RAWDON MACNAMARA, M.R.I.A.,

LICENTIATE OF THE ROYAL COLLEGE OF PHYSICIANS;
LICENTIATE, FELLOW, MEMBER OF COUNCIL, AND PROFESSOR OF MATERIA MEDICA, ROYAL COLLEGE OF SURGEONS IN IRELAND;
SURGEON TO THE MEATH HOSPITAL; ETC.

"Harum sententiarum quæ vera sit, deus aliquis viderit; quæ verisimillima, magna questio est."

DUBLIN: FANNIN AND CO., 41, GRAFTON STREET.
EDINBURGH: MACLACHLAN AND STEWART.
LONDON: LONGMAN AND CO.

1864.

R. D. WEBB AND SON, PRINTERS, GREAT BRUNSWICK-STREET.

TO

THOMAS E. BEATTY, M.D., M.R.I.A.,

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS;
FORMERLY
PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS, IN IRELAND;

AND TO

JAMES APJOHN, M.D., F.R.S.,

PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF DUBLIN,

THIS, THE SIXTH EDITION OF NELIGAN'S "MEDICINES," IS INSCRIBED,

AS A TRIBUTE OF RESPECT

FOR THEIR HIGH PROFESSIONAL AND SCIENTIFIC ATTAINMENTS,

AND AS A TRIFLING EXPRESSION OF THE WARM REGARD

IN WHICH THEY ARE HELD BY THEIR

OBLIGED AND OBEDIENT SERVANT,

RAWDON MACNAMARA.

PREFACE

TO THE SIXTH EDITION.

In his preface to the last edition of this work, my much lamented friend, Dr. Neligan, thus expressed himself:—"When a book reaches a fifth edition it scarcely requires a preface." If this sentiment be true of the fifth, how much more true should it be of the sixth edition? Yet many circumstances seem to me, on the present occasion, to call for some prefatory remarks; foremost amongst which must be the sudden and unexpected removal from the sphere of his useful labors of the talented and highly gifted person to whose pen is to be attributed the merit of the production of the five preceding editions of this work. A well educated, well read, practical physician, an accomplished author, a sterling friend, hospitable and generous in all his instincts, our profession sustained in the premature and unlooked for death of John Moore Neligan, a loss that at any time or in any country it could ill afford; but occurring as it did at a period when death was busy in our ranks, when many of the brightest names on our professional roll were swept from it for ever, his death in the very prime of manhood, in the very flush of honestly won professional success, was an event indeed as much to be deplored as it was unexpected. My connexion with this work, however, does not date from the period of Dr. Neligan's demise; some years previously, on its being announced to him that the fifth edition was exhausted, and that the publishers would wish him to undertake the revision of a new edition, he expressed a desire that I should be associated with himself in the labor, and solicited my co-operation. Although all our arrangements were at that time perfected, still the commencement of the revision of the work was postponed until the appearance of the long promised national Pharmacopœia; Dr. Neligan, although on the Pharmacopœial Committee, from a high sense of honor, steadily refusing to avail himself of his position, or to make any private personal use of the proofs of that work, which from his position had to be constantly submitted for his inspection. The result was that my valued friend died without having done any thing towards the revisal of the sixth edition, his death having occurred some six months previous to the appearance of the British Pharmacopœia. The present edition has been thus deprived of the great advantage of his supervision, and for its merits or demerits I alone am responsible; and it can readily be conceived that a new, and in many instances, a much altered Pharmacopœia has rendered imperative a thorough modification of the work, if it had not necessitated its being entirely re-written. Whilst studying to preserve the text as much as practicable in its integrity, the nature of the pharmacopœial changes, and the rapid progress of medical science, have called for many and important alterations and additions which have resulted in the production of original matter to a very great extent, and have swelled the bulk of the work by some hundred and fifty additional pages. Nor can the amount of additional matter be estimated by the number of additional pages only. In the last edition of the book much space was occupied in reproducing the several formularies of the three Pharmacopœias issued respectively by the Dublin, Edinburgh, and London Colleges. Now we have but one formulary; consequently two-thirds of the space so occupied in the last edition of this work have been economised and devoted to original matter.

What may be looked upon as distinctive and original features in this edition of the "Medicines" are the full explanations given, first verbally, and then in equations after each process and test. To such readers as have been in the habit of being taught in symbols, this latter form of explanation requires no word of recommendation, its precision and clearness leaving nothing to be desired; to such as have not as yet mastered this elementary difficulty, I would most earnestly recommend their study; in a very short time they will have mastered all difficulties attendant upon their perusal, and they will be amply repaid for the trouble it will have cost them by the rapidity with which they will be enabled to see, as it were at a glance, the explanation of a process which would otherwise cost many words of description, and still not be as clear or as satisfactory. In the list of Supplementary Agents will be found the "Tests for Volumetric Analysis," under each of which I have given full, and as I trust, clear explanations. In this Edition appears, also for the first time, the description of many important and new remedial agents, such as Lithia and its Salts, Pumpkin, Kamela, Santoninum, Bela, Podophyllum, Anilina, Cerium and its Salts, Carbolic Acid, Veratrum Viride, Bichromate of Potash, Permanganate of Potash, Pinus Larix, Actæa Racemosa, Hydrocotyle Asiatica, Peroxide of Hydrogen, Calabar Bean, Benzoate of Ammonia, Phosphate of Ammonia, Bromide of Ammonium, Sulphurous Acid, &c. many of which have already established themselves as remedial agents of undoubted value ; some of which are still on their trial, and may or may not prove worthy of being added to the list of our Materia Medica, but which are certainly worthy of a more extended clinical investigation.

In the following pages will also be found more than three hundred medicines and formularies (exclusive of the formularies contained in Appendix A) which are not officinal in the British Pharmacopœia, and which can be recognized as such by the large asterisk (*) prefixed. The *preparations*, with their *characters* and *tests*, contained in the British Pharmacopœia, will readily be distinguished; the former either by being enclosed in brackets, or within inverted commas with the word PREPARATION prefixed; the latter by their being printed in a different and smaller type than that used in the body of the work. The prescriptions have been carefully revised and adapted to the present Pharmacopœia, and their number considerably increased by the addition of many new formularies. In the Posological Table an alteration, I trust for the better, will also be observed.

In a work bearing to the production of a former writer the relation that this does, it might be considered just to the reader to supply him with the means of readily and with precision distinguishing the portions due to either author ; but to have carried out this idea in its integrity, would have been attended with greater difficulties than the importance of the distinction appeared to merit.

In this preface I have to a certain extent endeavoured to supply this defect by pointing out the portions for which I am primarily answerable; for the whole of course I know that I am responsible; I therefore submit the work to the profession with solicitude, conscious that I have devoted to it my best faculties, a comparatively large portion of valuable time, and the accumulated experience and knowledge acquired by many years teaching of these subjects. I therefore cherish the hope that the value of the product may prove adequate to the cost of the production; but when I recollect how much its progress has been embarrassed and interrupted by the labors and anxieties inseparable from active professional duties, both public and private, and the short time that has intervened between the appearance of the Pharmacopœia and the publication of this edition, it appears scarcely reasonable to suppose that its plan will be found free from defect, or its execution from inaccuracy. I commend it to the candid reader, satisfied that the best judge will be the most lenient critic.

RAWDON MACNAMARA.

95, ST. STEPHEN'S GREEN, SOUTH, DUBLIN.
12*th November*, 1864.

TABLE OF WEIGHTS AND MEASURES.

The Weights and Measures used in the British Pharmacopœia, with their symbols, are as follows:—

WEIGHTS.

1 Pound .	lb. .	= 16 Ounces	= 7,000	Grains Troy.
1 Ounce .	oz. .	= . .	= 437·5	Grains „
1 Grain .	gr. .	= . .	= 1	Grain „

MEASURES.

1 Gallon . .	C. .	= 8 Pints . .	O. viij.
1 Pint . .	O. .	= 20 Fluid Ounces .	fl. oz. xx.
1 Fluid Ounce .	fl. oz. .	= 8 Fluid Drachms	fl. drs. viij.
1 Fluid Drachm	fl. drm.	= 60 Minims . .	min. lx.
1 Minim . .	min. .	= 1 Minim . .	min. j.

Temperature in all cases is to be determined by Fahrenheit's thermometer, and the specific gravity of liquids is to be taken at the temperature of 62°. All liquids are ordered by measure unless it is stated otherwise.

RELATION OF MEASURES TO WEIGHTS OF THE BRITISH PHARMACOPOEIA.

1 Gallon . .	=	the measure of	10	Pounds of water.
1 Pint . . .	=	„	1·25	„ „
1 Fluid ounce .	=	„	1	Ounce „
1 Fluid drachm	=	„	54·68	Grains Troy.
1 Minim . .	=	„	0·91	„ „

Although these are the only weights and measures that can *legally* be used, still I think it advisable for the present to reproduce here the weights formerly known in our works on Pharmacy as Apothecaries' Weights. According to the ordinance contained in the last edition of the Dublin Pharmacopœia (1850), prescriptions were directed to be compounded by *Avoirdupois Weights,* the ounce being sub-divided as in Troy Weight into eight drachms or twenty-four scruples, in Ireland. The London and Edinburgh Colleges directed *Troy Weights* to be used in England and Scotland.

APOTHECARIES' WEIGHTS.—IRELAND.

1 Pound	= 16 Ounces	=	7,000	Grains Troy.
1 Ounce	= 8 Drachms	=	437·50	Grains „
1 Drachm	= 3 Scruples	=	54·68	Grains „
	1 Scruple	=	18·22	Grains „

APOTHECARIES' WEIGHTS.—ENGLAND AND SCOTLAND.

1 Pound	= 12 Ounces	=	5,760	Grains Troy.
1 Ounce	= 8 Drachms	=	480	Grains „
1 Drachm	= 3 Scruples	=	60	Grains „
	1 Scruple	=	20	Grains „

The proportion between the two tables may be shortly stated as follows :—

1 Pound Troy : 1 Pound Avoirdupois : : 144 : 175.
1 Ounce Troy : 1 Ounce Avoirdupois : : 192 : 175.

SYMBOLS EMPLOYED.

The Pound.......................... lb.
The Ounce.......................... ℥
The Drachm.......................... ʒ
The Scruple.......................... ℈
The Grain.......................... gr.

The **Fluid Measures** were the same in the three British Pharmacopœias.

1 Gallon	= 8 Pints = 277.274 cubic inches.
1 Pint	= 20 Fluid Ounces.
1 Fluid Ounce	= 8 Fluid Drachms.
1 Fluid Drachm	= 3 Fluid Scruples.
1 Fluid Scruple	= 20 Minims.

SYMBOLS EMPLOYED.

The Gallon.......................... C. or Cong.
The Pint.......................... O.
The Fluid Ounce.......................... f℥
The Fluid Drachm.......................... fʒ
The Fluid Scruple.......................... f℈
The Minim.......................... ♏ or Min.

These symbols, both for weights and measures, although apparently no longer recognized by the Pharmacopœial authorities, are in my opinion too deeply rooted in the minds of practitioners, too intimately associated with our medical literature, and, more than all, too convenient, to be readily given up; at all events, for many years yet to come.

RELATION OF WEIGHTS OF THE BRITISH PHARMACOPOEIA TO METRICAL WEIGHTS.

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

RELATION OF MEASURES OF THE BRITISH PHARMACOPOEIA TO METRICAL MEASURES.

1 Gallon . . .	=	4.543467 litres.
1 Pint	=	0·567933 ,,
1 Fluid ounce . .	=	0·028396 ,,
1 Fluid drachm .	=	0·003549 ,,
1 Minim . . .	=	0·000059 ,,

METRIC WEIGHTS AND MEASURES USED IN PHARMACY,

With their English equivalents.

Calculated from 27° and 28° Victoria, cap. 117. An act to render permissive the use of the metric system of weights and measures.

WEIGHTS.

Milligramme	=	0.01543 grains.
Centigramme	=	0.15432 ,,
Decigramme	=	1.54323 ,,
GRAMME	=	15.43235 ,,
Decagramme	=	154.32349 ,,
Hectogramme	=	1543.23487 ,,
Kilogramme	=	15432.34870 ,,

APPROXIMATE VALUES.

Gramme	=	15½ Grains.
Kilogramme	=	35¼ oz. Avoirdupois.
,,	=	32 oz. Troy.

FLUID MEASURES.

Millilitre	=	0.00176 Pints.
Centilitre	=	0.01760 ,,
Decilitre	=	0.17607 ,,
LITRE	=	1.76077 ,,

APPROXIMATE VALUES.

Millilitre	=	17 Minims.
Centilitre	=	8½ Scruples.
Decilitre	=	3½ Ounces.
Litre	=	35¼ Ounces.

The weight of a Litre of water is one Kilogramme.

SYMBOLS AND EQUIVALENT WEIGHTS
OF ELEMENTARY BODIES.

Elementary Bodies	Symbols	Equivalent Weights
Aluminum . .	Al	13·75
Antimony (Stibium) .	Sb	122
Arsenic . .	As	75
Barium . .	Ba	68·5
Bismuth . .	Bi	210
Boron . .	B	11
Bromine . .	Br	80
Calcium . .	Ca	20
Carbon . .	C	6
Chlorine . .	Cl	35·5
Chromium . .	Cr	26·25
Copper (Cuprum) .	Cu	31·75
Gold (Aurum) . .	Au	196·5
Hydrogen . .	H	1
Iodine . .	I	127
Iron (Ferrum) . .	Fe	28
Lead (Plumbum) .	Pb	103·5
Lithium . .	L	7
Magnesium . .	Mg	12
Manganese . .	Mn	27·5
Mercury (Hydrargyrum) .	Hg	100
Nitrogen . .	N	14
Oxygen . .	O	8
Phosphorus . .	P	31
Platinum . .	Pt	98·5
Potassium (Kalium) .	K	39
Silver (Argentum) .	Ag	108
Sodium (Natrium) .	Na	23
Sulphur . .	S	16
Tin (Stannum) . .	Sn	59
Zinc . .	Zn	32·5

LIST OF BOOKS REFERRED TO,

CONTAINING PLATES OF OFFICINAL PLANTS.

Asiatic Researches. 20 vols. 4to. Calcutta, 1788—1836.
BIGELOW, *American Medical Botany.* 3 vols. 4to. London, 1817—1820.
Botanical Magazine. 8vo. London, 1787—1863.
Botanical Register. 33 vols. 8vo. London, 1815—1847.
English Botany. Smith and Sowerby. 36 vols. 8vo. London, 1790—1814.
Flora Londinensis. Curtis. 6 fasciculi, folio. London, 1777—1798.
HOOKER, *Journal of Botany.* 3rd Series, 9 vols. 8vo. 1849—1857.
HOWARD, *Illustrations of the Nueva Quinologia of Pavon.* Folio. London, 1862.
LAMBERT, *A Description of the genus Pinus.* 2 vols. folio. London, 1803, 1828.
LODDIGES, *The Botanical Cabinet.* 20 vols. 8vo. London, 1818—1833.
NEES VON ESENBECK, *Plantæ Medicinales.* 2 vols. folio. Düsseldorf, 1828.
Pharmaceutical Journal. 8vo. London, 1842—1863.
Philosophical Transactions of the Royal Society. 4to. London, 1665—1863.
RHEEDE, *Hortus Indicus Malabaricus.* 12 vols. folio. Amsterdam, 1678—1703.
RISSO ET POITEAU, *Histoire Naturelle des Orangers.* Folio. Paris, 1818.
ROXBURGH, *Plants of the Coast of Coromandel.* 3 vols. folio. London, 1795—1819.
ROYLE, *Illustrations of the Botany of the Himalaya Mountains, and of the Flora of Cashmere.* 2 vols. 4to. London, 1839.
RUMPHIUS, *Herbarium Amboinense.* 6 vols. folio. Amsterdam, 1741—1755.
STEPHENSON AND CHURCHILL, *Medical Botany.* 4 vols. 8vo. London, 1831.
Transactions of the Linnæan Society. 4to. London, 1791—1863.
Transactions of the Royal Society of Edinburgh. 4to. Edinburgh, 1788—1862.
WALLICH, *Plantæ Asiaticæ rariores.* 3 vols. folio. London, 1830—1832.
WEDDELL, *Histoire Naturelle des Quinquinas.* Folio. Paris, 1849.
WIGHT, *Icones Plantarum Indiæ Orientalis.* 6 vols. 4to. Madras, 1838—1853.
WOODVILLE, *Medical Botany.* 4 vols. 4to. London, 1790—1794.

CONTENTS.

CHAPTER I.—ANTACIDS.

CHAPTER II.—ANTHELMINTICS.

CHAPTER III.—ANTISPASMODICS.

CHAPTER IV.—ASTRINGENTS.

CHAPTER V.—CATHARTICS.

CHAPTER VI.—CAUSTICS.

CHAPTER VII.—DIAPHORETICS.

CHAPTER VIII.—DIURETICS.

CHAPTER IX.—EMETICS.

Page

CHAPTER X.—EMMENAGOGUES.

CHAPTER XI.—EMOLLIENTS.

Page

CHAPTER XII.—EPISPASTICS.

CHAPTER XIII.—EXPECTORANTS.

CHAPTER XIV.—NARCOTICS.

CHAPTER XV.—REFRIGERANTS.

CHAPTER XVI.—SEDATIVES OR CONTRA-STIMULANTS.

CHAPTER XVII.—SIALOGOGUES.

CHAPTER XVIII.—GENERAL STIMULANTS.

CHAPTER XIX.—SPECIAL STIMULANTS.

CHAPTER XX.—TONICS.

CHAPTER XXI.—SUPPLEMENTARY AGENTS.

MEDICINES,

THEIR USES AND MODE OF ADMINISTRATION.

CHAPTER I.

ANTACIDS.

(Alkalines—Antilithics—Absorbents—Lithontriptics).

ANTACIDS may be defined, in general terms, to be medicines which correct acidity by combining chemically with any free acid that may exist in the stomach or digestive organs, and neutralizing it. Their action is manifestly only temporary and palliative, as they do not correct that peculiar state of the digestive organs which causes the formation of acid; their protracted use, indeed, produces a tendency to acid secretion in the alimentary canal; and few individuals can bear the continued use of free or carbonated alkalies, a state of general anemia, usually attended with oxalic acid deposits in the urine, and symptoms somewhat analogous to those of scurvy, being caused thereby. Antacids should, therefore, be prescribed in combination with *vegetable tonics;* and in no case should their administration be long persisted in without occasional interruptions. Besides their merely chemical action, alkaline remedies aid the digestion and thereby promote the assimilation of fatty matters, thus resembling to a certain extent the action of the bile and pancreatic juice; they are consequently indicated when there is a deficiency of these secretions. When administered in full doses or their use continued for some time, the fibrine of the blood becomes diminished in quantity, and with the view of producing this effect alkalies are sometimes employed in inflammatory affections. One or two circumstances relating to the particular remedy of this class which ought to be employed, when they are administered with the intention of correcting acidity, may be here noticed :—When the acid exists in the stomach in the gaseous state, ammonia or its carbonates should be preferred, as, in consequence of their volatility, a gaseous acid, which would elude the action of the fixed alkalies, may be neutralized by them. If the acidity be present in the lower bowels, as in the cœcum or colon, magnesia or lime ought to be administered, as being less likely than the other antacids to be neutralized or absorbed before they reach that portion of the intestinal canal. When the acid exists in the urinary organs, the alkalies will be found best adapted, as they have a tendency to act more directly on the kidneys; and where it is *lithic acid* that predominates in the urine, the preparations of lithia or potash should be preferred to those of soda, as the salts formed by the former with the acid in question are much more soluble than those formed with the latter. In persons of a corpulent habit of body potash is to be preferred to ammonia or soda when the use of an alkali is indicated. And, finally, ammonia and its preparations are best adapted for the old and debilitated, as also for those of enfeebled constitution.

LIQUOR AMMONIÆ FORTIOR. *Strong Solution of Ammonia.*

Take of hydrochlorate of ammonia, in coarse powder, three pounds; slaked lime, four pounds; distilled water, thirty-two fluid ounces. Mix the lime with the hydrochlorate of ammonia, and introduce the mixture into an iron bottle placed in a metal pot surrounded by sand. Connect the iron tube, which screws air-tight into the bottle in the usual manner, by corks, glass tubes, and caoutchouc collars with a Woulf's bottle capable of holding a pint; connect this with a second Woulf's bottle of the same size, the second bottle with a matrass of the capacity of three pints, in which twenty-two ounces of the distilled water are placed, and the matrass, by means of a tube bent twice at right angles, with an ordinary bottle containing the remaining ten ounces of distilled water. Bottles 1 and 2 are empty, and the latter and the matrass which contains the twenty-two ounces of distilled water are furnished each with a siphon safety-tube charged with a very short column of mercury. The heat of a fire, which should be very gradually raised, is now to be applied to the metal pot, and continued until bubbles of condensible gas cease to escape from the extremity of the glass tube which dips into the water of the matrass. The process being terminated, the matrass will contain about forty-three fluid ounces of strong solution of ammonia.

Bottles 1 and 2 will now include, the first about sixteen, the second about ten fluid ounces of a coloured ammoniacal liquid. Place this in a flask closed by a cork, which should be perforated by a siphon safety-tube containing a little mercury, and also by a second tube bent twice at right angles, and made to pass to the bottom of the terminal bottle used in the preceding process. Apply heat to the flask until the coloured liquid it contains is reduced to three-fourths of its original bulk. The product now contained in the terminal bottle will be nearly of the strength of solution of ammonia, and may be made exactly so by the addition of the proper quantity of distilled water or of strong solution of ammonia.

EXPLANATION OF PROCESS.—On mixing hydrochlorate of ammonia (sal ammoniac) with slaked lime, we find, as the result of this process, that the chlorine leaves the sal ammoniac and unites with the lime, whilst the ammoniacal gas, set free, is absorbed by the water, which it is made to traverse, thus, $NH_4Cl + CaO, HO = CaCl + 2HO + NH_3$.

Ammoniacal gas, NH_3, dissolved in water, and containing 32·5 per cent. of the solution.

CHARACTERS.—A colourless liquid, with a characteristic and very pungent odour, a burning, very alkaline, acrid taste, and strong alkaline reaction.

TESTS.—Specific gravity, 0·891. One fluid drachm requires for neutralization 102 measures of the volumetric solution of oxalic acid. When diluted with four times its volume of distilled water, it does not give precipitates with solution of lime, oxalate or hydrosulphuret of ammonia, or ammonio-sulphate of copper; and, when treated with an excess of nitric acid, is not rendered turbid by nitrate of silver, or by chloride of barium.

The pharmacopœial tests indicate the usual impurities found in this solution. If, after the requisite dilution, it yields a precipitate (white) with solution of lime, that would indicate the presence of carbonate of ammonia, a salt constantly one of its constituents, and due to the abstraction of carbonic acid from the atmosphere; the oxalate of ammonia, if it produce a white precipitate, would indicate the presence of lime, one of the ingredients in the manufacture of the preparation. Copper (a rare impurity) would be indicated by the production of a precipitate (black) on the addition of the hydrosulphuret of ammonia; and sulphide of ammonium (also a rare impurity) is indicated by the precipitate (black) produced on the addition of the ammonio-sulphate of copper. The existence of chlorides or sulphates would be demonstrated by the turbidity produced on the addition, respectively, under the conditions stated, of the solutions of nitrate of silver and chloride of barium.

In addition to these impurities, Dr. Douglas Maclagan has described an adulteration of commercial water of ammonia with *pyrrol*, which, he supposes, occurs from its being distilled directly from the refuse water of the gas-house. The presence of this principle renders it completely unfit for use in either medicine or pharmacy. It may be readily detected by adding pure nitric acid, which produces a red colour, afterwards becoming purple, if any *pyrrol* be present.

PREPARATIONS.—Linimentum Ammoniæ, Linimentum Camphoræ compositum, Liquor Ammoniæ.

For the properties, &c. of this medicine see the next preparation.

Liquor Ammoniæ. Solution of Ammonia.

Take of strong solution of ammonia, one pint; distilled water, two pints; mix, and preserve in a stoppered bottle.

TESTS.—Specific gravity, 0·959. One fluid drachm requires for neutralization 30·8 measures of the volumetric solution of oxalic acid.

CHEMICAL PROPERTIES.—These two preparations, *Liquor Am-*

moniæ Fortior and *Liquor Ammoniæ*, are solutions in water, varying but in strength, of gaseous ammonia. Gaseous ammonia is composed of NH_3, or (according to Sir Robert Kane) of one equivalent of amidogene (NH_2) united to one of hydrogen. Ammoniacal gas is a colourless substance, resembling atmospheric air, but possessing a peculiar suffocative pungent odour, irrespirable unless when largely diluted with atmospheric air, and even then producing irritation attended by cough and distress to the pulmonary apparatus. Strongly alkaline in its reaction, it changes the color of the infusion of blue cabbage to green, and restores to reddened litmus paper its blue color; to turmeric paper it communicates a fugacious brown color. With acids it forms salts; its fumes, brought into contact with those of strong muriatic or nitric acids, furnishing dense white vapour, respectively muriates and nitrates of ammonia. It may be brought into a liquid state by conducting its gas when perfectly dry into a tube cooled to $-40°$; the liquid is then colourless; of sp. gr. 0·614, at 60°, and boils at the temperature of $-28°·66$ under a pressure of 29·5 inches of mercury. Faraday has succeeded in reducing it to a white crystalline solid at a temperature of $-103°$. Under a pressure of $6\frac{1}{2}$ atmospheres, ammonia is liquified at 50°.

So far for ammoniacal gas. Its solution in water may be recognized by its odour, taste, and alkaline reaction, fugacious with respect to the test papers; by the white fumes it yields with chlorine or hydrochloric acid, the deep blue color it gives with the salts of copper, and the white precipitate it throws down with corrosive sublimate. The chemical composition of both it and the salts of ammonia once for all will require attention. Two views have been put forward explanatory of their composition; one, that already alluded to, of Sir Robert Kane, the *amidogene* theory; the second—that of Berzelius, the *ammonium* theory. The first looks upon gaseous ammonia as composed of an hypothetical substance—amidogene (NH_2) united to hydrogen as a base; $H + NH_2 = NH_3$. The second theory—that of Berzelius, assumes the existence of a metallic base, ammonium (NH_4), which conducts itself with oxacids and hydracids precisely as any other metal would. The production of this base is thus accounted for: when ammoniacal gas (NH_3) is conveyed into water (HO) some of this latter is decomposed into its elements; the hydrogen unites with the ammonia (NH_3) to form ammonium (NH_4), with which the oxygen combines to form oxide of ammonium, which is dissolved in the remainder of the water, thus, $NH_3 + HO = NH_4O$.

When this gas comes into contact with an hydracid, the reaction is susceptible of an equally simple explanation; for instance, sal ammoniac is formed when the fumes of hydrochloric acid and of caustic water of ammonia are brought into contact; this, which had been represented as a simple union of the acid with the gas ($NH_3 + HCl$), can be reduced to the ammonium theory by a very simple and easily intelligible equation ($NH_3 + HCl = NH_4Cl$).

In the case of the oxacids the explanation is equally satisfactory. When the gas is brought into contact with, for instance, sulphuric acid (SO_3HO), the water is resolved into its elements, the hydrogen uniting with the ammonia to form ammonium, with which the oxygen unites, forming an oxide of ammonium, which unites with the sulphuric acid to form sulphate of ammonia, thus, $NH_3 + SO_3HO = NH_4O,SO_3$.

This latter, the ammonium theory, is that which is most generally adopted by chemists of the present day.

THERAPEUTICAL EFFECTS.—Ammonia acts as an antacid directly by its neutralizing powers; it also stimulates powerfully the digestive organs. It is therefore to be preferred to the other remedies of this class, in cases where we wish to combine the effects of a stimulant and antacid, as in cardialgia and flatulence arising from acidity of the stomach in debilitated constitutions; but if there is any tendency to inflammation present, it should not be employed. Of the two preparations, though both, *properly diluted*, may be administered internally, that which is designed for such purpose is the liquor ammoniæ, which contains about 12 per cent of ammoniacal gas; the stronger solution being reserved for external application. This weaker solution, as an antidote in poisoning with the mineral acids, is not so valuable as the other alkalies; but in cases of poisoning with prussic acid, oil of bitter almonds, &c., it is especially serviceable, its action on the system being directly to counteract the sedative effects of that acid. (See *Caustics*, *Epispastics*, and *General Stimulants*).

DOSE AND MODE OF ADMINISTRATION.—Min. v to min. xxx. diluted with at least one ounce of water, syrup, or any bland fluid.

INCOMPATIBLES.—All acids; and the earthy and metallic salts, except those of potash, soda, lime, and baryta.

In poisoning with ammonia, the best antidotes are the vegetable acids, of which perhaps vinegar is the most generally accessible, and of equal value.

*AMMONIÆ BICARBONAS. *Bicarbonate of Ammonia.* ($NH_4O, 2CO_2HO = 79$).

PREPARATION.—"Take of commercial sesquicarbonate of ammonia, any convenient quantity; reduce it to a fine powder, and, having spread it on a sheet of paper, expose it to the air for twenty-four hours. Let it be now enclosed in a well-stoppered bottle."

PHYSICAL PROPERTIES.—This salt, when prepared by crystallization, may be obtained in large crystals of the right rhombic prism series; it has a weak ammoniacal odour, and a saline taste.

CHEMICAL PROPERTIES.—It is composed of one equivalent of ammonia, two of carbonic acid, and two of water ($NH_3 2CO_2 +$

2HO), or of one equivalent of *amidogene*, one of hydrogen, two of carbonic acid, and two of water, H, NH_2 $2CO_2 + 2HO$ (Kane), or of one of oxide of ammonium, two of carbonic acid, and one of water, $NH_4O,2CO_2,HO$, (Berzelius). It is permanent in the air; exposed to a strong heat, it evaporates, leaving no residue if pure; it is soluble in eight parts of water at 60°; boiling water decomposes it, driving off part of its carbonic acid and ammonia. The solution in cold water is faintly alkaline.

THERAPEUTICAL EFFECTS.—This preparation, which was retained in the last edition of the Dublin Pharmacopœia, is an excellent antacid, though not much used; it possesses the stimulating properties of ammonia or of the sesquicarbonate, but in a far less degree; and, being more agreeable to the taste, is to be preferred in many cases. It also possesses the advantage of effervescing more freely in solution on the addition of an acid, which is of importance when ammonia is prescribed in any of the vegetable infusions or decoctions. Twenty grains of this salt require for its saturation about 19 grains of tartaric or 18 of citric acid.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xxx. It may be given in *cold* aqueous vehicles, or in any of the bitter vegetable infusions or decoctions.

INCOMPATIBLES.—Same as for the sesquicarbonate of ammonia.

AMMONIÆ CARBONAS. *Carbonate of Ammonia.* Synonym: *Ammoniæ Sesquicarbonas*, Lond. Dub. Sesquicarbonate of Ammonia, $2NH_4O,3CO_2=118$.

PREPARATION.—This salt, for the preparation of which we have no formula in the British Pharmacopœia, is generally prepared on the large scale by the reaction on each other of either the sulphate of ammonia or chloride of ammonium and chalk. A double decomposition ensues on these two substances, when powdered, being mixed together intimately, and heat applied; the carbonic acid of the chalk goes to the ammonia, and is volatilized as sesqui-carbonate of ammonia, whilst the sulphuric acid, or chlorine, as the case may be, remains with the lime; thus, on the ammonium theory, with sal ammoniac the reaction would be:—$3NH_4Cl + 3CaOCO_2 = 3CaCl + 2NH_4O,3CO_2 + NH_3 + HO$. The ammoniacal gas and the water here indicated are dissipated by the heat employed.

CHARACTERS.—In translucent crystalline masses, with a strong ammoniacal odour and alkaline reaction; soluble in cold water, more sparingly in spirit; and readily dissolved by acids with effervescence. In addition to these characters, this salt is recognized as one of ammonia by the tests already indicated for this substance under the head of Liquor Ammoniæ Fortior.

TESTS.—Volatilizes entirely when heated; when treated with an excess of dilute nitric acid, it gives no precipitate with chloride of barium or nitrate of silver. 50 grains are exactly neutralized by 84·74 measures of the volumetric solution of oxalic acid.

ADULTERATIONS.—If this salt contains any fixed or insoluble impurity, it will not be entirely sublimed by heat nor completely soluble in water. Sometimes, owing to bad preparation, it contains chloride of ammonium or sulphate of ammonia; their presence is detected, the former by nitrate of silver, the latter by chloride of barium causing a white precipitate in a solution of the salt, nitric acid having been previously added to saturation. Lead also is sometimes present, derived from the leaden receivers employed in its manufacture. This impurity may be signalized by the dark color resulting on the transmission through its solution of a stream of sulphide of hydrogen. The volumetric test indicates 22·0648 grains of the oxide of ammonium in each 50 grains.

THERAPEUTICAL EFFECTS.—As an antacid, it may be employed in the same forms of dyspepsia as the solution of ammonia; but where flatulence is present, the use of the carbonate is objectionable, owing to the carbonic acid which is set free in the stomach: its stimulant properties contraindicate its employment where there is any tendency to inflammation. Carbonate of ammonia is administered with much advantage in the lithic acid diathesis; and it has been used, it is stated, with much benefit in diabetes; but my own experience, as well as that of more recent observers, is not confirmatory of this statement. (See *Emetics and General Stimulants*).

DOSE AND MODE OF ADMINISTRATION.—Gr. iii. to gr. x. in pill, or in any *cold* aqueous vehicle. Gr. xxx. usually produces vomiting. It is frequently used in the form of effervescence. The relative proportions of this salt with the following acids are these:—20 grains of ammoniæ carbonas (B. P.) require for saturation 6 fluid drachms of freshly prepared lemon-juice; 24 grains of crystallized citric acid; and 25½ grains of crystallized tartaric acid. Thus administered, the salt ingested is either a citrate or tartrate, produces diaphoretic action, and is generally exhibited in febrile accesses.

PREPARATION.—Spiritus Ammoniæ aromaticus.

INCOMPATIBLES.—Acids; the fixed alkalies and their carbonates; bitartrate of potash; calcareous salts; and the salts of iron, zinc, lead, and mercury; but sulphate of magnesia is not incompatible with sesquicarbonate of ammonia.

LIQUOR CALCIS. *Solution of Lime.* (Synonym: *Lime-water*).

Take of slaked lime, two ounces; distilled water, one gallon. Introduce the lime into a stoppered bottle containing the water, and shake well for two or three minutes. After twelve hours the excess of lime will have subsided, and the clear solution may be drawn off with a siphon as it is required for use, or transferred to a green glass bottle furnished with a well-ground stopper. When the whole of the solution has been withdrawn from the bottle in which it was made, a fresh solution may be obtained by shaking the sediment at the bottom of the bottle with another gallon of distilled water; and if the lime be pure, and the bottle accurately stopped, the process may be repeated four or five times.

TEST.—Ten fluid ounces require for neutralization at least twenty measures of the volumetric solution of oxalic acid.

PHYSICAL PROPERTIES.—A transparent colourless liquid; odourless, but having a disagreeable, alkaline taste.

CHEMICAL PROPERTIES.—Lime is only sparingly soluble in water, requiring 732 parts of cold, and about 1,500 parts of boiling water for its solution (Wittstein); being therefore more soluble in cold than in hot water, so that a saturated solution, when boiled, deposits a hydrate of lime. The amount dissolved in water, at the following temperatures, has been established by the experiments of Mr. Phillips:—A pint of water at 32° dissolves gr. 13·25 of lime; at 60°, gr. 11·6; at 212°, gr. 6·7; results corresponding very nearly with those of Wittstein; boiling water dissolving but one-half the quantity of that dissolved by water at the freezing point. The volumetric test indicates an amount of lime corresponding to 11·2 grains to each pint. Exposed to the air, lime-water absorbs carbonic acid, and becomes covered with a thin crust of carbonate of lime; it must consequently be kept for medical use in well-stoppered bottles. According to M. Chevreul, lime-water, if kept in white glass bottles for any length of time, dissolves an appreciable portion of the oxide of lead which usually enters into their composition; it should therefore be preserved in those made of green glass. It acts faintly alkaline on vegetable colours, gives white precipitates with carbonic and oxalic acids, but does not precipitate with sulphuric acid.

THERAPEUTICAL EFFECTS.—Lime-water is a useful antacid in those forms of dyspepsia which are characterized by great irritability of the stomach, accompanied by constant secretion of acid. In the United States Dispensatory, a diet almost exclusively of lime-water and new milk, in the proportion of one part of the former to two or three of the latter, is recommended as a very effectual plan of treatment in dyspepsia accompanied by vomiting of food; but in such cases I have found Carrara water with milk much more efficacious. In the acidity of the stomach of the gouty and rheumatic diathesis, the alkaline antacids are usually preferred to lime; but the use of lime-water increases the urinary secretion and diminishes the tendency to the deposit of urates, indications of its therapeutical value in these diseases—a fact pointed out by Dr. Whytt of Edinburgh in 1733, and the value of which in years gone by gained great reputation for an empirical remedy, "Miss Joanna Stephens' receipt for stone and gravel"—a receipt for the disclosure of which Parliament in the year 1739 awarded a grant of £5,000, and which was found to be lime (the result of the calcination of egg-shells and snails), chamomile flowers, sweet fennel, parsley, burdock leaves, &c. Previous to this award, a committee of professional men had reported favourably on its efficacy in the treatment of the cases of four patients affected with stone, in all of whose bladder, after death, the stone was found! In virtue of its antacid properties, lime-water, combined with some one or other of the vegetable tonics, will also be found of great service in old-standing cases of atonic diarrhœa;

and in the diarrhœa attending typhoid fever, a combination of lime-water, milk, and a few drops of turpentine in each dose, with perhaps the addition of a few grains of bismuth, as the case may seem to require, will be found of signal service. In gastrodynia its administration in combination with milk has been attended with the happiest results. Lime-water may also be given as an antidote in poisoning with nitric, hydrochloric, or oxalic acids.

DOSE AND MODE OF ADMINISTRATION.—f℥j. to f℥iv. It is most conveniently administered in milk, which conceals its disagreeable taste; but as this addition might be injurious in some cases, it may be given alone. When lime-water has been administered for some time, its use should be occasionally intermitted.

INCOMPATIBLES.—The vegetable and mineral acids; alkaline and metallic salts; tartar emetic.

Liquor Calcis Saccharatus. Saccharated Solution of Lime.

Take of slaked lime, one ounce; refined sugar, in powder, two ounces; distilled water, one pint. Mix the lime and the sugar by trituration in a mortar. Transfer the mixture to a bottle containing the water, and, having closed this with a cork, shake it occasionally for a few hours. Finally, separate the clear solution with a siphon, and keep it in a stoppered bottle.

TESTS.—Specific gravity, 1·052. One fluid ounce requires for neutralization 25·4 measures of the standard solution of oxalic acid, which corresponds to 7·11 grains of lime.

This preparation, a formulary analogous to which was first suggested by M. Béral, and which was introduced into practice by Dr. Capitaine, differs but little from the Liquor Calcis just described, save in the increased amount of lime it contains. Its therapeutical uses are identical with those of lime-water, requiring, however, in consequence of its causticity, rather free dilution. The dose for children will be from 20 to 30 minims; for adults, 1 to 3 drachms, which may be repeated twice or thrice a day. Its chemical history may be considered as identical with that of Liquor Calcis. M. Trousseau employs it in the chronic diarrhœa of infants, and, when they are liable to this complaint, recommends its addition in small quantities to the milk ordinarily employed as an article of their diet.

CRETA PRÆPARATA. *Prepared Chalk.* Carbonate of Lime, $CaO, CO_2 = 50$, nearly pure.

Take of chalk, one pound; water, a sufficiency. Reduce the chalk to powder, and, having rubbed this in a mortar with as much water as will give it the consistence of cream, fill the mortar with more water, and stir well, giving the whole a circular motion. Allow the mixture to stand for fifteen seconds, and then decant the milky liquid into a large vessel. Rub what remains in the mortar, adding as much water as was previously used, and, after allowing it to settle for fifteen seconds, again decant, and let this process be repeated several times, using, if necessary, additional chalk. Transfer the fine sediment which subsides from the decanted liquids to a filter, and dry it at a temperature of 212°.

CHARACTERS.—A white amorphous powder, effervescing with acids, and dissolving perfectly, or with a mere trace of residue, in dilute hydrochloric acid. This solution, when supersaturated with solution of ammonia, gives, upon the addition of oxalate of ammonia, a copious white precipitate.

TEST.—The salt formed by dissolving the chalk in hydrochloric acid, if rendered neutral by evaporation to dryness and redissolved in water, gives only a very scanty precipitate on the addition of saccharated solution of lime.

The directions given in the Pharmacopœia require but little explanation; by the process directed, the coarser particles are first allowed to precipitate, and, on subsequent decantation and rest, the chalk in the form of a fine powder subsides, and on drying is fit for use. Its complete solution in hydrochloric acid indicates the absence of silica as also of sulphate of lime, which in a finely-ground state has been sometimes substituted for it. The copious white precipitate produced on the addition of oxalate of ammonia is oxalate of lime. The previous saturation with ammonia is essential, as the oxalate is soluble in the acid solution; whilst, under the conditions stated in the *test*, the absence of oxide of iron, magnesia, alumina, baryta, and strontian is to be presumed.

In addition, it may be stated that carbonate of lime is occasionally found in conical masses of a greyish-white color; that it is odourless and tasteless, but adherent to the tongue; that it is permanent in the air; but that, if exposed to a red heat, it parts with its carbonic acid, and is converted into quicklime; that it is miscible with, but scarcely soluble in, water, one part requiring about 1,600 parts of cold, and 8,834 parts of boiling water for its solution, and that it dissolves in large quantity in water containing carbonic acid, from which, however, it is deposited on exposure to the air.

THERAPEUTICAL EFFECTS.—Chalk is employed with much benefit as an antacid in acidity of the digestive organs, especially when accompanied by diarrhœa, as is so frequently the case in infancy and childhood; for this purpose it is advantageously combined with aromatics or with opium. It is an excellent antidote in poisoning with nitric, hydrochloric, or oxalic acids, and is used with benefit as a desiccant in bed-sores, burns and scalds, intertrigo, erysipelas, and some forms of skin diseases when unattended with local inflammatory action. Carbonate of lime dissolved in water by means of carbonic acid in excess constitutes an aerated solution of the bicarbonate, and is sold by venders of mineral waters under the name of *Carrara water*. This is a most useful and agreeable form for its administration, and when given mixed with an equal quantity of milk, is productive of excellent effects in many forms of chronic dyspepsia, especially in those characterized by pain, excessive secretion of air in the stomach, by regurgitation of food, and by vomiting. The quantity of bicarbonate of lime, however, held in solution is so small, that its action as an antacid is but trifling. All preparations of lime are contra-indicated in cases in which there is a tendency to phosphatic deposits in the urine, or to habitual constipation.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. cxx. in powder or in mixture. The *Carrara water* may be taken as an ordinary drink, just as soda water is employed.

PREPARATIONS.—Hydrargyrum cum cretâ (described under the head of Cathartics); mistura; pulvis cretæ aromaticus; pulvis cretæ aromaticus cum opio (described under the head of Astringents).

Mistura Cretæ. Chalk mixture. (Take of prepared chalk, a quarter of an ounce; gum arabic, in powder, a quarter of an ounce; syrup, half a fluid ounce; cinnamon water, seven fluid ounces and a-half. Triturate the chalk and gum arabic with the cinnamon water, then add the syrup, and mix). Chiefly used in diarrhœa for its antacid properties, and as a vehicle for more active medicines. Dose, f℥j. to f℥ij.

Pulvis Cretæ Aromaticus. Aromatic Powder of Chalk. Syn. *Confectio Aromatica,* L. *Pulvis Cretæ Compositus,* D. (Take of prepared chalk, one pound; aromatic powder, three pounds. Mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle). This preparation is proposed as the analogue of the aromatic confection of the London Pharmacopœia, which contained about one third its weight of prepared chalk, which, however, constitutes but one fourth its bulk of the present preparation. In the analogous preparation of the Dublin Pharmacopœia the chalk constituted one half its amount. The water requisite to convert the powder into a confection is omitted, as, if added to the mass, and it be kept for some time, it renders it liable to ferment. The powder is antacid and aromatic, well suited for employment in the gastric disturbances of young patients. Dose, from gr. v. to gr. lx.

CALCIS CARBONAS PRÆCIPITATA. *Precipitated Carbonate of Lime.*

Take of chloride of calcium, five ounces; carbonate of soda, thirteen ounces; boiling distilled water, a sufficiency. Dissolve the chloride of calcium and the carbonate of soda each in two pints of the water, mix the two solutions, and allow the precipitate to subside. Collect this on a calico filter, wash it with boiling distilled water, until the washings cease to give a precipitate with nitrate of silver, and dry the product at the temperature of 212°.

On mixing these two solutions together, double decomposition ensues; the oxygen and carbonic acid of the carbonate of soda go to the calcium and form carbonate of lime, whilst the chlorine goes to the sodium to form chloride of sodium:—thus $Ca\,Cl + NaO, CO_2\ 10HO = CaO, CO_2 + Na\,Cl + 10HO$. The directions with respect to the nitrate of silver are to indicate the complete washing away of the resulting chloride of sodium, as so long as it is present it will yield a white precipitate, chloride of silver, with this solution. A more elevated temperature than that directed might result in the production of caustic lime.

CHARACTERS.—A white crystalline powder, insoluble in water, dissolving in hydrochloric acid with effervescence. The solution when neutralized by ammonia, on the addition of oxalate of ammonia, lets fall a copious white precipitate.

TESTS.—With dilute nitric acid it gives a clear solution, which, if perfectly neutral, is not precipitated by saccharated solution of lime added in excess, or by the solution of nitrate of silver.

PREPARATION.—Mistura Cretæ.

The remarks made as to the chemical history of prepared chalk apply with equal force to this preparation. Precipitated carbonate of lime is not much employed in medicine, as it possesses but little advantage over prepared chalk, and is much more expensive; its chief use is as an ingredient in tooth-powders. Although indicated in the Pharmacopœia as a constituent of the chalk mixture, it is not so in fact, prepared chalk being the preparation which is employed; it is, however, a constituent of the *trochisci bismuthi*, which will be described hereafter.

LITHIÆ CARBONAS. *Carbonate of Lithia.* LO, CO_2=(37).

In the year 1817 Arfwedson announced the existence of lithia in the mineral petalite, since when its presence has been signalized in many other minerals, such as triphane, lepidolite, spodumene, as also in the Carlsbad and other waters. Davy ascertained that it was the oxide of the metal lithium, a metal which is the lightest of all known solids, its specific gravity being 0·594, of a white colour, softer than lead, capable of being welded and drawn out into wire, decomposing water, uniting with its oxygen and setting free the hydrogen, but without producing the phenomenon of flame; heated in the air, it burns with an intense white light. In spectrum analysis it yields a dark spectrum with two bright lines, one a pale yellow, the other a bright red. This metal, as well as its salts, is characterised by the splendid crimson red colour which it communicates to the flame of alcohol; its carbonate distinguishes it from the carbonates of the alkaline earths by its superior solubility, whilst the solubility of its chloride in alcohol distinguishes it from potash and soda. No directions are given in the Pharmacopœia for the preparation of the carbonate; but it is easily prepared in virtue of the reaction that ensues on the mixture of a strong solution of carbonate of ammonia with a saturated solution of sulphate of lithia, when, on the application of heat, a white precipitate falls down, the carbonate of lithia, whilst sulphate of ammonia is held in solution. Sulphate of lithia is itself generally prepared in the following manner:—Lepidolite, a mineral which contains from 3 to 4 per cent. of lithia, in combination with potassa, soda, alumina, lime, &c., is finely powdered, mixed with double its weight of quicklime, and then calcined in a strong forge fire; the product is then boiled in water, to which slaked lime has been added. The liquid is next decanted, saturated with hydrochloric acid, and evaporated, when chloride of potassium is deposited; the alumina and lime are partially precipitated by the addition of an excess of carbonate of ammonia, and on evaporation to dryness and calcination of the residue, the ammoniacal salts are expelled, leaving behind but a mixture of chlorides of potassium, sodium, and lithium; this latter is dissolved out by strong alcohol, which, on distillation, yields chloride of lithium, a deliquescent salt, which, by the addition of strong sulphuric acid, can be converted into the sulphate of lithia.

CHARACTERS.—In white powder or in minute crystalline grains, alkaline in reaction, soluble in 100 parts of cold water, insoluble in alcohol. It dissolves with effervescence in hydrochloric acid; and the solution, evaporated to dryness, leaves a residue of chloride of lithium, which, redissolved in water, yields a precipitate with phosphate of soda.

TESTS.—Ten grains of the salt, neutralized with sulphuric acid, and afterwards heated to redness, leave 14·86 grains of dry sulphate of lithia; which, when redissolved in distilled water, yields no precipitate with oxalate of ammonia or solution of lime.

The precipitate produced on the addition of phosphate of soda is phosphate of lithia. The oxalate of ammonia, used as a *test,* would indicate (were it present) lime which had been employed in the process for extracting the salts of lithia from the minerals in which it exists. The solution of lime would indicate the presence of alumina.

LITHIÆ CITRAS. *Citrate of Lithia.* $3LO, C_{12}H_5O_{11}=210$.

Take of carbonate of lithia, fifty grains; citric acid, in crystals, ninety grains; warm distilled water, one fluid ounce. Dissolve the citric acid in the water, and add the carbonate of lithia in successive portions, applying heat until effervescence ceases, and a perfect solution is obtained. Evaporate by a steam or sand bath till water ceases to escape, and the residue is converted into a viscid liquid. This should be dried in an oven or air-chamber, at the temperature of about 240°, then rapidly pulverized, and enclosed in a stoppered bottle.

The citrate of lithia is readily prepared by the pharmacopœial process. On the addition of the carbonate of lithia to the solution of citric acid its carbonic acid is expelled, and the citrate of lithia is held in solution, and can be recovered as directed; its deliquescence renders necessary the direction that it should be kept in a stoppered bottle. The reaction that ensues is thus expressed, $3(LO, CO_2)+(3HO, C_{12}H_5O_{11}+HO)=4HO+3CO_2+3LO, C_{12}H_5O_{11}$.

CHARACTERS.—A white amorphous powder, deliquescent, and soluble in water without leaving any residue. Heated to redness it blackens, evolving inflammable gases; and the residue, neutralized by hydrochloric acid, yields with rectified spirit a solution which burns with a crimson flame.

TEST.—Twenty grains of the salt, burned at a low red heat, with free access of air, leave 10·6 grains of white residue *(carbonate of lithia).*

THERAPEUTICAL EFFECTS.—The medicinal properties of lithia and its salts are still *sub judice.* The low position which the equivalent of lithia occupies on the hydrogen scale would, *a priori,* indicate many of its salts as being antacids of considerable power, but it is principally with reference to the gouty diathesis that they now are of importance. Some five and twenty years ago Lipowitz, Ure, and Binswanger drew attention to the solvent powers over uric acid calculi possessed by the carbonate of lithia, powers notably excelling those possessed by the other alkaline carbonates, and Mr. Ure suggested the injection of solutions containing this salt into the bladder in cases of urinary calculi, composed either in whole or in part of uric acid. To Dr. Garrod, however, is the merit due of utilizing these observations and rendering them of practical value. Up to the time of Bunsen lithium and its salts were but a matter of scientific interest, considerable difficulty being experienced in demonstrating their presence; but, by the agency of spectrum analysis, they have been proved to be not only a constituent of minerals, but also of the animal and vegetable kingdoms, being present in sea-water; in numbers of springs, many of which enjoy a world-wide reputation in the treatment of gout; in the ashes of many plants, as also in the blood, muscles, and milk of the human subject.

Dr. Garrod extended the experiments alluded to of Ure, &c., by comparative observations as to the relative solvent powers possessed over cartilage incrusted with gouty deposits of urate of soda, of the carbonates of lithia, potash, and soda, and found that while the first completely removed them, and the second acted strongly upon them, the third seemed to leave them unaltered. Encouraged by these results, he has subjected the salts of lithia to a very extended clinical experience, and with apparently most satisfactory results. He finds that though not to be depended upon to the exclusion of other well-known and approved remedies in the treatment of acute gout (although even here of use as auxiliaries), in cases of chronic gout they are of great service in checking the deposit of gouty concretions, if not of removing them when formed; and he has also found them valuable agents in a prophylactic sense. Their alkalizing and diuretic properties are well marked. Dr. Garrod recommends that these salts should be administered in a state of free dilution, preferring the preparations known to mineral water manufacturers as *lithia water*, preparations in which the carbonate of lithia is held in solution by an excess of carbonic acid, and which are prepared by Messrs. Bewley and Hamilton of this city of two strengths, containing respectively two or four grains of the carbonate to the half-pint of water. I may remark that I have found this preparation of great service as an ordinary drink in the case of patients affected with gouty dyspepsia, attended with pain and flatulence. The citrate of lithia, in consequence of its greater solubility, may be preferred to the carbonate; it can be administered in doses from three to five grains, or more, dissolved in water, to which some syrup and carminative tincture may be added to suit the palate.

MAGNESIA *Magnesia.* $MgO=20$. *Calcined Magnesia.*

Take of carbonate of magnesia, four ounces. Introduce the carbonate of magnesia

into a Cornish or Hessian crucible, closed loosely by a lid, and let this be exposed to a low red heat as long as a little of the powder, taken from the centre of the crucible, when cooled and dropped into dilute sulphuric acid, gives rise to effervescence. The product should be preserved in corked bottles.

CHARACTERS.—A white powder, insoluble in water, but readily dissolved by acids without effervescence. Its solution in hydrochloric acid, when neutralized by a mixed solution of ammonia and hydrochlorate of ammonia, gives a copious crystalline precipitate when phosphate of soda is added to it.

TESTS.—Dissolved in nitric acid, and neutralized with a mixture of ammonia and hydrochlorate of ammonia, it does not give any precipitate with oxalate of ammonia or chloride of barium.

For the properties, &c., of this medicine see the next preparation.

Magnesia Levis. Light Magnesia. $MgO = 20$.

Take of light carbonate of magnesia, four ounces. Introduce the carbonate of magnesia into a Cornish or Hessian crucible, closed loosely by a lid, and let this be exposed to a low red heat as long as a little of the powder, taken from the centre of the crucible, when cooled and dropped into dilute sulphuric acid, gives rise to effervescence. The product should be preserved in corked bottles.

CHARACTERS.—A bulky white powder, differing from the preceding preparation only in its greater levity, the volumes corresponding to the same weight being to each other in the ratio of three and a-half to one.

By these processes the carbonic acid and water, in each case, of the carbonate of magnesia employed is expelled by the heat directed, and the oxide of magnesium is left behind, thus, $3(MgO, CO_2 + HO) + MgO, 2HO = 4MgO + 3CO_2 + 5HO$.

Should any of the powder effervesce under the conditions stated, it would manifestly indicate the insufficient calcination of the carbonate. A *low* red heat is directed, as a fiercer one would render the product less soluble in acids, and consequently less valuable as a remedial agent. It is directed to be preserved in well corked bottles, as by exposure to the air it slowly absorbs carbonic acid and moisture. The copious precipitate alluded to in the *characters* is the ammoniacal phosphate of magnesia, whilst the non-production of a precipitate under the conditions stated in the *tests* with oxalate of ammonia indicates the absence of lime; with chloride of barium, of sulphate of magnesia.

PHYSICAL PROPERTIES.—A very light soft powder, perfectly white, odourless and tasteless, slightly adherent to the tongue. Specific gravity about 2·3.

CHEMICAL PROPERTIES.—Magnesia consists of one equivalent of the metal magnesium, and one of oxygen. Exposed to the air it slowly absorbs carbonic acid and moisture; it is highly infusible; like lime, it is more soluble in cold than in hot water, requiring 5142 times its weight of water at 60° for its solution, and 36,000 parts of boiling water; but it differs from lime in not, on the addition of water, producing a marked elevation of temperature. When moistened it acts feebly alkaline on vegetable colours.

ADULTERATIONS.—Magnesia generally contains some carbonate, either from faulty preparation or bad keeping; the presence of which is indicated by effervescence being caused on the addition of any dilute mineral acid. It is frequently adulterated with lime, silica, and alumina. If it contains silica, it will not dissolve completely in dilute hydrochloric acid; if alumina is present, the solution in the dilute acid precipitates with excess of ammonia; and if lime is present, solution of oxalate of ammonia, or of the bicarbonate of potash, gives a white precipitate with the solution in the dilute acid. Sulphate of magnesia sometimes exists in it; this is detected by solution of chloride of barium giving a white precipitate with the solution in hydrochloric acid. Magnesia is occasionally made to absorb water in order fraudulently to increase its weight, which may be thus augmented from 17 to even 40 per cent.; this fraud may be detected by the loss of weight which occurs on exposure to a red heat. Chevallier states that in one instance he found it adulterated with flour, a sophistication readily detected by its not being completely soluble in dilute hydrochloric acid, or by the addition of iodine striking with the flour a blue colour.

THERAPEUTICAL EFFECTS.—As an antacid, magnesia is employed in dyspepsia attended with acidity of the stomach and with constipation; in such cases it is generally preferred to the alkalies, as being less irritant, and as the combinations which it forms with the free acids of the stomach are generally laxative. In gastrodynia and heartburn, given in combination with some aromatic a short time before the meals, it seldom fails to prove beneficial. It is also administered with much advantage in the acidity attendant on infantile diseases; in that of persons of a gouty and rheumatic diathesis, as it diminishes the quantity of uric acid in the urine; and in lithiasis. Magnesia is also used as an antidote in poisoning with the mineral acids, but its employment in such cases is objectionable, for, during its combination with the acids, a degree of heat sufficient to destroy the mucous membrane of the stomach is produced. In poisoning with arsenic it proves an efficacious antidote, for which purpose it should be administered suspended in water or milk. (See *Cathartics*).

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. twice or three times daily. It may be given suspended in milk, in some of the bitter vegetable infusions, or in some aromatic water. In prescribing it, practitioners should always bear in mind the danger, after long continued use, of its forming concretionsi n the alimentary canal, depending, as it does, for its elimination on the amount of acids which it may meet in the primæ viæ. Many cases are on record where large masses have been met with in the intestines, agglutinated together with intestinal mucus, months after its administration had been discontinued. Although the two forms are introduced into the Pharmacopœia, I am not satisfied as to the existence of any marked difference in their physiological effects or therapeutic uses. The lighter variety (Magnesia levis) is that employed in the preparation of the Pulvis Rhei Compositus. A preparation termed White's Saccharized Hydrate of Magnesia has been recently introduced to the notice of the profession by Messrs. Boileau of this city. It is a gelatinous whitish fluid, of an agreeable lemon odour and sweetish taste—properties which suit it admirably as a medicine for children. The directions for use are as follows:—For children under six months, one tea-spoonful; six to nine months, two tea-spoonfuls; nine to eighteen months, one dessert-spoonful; over eighteen months, one table-spoonful. For adults, half a wine-glassful. Two ounces, or one wine-glassful, is stated to contain a quantity of magnesia equivalent to 40 grains of the carbonate.

INCOMPATIBLES.—Acids; acidulous salts; metallic salts; and hydrochlorate of ammonia.

MAGNESIÆ CARBONAS. *Carbonate of Magnesia.* $3(MgO, CO_2 + HO) + MgO, 2HO = 173$. Syn.—*Magnesiæ Carbonas Ponderosum*, D.

Take of sulphate of magnesia, ten ounces; carbonate of soda, twelve ounces; boiling distilled water, a sufficiency. Dissolve the sulphate of magnesia and the carbonate of soda each in a pint of the water, mix the two 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 the water, and having collected the insoluble matter on a calico filter, wash it repeatedly with distilled water, until the washings cease to give a precipitate with chloride of barium. Finally dry the product at a temperature not exceeding 212°.

CHARACTERS.—A white granular powder, which dissolves with effervescence in the dilute mineral acids, yielding solutions which, when first treated with hydrochlorate of ammonia, 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.

TESTS.—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. Fifty grains calcined at a red heat are reduced to twenty-two.

For the properties, &c. of this medicine see the next preparation.

Magnesiæ Carbonas Levis. Light Carbonate of Magnesia. $3(MgO, CO_2 + HO) + MgO, 2HO = 173$.

Take of sulphate of magnesia, ten ounces; carbonate of soda, twelve ounces; distilled water, a sufficiency. Dissolve the sulphate of magnesia and the carbonate of soda, each in half a gallon of the water, mix the two solutions cold, and boil the mixture in a porcelain dish for fifteen minutes. Transfer the precipitate to a calico filter, and pour upon it repeatedly boiling distilled water, until the washings cease to give a precipitate with chloride of barium. Lastly, dry by a heat not exceeding 212°.

CHARACTERS.—A very light powder, which, when examined under the microscope, is found to be partly amorphous, with numerous slender prisms intermixed. The other characters and tests are the same as those of carbonate of magnesia.

I have grouped these two preparations together, as the chemical reaction that ensues in the manufacture of each admits of the same explanation. At first sight it might be supposed that the carbonate of soda and sulphate of magnesia would re-act upon each other so as to produce a carbonate of magnesia and sulphate of soda, of which the former would be precipitated, and the latter held in solution, thus, $MgO, SO_3 + NaO, CO_2 = MgO, CO_2 + NaO, SO_3$; the water which enters into the composition of each of the salts being omitted in the equation, as not playing any part in the decomposition. Such, however, is but partially, not entirely true; one portion of the materials so conduct themselves, but another portion, instead of forming a carbonate, makes a bicarbonate of magnesia, at the expense of one of the atoms of carbonate of magnesia, which thus robbed of its carbonic acid is precipitated as oxide of magnesium—and so causing the precipitate to be composed partially of carbonate of magnesia and partly of oxide. The bicarbonate thus formed being a soluble salt would be lost in the process, were it not that by the boiling directed, its second atom of carbonic acid is subsequently expelled, and it also is precipitated as carbonate of magnesia. The following equation accounts for the production of the pharmacopœial preparation. $4(MgO, SO_3 + 7HO) + 4(NaO, CO_2 + 10HO) = 3(MgO, CO_2 + HO) + MgO, 2HO + CO_2 + 4(NaO, SO_3, 10HO) + 23HO$. Were a precipitate to be produced under the conditions stated in the "characters," on the addition of a solution of ammonia, it would indicate the presence of alumina, the salts of magnesia so formed being soluble under the conditions stated. The precipitate yielded upon the addition of the phosphate of soda is the ammoniaco-magnesian phosphate. Were it to precipitate under the conditions stated in the "tests," on the addition of chloride of barium, the existence of sulphate of magnesia is to be inferred, whilst lime would be detected by the oxalic acid used as directed. In addition to the characters given us in the Pharmacopœia, it may be stated to be inodorous, tasteless, permanent in the air, very sparingly soluble in water, requiring 2,493 parts of cold, and 9,000 of hot water for its solution. It is far more soluble in water charged with carbonic acid. The relative amount of intimate aggregation of their particles constitutes the sole difference between the two preparations; and this is effected by employing a large amount (one gallon) of water in the process when we require a light specimen; but when we wish for the heavy variety, using a small quantity (one quart). The washing directed is to remove either carbonate or sulphate of soda, which are carried down with the carbonate of magnesia, the final absence of which salts is indicated by the non-production of a precipitate on the addition to the washings of a solution of chloride of barium.

THERAPEUTICAL EFFECTS.—Carbonate of magnesia is employed as an absorbent and antacid in the same cases as magnesia; but, owing to the carbonic acid which is disengaged in the stomach when it meets with the acids naturally present in that viscus, its use is objectionable in many cases. The light and heavy carbonates of magnesia, precisely similar in chemical composition, appear to have an analogous therapeutical action; but from a fancied idea of superiority as regards certainty and mildness of effect, the latter is preferred by many practitioners. (See also *Cathartics*).

DOSE AND MODE OF ADMINISTRATION.—Gr. xv. to gr. xxx. It may be administered suspended in milk, or in some aromatic water. The most convenient form, however, for the exhibition of the carbonate of magnesia, is the solution in carbonated water which was first introduced to the notice of the profession by Sir James Murray of this city; and is still manufactured very extensively on his original plan, and also according to the method of the late Mr. Dinneford, both being in general very excellent preparations. It is prepared by exposing distilled water, in which very pure carbonate of magnesia is suspended (in the proportion of from 10 to 20 grains of the latter to every ounce of the former), to a stream of carbonic acid gas forced into it by means of steam power, until a complete solution is formed. It then constitutes *Aqua Magnesiæ bicarbonatis*, and is given as an antacid in doses of f℥ss. to f℥iss. This preparation, as prepared by different makers, is very liable to vary in strength, and in some instances a solution of sulphate of soda is substituted for it. Messrs. Bewley and Hamilton of this city prepare a solution containing ten grains of the carbonate of magnesia to each ounce. By the following simple method proposed by Mr. Redwood of London the precise quantity of carbonate of magnesia contained in it may be readily ascertained :—Evaporate a fluid ounce of the solution to dryness in a Wedgewood dish ; calcine the residue at a red heat for about five or ten minutes in a small Berlin crucible; then weigh the calcined residue. If this residue be pure calcined magnesia, every five grains of it will be equivalent to twelve grains of the hydrated carbonate of magnesia of commerce; after weighing the calcined residue, treat it with distilled water, when, if there are any soluble salts present, they will be dissolved out, and may be tested, weighed, and the amount deducted from the weight of the magnesia.

PREPARATION.—Trochisci Bismuthi.

INCOMPATIBLES.—Acids ; acidulous and metallic salts ; hydrochlorate of ammonia ; lime, baryta, potassa, soda.

LIQUOR POTASSÆ. *Solution of Potash.*

Take of carbonate of potash, one pound ; slaked lime, twelve ounces ; distilled water, one gallon. Dissolve the carbonate of potash in the water, and having heated the solution to the boiling point in a clean iron vessel, gradually mix with it the slaked lime, and continue the ebullution for ten minutes with constant stirring. Then remove the vessel from the fire ; and when, by the subsidence of the insoluble matter, the supernatant liquor has become perfectly clear, transfer it by means of a siphon to a green-glass bottle, furnished with an air-tight stopper.

EXPLANATION OF PROCESS.—On the addition of the slaked lime to the carbonate of potash, the latter is deprived of its carbonic acid, which unites with the lime to form a carbonate of lime, which, being insoluble, is precipitated, whilst the potash is held in solution, and separated from the carbonate of lime by means of a siphon—the readiest way, inasmuch as the liquor potassæ would act upon paper or woollen filters; besides which, the prolonged exposure to the air would enable it to abstract carbonic acid, and thus develope in it as an impurity, carbonate of potassa. This equation explains the reaction, $KO, CO_2\ 2HO + CaO = CaO, CO_2 + KO + 2HO$.

TESTS.—Specific gravity 1·058. One fluid ounce requires for neutralization 48·25 measures of the volumetric solution of oxalic acid. It does not effervesce when added to an excess of dilute hydrochloric acid, nor give a precipitate with lime or oxalate of ammonia. When it is treated with an excess of dilute nitric acid, 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.

Its not effervescing on the addition of the acid, and not being precipitated on the addition of lime, indicate the absence of carbonate of potassa. Were it to precipitate on the addition of oxalate of ammonia, the presence of lime is to be inferred; the chloride of barium would indicate the presence of sulphates; the nitrate of silver, of chlorides; the ammonia, of silica. The volumetric test establishes the presence of 20·67 grains of caustic potash in each fluid ounce.

PHYSICAL APPEARANCES.—A transparent colourless liquid, odourless, of intensely alkaline acrid taste, and of oleaginous feel, caused by the formation of a soap when rubbed between the fingers, resulting from the action of the alkali on the fatty matters of the cuticle.

CHEMICAL PROPERTIES.—Highly alkaline in its reaction on the test papers. Solutions of tartaric, perchloric, and carbozotic acids precipitate with it, respectively, bitartrate, perchlorate, and carbozotate of potash. If the solution of tartaric acid be not in excess, it may require brisk agitation to develope the precipitate. A solution of bichloride of platinum throws down a yellow precipitate; it and the salts of potash communicate a *violet* colour to the flame of alcohol, as also in blow-pipe analysis. In spectrum analysis, potassium gives a red line in the extreme red rays, and a violet in the extreme violet rays. It is directed to be kept in bottles of green glass, as it slowly acts on the lead contained in those of white glass, cementing the stopper to the neck of the bottle.

THERAPEUTICAL EFFECTS.—In dyspepsia attended with acid eructations, cardialgia, and gastrodynia, solution of potash is employed with much benefit, and especially in those derangements of the digestive organs consequent on excessive indulgence in spirituous liquors. It not only neutralizes the free acid, but also counteracts the morbid tendency of the stomach to acid secretion; it must, however, be remembered that its action is only temporary, and that its continuous use deranges digestion and produces a tendency to acid secretion. Its beneficial action is often manifested in various forms of chronic cutaneous diseases, such as psoriasis, acne, and pityriasis, when they are dependent on or connected with acidity of the digestive organs, in which cases it should be preferred to the other remedies of this class. In the acidity of the stomach of the gouty and rheumatic, and in deposits of lithic acid or the lithates in the urine, solution of potash is also administered with much advantage. In scrofulous affections of the testis, of the mammary, salivary, and mesenteric glands, in bronchocele, in chronic enlargements of the liver, and in many forms of external tubercular disease, the internal use of this remedy is in general productive of excellent effects. Potash and its salts are rapidly absorbed from the stomach and pass into the blood, the alkalinity of which fluid they augment, and by rendering the fibrine more soluble tend to prevent its deposition, both of which effects serve as indications for its therapeutical employment. Solution of potash, when taken for some time, diminishes nutrition, and promotes the absorption of fat which may have accumulated or been deposited; it thus proves the most beneficial remedy in *fatty* diseases, and is productive of excellent effects in preventing or removing the adipose condition of the body to which some persons are liable; for these purposes I have repeatedly used it with the most satisfactory results. The effects of solution of potash on the system generally, but more especially on the urine, have been very carefully and ably investigated by Dr. Parkes of London. (*British and Foreign Medico-Chirurgical Review*, vol. xi. page 258). In ardor urinæ its value has long been recognized by every practical surgeon; and in chronic bronchitis, attended with thick, viscid, and difficult expectoration, it proves of service in liquifying the mucus. Large doses of this solution prove an energetic poison. Such cases, however, are rare, being in general the result of accident. The best antidotes are vinegar, lemon-juice, and the fixed oils. It should be remembered that perforation results more rapidly on the action of the caustic alkalies on the coats of the stomach than even of the strong acids, these latter forming a coagulum with the intestinal mucus, which for a time limits the further action of the poison; whilst, on the contrary, it forms soluble compounds with the caustic alkalies, thus affording a fresh surface for their continued action; hence more prompt measures, if possible, are required in poisoning by the caustic alkalies than in the case of the acids.

DOSE AND MODE OF ADMINISTRATION.—Min. x. gradually increased to f℥j. or f℥ij.; it should be largely diluted. Fresh table-beer, or veal broth, partly conceals its nauseous taste, and consequently either may be employed as a vehicle for its administration. The combination with some aromatic bitter, as gentian, cascarilla, or calumba, is generally found very beneficial.

**Brandish's alkaline solution*. (Best American pearl-ashes, ℔ij.; quicklime, recently burned; and wood-ashes from the ash, of each, ℔ij.; boiling water, cong. vj.; add first the lime, then the pearl-ashes, and afterwards the wood-ashes to the boiling water; mix, and in twenty-four hours draw off the clear liquor, to every pint of which add, of oil of juniper, min. ij.). This solution has a less disagreeable taste than the officinal *liquor potassæ*, and is therefore often substituted for it; it is, however, very liable to vary in strength. Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—Acids, acidulous and metallic salts, and the preparations of ammonia.

POTASSÆ BICARBONAS. *Bicarbonate of Potash.* $KO, HO, 2CO_2 = 100$.

Take of carbonate of potash, one pound; distilled water, two pints; hydrochloric acid of commerce, one pint and a-half; water, three pints; white marble in fragments, one pound, or a sufficiency. Dissolve the carbonate of potash in the distilled water, and filter the solution into a three-pint bottle, capable of being tightly closed by a cork traversed by a glass tube sufficiently long to pass to the bottom of the fluid. Introduce the marble into another bottle, in the bottom of which a few small holes have been drilled, and the mouth of which is closed by a cork also traversed by a glass tube, and place the bottle in a jar of the same height as itself, but of rather larger diameter. Connect the two glass tubes air-tight by a caoutchouc-tube. The cork of the bottle containing the carbonate of potash having been placed loosely, and that of the bottle containing the marble tightly, in its mouth, pour into the jar surrounding the latter bottle the hydrochloric acid previously diluted with the water. When carbonic acid gas has passed through the potash solution for two minutes, so as to expel the whole of the air of the apparatus, fix the cork tightly in the neck of the bottle, and let the process go on for a week. At the end of this time numerous crystals of carbonate of potash will have formed, which are to be removed, shaken in a capsule with twice their bulk of cold distilled water, and, after decantation of the water, drained and dried on filtering paper by exposure to the air. The mother liquor, filtered if necessary, and concentrated to one half, at a temperature not exceeding 110°, will yield more crystals. The tube immersed in the solution of carbonate of potash, which should have as large a diameter as possible, may require the occasional removal of the crystals formed within it, in order that the process may not be interrupted.

EXPLANATION OF PROCESS.—By the reaction of hydrochloric acid on marble we have carbonic acid set free, thus, $CaO, CO_2 + HCl = CaCl + HO + CO_2$, which, being conveyed into the solution of carbonate of potassa, converts it into the bicarbonate. The arrangement adopted is to secure the continuous delivery of carbonic acid according as it is consumed, *but not faster*, the ingress of the hydrochloric acid on the marble being evidently checked until space is made for it by the absorption by the carbonate of potassa of the carbonic acid previously set free. Hydrochloric acid is selected in preference to sulphuric acid, in consequence of the greater solubility of the resulting salt not interfering with the process, and consequently permitting of its being, once it is set going, a self-acting and self-regulating one.

CHARACTERS.—Colourless, right rhombic prisms, not deliquescent, of a saline, feebly alkaline taste, not corrosive. Dilute hydrochloric acid causes strong effervescence, forming a solution with which bichloride of platinum gives a yellow precipitate.

TESTS.—Fifty grains, exposed to a low red heat, leave thirty-four and a-half grains of a white residue, which require for exact saturation fifty measures of the volumetric solution of oxalic acid.

The characters given in the Pharmacopœia require no explanation;

in addition to these, however, it may be stated that bicarbonate of potassa is odourless; that exposed to the air it undergoes no change; that it is insoluble in alcohol, but soluble in four times its weight of water at 60°, and its own weight of boiling water, which, however, by prolonged ebullition expels a portion of its carbonic acid, making it a sesqui-carbonate; that it re-acts feebly as an alkali on the test papers. The "tests" refer to the action of a red heat upon the salt, expelling one of its atoms of carbonic acid, and thereby reducing it to the condition of anhydrous carbonate of potash ($KOCO_2=69$), the white residue alluded to. The amount of this residue corresponds to the atomic weights of the respective salts, inasmuch as 100: 69::50: 34·5; and it also corresponds with the number of measures of the volumetric solution of oxalic acid required for its saturation. Bicarbonate of potassa is distinguished from the carbonate by the addition of a solution of corrosive sublimate, which, with the carbonate, throws down immediately a brick-red precipitate, the oxychloride of mercury (HgCl, 3Hgo), whilst with the bicarbonate it simply produces an opalescence in the mixture, which, however, after some time throws down a similar precipitate.

ADULTERATIONS.—Bicarbonate of potash frequently contains carbonate of potash, from not having been sufficiently saturated with carbonic acid gas during its preparation; this is best detected by the action of a solution of corrosive sublimate on its solution in 40 parts of water; if the salt contains the carbonate, a brick-red precipitate will be produced. If any sulphates or chlorides are present, a solution supersaturated with nitric acid is precipitated white with a solution of hydrochlorate or nitrate of baryta if the impurity is a sulphate, and with solution of nitrate of silver if it contains a chloride.

THERAPEUTICAL EFFECTS.—Bicarbonate of potash may be administered as an antacid in the same cases as solution of caustic potash, its operation being similar, but it is less irritating than, and not so powerful as that preparation; it acts, however, more decidedly on the kidneys, increasing the secretion of urine, especially when taken in the form of the effervescing solution. Solutions of this kind are prepared by the mineral-water manufacturers. Messrs. Bewley and Hamilton keep them prepared of different strengths, No. 1 containing 10 grains of bicarbonate potassæ; No. 2, 20 grains; No. 3, 40 grains; and No. 4, 60 grains, dissolved with an excess of carbonic acid in each half pint of water. It possesses the advantage, also, of being less unpleasant to the taste than the liquor potassæ; and its employment may be continued without interruption for a longer period.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. two or three times a day; it may be given dissolved in some aromatic water; it may also be given in the form of extemporaneous effervescence, gr. xx. of crystallized bicarbonate of potassa being saturated with gr. xiv. of crystallized citric acid, gr. xv. of crystallized tartaric acid, and about f℥iiiss. of fresh prepared lemon-juice.

INCOMPATIBLES.—Acids; acetate and hydrochlorate of ammonia; lime-water; and most of the metallic salts, but not sulphate of magnesia.

POTASSÆ CARBONAS. *Carbonate of Potash.* $KO,CO_2+2HO=87$.

Coming into commerce we find two salts, very distinct indeed in their physical appearances, and yet both owing their origin to the same source, the combustion of inland plants—one termed potashes, the other pearl-ashes. Differing, however, as they do in their physical appearance, still both owe their chemical characters to the same cause, the existence in them, in a varying state of purity, of the salt carbonate of potash. These two salts are extensively manufactured in the United States, Canada, Russia, and on the shores of the Baltic. To prepare potashes, various kinds of wood are burned, the ashes collected and lixiviated, and the result of the subsequent evaporation of the solution is *potashes.* These ashes consist of two portions, one soluble, the other insoluble; the soluble portions represent various salts of potash, such as the carbonate, sulphate, phosphate, silicate, and chloride; the insoluble portions are salts of lime, silica, alumina, iron, and manganese. By treating the ashes with water, the soluble salts are removed, leaving behind those that are insoluble. The solution is evaporated in iron kettles kept constantly full, until the mass becomes dark coloured, and of the consistence of sugar, when it is termed by the manufacturers "black salts;" this portion of the process generally occupies several days. The mass is next fused, by which proceeding all volatile matters are driven off, and after these have all been expelled, and the mass assumes a quiescent appearance, the liquid is ladled into iron pots, where it congeals and constitutes the potashes of commerce. These are dark, often approaching in color a mahogany red, highly deliquescent, alkaline, and caustic.

To prepare pearl ashes, the process is all but identical down to the stage of fusion, instead of which the "black salts" are transferred to an oven-shaped furnace, whose flame is allowed to play over the mass, and thus its volatile impurities are gotten rid of, the salt being changed in color from a reddish brown to a bluish white; the red color is attributed to the presence of salts of iron—the blue, of salts of manganese.

Whether pearl ash or potash, the salt is still far too impure to be used in medicine. Repeated solution, evaporation, and crystallization will, however, yield us a product fit for being so employed. For conducting these processes, we formerly had directions given us in our Pharmacopœias. These now are omitted, as also the methods of preparing a pure carbonate of potash from the bicarbonate by exposing it to a red heat, and from the cream of tartar *(potassæ carbonas e tartari crystallis)* by a similar process.

CHARACTERS.—A white crystalline powder, alkaline and caustic to the taste, very deliquescent, readily soluble in water, but insoluble in spirit, effervescing with dilute hydrochloric acid, and forming a solution with which bichloride of platinum gives a yellow precipitate.

TESTS.—Loses about twenty-one per cent. of its weight when exposed to a red heat. When supersaturated with nitric acid, and evaporated to dryness, the residue is almost entirely soluble in water, only a little silica remaining undissolved. It is precipitated only faintly by chloride of barium and nitrate of silver. Eighty-seven grains require for neutralization at least ninety-eight measures of the volumetric solution of oxalic acid.

Reference to what has been already written in the remarks on the previous preparations of potash will fully explain these *characters* and *tests*. The loss on exposure to heat represents the water with which it unavoidably becomes charged; the volumetric test allows but for the merest trace of impurity.

THERAPEUTICAL EFFECTS.—As an antacid it may be employed in the same cases as the bicarbonate, but in consequence of its unpleasant taste, and irritant even poisonous properties, it is not much used in medicine. The external application of preparations containing the alkalies has been highly recommended by Devergie for the treatment of many obstinate cutaneous affections. I have used solutions and ointments containing the alkaline carbonates and bicarbonates, with an excellent effect in the treatment of many diseases of the skin, particularly in some forms of papular, vesicular, and pustular eruptions, especially in those seated on the scalp.* But although I sometimes use the carbonate of potash when the disease is very chronic and of a non-inflammatory character, as in porrigo capitis, its acridity forbids its general employment.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx. largely diluted; for external use, half a drachm to a drachm may be dissolved in a pint of distilled water, or made into an ointment with an ounce of prepared lard, or white wax ointment.

PREPARATIONS.—Mistura ferri composita, decoctum aloes compositum, liquor potassæ, liquor arsenicalis.

INCOMPATIBLES.—Same as the bicarbonate; but sulphate of magnesia is decomposed by the carbonate. In cases of poisoning with this salt, the antidotes are the same as those for solution of potash.

LIQUOR SODÆ. *Solution of Soda.*

Take of carbonate of soda, twenty-eight ounces; slaked lime, twelve ounces; distilled water, one gallon. Dissolve the carbonate of soda 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 remove the vessel from the fire; and, when by the subsidence of the insoluble matter the supernatant liquor has become perfectly clear, transfer it by means of a siphon to a green-glass bottle furnished with an air-tight stopper.

* See Neligan on Diseases of the Skin: Dublin, 1852.

The reaction that ensues here is precisely similar to that which occurs in the making of the liquor potassæ. The carbonic acid is removed by the quick lime, forming carbonate of lime, which is precipitated, and the caustic soda is held in solution thus, $NaO,CO_2+CaO=CaO,CO_2+NaO$.

CHARACTERS.—A colourless, odourless fluid, with strongly marked alkaline taste, and of soapy feel—alkaline reaction on the test papers —not precipitable on the addition of tartaric acid, by which it is readily distinguished from liquor potassæ; its most marked character, however, is the yellow color which it and its salts communicate to the flame of alcohol. By spectrum analysis it can be thus detected, when present even in the minutest quantity; Bunsen estimating the amount of soda that could be thus detected at the 195,000,000th part of a grain!

TESTS.—Specific gravity, 1·047. One fluid ounce requires for neutralization forty-seven measures of the volumetric solution of oxalic acid. It does not effervesce when added to an excess of dilute hydrochloric acid, nor give a precipitate with lime or oxalate of ammonia. When it is treated 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.

The volumetric test indicates the presence in each ounce of 14·57 grains of caustic soda—a quantity compared with that in the analogous preparation, liquor potassæ, in strict proportion to their relative chemical equivalents. The non-effervescence indicates the absence of carbonate of soda, as also does the non-precipitation on the addition of the lime; the oxalate of ammonia indicates the absence of lime; the non-turbidity on the addition of ammonia, the absence of silica; the turbidity produced on the addition of chloride of barium and nitrate of silver is caused by the presence in small quantities respectively of sulphate and chloride of sodium.

THERAPEUTICAL USES.—This preparation may be used under conditions similar to those described under the head of liquor potassæ. Its action on the urinary organs, however, is not so well marked.

DOSE AND MODE OF ADMINISTRATION.—Same as liquor potassæ.

INCOMPATIBLES.—Acids; acidulous and metallic salts; and the preparations of ammonia.

In cases of poisoning with solution of soda the best antidotes are vinegar, lemon juice, and the fixed oils.

PREPARATIONS.—Sodæ valerianas; antimonium sulphuratum.

SODÆ BICARBONAS. *Bicarbonate of Soda.* $NaO,HO,2CO_2=84$.

Take of carbonate of soda, two pounds; dried carbonate of soda, three pounds; white marble, in fragments, four pounds; hydrochloric acid of commerce, one gallon; water, two gallons; distilled water, a sufficiency. Fill with the marble a tubulated glass bottle having a few small holes drilled in the bottom, connect the tubulure tightly by a bent tube and corks with an empty two-necked bottle, and connect this with another bottle filled with the carbonates of soda well triturated together, and let the tube be long enough to reach the bottom of the bottle. Before fixing the cork in the bottle containing the carbonate of soda, partially immerse the bottle containing the marble in the hydrochloric acid previously diluted with the water, and placed in any convenient vessel. When the whole apparatus is filled with carbonic acid gas, fix in tightly the cork of the bottle containing the carbonate of soda, and let the action go on until the gas ceases to be absorbed. Agitate occasionally for half an hour the damp salt which is formed with half its weight of cold distilled water, drain the undissolved portion, and dry it by exposure to the air on filtering paper placed on porous bricks.

EXPLANATION OF PROCESS.—The reaction of the hydrochloric acid on white marble, in virtue of which carbonic acid is obtained, has been already discussed under "bicarbonate of potassa," where a process somewhat similar to this is directed; with this difference, however, that here the carbonic acid is introduced into the carbonates whilst in a *dry* condition, not in a state of solution. The object of using these two salts of soda is, that the carbonate of soda may furnish enough of water to supply what is required for the water of crystallization of the bicarbonate of soda; a slight excess is employed which communicates the damp appearance alluded to; by washing, any carbonate that may remain unacted upon is removed.

CHARACTERS.—In powder or small opaque irregular scales, white, inodorous, of a saline, not unpleasant taste. Imparts a yellow color to flame. Dissolves with much effervescence in diluted hydrochloric acid, forming a solution in which bichloride of platinum causes no precipitate. It loses a portion of its carbonic acid at 212°.

The non-precipitation by bichloride of platinum distinguishes it from the salts of potash, with which the bichloride would yield a yellowish precipitate.

TESTS.—When 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 fifty-three of an alkaline residue, which requires for neutralization one hundred measures of the volumetric solution of oxalic acid.

The chloride of barium indicates the absence of sulphates; the nitrate of silver, of chlorides. The 53 grains represent dried carbonate of soda, the amount of produce which reference to their equivalent weights would indicate; whilst the volumetric solution will prove the presence of 23 grains of oxide of sodium—tests indicating the absolute purity of the salt.

ADULTERATIONS.—The only adulteration of importance is with the simple or monocarbonate, and this is seldom wanting; it may be readily detected by the action of solution of corrosive sublimate, which gives a reddish-brown precipitate with a solution of the bicarbonate in 40 parts of distilled water, if it contains so much as a hundredth part of the carbonate.

THERAPEUTICAL EFFECTS.—In the various forms of dyspepsia attended with secretion of acid and vomiting no remedy is so frequently employed as the bicarbonate of soda, being usually taken in solution with excess of carbonic acid. In lithiasis, and in gout and rheumatism, where there is excessive secretion of uric acid and the urates, the lithia or potash preparations should be preferred, for the salt formed with soda and uric acid is extremely insoluble, being the compound which is deposited in the joints of persons who suffer from repeated attacks of gout. Its use is highly injurious when there are phosphatic deposits in the urine. At page 25, I have referred to the employment of the alkaline carbonates and bicarbonates in the treatment of skin diseases. I have chiefly used the bicarbonate of soda in the form of ointment made with the simple cerate of the London or Edinburgh Pharmacopœia, with cold cream or with cucumber cerate, as greasy unguents are in many instances productive of mischief in eruptions of the skin, more especially when they are seated on the scalp.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. dissolved in water. For external application, from twenty to thirty grains of the bicarbonate of soda may be made into an ointment, with an ounce of cerate or cold cream.

**Aqua Sodæ effervescens.* (Bicarbonate of soda, ℥j.; water Oj.; dissolve the bicarbonate in the water, and saturate it with carbonic acid under strong pressure. Preserve the liquid in well-closed vessels). This constitutes *soda water*, the form in which the bicarbonate is most generally used; as met with in the shops, however, soda water is seldom anything more than a simple solution of carbonic acid in water, not containing any carbonate of soda; this may be easily known by adding some weak acid to the solution, as soon as it has ceased to effervesce after being poured from the bottle, when no further effervescence will take place, unless the alkaline carbonate be present. Dose, f℥vj. to f℥viij. two or three times a-day. Being usually prepared on the large scale by mineral water vendors, it has been properly omitted from the Pharmacopœia The soda water manufactured by Messrs. Bewley and Hamilton of this city is of five different strengths, as follows:—No. 1 contains 10 grains of crystallized carbonate of soda; No. 2, 20 grains; No. 3, 40 grains; No. 4, 60 grains; and No. 5, 90 grains.

INCOMPATIBLES.—Acids; lime-water; hydrochlorate of ammonia; and metallic salts, except those of magnesia.

SODÆ CARBONAS. *Carbonate of Soda.* $NaO, CO_2 + 10HO = 143$.

We have two distinct sources from which we obtain carbonate of soda—one by the combustion of plants in which this alkali normally exists; the other, by what may be termed the artificial plan, a process first suggested by M. Leblanc, whose name it bears, "Leblanc's process." In commerce we find two substances, one called *barilla*, the other *kelp*, both obtained by the incineration of plants generally growing by the sea-side; barilla being the produce of plants belonging to the natural family of the *Salsola*, *Salicornia*, and *Chenopodium*; kelp, the produce of sea-weeds, principally the algæ and fuci. These latter are found on the rocky shores of many countries, such as the Hebrides, Orkneys, Ireland, &c.; the former are cultivated in Spain, Sicily, Teneriffe, the Canary Islands, &c., whence they are imported, packed in barrels, in the form of ash, in hard, dry, porous, greyish-blue masses covered with efflorescence, of a peculiar odour and caustic alkaline taste. This formerly was our great source of carbonate of soda, kelp being then but rarely employed for this purpose; its use is now exclusively confined to the manufacture of *iodine* (which see). At present barilla is principally employed in the making of soap. During the wars of the French empire these ashes were excluded from their commerce, and it became a matter of necessity to devise a new source whence carbonate of soda could be obtained. A prize was offered for the purpose, and, necessity being the mother of invention, *Leblanc* devised the process which in France still bears his name, which now, from motives of economy, is almost universally adopted, and which, in a word, consists in converting chloride of sodium into sulphate of soda by the action upon it of sulphuric acid; the resulting sulphate of soda is then mixed with carbonate of lime and charcoal, and the result is carbonic oxide gas which escapes, carbonate of soda which is dissolved out, and oxysulphide of calcium. The following equation explains this reaction:—$2(NaO,SO_3)+3(CaO,CO_2)+9C=2NaO,CO_2+(Ca_2S_2,CaO)+10CO$. The third atom of chalk is essential to the success of the process, as were it not employed, the sulphide of calcium would react on the carbonate of soda, and on the addition of the water we would have dissolved not carbonate of soda, but sulphide of sodium, leaving carbonate of lime behind, thus, $CaS+NaO,CO_2=CaO,CO_2+NaS$. This reaction, however, does not take place with the *oxysulphide* of calcium.

CHARACTERS.—In transparent, colourless, laminar crystals of a rhombic shape, efflorescent, inodorous, with a harsh alkaline taste, and strong alkaline reaction. It imparts a yellow colour to flame, and dissolves with effervescence in diluted hydrochloric acid, forming a solution which does not precipitate with bichloride of platinum. By heat it undergoes aqueous fusion, and loses 63 per cent. of its weight.

The crystals are soluble in twice their weight of water at 60°, and in their own water of crystallization at 212°. Not soluble in alcohol; the loss in weight referred to is the water of crystallization.

TESTS.—When supersaturated with nitric acid it precipitates only slightly or not at all with chloride of barium, or nitrate of silver. One hundred and forty-three grains require for neutralization at least ninety-six measures of the standard solution of oxalic acid.

The impurities referred to in the *tests* are sulphates and chlorides. The volumetric test allows also but very little impurity, indicating the presence of 29·76 grains of oxide of sodium instead of 31 grains, which, if absolutely pure, should be present.

THERAPEUTICAL EFFECTS.—Carbonate of soda is not employed as an antacid so frequently as the bicarbonate, in consequence of its disagreeable taste; but it is very generally used in the dried state as an alterative in the diseases of infancy and childhood. In the treatment of the eruptive diseases of the skin already referred to (page 25), given internally, and applied externally in the forms of ointment, liniment, or lotion, its employment is productive of the best results. I have for several years used it very extensively both in hospital and private practice in the treatment of impetigo, of herpes, and the dry form of eczema of the scalp, and have generally found it to effect a cure of these ordinarily intractable affections. In large doses carbonate of soda is corrosive and irritant, and may thus produce symptoms of poisoning by its local action on the mucous membrane of the stomach; the best antidotes are fixed oil and the vegetable acids.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. dissolved in water; for external application from gr. xxx. to gr. cxx. may be dissolved in a pint of water, or an ointment prepared with from gr. x. to gr. xx. to the ounce of cerate or cold cream.

PREPARATIONS.—Calcis carbonas præcipitatum, Ferri carbonas saccharata, Liquor sodæ, Liquor sodæ chloratæ, Magnesiæ carbonas, Magnesiæ carbonas levis, Sodæ arsenias, Sodæ bicarbonas, Sodæ carbonas exsiccata, Sodæ et potassæ tartras, Sodæ phosphas, Zinci carbonas.

Sodæ Carbonas Exsiccata. Dried Carbonate of Soda. $NaO, CO_2 = 53$. (Take of carbonate of soda, eight ounces. Expose the carbonate of soda in a porcelain capsule to a rather strong sand heat, until the liquid which first forms is converted into a dry cake, and having rubbed this to powder, enclose it in a stoppered bottle). Thus deprived of its water of crystallization, carbonate of soda may be given in the form of powder or pill. In dyspepsia attended with acidity, a combination of it with blue pill and rhubarb pill frequently proves of signal service. It has a very caustic taste, and therefore, when given in powder, especially if to children, should be combined with some bland substance, as sugar of milk or gum tragacanth, to conceal its acrimony. Fifty-three grains of the dried carbonate of soda are equal to 143 grains of the crystallized salt. Dose, gr. v. to gr. x.

INCOMPATIBLES.—Acids and their salts, lime-water, and magnesia.

CHAPTER II.

ANTHELMINTICS.

(Vermifuges).

ANTHELMINTICS are remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. Besides the specific or more immediate anthelmintics, which alone are described in this chapter, many of the more active cathartics effect this purpose; and they should be always administered in conjunction with, or shortly after the specific remedies, the efficacy of which they tend much to increase. Anthelmintics may with advantage be subdivided into *vermifuges*, or medicines which simply expel the parasite, but without destroying him—all purgatives come under this head; and *vermicides*, or medicines which destroy the worm. It is evident that any medicine which will combine these two properties must prove the best anthelmintic. As the action of these remedies, however, is merely temporary, it will be requisite, as soon as the worms are expelled, to employ means calculated to restore the digestive organs to a healthy state, and to correct that peculiar condition of them *(helminthiasis)* which promotes the generation of intestinal worms. The means best calculated for this purpose are:—keeping the surface of the body warm by proper clothing, a light but nutritious diet with a moderate use of common salt, and at the same time the administration of bitter tonics with gentle aperients, and, if anemia be present, the preparations of iron. The recent valuable and important investigations of Küchenmeister have proved that intestinal parasites are most probably generally developed in man from ova existing in the flesh of the lower animals when taken as food; and from this fact may be derived at least one most important indication for their prevention in those who have suffered from them, namely, that such persons should never use meat which has not been thoroughly cooked, and also that the flesh of the pig should not in any form constitute part of their diet. In children especially, the presence of worms in the intestinal canal is very apt to produce various spasmodic and nervous diseases, which simulate epilepsy, chorea, hysteria, &c.; in such cases antispasmodics are advantageously combined with vermifuges, and their use for some time after the worms have been expelled is absolutely requisite, as the habit, so to say, acquired by the system is with difficulty got rid of; for the removal of nervous affections thus caused, I have found the cold salt-water shower bath, with the internal administration of valerianate of zinc, very efficacious. The administration of anthelmintics should be continued in all cases for a long time, even for weeks, after all traces of the parasites have ceased to appear in the stools, as the ova may remain for a lengthened period in the intestinal canal before being developed into worms.

In the following pages it will be seen that many of the remedies described have special action over the different species of worms which inhabit the human intestinal canal. So it may perhaps be as well to draw attention to the varieties of those most frequently the subject of treatment. In works which treat of helminthology these parasites are divided into two classes, the *cylindrical*, which are provided with an alimentary canal; the *non-cylindrical*, which are not so endowed—these also are respectively termed *cœlelmintha* (*κοῖλος, hollow; ἕλμινς, a worm*); and *sterelmintha* (*στερεός, solid; ἕλμινς*, a worm). Amongst the cœlelmintha we find, 1. The *Ascaris lumbricoides*, or large round worm (termed *lumbricoides* from its resemblance to the common earth-worm, from which, however, it is very different, the *ascaris* having a body *without* setæ, and a mouth with three tubercles, and of very sluggish movements; the *lumbricus* having a body with eight rows of setæ; a mouth with two unequal lips, one superior, and one inferior; and of active movements). The habitat of this worm is generally the small intestines. 2. The *Tricocephalus dispar*, or long thread-worm, occupying the cœcum and large intestine; 3. The *Ascaris vermicularis* (by recent helminthologists referred to a genus distinct from the *Ascaris*, and termed *Oxyuris vermicularis)*, or small thread-worm, principally found in the rectum; in general best treated by enemata, specific or otherwise. Amongst the *Sterelmintha* we find, 1. The *Tœnia solium*, or common tape-worm, an inhabitant of the small intestines of the English, Germans, Dutch, but pre-eminently of the Abyssinians, amongst whom it is rare to find one exempt from its presence. 2. The *Bothriocephalus latus*, or broad tape-worm, which occupies the intestines of the Swiss and Russians.

These varieties of entozoa, though the principal infesting the human alimentary canal, constitute by no means an exhaustive list. For a perfect one, as also for full particulars by which they may severally be identified, I must refer my readers to Küchenmeister's valuable treatise on the subject, translated for the Sydenham Society by Dr. Lankester; or to the valuable treatise on Medical Zoology by M. A. Moquin Tandon, translated by Dr. Hulme. Even this list, however, for practical purposes may be still further reduced, as unless under extraordinary circumstances we will not be called on to prescribe for the Tricocephalus dispar, as, though constantly found present in post-mortem examinations, during life it rarely gives rise to any evidence of its existence; nor for the Bothriocephalus latus, as its presence is confined to the persons of Swiss and Russians.

*ABSINTHIUM, *Wormwood. The herb of Artemisia absinthium.* Indigenous; belonging to the natural family *Compositæ (Asteraceæ,* Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

BOTANICAL CHARACTERS.—An undershrub, 1–1½ foot high, erect, covered with silky hoariness; Leaves bipinnatifid, downy, segments lanceolate; Flowers in erect leafy panicles, hemispherical, drooping, large, dingy yellow.

PROPERTIES.—The whole plant is aromatic and bitter, with a strong disagreeable odour. Its most important constituents are, *absinthine,* extractive, resin, and a green volatile oil; it yields its properties to both water and alcohol. Absinthine is a semi-crystalline mass, soluble in alcohol, of unpleasant odour, and having a very bitter taste. The herb, when carefully dried with a stove heat, retains its aroma and bitterness for a long time.

THERAPEUTICAL EFFECTS.—Wormwood, although rarely used, and in consequence omitted from the British Pharmacopœia, is an excellent indigenous anthelmintic, possessing also tonic and stimulant properties, so that its use continued after the expulsion of the worms prevents their reproduction. It is well adapted for giving tone to the digestive organs in debilitated habits.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. xxx. to gr. lx. M. Cazin recommends it to be given in the form of wine, prepared by digesting an ounce of the herb with an equal quantity of garlic in a bottle of white wine; the dose of this is from f℥j. to f℥ij. every morning.

Infusum Absinthii (Wormwood, dried, ℥iss.; boiling water, Oj.; infuse for an hour, and strain). Dose, f℥j. to f℥ij.

Tinctura Absinthii (Dry wormwood cut fine, one part; proof spirit, twelve parts; macerate for six days, express and filter). Dose, fʒij. to f℥ss.

INCOMPATIBLES.—The sesqui-salts of iron; acetate of lead; and sulphate of zinc.

*ALLIUM SATIVUM. *Garlic.* A native of Italy, Sicily, and the South of France, commonly cultivated in our gardens; belonging to the class *Hexandria*, order *Monogynia*, in the Linnæan arrangement, and to the natural family *Liliaceæ*.

BOTANICAL CHARACTERS.—Stem, a foot and a half to three feet high, surrounded with many linear, grass-like leaves, and bearing a head of many whitish flowers emerging from a membraneous spatha.

PREPARATION.—The bulb is dug up for use in the month of August, cleaned and dried in the sun, and kept in bunches in a dry place.

PHYSICAL PROPERTIES.—The bulb, as it is termed, consists of several small bulbs, called cloves, grouped together within a common membraneous covering, which, when dry, is of a dirty whitish colour, and withered aspect; the cloves have each their proper covering, they are white and succulent, of a strong, disagreeable, peculiar odour, and an acrid, pungent taste.

CHEMICAL PROPERTIES.—Garlic consists of an acrid, volatile oil, fecula, albumen, and a saccharine matter; its medical properties depend on the volatile oil, which is heavier than water, of a yellowish colour, and a very penetrating odour; it is a peculiar sulphurised compound composed of 6 atoms of carbon, 5 of hydrogen, and 1 of sulphur (Wertheim).

THERAPEUTICAL EFFECTS.—Garlic, though now seldom employed as an anthelmintic in regular practice, and consequently omitted from the British Pharmacopœia, is an excellent remedy in ascarides. Roque states that he has employed it with great success; he gives the infusion by the mouth, and by injection (for many obvious reasons by far the more preferable way), and at the same time causes friction to be made with a liniment of it over the abdomen.

DOSE AND MODE OF ADMINISTRATION.—In substance, ℥ss. to ℥j., swallowed whole, or made into pills with soap; of the expressed juice, min. xx. to min. xxx. on sugar; of an infusion prepared by infusing ℥ss. of the bulb in f℥vj. of water or milk, f℥ij. to f℥iij. two or three times daily.

Syrup of Garlic (Garlic, one part; boiling water, eight parts; sugar, sixteen parts). Dose, f℥ss. to f℥j.

*CUCURBITA PEPO. *Pumpkin.* For some years past testimony has been growing in favor of the efficacy of the seeds of the Pumpkin, a member of the natural family *Cucurbitaceæ*, in the treatment of Tænia. The virtue is stated to exist in the bland mucilaginous oil with which the seeds abound. The directions for its administration are as follows:—Take two ounces of Pumpkin seeds, pound them in a mortar with half-a-pint of water, so as to make an emulsion; strain through linen, and administer at one dose, fasting. Should this dose produce no effect on the bowels within a couple of hours, it is to be followed by a dose of castor oil, which, if necessary, may be repeated on the following day. This plan of treatment is supported by most respectable evidence, especially on the part of American practitioners. I myself have administered, in the manner described, these seeds to a patient who undoubtedly was suffering from tape-worm, and although I never was able to satisfy myself that the worm (or any portion of it) was expelled, still the patient expressed herself as completely relieved of all her previous troublesome symptoms. Further investigation is undoubtedly called for, as if these seeds prove efficacious, a remedy, from the mildness of its operation and agreeable taste, most heartily to be wished for, has been added to our list of remedies in this most serious disease.

CUSSO. *Kousso.* Brayera anthelmintica, *DC.* Plate 10, vol. ii. *Hooker's Journ. Bot.* 3rd ser. The Flowers; collected in Abyssinia. *The dried flowers of Brayera anthelmintica.* This tree, belonging to the Natural family *Rosaceæ,* is a native of Abyssinia, in which country its flowers are a popular anthelmintic amongst the natives. They have been used more or less in France since 1824, but were not introduced into the British islands until about ten years ago.

CHARACTERS.—Flowers small, reddish-brown, on hairy stalks, outer limb of calyx five-parted, the segments ovate reticulated.

BOTANICAL PROPERTIES.—A tree from twenty to thirty feet high, with round branches, alternate imparipinnate leaves, sheathing at the base, and small, greenish, diœcious flowers in crowded panicles, resembling somewhat those of the elm.

PREPARATION.—The flowering panicles are gathered before the seeds are quite ripe, whilst still a number of florets remain unchanged, and are dried in the sun; for medical purposes they are reduced to coarse powder.

PHYSICAL PROPERTIES.—The bunches of flowers are of a greenish-yellow colour, but on close examination the edges of the petals are purplish; they have a fragrant balsamic odour, when freshly opened, compared by Pereira to the combined odour of tea, hops, and senna leaves; the taste is slightly acrid and unpleasant.

CHEMICAL PROPERTIES.—According to the analysis of Wittstein, Cusso contains two varieties of tannin, a bitter acrid resin and a tasteless resin, a fatty oil, chlorophylle, water, sugar, gum, &c. To Clemens Willing, Cusso yielded in small quantities a volatile oil to which its odour is due. Martin states that he has obtained from it a crystalline principle, soluble in alcohol and ether, and which he proposes to name *Kwoseine.* The infusion and decoction are changed to a dark-green colour by the sesqui-salts of iron.

THERAPEUTICAL EEFECTS.—This substance has for at least two centuries borne the highest repute amongst the Abyssinians, who are much afflicted with the tape-worm, for its expulsion from the human intestines; and the experience of all who have tried it, both on the Continent for years back, and in England since its introduction, is confirmatory of its efficacy. It does not seem to produce any very manifest physiological effects, causing usually but slight nausea and a sensation of thirst; in some cases, however, it excites violent pains in the intestines and vomiting. Its action on the bowels is but slight, and the worms are often expelled alone, but it is more advisable to give a mild purgative a short time before it has been taken. It manifestly acts as a poison to the parasites, for in most of the cases in which it has been tried the worms have been expelled dead, and frequently in small fragments; and Küchenmeister, in his experiments on anthelmintics, found that tape-worms placed in an infusion of Cusso mixed with milk died within half an hour of their introduction.*

Its operation is admitted by the generality of those who have used it to be not alone effectual but safe, producing less disturbance of the system than most other remedies of this class; it is also equally effective, whether it be the *Tænia solium* or *Bothriocephalus latus* which is present in the intestines. But it must be remarked that although Cusso expels the tape-worm, it does not remove the diseased condition of the system on which the production of the parasite depends.

DOSE AND MODE OF ADMINISTRATION.—From ℥ss. to ℥j. for an adult: for children from gr. xxx. to gr. cxx. The following is the mode in which it is administered:—The powdered flowers are to be mixed with luke-warm water—for an adult about ten ounces, and allowed to infuse for a quarter of an hour, a little lemon-juice is then to be added, and the infusion being stirred up, the whole is taken, liquid and powder, at two or three draughts at short intervals, being washed down by cold water and lemon-juice. To promote the operation, tea, without sugar or milk, may be taken. In three or four hours, if the remedy has not operated, a dose of castor-oil or a saline purgative should be administered. The dose is best administered in the morning, fasting; the last meal of the previous evening should be a light one; and the action of the remedy seems to be promoted by a mild purgative having been taken on the day before.

PREPARATION.—Infusum.

Infusum Cusso. Infusion of Kousso. (Take of Cusso, in coarse powder, a quarter of an ounce; boiling distilled water, four fluid ounces. Infuse in a covered vessel, for fifteen minutes, without straining.) This formulary may be considered a medium dose, and may be substituted for that already described.

FILIX. *Fern Root.* Aspidium Filix mas, *Swartz.* Plate 49, *Woodv. Med. Bot.* Indigenous. The Rhizome dried; collected in summer. *Rhizome of Nephodrium (Lastrea,* Presl.*) filix-mas.*

* See on Medical and Vegetable Parasites, &c. Sydenham Society's Edition, 1857, vol. i. page 148.

Male Shield Fern; belonging to the Linnæan class and order *Cryptogamia Filices*, and to the Natural family *Filices* (*Polypodiaceæ*, Lindley.)

CHARACTERS.—Tufted, scaly, greenish-brown; powder greenish-yellow, with a disagreeable odour, and a nauseous, bitter, somewhat astringent taste.

BOTANICAL CHARACTERS.—Rhizome or underground stem large, tufted, scaly; producing in spring beautiful fronds or leaves, pinnate, with oblong, serrated, obtuse leaflets.

PREPARATION.—The rhizome should be dug up in summer, cleared of root-fibres, &c., but not washed, and dried quickly and thoroughly in the open air, in the shade, or in a hot-air press at a temperature not above a 140° F.; the tufts and those parts of the root-stock which are greenish internally are alone to be kept; they should be reduced to powder immediately, and preserved in well-stoppered bottles; the druggist's stock should be renewed annually, as in two years the plant loses its medical properties.

CHEMICAL PROPERTIES.—It contains a small portion of an odorous, volatile oil, on which its anthelmintic properties seem to depend; fixed oil, fecula, uncrystallizable sugar, gum, and woody fibre, &c. The results of a very elaborate analysis by Bock show that 1000 parts of the dry root contain 0·4 of the volatile oil and 60 of the fixed oil.

THERAPEUTICAL EFFECTS.—The powder of the male fern-root is perhaps one of the most efficacious anthelmintics we possess in the treatment of tænia, and as an indigenous remedy it is especially worthy of attention. Although mentioned in the writings of the most ancient authors on Materia Medica, it had fallen into oblivion, and owes its introduction into modern practice to having been the active ingredient in a quack remedy for tænia, used by Madame Nouffer, the widow of a Swiss surgeon, from whom, in consequence of the great success attending her plan of treatment, the formulary was purchased by Louis XVI. for 18,000 francs. Bremser, however, in his treatise on intestinal worms, states that "though an excellent remedy against *Bothriocephalus latus* (the tape-worm of the Swiss), it is not so efficacious against *Tænia solium* (the tape-worm of this country). That such a statement is not correct has been recently proved by the investigations of Dr. Christison on its action; in upwards of twenty instances in which the ethereal extract was either employed directly by himself, or the particulars of which were communicated to him by others, in every case, without exception, the worm was discharged after a single dose, and usually in one mass, and for the most part without pain or other uneasiness either before or during its action; but in a few, griping sickness and even vomiting occurred. My own experience, too, of the remedy, in some cases in which I had an opportunity of trying it, was altogether so satisfactory as to lead me to estimate it as highly as any other medicine of this class in cases of tape-worm. It is, however, most important that the preparation used should be pure and well prepared from the true fern. It would also seem from cases which have been recently recorded, that the worm is not so apt to be reproduced as after the use of other remedies.

DOSE AND MODE OF ADMINISTRATION.—Powder gr. lx. to ℥iij.; it should be given in the morning early, and followed in two hours afterwards by a brisk purge; but the powder, no matter how well kept, is uncertain in its action, and the following is the preparation now always used:—

PREPARATION.—Extractum liquidum.

Extractum Filicis Liquidum. Liquid Extract of Fern Root. (Take of fern root, in coarse powder, two pounds; ether, four pints, or a sufficiency. Mix the fern root with two pints of the ether; pack closely in a percolator; and add the remainder of the ether at intervals, until it passes through colourless. Let the ether evaporate on a water bath, or recover it by distillation, and preserve the oily extract.) This extract, which is an oleo-resin, is when properly prepared a thick, dark-green fluid of the consistence of strong syrup, and has a rather agreeable violaceous odour. Christison recommends it to be given in emulsion, by triturating from 18 to 24 grains with yoke of egg and adding gradually syrup of orange and water. If the worm do not come away in six hours, a brisk purgative should be given. Küchenmeister's experiments shew that tænia die in a mixture composed of this extract and white of egg in from three and a half to four hours. In the Hamburgh Pharmacopœia for 1852 the extract of male fern is said to be best prepared from the fresh roots by means of a pneumatic press.

GRANATI RADIX. *Pomegranate Root.* Punica Granatum, Linn. *Plate* 57, Steph. and Church. Med. Bot. *The bark of the root, fresh or dried; chiefly imported from Germany.*—A native of the North of Africa introduced into the South of Europe, where it now grows freely; belonging to the Linnæan class and order *Icosandria Monogynia,* and to the Natural family *Myrtaceæ.*

BOTANICAL CHARACTERS.—A small handsome tree, growing to the height of twenty feet, with brownish bark, and smooth leaves on short footstalks; it produces in July, at the extremities of the young branches, splendid rich-scarlet flowers, which are succeeded by the orange-like fruit, crowned with the hardened persistent calyx.

PHYSICAL PROPERTIES.—Pomegranate bark is usually met with in short quills, portions of quills, or strips with pieces of the root attached, of a greyish-yellow colour externally, yellowish internally, brittle not fibrous, with a faint odour, and an astringent not bitter taste.

CHARACTERS.—In quills or fragments of a greyish-yellow colour externally, yellow internally, having a short fracture, little odour, and an astringent slightly bitter taste.

CHEMICAL PROPERTIES.—According to Mitouart's analysis, it consists of tannin, wax, a sweetish substance (part of which is soluble in alcohol, and part in water, the former crystallizable, the latter having the characters of Mannite), and free gallic acid in large quantity.

Righini has recently discovered in it a peculiar acrid oleo-resinous principle, which he has named *Punicine*, and on which it is probable that its vermifuge properties depend.

ADULTERATIONS.—The root bark of the common barberry *(berberis vulgaris)*, and of the box-tree *(Buxus sempervivens)*, are said to be sometimes substituted for that of the pomegranate; the fraud is easily detected, as neither of these substances, although very bitter, possesses the least astringency.

THERAPEUTICAL EFFECTS.—The bark of the root of the pomegranate is an excellent vermifuge in cases of tape-worm, and is much employed in various parts of Europe, although but rarely used in this country. It is chiefly used in India, where it is said scarcely ever to fail, if properly administered; some practitioners state that it should not be employed unless joints of the worm have already come away naturally. In Küchenmeister's experiments, a decoction of pomegranate root-bark with milk was found to kill tape-worms in from three to three and a half hours; he further states that *he prefers the extract prepared according to the form given below to all other remedies for the tape-worm* with which he is acquainted.*

DOSE AND MODE OF ADMINISTRATION.—Two ounces of the bruised bark, stripped from the fresh root if possible, are macerated for twenty-four hours in two pints of water, then boiled to one-half, and filtered; this is given in three doses, with an interval of half an hour between each dose; vomiting frequently occurs after the first or second dose, but this should not prevent us from administering a third. Soon afterwards the patient passes many stools in which joints of the worm are expelled. The dose should be occasionally repeated for four or five days after fragments of the worm have ceased to come away. Most practitioners have found the dried root to be inert.

PREPARATION.—Decoctum.

Decoctum Granati Radicis. Decoction of pomegranate root. Take of pomegranate root, fresh or dry, sliced, two ounces; distilled water, two pints. Boil down to a pint, and strain.

* *Extractum Punicis granati*, KUCHENMEISTER (Pomegranate root bark, slightly bruised, ℥iv.; macerate for twenty-four hours in f℥xvj. of distilled water; then boil with a gentle heat for twelve hours, until ℥vj. remain). To be taken in three or four doses at intervals of from half an hour to one hour.

KAMELA. *Kamela.* Rottlera tinctoria. Plate 168, *Roxb. Corom. The powder which adheres to the capsules: imported from India.* The down or pubescence, mixed with hairs, collected from the capsules of the Rottlera Tinctoria, an East Indian plant belonging to the Natural family *Euphorbiaceæ*, section *Crotonæ.* The Rottlera appears to grow universally throughout Hindostan, being of

* *Opus citatum*, p. 174.

arborescent character, attaining some twenty or thirty feet in height. The natives employ the down under the name of *Kamela* or *Reroo* both as a dye-stuff and as a vermifuge.

CHARACTERS.—Granular, of an orange-red colour, and peculiar odour, inflammable; it is with difficulty mixed with water, but when boiled with alcohol the greater part is dissolved, forming a red solution.

TEST.—Ether dissolves most of it; the residue consisting principally of tufted hairs.

CHEMICAL PROPERTIES.—No accurate analysis has been as yet made of the Kamela; its alcoholic or ethereal saturated solution, when evaporated, yields a resinous extract, upon which probably its active properties depend; one fluid drachm of such an alcoholic tincture yields four grains of the extract.

THERAPEUTICAL EFFECTS.—Independently of its anthelmintic properties presently to be noted, Kamela in large doses acts as a purgative, nauseant, and emetic; these, however, as yet have resulted but as secondary effects, its use amongst the native Indians being confined to its anthelmintic properties. Its principal value is in the treatment of the tænia solium; the merit of introducing it in such cases to our notice being due to Dr. C. M'Kennon, of the Bengal army. Dr. Gordon speaks highly of it, stating that in the Punjaub, where tænia is extremely prevalent, the soldiers under his charge when so afflicted never thought of giving further trouble than applying for a dose of this medicine, "after which they parted with the worm in the course of a few hours, and then went on with their military duty as if nothing had happened."

Some discrepancy exists as to the manner in which the worm is discharged, some stating it to have passed alive, others dead.

DOSE AND MODE OF ADMINISTRATION.—From one to four drachms of the powder, mixed in the form of bolus with honey; in the form of saturated tincture, from one to two or three drachms diluted with some aromatic water; or in the form of the extract prepared as described, in from three to ten grain doses.

* MUCUNA, *Cowitch, or Cowhage. The hairs from the pods of Mucuna pruriens.* This plant, Decandolle's nomenclature for which has been adopted, is a native of the West Indian islands, belonging to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Diadelphia Decandria.*

BOTANICAL CHARACTERS.—A twining shrub, bearing purplish flowers, with a disagreeable, alliaceous odour, in axillary racemes; succeeded by coriaceous legumes, each containing three to five seeds.

PHYSICAL PROPERTIES.—The entire legumes, with the hairs attached, are usually imported; they are shaped like the letter *ſ*, of a brownish colour, from two to four or five inches long, thickly clothed with strong brown bristles or setæ, which, under the microscope, appear finely acuminate and serrated towards the point; these bristles separate easily and adhere obstinately to the skin, producing intolerable itching, accompanied by intense heat, and sometimes pain and swelling.

THERAPEUTICAL EFFECTS.—The operation of cowitch as an anthelmintic seems to be completely mechanical; the minute hairs wounding or irritating the worms, thus obliging them to let go their hold on the coats of the intestine, which is protected from injury by its mucous secretion. It is chiefly serviceable in cases of lumbrici, having but little effect on the tape-worm; indeed, by many practitioners it is esteemed, and probably not without reason, as the best vermifuge for the lumbrici.

DOSE AND MODE OF ADMINISTRATION.—The legumes are dipped in syrup, and then scraped, so as to remove the hairs; this process is repeated with fresh legumes until the syrup acquires the consistency of honey; of this a tea-spoonful is given to a child, or a table-spoonful to an adult, for three successive mornings before breakfast, the last dose being followed by a brisk purge.

SABADILLA. *Cevadilla. Asagræa officinalis*, Lindl. Bot. Reg. vol. xxv. plate 33. *The dried fruit; imported from Vera Cruz and Mexico.* This plant, which has been named *Asagræa officinalis* by Lindley, and *Schœnocaulon officinale* by Gray, is a native of Vera Cruz and Mexico, belonging to the Linnæan class and order *Polygamia Monœcia*, and to the Natural family *Melanthaceæ*. It has been also referred to the *Veratrum sabadilla*, U.S.P., and to the *Helonias officinalis*, Don.

BOTANICAL CHARACTERS.—A bulb, sending up numerous grassy leaves, from the centre of which springs an annual stem, about six feet in height, terminated by a spike of small white flowers, succeeded by numerous trifollicled capsules.

CHARACTERS.—Fruit 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, possessing an intensely acrid, bitter taste.

PHYSICAL PROPERTIES.—The fruit consists of three follicles, oblong, adherent at the base, about half an inch in length; they are composed of a thin, yellowish, elastic membrane, containing from one to (seldom) three shining black seeds; the seeds have little odour, but when powdered and snuffed into the nostrils, they produce violent sneezing and a discharge of mucus; they have an acrid, intensely bitter taste, which is very permanent.

CHEMICAL PROPERTIES.—Cevadilla consists of fatty matter, *cevadic and veradric acids*, wax, two kinds of resin, one hard and insoluble, the other soluble in ether, *veratria* combined with gallic acid (and, according to Couerbe, a second crystalline body named by him *sabadilline*), yellow colouring matter, and gum.

THERAPEUTICAL EFFECTS.—Although possessed of highly poisonous properties, cevadilla has been employed internally as an anthelmintic with much success in cases of tape-worm and of ascarides; Schmucker (who places great confidence in the treatment of ascarides by Cevadilla) states that he has seen them die, with convulsive movements, when sprinkled over with the powder. Its use has hitherto been almost entirely confined to the Continent, and from the numerous instances of its successful employment recorded by different practitioners, it appears deserving of a high character as a vermifuge. (See, also, *General Stimulants.*)

DOSE AND MODE OF ADMINISTRATION.—Cevadilla should be administered with caution, and its use always commenced with very small doses, in order to ascertain how far it will be borne by the digestive organs. M. Cazin, of Boulogne, who has had much experience in vermifuge remedies, prescribes it as follows:—"For children, from a grain and a half to four or five grains of the powdered seeds, mixed with syrup of rhubarb; and for adults, eight or more grains, with the addition of a little sugar and a few drops of oil of fennel." In every case he repeats the dose daily for four days, after which he administers for some time the infusion of chamomile.

Enema of Cevadilla. (Cevadilla, gr. 60; water, f℥x.; milk, f℥iij.; the Cevadilla is boiled in the water until it is reduced to seven ounces, then filtered, and the milk added). To be administered in cases of ascarides.

PREPARATION.—*Veratria.* See *General Stimulants.*

SANTONICA. *Santonica.* (Syn. *Santonici Semen; Semen contra; Semen cynæ; Wormseed.*) *The unexpanded flower-heads of an undetermined species of Artemisia,* Linn. *Imported from Russia.* In commerce two varieties of Santonica have long been known; one called Aleppo, Alexandrian, or Levant, the other Barbary, *wormseed.* On the authority of Guibourt, the former is attributed to the *Artemisia contra* of Linnæus, the latter to the *Artemisia glomerata* of Sieber, both belonging to the natural family *Compositæ.* Wormseed, as usually met with, consists not only of the flower-heads mentioned in the Pharmacopœia, but also of broken peduncles and minute, obtuse, smooth leaves. Barbary wormseed differs from that of the Levant in having its components covered with a species of whitish down, which is absent in the latter; the odour of both varieties is due to the presence of a volatile oil, but their therapeutical value is undoubtedly due to the neutral principle next to be described.

CHARACTERS.—Flower-heads rather more than a line in length, and nearly half-a-line in breadth, fusiform, blunt at each end, pale greenish-brown, smooth; resembling seeds in appearance, but consisting of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers; odour strong, taste bitter, camphoraceous.

TEST.—Flower-heads not round or hairy.

THERAPEUTICAL USES.—Wormseed has long been celebrated as a remedy for oxyurides, and, especially, lumbrici; in tænia its value is not equally recognized. Occasionally, in these latter, it has proved serviceable, but far more frequently has failed in giving relief.

DOSE AND MODE OF ADMINISTRATION.—Wormseed may be administered either in the form of infusion or powder. The dose of this latter is from 20 to 60 grains, to be repeated night and morning for some days, and subsequently followed up by the administration of a brisk cathartic. Bremser's favorite (and, according to himself, never-failing) remedy against every species of worm was as follows:—Seminum santonici contusorum, ℥ss.; pulveris valerianæ, gr. 120; pulveris jalapæ, gr. 120; potassæ sulphatis, gr. 120; oxymellis scillæ, q.s. ut fiat electuarium. Sumat æger cochlearia duo (vel tria) parva quotidie.

PREPARATION.—*Santoninum.*

SANTONINUM. *Santonin.* $C_{30}H_{18}O_6$. A crystalline neutral principle obtained from Santonica.

Take of Santonica, bruised, one pound; slaked lime, seven ounces; hydrochloric acid, a sufficiency; solution of ammonia, half a fluid ounce; rectified spirit, fourteen fluid ounces; purified animal charcoal, sixty grains; distilled water, a sufficiency. Boil the santonica with a gallon of the water and five ounces of the lime, in a copper or tinned iron vessel, for an hour; strain through a stout cloth, and express strongly. Mix the residue with half a gallon of the water, and the rest of the lime; boil for half an hour, strain, and express as before. Mix the strained liquors, let them settle, decant the fluid from the deposit, and evaporate to the bulk of two pints and a half. To the liquor, while hot, add, with diligent stirring, the hydrochloric acid until the fluid has become slightly and permanently acid, and set it aside for five days, that the precipitate may subside. Remove by skimming any oily matter which floats on the surface, and carefully decant the greater part of the fluid from the precipitate. Collect this on a paper filter, wash it first with cold distilled water till the washings pass colourless and nearly free from acid reaction, then with the solution of ammonia previously diluted with five fluid ounces of the water, and lastly with cold distilled water till the washings pass colourless. Press the filter containing the precipitate between folds of filtering paper, and dry it with a gentle heat. Scrape the dry precipitate from the filter, and mix it with the animal charcoal. Pour on them nine ounces of the rectified spirit, digest for half an hour, and boil for ten minutes. Filter while hot, wash the charcoal with an ounce of boiling spirit, and set the filtrate aside for two days in a cool dark place to crystallize. Separate the mother liquor from the crystals and concentrate to obtain a further product. Collect the crystals, let them drain, re-dissolve them in four ounces of boiling spirit, and let the solution crystallize as before. Lastly, dry the crystals on filtering paper in the dark, and preserve them in a bottle protected from light.

In this process lime is used with the view of insulating the santoninum, which is subsequently liberated by the action of the hydrochloric acid; for santoninum, though neutral to test papers, is capable of uniting with alkaline bases, &c. to form salts, which, however, are again, in consequence of the weakness of its affinity, decomposed by almost any acid. The animal charcoal is used for the purpose of decolorization, and advantage is taken of the solubility of the santoninum in boiling spirit to recover it from this mixture. Light is to be avoided, as under its influence the crystals change colour.

CHARACTERS.—Colourless, flat rhombic prisms, feebly bitter, fusible and sublimable by a moderate heat, scarcely soluble in cold water, sparingly in boiling water, but abundantly in chloroform and in boiling rectified spirit. Sunlight renders it yellow.

TESTS.—Not dissolved by diluted mineral acids. Entirely destructible by a red heat with free access of air.

Santonine occurs in beautiful white crystalline plates, of great brilliancy; but on exposure to light they rapidly change to yellow. It has a bitter taste, is very insoluble in water, requiring 5,000 parts for its solution, but dissolves readily in fatty matters and in alcohol; it volatilises at a low heat. The process for its preparation in the pure state is both prolonged and difficult; and, moreover, as it is kept with difficulty, it bears a very high price; nevertheless it can be obtained in a perfect condition by care, and is much more certain in its effects than the following preparation proposed by M. Gaffard, which he calls brown or impure santonine, and which he has found to act very efficaciously when ascarides or lumbrici are present in the intestines:—*Brown Santonine.*—"Take of Aleppo worm-seed, three ounces; carbonate of potash, one ounce; slaked lime, sifted, half an ounce; water, from three pints to three pints and a half. Place the mixture on the fire, stirring occasionally with a wooden spatula; let it boil for an hour; on removing it from the fire, pass it with expression through a linen cloth, let it settle, decant, and add hydrochloric or nitric acid until it reddens litmus without being sensibly acid to the tongue; allow it to rest, pass it through a filter previously moistened, or through a piece of close canvas, and allow the product which remains on the filter to dry in the open air until it acquires the consistence of firm butter."

THERAPEUTICAL EFFECTS.—Santoninum, as well as wormseed, in small doses appears to increase the appetite and to stimulate the digestive organs; in larger doses, marked symptoms of disturbance in the circulatory organs present themselves; and, in larger doses still, we meet with nausea, vomiting, tenesmus, and bloody stools. A most remarkable symptom has been described by Spencer Wells, which has been subsequently verified by many observers, myself amongst the number, that under its influence vision becomes curiously affected, the patients seeing things either yellow or green, the former being essentially the primitive colour. All efforts to account for this remarkable phenomenon by detection of any colouring matter in the serum of the blood have hitherto failed, and we must therefore content ourselves by referring them to cerebral disturbances extending their action to the optic nerve and retina. In any case in which I observed this remarkable symptom, the most careful examination failed in discovering any change of colour in the sclerotic, and alarming though they are to the patient, they need give the practitioner but little anxiety, as after some few hours they spontaneously subside and finally disappear. My own experience of pure santonine is most favourable, and I have rarely found the most obstinate cases of ascarides or lumbrici resist its prolonged use: the brown santonine I have not employed.

DOSE AND MODE OF ADMINISTRATION.—Brown santonine is best given according to M. Gaffard in the form of lozenges, which may be prepared as follows:—Brown santonine, ʒiij.; powdered sugar, ℥xiij.; powdered gum, ℥iss.; essential oil of lemon, min. xxv. Place the brown santonine in a marble mortar; add by degrees, and with constant trituration, the sugar mixed with the essential oil and the gum, so as to make a homogeneous powder. Form with a sufficient quantity of water a mass of the desired consistence, and divide it into lozenges, each of which shall weigh, when dried, fifteen grains: each lozenge will then contain somewhat more than one-third of a grain of brown santonine. For infants under six months the dose will be one lozenge night and morning; from six months to a year, two lozenges night and morning; from one to two years, three; and from two to four years, four, night and morning; for children of five years and upwards, a lozenge for each year of the child's age should be given, night and morning. The medicine to be continued until the worms are no longer passed. Pure santonine may be given in powder combined with scammony, rhubarb, or in anemic children with the powder of iron. The dose is from gr. ss. to gr. ij., according to the age of the child. In many cases under its use the urine acquires a reddish tint, which may give rise to an unfounded apprehension of hæmaturia. Küchenmeister found that a solution of santonine in castor oil mixed with albumen killed ascarides in ten minutes, while without the oil it had no effect, neither had a watery infusion. He therefore recommends it to be given in oil in the proportion of from two to five grains to an ounce of castor oil. In the case of ascarides in the rectum, the oily solution might be administered in the form of enema. The French prescribe pure santonine in the form of lozenges made with white sugar and mucilage. These lozenges are best made with coco not deprived of its oil. In my experience I have found them quite satisfactory; they can be had at any respectable medical hall. Küchenmeister, however, prefers the santonate of soda, a salt obtained by digesting an alcoholic solution of santonine with carbonate of soda, evaporating and crystallizing; its composition is, $NaO,HO, C_{30}H_{18}O_6+7HO$. He states that he has never seen any bad consequences resulting from its use, whilst its solubility makes it a most eligible preparation. Dose, from two to eight grains, mixed with sugar: it should be administered *per se*, as almost every acid decomposes it.

* SPIGELIA. *Root of Spigelia Marilandica; Carolina-pink Worm-grass.* A native of the United States; belonging to the Lin-

næan class and order *Pentandria Monogynia*, and to the Natural family *Gentianaceæ* (*Loganiaceæ*, Lindley).

BOTANICAL CHARACTERS.—A perennial root; sending up numerous single stems; bearing, in the month of July, rich carmine-coloured flowers, in racemes.

PHYSICAL PROPERTIES.—Usually met with in bundles of the entire plant, about twenty inches long. The officinal part consists of numerous, yellowish-brown fibres, proceeding from a small, dark-brown rhizome. They have a faint odour, and a bland, somewhat nauseous taste.

CHEMICAL PROPERTIES.—The root consists of acrid resin, tannin, bitter extractive, and woody fibre, with a trace of fixed oil.

THERAPEUTICAL EFFECTS.—Spigelia root, in consequence of its being much more active in the recent state than when dried, bears a higher character as an anthelmintic in America than in Europe, and being therefore not much used in this country, has been omitted from the British Pharmacopœia. It is the most popular vermifuge in the United States for the expulsion of lumbrici, possessing, however, little or no power over any other species of intestinal worm.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xx. for children; for an adult from gr. lx. to gr. cxx.

Infusum Spigeliæ, U. S. P. (Spigelia root, ℥ss.; boiling water, f℥xvj.; macerate for two hours in a covered vessel, and strain. Dose, f℥ss. to f℥j. for a child; four times the quantity for an adult.

Extractum Spigeliæ and Sennæ Fluidum, U. S. P. (Pinkroot, senna, sugar, carbonate of potash, oils of caraway and anise, diluted alcohol). A popular remedy in the United States, combining the purgative properties of the senna with the anthelmintic of spigelia; the carbonate of potash dissolves some resin that appears during the process; it sits well on the stomach, and is palatable; its dose is half a fluid ounce for an adult, half a fluid drachm for a child. If ever spigelia becomes a remedy to be depended upon in these countries, it must, for reasons stated, be by the importation of it in some such form as this.

OLEUM TEREBINTHINÆ. *Oil of Turpentine.* $C_{20}H_{16}$. *Pinus palustris*, Miller's Dict., *Pinus Tæda*, Linn., *and sometimes Pinus Pinaster*, Aiton. *Plates* 9, 10, 16, 17, 20, Lambert, Pinus. *The oil distilled from the turpentine; imported from France and America.* Of the three varieties of pines indicated in the Pharmacopœia (which are by no means the only varieties from which turpentine is procurable) the pinus palustris, *swamp* or *long-leaved* pine, is an inhabitant of the Southern States of America, and yields by far the largest proportion of the turpentine, tar, &c., that come to us from that country. The pinus tæda, *loblolly*, or *old field* pine, grows in Virginia, where it occupies those fields that have been exhausted by cultivation, and also furnishes turpentine, but of a more viscid character than that yielded by the preceding variety; whilst the pinus pinaster, or *cluster pine*, is a native of the South of France, especially near Bourdeaux, and supplies us with *Bourdeaux turpentine, galipot, pitch, and tar.* All these trees belong to the Natural family *Coniferæ* (*Pinaceæ*, Lindley), and the Linnæan class and order *Monœcia Monadelphia.*

PREPARATION.—*Common Turpentine, Terebinthina vulgaris*, is procured in America by cutting off the outer bark near the root of the tree, and making an incision through the inner bark into the wood; as the turpentine exudes, it flows into a hole dug in the earth, whence it is removed into casks. Strictly speaking it is an oleo-resin, being composed of oil holding resin in solution; these can be separated by distillation; the oil (vulgarly known as *spirits* of turpentine) distils over, whilst the resin remains behind. *Volatile oil of turpentine* is an article of the Materia Medica in the British Pharmacopœia, being always prepared by the manufacturer on a large scale.

CHARACTERS.—Limpid, colourless, with a strong peculiar odour, and pungent and bitter taste.

PHYSICAL PROPERTIES.—Oil of turpentine is a transparent, nearly colourless, limpid fluid; of a peculiar, penetrating, balsamic odour; and a pungent, bitter, disagreeable taste. Specific gravity, ·872 at 50° F.

CHEMICAL PROPERTIES.—Its composition is $C_{20}\,H_{16}$. It is very soluble in ether, less so in alcohol, and very sparingly soluble in water. If agitated with one-eighth part of alcohol, any resinous portion which it may contain will be removed, and its *taste* be much improved. On standing, the alcohol separates from the turpentine, leaving but a small portion (one-fifth) dissolved in the oil; by agitation with water this also can be separated. Exposed to the air it gradually absorbs oxygen, thickens and becomes yellowish. It boils at 314°, and cooled down to —17° it deposits white crystals, *stearopten*, which are heavier than water. Oil of turpentine is very inflammable, burning with a heavy, yellowish flame, and much smoke; in chlorine gas it takes fire spontaneously.

THERAPEUTICAL EFFECTS.—As perhaps the most effectual remedy we possess for the expulsion of tape-worm, oil of turpentine stands deservedly in high repute. It operates as a specific poison to the parasite, causing its immediate death; thus in Küchenmeister's experiments the tape-worm died in from an hour to an hour and a quarter in a mixture of oil of turpentine and white of egg. It is nearly equally efficacious over the lumbrici; and has been also used with much benefit in the form of enema for ascarides in the rectum. Occasionally its administration is attended with unfortunate results—strangury, bloody urine, vertigo, a species of intoxication, an erythematic eruption on the skin being witnessed; these effects, however, are more likely to follow its use in small than in large doses. (See *Cathartics, Diuretics, Epispastics,* and *General Stimulants.*)

DOSE AND MODE OF ADMINISTRATION.—As an *anthelmintic:* for adults, f℥ss. to f℥ij.; for children, fʒj. to f℥ss. It may be given either floating on the surface of water, or made into an emulsion with mucilage (of which it requires equal portions), or with yolk of egg (one to every ounce), or in the form of enema.

PREPARATIONS.—Confectio, Enema, Linimentum, Linimentum Terebinthinæ aceticum, Unguentum.

Confectio Terebinthinæ. Confection of Turpentine. (Take of oil of turpentine, one fluid ounce; liquorice root, in powder, one ounce; clarified honey, two ounces. Rub the oil of turpentine with the liquorice, add the honey, and mix them together to a uniform consistence.) This form has been adopted from Dr. Copland's Dictionary of Practical Medicine. Confection of turpentine is readily miscible with water, for which method of administration it is well adapted, but in the solid state it is very nauseous. The dose as an *anthelmintic* is from ℥ij. to ℥iv. for adults, and from ℥ss. to℥j. for children.

Enema Terebinthinæ. Enema of Turpentine. (Take of oil of turpentine, one fluid ounce; mucilage of starch, fifteen fluid ounces. Mix. A full dose for an adult; one-fourth part may be administered to a child.)

CHAPTER III.

ANTISPASMODICS.

ANTISPASMODICS, as their name indicates, are medicines which counteract irregular or inordinate muscular action—*spasm*. This deranged state of the system depends on so many different causes, and is produced by so many different sources of irritation, that its successful treatment will very frequently depend on the employment of remedies calculated to remove the more immediate cause or source of irritation by which the spasmodic affection is produced. It follows, therefore, that under peculiar circumstances the remedies which will be found most successful in counteracting spasm must be derived from very different divisions of the Materia Medica; and thus the term Antispasmodic will become applicable to a *narcotic*, a *sedative*, a *nauseant*, an *anæsthetic*, a *stimulant*, a *cathartic*, or a *tonic;* and in some cases remedies which directly depress the vital powers, such as the prolonged use of the warm-bath, and even in a few cases the abstraction of blood, are the most effectual means of subduing spasm. There are, however, certain medicines which appear to exert a direct control over spasmodic action, independently of any influence upon its exciting causes, and these form the subject of inquiry in the present chapter. The precise mode in which such agents produce their effects is not well understood, and the present extent of our knowledge regarding them is only that they act on the nervous system, from deranged conditions of which the state demanding their employment arises. Many of the substances contained in this class of medicines have a powerful, usually disagreeable odour, such as assafœtida, galbanum, valerian, &c.; and we consequently find that the older therapeutists included amongst antispasmodics all remedial agents possessing these properties; in the present day, however, the number of *pure* antispasmodics is much diminished, and it is probable that as our knowledge of therapeutics advances, this *sub*-division of medicines will be abolished. The prescriber must remember that antispasmodics vary in their effects on different individuals probably more than any other remedies, also that by repetition their power rapidly diminishes, and that their effects are manifested quickly, but are very evanescent.

ASSAFŒTIDA. *Assafœtida. Narthex Assafœtida*, Falconer *in* Royle's Materia Medica. *Plates* 20, 21, *vol. xxii*. Edinburgh Royal Soc. Trans. *A Gum-resin, obtained by incision from the living root, in Affghanistan and the Punjaub.* The plant furnishing us with the Assafœtida of commerce has been at various times stated to be the Ferula Persica, Ferula Assafœtida, and now the Narthex Assafœtida. All are natives of the south of Persia and the neighbouring districts of India, especially of Khorassan and Affghanistan; belonging to the Linnæan class and order *Pentandria Digynia*, and to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley).

BOTANICAL CHARACTERS.—A tall perennial plant, 5 to 8 feet high. The root is a foot or more in length, fusiform, 3 inches in diameter at the top, with a dark greyish corrugated surface, white or ash-coloured in the centre, abounding in an opaque, milky, fetid juice; leaves numerous, spreading, about 18 inches in length in the adult plant, of a dry leathery texture; stem erect, terete, striated, solid throughout, about two inches in diameter at the base, terminating in a luxurious head of compound umbels; flowers small, both barren and fertile; fruit from 7 to 15, ripening on the partial umbels, supported on short stalks; seed flattened, with plain albumen.

PREPARATION.—The process for obtaining assafœtida in the present day is stated by M. Buhse, a recent traveller in Persia, to be precisely similar to that described by Kæmpfer 160 years ago, as follows:—When the plant is four years old, the root-leaves are removed, and in forty days afterwards the top of the root is sliced off; a fœtid juice exudes, which concretes in a couple of days, is then scraped off, and a fresh slice of the root made—more juice exudes, is collected as above, and the same process repeated from ten to twelve times within six weeks—until the root is completely exhausted. The juice is exposed to the sun to become harder, and then packed in casks and cases, which are sent, by way of Bombay, to Europe.

CHARACTERS.—In irregular masses, partly composed of tears, moist or dry. The colour of a freshly-cut or broken piece is opaque white, but gradually becomes purplish-pink, and ultimately dull-yellowish or pinkish-brown. Taste bitter, acrid; odour fetid, alliaceous, and persistent. It dissolves almost entirely in rectified spirit.

PHYSICAL PROPERTIES.—Assafœtida is met with in commerce in irregular lumps from half a pound to three pounds in weight; pinkish-yellow and reddish-brown externally; when recently cut, of a pearl-white colour, with a waxy lustre, but on exposure to the air rapidly acquiring a rose-tint. It has a powerfully disagreeable, peculiar, alliaceous odour, and a strong, bitter, acrid taste. Specific gravity, 1·31 to 1·35.

CHEMICAL PROPERTIES.—It is composed of 65 per cent. of resin, 3·60 of volatile oil, 19·44 of gum, 11·66 of bassorin, with traces of saline matter, sulphate and carbonate of lime, extractive, lignin, &c., (Pelletier). According to Hlasiwetz, one pound of assafœtida of the best quality yields on the average one ounce of volatile oil, equal to about 3 per cent. It is a thin clear fluid, of a light yellow colour, with a penetrating smell, soluble both in alcohol and water; it contains sulphuret of allyle (Maclagan), its composition being $C_{24} H_{22} S_3$. To the sulphur present in this oil is due the blackening of pills containing assafœtida which have been silvered; the sulphur uniting with the silver to form sulphide of silver. The resin and volatile oil are the medicinal principles. Exposed to the air assafœtida is apt to become very hard, owing to the presence of the sulphate of lime, the *setting* of which is supposed to be the cause. It softens with a moderate heat; and is inflammable, burning with a fuliginous flame, is partially soluble in alcohol, ether, and vinegar; and may be formed into an emulsion with water. It is reduced to powder with difficulty, unless triturated with carbonate of potash.

THERAPEUTICAL EFFECTS.—Assafœtida is a powerful, stimulating antispasmodic, especially adapted for the spasmodic nervous diseases of females, as hysteria and some forms of chorea and epilepsy. No remedy we possess is so successful in the treatment of hysteria, administered either during the paroxysm or in the interval, especially when given in large doses, by which means alone its full benefit in this disease can be obtained; in a hysteric paroxysm we are frequently unable to administer medicines by the mouth, but when given in the form of enema, assafœtida will be found very effectual. In the convulsions of infants, especially when dependent on flatulence, and in the flatulent constipation of the aged, few remedies are more efficacious. It has been also employed with much benefit in the chronic spasmodic stage of hooping cough, in pure spasmodic asthma, and in that peculiar spasmodic difficulty of breathing so frequently the attendant of chronic catarrh. Its abominable odour, however, prevents it from being as generally used as its therapeutic powers would merit. Assafœtida has been also employed successfully as a vermifuge. Occasionally we meet with a very peculiar idiosyncrasy connected with the use of assafœtida, whether administered by the mouth or rectum—the induction of a marked sensation of faintness. I have in more than one instance remarked this, and have taken such precautions as to satisfy my own mind of the existence of such an idiosyncrasy.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx. in pills or emulsion.

PREPARATIONS.—Enema, Pilula Aloes et Assafœtidæ, Pilula composita, Tinctura.

Enema Assafœtidæ. Enema of Assafœtida. Syn.—*Enema fœtidum*, E. D. (Take of tincture of assafœtida, six fluid drachms; mucilage of starch, six fluid ounces. Mix). The formulary for this enema is unexceptionable in every particular save one, its bulk; if it were intended that it should be retained, f℥vi. are too many; if to be expelled, too few. In the former case, f℥ij. of the menstruum should be employed; in the latter, f℥vj. of the mucilage should be added to this enema.

Pilula Aloes et Assafœtidæ. Pill of Aloes and Assafœtida. (Take of Socotrine aloes, in powder, one ounce; assafœtida, one ounce; hard soap, in powder, one ounce; confection of roses, one ounce. Beat all together until thoroughly mixed.) Dose, from gr. v. to grain xx.

Pilula Assafœtidæ Composita. Compound Pill of Assafœtida.

(Take of assafœtida, two ounces; galbanum, two ounces; myrrh, two ounces; treacle, by weight, one ounce. Heat all together in a capsule by means of a steam or water bath, and stir the mass until it assumes a uniform consistence.) Dose from gr. v. to gr. xx.

Tinctura Assafœtidæ. Tincture of Assafœtida. (Take of assafœtida, in small fragments, two ounces and a half; rectified spirit, one pint. Macerate for seven days, strain, filter, and add sufficient rectified spirit to make one pint.) Only used in the form of enema, its taste and smell entirely forbidding its ingestion by the mouth. Dose, fl. ʒj. to fl. ℥ss.

**Spiritus Ammoniæ fœtidus.* (Assafœtida, ℥iss.; rectified spirit, Oiss.; strong solution of ammonia, sp. gr. ·900, f℥iij.; break the assafœtida into small pieces, and macerate it in the spirit for twenty-four hours; then distil off the entire of the spirit, and mix the product with the solution of ammonia. The specific gravity of this preparation is ·849.) If any *fluid* preparation of assafœtida is admissable by the mouth, it is this; it may be prescribed in from x. to xx. minim doses.

CASTOREUM. *Castor. Castor Fiber,* Linn. *The beaver. The preputial follicles and their secretion, dried, separated from the somewhat shorter and smaller oilsacs which are frequently attached to them; from the Hudson's Bay Territory.* The beaver, an inhabitant of the northern parts of Europe and North America, is placed by Cuvier in the class *Mammalia,* order *Rodentia.* Both the male and female beavers are furnished with castor sacs. In the living animal the secretion contained in them is fluid, but when removed from the animal it concretes rapidly.

CHARACTERS.—Follicles in pairs, about three inches long, fig-shaped, firm, and heavy, brown or greyish-black; containing a dry resinous reddish-brown or brown highly-odorous secretion, in great part soluble in rectified spirit, and in ether.

PHYSICAL PROPERTIES.—As met with in commerce, North American castor (the chief kind now imported into Britain, Russian castor being extremely scarce and consequently bearing a very high price) consists of the two sacs united together by a kind of natural ligament; they are wrinkled; of a reddish-brown colour externally, paler internally; breaking with a somewhat resinous fracture, sometimes quite hollow in the centre. It has a strong, peculiar, disagreeable odour, and a somewhat aromatic, bitter taste.

CHEMICAL PROPERTIES.—It contains volatile oil *(Carbolic acid),* resin, albumen, a peculiar principle discovered by Brandes and named by him *Castorine,* and to which it is stated to owe its properties, fatty matter, mucus, carbonate of lime, and salts of soda and potash. Castor yields its active principles almost entirely to alcohol, and but very imperfectly to water.

THERAPEUTICAL EFFECTS.—Castor was formerly in high esteem as an antispasmodic, but in the present day has nearly fallen into disuse, its employment being restricted to some of the milder forms of hysteria, in which any benefit it produces is probably owing to its nauseous smell and taste.

DOSE AND MODE OF ADMINISTRATION.—In substance from gr. lx. to gr. cxx.

PREPARATION.—Tinctura.

TINCTURA CASTOREI. *Tincture of Castor.* (Take of castor, one ounce; rectified spirit, one pint. Macerate for seven days, strain, express, filter and add sufficient rectified spirit to make one pint). Dose, from one to four fluid drachms, but to produce any appreciable effect by the castor which it contains, a dose would be required far exceeding what otherwise might be prudent, in consequence of the amount of spirit that should necessarily be ordered.

*COTYLEDON. *The herb of Cotyledon umbilicus; Common Navelwort.* An indigenous plant belonging to the natural family *Crassulaceæ* and the Linnæan class and order *Decandria Pentagynia.* This well-known plant, the peculiar peltate orbicular leaves of which give it the name of navelwort from the mode of insertion of their footstalk, grows rather commonly throughout Ireland on rocks and the walls of old ruins; it has a purplish stem about six inches high, and pale greenish-yellow flowers, pendulous in a simple raceme. A few years ago it acquired some note as a remedy for epilepsy, from the writings of Dr. Salter of Poole; and several other practitioners have corroborated his testimony of its good effects. My lamented friend the late Dr. Graves found it useful in some cases, while it altogether failed in others; nevertheless he looked upon it as a valuable addition to our list of remedies in a disease so whimsical in its amenability to treatment (Dublin Quarterly Journal of Medical Science, vol. xiv. p. 257); but in every case in which I tried it, it failed to effect a cure, although in a few instances some good effect appeared at first to follow its administration. Dr. Ranking also employed it perseveringly in thirty cases of epilepsy, but without obtaining any good effect from its use. Dr. Salter, whose employment of this plant was altogether empirical, recommends for use the juice expressed from the entire herb while the leaves are green and succulent, or a fluid extract prepared from the leaves by inspissation; the dose of the former is one ounce; of the latter one drachm, twice daily. By evaporation, the fluid extract can be solidified and administered in grain doses in the pilular form. I am not aware that the cotyledon has been tried in any other spasmodic disease than epilepsy.

*FULIGO LIGNI, *Wood soot,* formerly contained in the British Pharmacopœias, is still much used on the continent, and for a number of years has been employed with excellent effects as an antispasmodic by many physicians in this city. It has been found most beneficial in the latter stages of hooping-cough in children, and in some forms of hysteria. It is prepared by burning wood under a small flue, and collecting the soot which is deposited in the chimney. It consists of a peculiar extractive matter called *pyretin*, some acetic acid, acetates of soda, potash, magnesia, and ammonia, creasote, &c. It yields its active properties partly to water, but more completely to alcohol. The preparations of soot that have been employed are as follow:—

Decoctum Fuliginis (Wood soot, ℥iv.; boiling water, Oiss., boil down to Oj. and strain). Only used as an external application to chronic eruptions of the scalp, and to obstinate ulcers.

Tinctura Fuliginis (Wood soot, gr. cxx.; assafœtida, gr. lx; proof spirit, f℥xxxij.; digest for three days and strain). Dose, f℥j. to f℥ij.

Spiritus Fuliginis (Wood soot, 1 part; proof spirit, five parts; water, fifteen parts; distil four parts). Dose, min. xx. to min. xxx.

Extractum Fuliginis (Wood soot, one part; boiling water, eight parts; boil for fifteen minutes, strain through linen, and evaporate to a proper consistence). Dose, gr. v. to gr. x.

GALBANUM. *Galbanum. A Gum-resin, derived from an unascertained umbelliferous plant; imported from India and the Levant.* The true plant which yields Persian galbanum is involved in much doubt. M. Buhse in his travels in Persia mentions that he found it growing on the Damawend mountains. He believes it to be a species of *Ferula*, probably *Ferula erubescens*; but he states positively that it is not a species of either *Galbanum* (to which it was referred in the last edition of the L. P.) or *Opöidia* (to which source the last edition of the D. and E. Pharmacopœias referred it). It belongs to the natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia*. It is imported from India and from the Levant.

CHARACTERS.—In irregular tears, about the size of a pea, usually agglutinated into masses of a greenish-yellow colour, translucent, having a strong disagreeable odour, and an acrid bitter taste.

PREPARATION.—It is probably procured from the root by a process similar to that followed for obtaining assafœtida; for use in medicine, the London College directed the commercial drug to be purified as follows:—*Galbanum Præparatum*, "of Galbanum, in small lumps, ℔j., water sufficient to cover it; boil together until they are mixed, strain through a hair sieve, and evaporate in a water-bath, constantly stirring, so that it may harden when cold."

PHYSICAL PROPERTIES.—It occurs both in tears and in lump; the tears are globular, irregular, about the size of a pea, usually agglutinated into masses of a pale greenish-yellow colour, somewhat translucent, having a strong peculiar odour, and an acrid, disagreeable, bitter taste; the lump variety is of a darker colour, rather opaque, with a less powerful odour and taste; when exposed to cold, both kinds become brittle, and may be readily reduced to powder.

CHEMICAL PROPERTIES.—Galbanum consists chiefly of resin and gum, with a small proportion of volatile oil, and malate of lime. It is almost entirely soluble in proof spirit, and partially so in rectified spirit and in ether; it forms an emulsion with water, and is rendered softer, but not melted by heat.

THERAPEUTICAL EFFECTS.—Galbanum is employed in the same cases as assafœtida, with which it is generally combined, being less energetic than that substance. It is more frequently used externally, as a stimulating antispasmodic, being better suited for plasters in consequence of its consistence.

DOSE AND MODE OF ADMINISTRATION.—In substance, either in pill or emulsion, gr. x. to gr. xx.

PREPARATION.—Emplastrum, Pilula Assafœtidæ composita.

Emplastrum Galbani. Galbanum plaster. (Take of Galbanum, one ounce; ammoniac, one ounce; yellow wax, one ounce; litharge plaster, eight ounces. Melt the galbanum and ammoniac together, and strain. Then add them to the litharge plaster and wax, also previously melted together, and mix the whole thoroughly.) This plaster spread on leather has been applied over indolent tumours with some vague idea that it contributes to their discussion. Any therapeutical property it possesses is due to its consistency, and the support and *pressure* thereby imparted—qualities which make its application over the spinal region occasionally also of use in children affected with rickets.

MOSCHUS. *Musk. Moschus moschiferus*, Linn. *Native of Thibet and other parts of Central Asia. The inspissated secretion from the præputial follicles, dried; imported from China.* The musk animal, an inhabitant of the mountains of Eastern Asia, especially frequenting the steppes of the Altai, the banks of the river Irtysch, Mongolia, Thibet, and Butan, as far as Tonquin, is placed by Cuvier in the class *Mammalia*, order *Ruminantia*. It is about the size of a roebuck of six or seven months old, and has no horns; its fur throughout the life of the animal is characterized by the presence of two white bands, bordered with black, and enclosing between them a black band which extends along the under part of the neck from the throat to the chest. It leads a solitary life, except in August, and the secretion is supposed to play some part with reference to the process of reproduction. In the male animal, immediately in front of the præputial orifice, is situated a small sac filled with a viscid fluid, which in the dry state constitutes musk. It is imported into the British market principally from China. This is by no means the only animal endowed with a similar secretion; the musk-rat, the musk-ox, and some insects (the Aromia Moschata) being furnished with it.

CHARACTERS.—In irregular reddish-black rather unctuous grains; having a strong, peculiar, very diffusible odour, and a bitter, aromatic taste; contained in a round or slightly oval membranous sac, about two inches in diameter, covered on the outer side with stiff, greyish hairs arranged in a concentric manner around its central orifice.

PHYSICAL PROPERTIES.—The musk-bag, or as it is commonly called musk-pod, is somewhat oval, about 2½ inches long, and 1¾ inches broad, smooth, and bare on one side, somewhat convex, and covered with stiff, brownish-yellow hairs on the other; it contains from gr. lx. to gr. clxxx. of musk. Musk is in the form of small unctuous grains, of a deep reddish-brown colour, mixed with whitish hairs; it has a strong, peculiar, diffusible, very persistent odour, and a bitter, aromatic taste.

CHEMICAL PROPERTIES.—Musk consists of ammonia, stearine, elaine, cholesterine, acid oil combined with ammonia, volatile oil, an undetermined acid, gelatin, albumen, fibrine, carbonaceous matter, and numerous salts (*Guibourt* and *Blondeau*). It yields its active principles partly to water, but more completely to alcohol. The odorous principle never yet has been insulated; its extreme diffusibility has been attributed to the ammonia which it contains—a statement supported by the fact that rubbing it up with caustic potash increases its intensity. Hanle states that the addition of bitter almonds to a solution containing musk, for a time destroys the odour, but that it returns as the Prussic acid evaporates. The antimonium sulphuratum also removes its odour. Kermes mineral imparts to it the smell of onions.

ADULTERATIONS.—Grain-musk is usually adulterated; dried bullock's blood is employed for this purpose; it may be detected by adding to an infusion of the suspected drug a solution of corrosive sublimate; if it be genuine, it will not precipitate. Earth, sand, iron, and lead have also been found present. Spurious musk-bags are not uncommon in commerce; they are most easily detected by the microscopic characters of the hairs with which they are covered, as I first pointed out in the *Dublin Quarterly Journal*, vol. i., page 77. The hairs of the true musk-bag are furnished internally with distinct, regular, colour cells; while none can be perceived in those found on the spurious pods.

THERAPEUTICAL EFFECTS.—Musk is not much prescribed now, in consequence of its high price; it is nevertheless a stimulating antispasmodic of great power, and is administered with excellent effect in hysteria, in chorea, and in the subsultus tendinum and hiccough of fevers and other diseases assuming a typhoid type; in these latter cases its value, *in full doses*, combined with the carbonate of ammonia, cannot be too strongly enforced. In cases of hysteria of long standing, so nearly allied to epilepsy as to be scarcely distinguishable from it, I have obtained very beneficial results from the employment of musk.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. x. to gr. xx. It may be given in pill, or made into an emulsion with gum arabic, sugar, and rose-water.

INCOMPATIBLES.—Sulphate of iron; nitrate of silver; corrosive sublimate; and infusion of bark.

RUTA. *Rue; Ruta graveolens*, Linn. Plate 37, *Woodv. Med. Bot.* A native of the South of Europe, cultivated in our gardens. It belongs to the natural family *Rutaceæ*, and to the Linnæan class and order *Decandria Monogynia*.

BOTANICAL CHARACTERS.—A small branching shrub; with glaucous bluish-green leaves, and yellow flowers in umbellate racemes.

PHYSICAL PROPERTIES.—The entire plant is met with in the shops. It has a strong, disagreeable, somewhat aromatic odour in the fresh state, much of which is lost in drying; and a bitter, acrid, unpleasant taste.

CHEMICAL PROPERTIES.—Its medicinal properties depend on volatile oil and bitter extractive; the former, *Oleum Rutæ*, is officinal in the Pharmacopœia; it is obtained by distilling the fresh leaves and unripe fruit with water. Oil of Rue is of a pale yellow colour, becoming darker by age; it has the peculiar odour of the plant in a marked degree, and a bitter, acrid, warm taste; its specific gravity is ·911. Rue yields its active properties to boiling water, but by decoction the volatile oil is dissipated.

THERAPEUTICAL EFFECTS.—Rue is a stimulating antispasmodic of some power, although not much employed in the present day. It has been administered with benefit in the spasmodic colic and general convulsions of children; and in the hands of some practitioners is said to have proved useful in hysteria and idiopathic epilepsy.

DOSE AND MODE OF ADMINISTRATION.—Preparations of the fresh herb should be always employed, such as the infusion (prepared by infusing ℥j. of the herb in Oj. of boiling water, in a covered vessel, for an hour); or the oil: the dose of the former is f℥j. to f℥ij.; of the latter min. ij. to min. v. in some agreeable syrup. The *Syrup of Rue* of the shops, employed as a domestic remedy in the colic of infants and children, is prepared by dissolving twelve drops of the oil in half an ounce of rectified spirit, and adding to it a pint of simple syrup.

Oleum Rutæ. English Oil of Rue. The oil distilled in England from the fresh leaves and the unripe fruit.

CHARACTERS.—Colour pale yellow, odour disagreeable, taste bitter, acrid.

**Confectio Rutæ.* (Rue, fresh, bruised; caraway; bay berries, each ℥iss.; sagapenum, prepared, ℥ss.; black pepper, gr. cxx.; honey, ℥xvj.; distilled water, a sufficiency; rub the dry ingredients together to a very fine powder; then to the sagapenum melted in the water and honey over a slow fire add the powder gradually, and mix all together). Only used in enemas in the spasmodic affections of infants and children; for this purpose, from gr. xx. to gr. lx. may be added to f℥vj. or f℥viij. of thin gruel.

*SAGAPENUM. *Gum-resin of an unknown plant;* presumed by many authors to be the produce of a plant belonging to the natural family *Umbelliferæ.* Imported from the Levant, and from Alexandria.

PHYSICAL PROPERTIES.—It occurs in semi-translucent masses of a dark brownish-yellow colour, consisting of numerous tears agglutinated together; has a fœtid odour, weaker than assafœtida, and a hot, acrid taste; and breaks with a horny fracture.

CHEMICAL PROPERTIES.—According to the analysis of Pelletier, sagapenum consists of gum, resin, volatile oil, bassorine, and some salts.

THERAPEUTICAL EFFECTS.—Sagapenum produces effects precisely similar to, but weaker than, assafœtida; it is consequently scarcely ever employed now.

DOSE AND MODE OF ADMINISTRATION.—In substance, given in the form of pill, gr. v. to gr. xx.

* SUMBUL. *Jatamansi, or Musk Root. The root of an unascertained plant, probably some species of an Umbellifer.* This root has long been used in India as a perfume, incense, and medicine; it is the produce of a plant supposed to belong to the Natural family *Umbelliferæ*, and to be an inhabitant of low, moist countries. It was first employed in regular medicine by several Russian physicians, and some years since the attention of the profession was called to its medicinal properties by Dr. Granville of London, who published a pamphlet on its efficacy in various nervous diseases; and since then it has been more or less used in practice both in this country and America. It has been imported chiefly from Russia, and is stated to be procured from the district in the neighbourhood of Bucharest. It occurs in circular pieces, very light, from one to two inches in diameter, and from two to three inches in depth, flat or slightly concave above where the root top had been cut off, and terminating abruptly below in several root branches. The transverse section exhibits a very porous fibrous structure, surrounded by an extremely thin smooth epidermis; its colour internally is a dirty greyish-yellow with lighter coloured striæ, and externally very light brown. The odour is decidedly musk-like, and its taste aromatic and slightly bitter. Reinsch has examined it, and states it to contain volatile oil, two balsamic resins, wax, *sumbulic acid,* &c.

The diseases in which this drug has been chiefly used are, as above stated, those of the nervous system, such as hysteria, epilepsy, delirium tremens, etc. In this last affection (delirium tremens) Dr. Thielman of St. Petersburgh depends principally upon its administration, considering it, in its composing qualities, superior even to opium. It has been also employed in cholera, and is stated to bear a high character in Russia for its efficacy in that epidemic. Dr. Boyd, of the Somerset County Hospital for the Insane, states in his annual report for the year 1852, that he has found the tincture mitigate the severity of the fits in the epileptics in his institution. In its action it may be considered as allied to valerian, though more marked in its effects.

Sumbul may be given either in infusion or tincture. The infusion, which I consider the preferable form, may be prepared by infusing ℥ss. of the bruised and torn root in half a pint of boiling water for an hour in a closely covered vessel, and straining; the dose of it is from f℥ss. to f℥j. every second or third hour according to circumstances. The *tincture* is prepared by macerating for seven days ℥ij. of the coarsely powdered root in f℥xvj. of proof spirit, and straining; dose, f℥j. to f℥ij. The *resin*, however, has been the preparation most used in Russia, where it has been extensively employed both as a stimulating expectorant and antispasmodic. Dr. Murawieff gives the following formula for its preparation:—Slice the root into fine pieces, wash it with cold water until the water passes colourless; then macerate for two hours in a cool place, in a concentrated solution of carbonate of soda. Pour off the liquid and wash again with cold water. Infuse the dried root in rectified spirit, filter and add a little quicklime; filter again, precipitate any dissolved lime with a little sulphuric acid; treat the solution with animal charcoal, and finally filter. Then distil off the spirit; mix the residue with three parts of water, evaporate, wash with cold water, and dry. The dose of the resin thus obtained is from gr. ½ to gr. j. twice or three times daily. It may be also administered in the form of tincture or syrup.

VALERIANA. *Valerian. Valeriana officinalis*, Linn. *Plate* 96, Woodv. Med. Bot. *The root of plants indigenous to and also cultivated in Britain, collected in autumn and dried; that from wild plants growing on dry soil being preferred.* Belonging to the Linnæan class and order *Triandria Monogynia*, and to the Natural family *Valerianaceæ.*

CHARACTERS.—A short yellowish-white rhizome, with numerous fibrous roots about two or three inches long; of a bitter taste and penetrating odour, agreeable in the recent root, becoming fetid by keeping; yielding volatile oil and valerianic acid when distilled with water.

BOTANICAL CHARACTERS.—The rhizome is tuberous, perennial, sending up a smooth, erect, furrowed stem, from two to four feet high, which produces rose-coloured flowers in a somewhat panicled corymb.

PHYSICAL PROPERTIES.—The root, which should be dug up in autumn when the leaves have decayed, or in spring before the stem rises, consists of a short tuberous root-stock, and numerous root-fibres from two to six inches long, yellowish-brown externally, whitish internally, of a strong, penetrating, characteristic odour, (frequently presenting peculiar attraction to cats, producing in these animals a species of intoxication), and a bitter, acrid, somewhat aromatic taste. The roots of those plants which grow on the banks of rivers or in marshy places are generally inert.

CHEMICAL PROPERTIES.—It consists of woody fibre, resinous extractive, gummy extractive, resin, and a little more than one per cent. of volatile oil, which is crystallizable and has been termed *valerole*, and in which a peculiar acid, which has been named *valerianic acid*, is developed by exposure to the air. The volatile oil may be obtained from the dry root by distillation; it is a mixture of a peculiar oil having a camphoraceous odour, and of valerianic acid, but which, according to Gerhardt, does not exist in the oil when first distilled, and even Guibourt, who denies this statement, asserts that valerianic acid does not exist in the fresh root, but is developed in the process of drying. It is to the valerianic acid that the active properties of the plant have been attributed by some authors (others, however, on good grounds doubt this fact), consequently numerous processes have been lately proposed for obtaining this acid, but the most simple is by decomposing the valerianate of soda or of zinc by an acid, and distilling. Thus prepared it bears much resemblance to the volatile fatty acids; it is an oily liquid, colourless, with a strong persistent odour of valerian, and an acid, pungent taste; it boils at 270°, and is very soluble in water, alcohol, and ether; its density is ·944, and its composition $C_{10}H_{10}O_4$. Various combinations of valerianic acid have been suggested, in the hope of combining the recognised virtues of the bases, such as zinc, iron, quinine, &c., with the assumed properties of valerian; to Prince Louis Lucien Bonaparte the merit of this suggestion is due. These salts will be described after the preparations of valerian properly so called. Valerian imparts its properties to both water and rectified spirit. Magnesia mixed with valerian completely removes its odour, which, however, may be again restored by the addition of sulphuric acid.

THERAPEUTICAL EFFECTS.—Valerian is a stimulating antispasmodic, its action being particularly manifested on the cerebral organs; thus, when given in large doses, it produces head-ache, loss of vision, and vertigo. It was formerly used as a remedy in rebellious intermittents, and in adynamic fevers, but in the present day it is only employed as an antispasmodic, and opinions differ much with respect to its efficacy as such. My own experience leads me to place much reliance on it in the treatment of aggravated cases of hysteria, which so often bear a close resemblance to epilepsy, in consequence of which perhaps it is that its reputation in the treatment of this latter disease has been gained; and also in many nervous affections, especially chorea; however, I have always remarked that it soon loses its antispasmodic powers, even though the dose be increased. It is unquestionable that some of the salts of valerianic acid are more certain in their operation than the preparations of the herb, and will therefore, probably, ere long displace the latter from our list of therapeutic agents.

PREPARATIONS.—Infusum, Tinctura, Tinctura ammoniata.

Infusum Valerianæ. Infusion of Valerian. (Take of valerian, bruised, one hundred and twenty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain). Dose—from one to two fluid ounces.

Tinctura Valerianæ. Tincture of Valerian. (Take of valerian, bruised, two ounces and a half; proof spirit, one pint. Macerate the valerian for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint).

Tinctura Valerianæ Ammoniata. Ammoniated Tincture of Valerian. (Take of valerian, bruised, two ounces and a half; aromatic spirit of ammonia, one pint. Macerate the valerian for seven days in a well-closed vessel, then filter, and add sufficient aromatic spirit of ammonia to make one pint.) The dose of either of these tinctures may be assumed to be the same—from half a fluid drachm to two fluid drachms—of the two, the latter will be found to be the most efficacious antispasmodic, especially in the case of hysterical females.

SODÆ VALERIANAS. *Valerianate of Soda.* ($NaO,C_{10}H_9O_3=144$).

Take of solution of soda, a sufficiency; fousel oil, four fluid ounces; bichromate of potash, nine ounces; sulphuric acid, six fluid ounces and a half; distilled water, half a gallon. Dilute the sulphuric acid with ten fluid ounces of the water, and dissolve the bichromate of potash in the remainder with the aid of heat. When both liquids are cold, mix them with the fousel oil in a matrass with occasional brisk agitation, until the temperature of the mixture has fallen to about 90°. Connect the matrass with a condenser, and distil until about half a gallon of liquid has passed over. Saturate the distilled liquid accurately with the solution of soda, remove any oil which floats on the surface, evaporate till watery vapour ceases to escape, and then raise the heat cautiously, so as to liquefy the salt. When the product has cooled and solidified, break it into pieces, and immediately put it into a stoppered bottle.

Fousel oil, or amylic alcohol, will be more fully described in its appropriate place (Supplementary Agents). Suffice it now to state that it is composed of $C_{10}H_{11}O,HO$, or that it is the hydrated oxide of amyle ($C_{10}H_{11}$). By the action of oxygen upon the Fousel oil two of its atoms of hydrogen will be removed in the form of water, leaving valerianic aldehyd, thus, $C_{10}H_{11}O,+2O=C_{10}H_9O+2HO$; and by the addition of two other atoms of oxygen this is converted into valerianic acid, thus, $C_{10}H_9O+2O=C_{10}H_9O_3$. The valerianic acid thus formed, when neutralized by soda, constitutes valerianate of soda. The requisite amount of oxygen is furnished by the action of the sulphuric acid on the bichromate of potash, in virtue of which chrome alum is formed, and oxygen set free, thus, $KO,2CrO_3 + 4SO_3HO = 3O + KO,Cr_2O_3,4SO_3 + 4HO$.

The oil alluded to is the valerianate of the oxide of amyle ($C_{10}H_{11}O, C_{10}H_9O_3$).

CHARACTERS.—In dry white masses without alkaline reaction, entirely soluble in rectified spirit, and giving out a powerful odour of valerian on the addition of dilute sulphuric acid.

This salt has hitherto been employed but in the manufacture of the other valerianates, for which purpose it was originally introduced into the last edition of the D.P. In my opinion it deserves more than a pharmaceutical employment, as affording us a distinct means of ascertaining the absolute therapeutical value of valerianic acid. So long as we confine ourselves to prescribing valerianates of decided basic properties, such as those of zinc, it may fairly be questioned to which element of the salt the accruing benefit is due, but in the case of the valerianate of soda, if antispasmodic advantage follows its use, it can only be attributed to the valerianic acid.

ZINCI VALERIANAS. *Valerianate of Zinc.* ($ZnO,C_{10}H_9O_3 = 133{\cdot}5$)

Take of sulphate of zinc, five ounces and three quarters; valerianate of soda, five ounces; distilled water, a sufficiency. Dissolve the sulphate of zinc and the valerianate of soda, each in two pints of the water; raise both solutions to near the boiling point; mix them, cool, and skim off the crystals which are produced. Evaporate the mother liquor at a heat not exceeding 200°, till it is reduced to four ounces; cool again, remove the crystals which have formed, and add them to those which have been already obtained. Drain the crystals on a paper filter, and wash them with a small quantity of cold distilled water, till the washings give but a very feeble precipitate with chloride of barium. Let them now be again drained, and dried on filtering paper at ordinary temperatures.

EXPLANATION OF PROCESS.—A simple case of double decomposition; the sulphuric acid leaving the zinc and uniting with the soda to form sulphate of soda, whilst the valerianic acid unites with the zinc, forming the valerianate of zinc, thus, $NaO, C_{10}H_9O_3 + ZnO,SO_3 = ZnO, C_{10}H_9O_3 + NaO, SO_3$. Advantage is taken of its sparing solubility in cold water to separate the resulting salts, and the elutriation is with the object of removing the sulphate of soda.*

CHARACTERS.—In brilliant, white, pearly, tabular crystals, with a feeble odour of valerianic acid, and a metallic taste; scarcely soluble in cold water or in ether, soluble in hot water and alcohol. Heated to redness in an open crucible it leaves a residue which, when dissolved in dilute sulphuric acid, gives a white precipitate with hydrosulphuret of ammonia.

The white precipitate produced by the hydrosulphuret of ammonia is the sulphide of zinc.

TESTS.—Its solution in hot water is not precipitated by chloride of barium. It gives, when heated with dilute sulphuric acid, a distillate, which, when mixed with the solution of acetate of copper, does not immediately affect the transparency of the fluid, but forms after a little time oily drops, which gradually pass into a bluish-white crystalline deposit.

Sulphate of zinc, if present, would precipitate a sulphate of barytes on the addition of chloride of barium, whilst the other test is directed against a but too prevalent sophistication, butyrate of zinc, a salt in its physical characters closely resembling the valerianate. On the addition of the sulphuric acid and application of heat, either valerianic or butyric acids would be set free; the latter *immediately* throws down a blue precipitate on being added to the solution of acetate of copper; the former acts as described in the *test*, the oily drops being anhydrous valerianate of copper. We may in every instance suspect any sample that presents a *strong* valerianic odour; in such case the probability being that it is some one or other of the salts of zinc perfumed with oil of valerian. The acetate, oxide, and other preparations of the metal to which oil of valerian has been added, may be detected by adding a few drops of dilute hydrochloric acid, by which the valerianic acid will be evolved from the true but not from a false valerianate; the acetate may be still further identified by the production of acetic ether on the heating of a mixture of the suspected specimen with a little proof spirit and sulphuric acid.

THERAPEUTICAL EFFECTS.—Valerianate of zinc is a tonic antispasmodic of much power, and as such is peculiarly adapted for the treatment of neuralgic affections, which are so generally dependent on loss of tone in the system. It has been found especially useful in the treatment of facial neuralgia and of vertigo; but I have seen it prove equally beneficial in most of the protean forms of hysterical neuralgia. It is an excellent remedy in the ordinary convulsive affections of children and young persons of either sex, and when these depend on the presence of worms in the intestines it is peculiarly beneficial, acting indirectly as an anthelmintic of much power. In short, I look on it as a most valuable addition to the Materia Medica, and I fully agree with the observations of Devoy, that the chemical combination proves much more beneficial than the oil of valerian and oxide of zinc prescribed together. For some time the remedy had fallen into disrepute, owing to the difficulty of obtaining it pure; but this has been remedied by the new and cheap process originally introduced into the last edition of the D. P.

DOSE AND MODE OF ADMINISTRATION.—The dose of it is from three-fourths of a grain to one, two, or three grains twice or three times a day; it may be prescribed in the form of pill made with a little mucilage or conserve of red roses, or in solution in orange-flower water, or in distilled water flavoured with syrup of orange-flowers. The compounder must bear in mind that the crystals of valerianate of zinc do not dissolve readily in cold water, floating on the surface in consequence of their lightness; they should, therefore, be first incorporated with a few drops of water in a mortar.

INCOMPATIBLES.—All acids; the soluble carbonates; most metallic salts; and astringent vegetable infusions or decoctions.

*AMMONIÆ VALERIANAS. *Valerianate of Ammonia.* ($NH_4O, C_{10}H_9O_3 = 119$). This salt has been recently a good deal employed in medicine in consequence of a favourable report made upon it by several French physicians. It is obtained directly by saturating strong solution of ammonia with a slight excess of valerianic acid. The solution is evaporated to the consistence of a syrup, then mixed with twice its bulk of alcohol, and allowed spontaneously to evaporate. When the evaporation is completed, the valerianate of ammonia crystallizes in concentric rays. These should be most carefully dried without exposure to the air, and kept in a closely-stopped bottle. When thus prepared valerianate of ammonia is in the form of minute, pearly white, deliquescent crystals, with a sweetish taste and a mixed odour of valerianic acid and of ammonia. It is a neutral salt, but a concentrated solution in water, in which it is very soluble, soon becomes acid on exposure to the air. It is soluble also in alcohol; and a pretty certain test that it does not contain free valerianic acid is its complete and ready solubility in both alcohol and water.

This preparation has been too recently introduced into medicine to permit a very decided opinion being given as to its therapeutic value. It is as may be anticipated from its composition a stimulating antispasmodic, and has been recommended in neuralgia, hysteria, chorea, epilepsy, &c.; but in any cases in which I have employed it, the valerianate of ammonia did not appear to possess properties so superior to the other salts of valerian as to compensate for the difficulty of its preparation and the uncertainty of its composition. The dose of it is from gr. j. to gr. v. dissolved in from f℥ij. to f℥iv. of water and sweetened with sugar; but that it may be given in much larger doses is evident from the fact that in experiments tried upon dogs so much as gr. cl. did not produce any injurious effects.

M. Pierlot, who was the first to introduce this preparation into pharmacy, states that it should be always prepared and kept in solution as follows:—Distilled water, ninety-five parts; valerianic acid, three parts; carbonate of ammonia sufficient to saturate the acid; mix, and then add of the alcoholic extract of valerian, two parts. He adds the extract to prevent the salt undergoing decomposition. The dose of *Pierlot's* solution of valerianate of ammonia is from min. v. to f℥ss. diluted largely.

*FERRI VALERIANAS. *Valerianate of Iron.* ($Fe_2O_3 3C_{10}H_9O_3 = 359$).

PREPARATION.—Valerianate of soda, five ounces and three drachms; sulphate of iron, four ounces; distilled water, one pint; let the sulphate of iron be converted into a per-sulphate, and then dissolve the two salts in water, mix the two solutions, and, having placed the precipitate which forms upon a filter, and washed it with water, let it be dried by placing it for some days rolled up in bibulous paper, on a porous brick. This preparation should be kept in a well-stopped bottle.

EXPLANATION OF PROCESS.—The valerianate of soda and persulphate of iron mutually react on each other; the valerianic acid going to the iron to form valerianate of iron, and the sulphuric acid to the soda to form sulphate of soda, thus, $Fe_2O_3,3SO_3+3(NaO,C_{10}H_9O_3)=Fe_2O_33C_{10}H_9O_3+3NaO\,SO_3$.

PHYSICAL PROPERTIES.—Valerianate of iron, thus prepared, is in the form of a reddish-brown dull powder accreted into small porous masses. It is nearly tasteless, but has a very strong, disagreeable, valerianic odour.

CHEMICAL PROPERTIES.—According to Wittstein it is composed of three equivalents of sesquioxide of iron, seven of valerianic acid, and two of water; my experiments lead me to believe its composition to be as given above; it is, however, of so unstable a nature that the accurate determination of its composition is attended with great difficulty. It is insoluble in water, but is soluble in alcohol; heated, the valerianic acid is driven off, and sesquioxide of iron left. Valerianate of iron is not a permanent compound, for if exposed to the air the acid evaporates rapidly, and the salt undergoes decomposition; this effect is produced more rapidly by the addition of any of the stronger acids.

ADULTERATIONS.—Owing to the high price at which they were sold, all the valerianates were much adulterated; but as the process proposed by the Dublin College for their preparation yields them at a cheap rate, this sophistication is no longer to be so much apprehended. The purity of the valerianate of iron may be readily ascertained by its chemical and physical properties as given above.

THERAPEUTICAL EFFECTS.—This preparation has not been much employed in medicine hitherto, nor do I think that it is likely to come into general use, in consequence of its disagreeable odour and the facility with which it undergoes decomposition. Its effects are nearly similar to those of the valerianate of zinc, but my experience of it is not very favourable.

DOSE AND MODE OF ADMINISTRATION.—In pill made with liquorice powder and mucilage, half a grain to one grain three times a day.

INCOMPATIBLES.—All acids; and the astringent vegetable extracts.

*QUINÆ VALERIANAS. *Valerianate of Quina.*

PREPARATION.—Muriate of quina, seven drachms; valerianate of soda, one hundred and twenty-four grains; distilled water, sixteen ounces; dissolve the valerianate of soda in two ounces, and the muriate of quina in the remainder of the water, and, the temperature of each solution being raised to 120°, *but not higher*, let them be mixed, and let the mixture be set by for twenty-four hours, when the valerianate of quina will have become a mass of silky acicular crystals. Let these be pressed between folds of blotting paper, and dried without the application of artificial heat.

EXPLANATION OF PROCESS.—A simple case of double decomposition, the valerianic acid uniting with the quinine to form the required salt, and leaving as a residuum the chloride of sodium.

PHYSICAL PROPERTIES.—Valerianate of quina occurs in satiny crystalline masses of snowy whiteness; the crystals are octohedrons or hexagonal prisms. Its taste is purely bitter, not disagreeable, and it has a very feeble odour of valerianic acid.

CHEMICAL PROPERTIES.—It is composed of one equivalent of quina, one of acid, and twenty-four of water of crystallization. Heated it loses twenty equivalents of water, and is converted into a resinous mass no longer soluble in water: the same effect is produced by its solution in water, being kept for some time at a boiling temperature. Valerianate of quina is soluble in water, both proof and rectified spirit, and oils.

ADULTERATIONS.—I must refer to the observations made under this head with respect to the valerianate of iron. The best test for these salts is the addition of dilute hydrochloric acid which disengages from them valerianic acid, readily recognizable by its odour.

THERAPEUTICAL EFFECTS.—This is a very excellent preparation, being not only antispasmodic, but antiperiodic, so that it is specially adapted for those neuralgic diseases which assume an intermittent character. It therefore fulfils in itself two effects which are so often indicated in this class of diseases, and thus has proved to be a most useful remedy in many neuralgic affections, such as hemicrania, which so frequently baffle the physician's art.

DOSE AND MODE OF ADMINISTRATION.—The dose is from gr. ss. to gr. ij. three times a day. In periodic neuralgia a double dose should be given about an hour before the expected occurrence of the attack. As regards the mode of prescribing it, the remarks on valerianate of zinc are equally applicable to valerianate of quina.

INCOMPATIBLES.—Same as for valerianate of zinc.

CHAPTER IV.

ASTRINGENTS.

(Styptics—Desiccants—Constringents.)

ASTRINGENTS may be defined to be substances which produce contraction and condensation when they come into contact with living matter. The more immediate effect of astringents is to diminish secretion and excretion; ultimately they exert a tonic influence on the human body. Hence they appear to be very nearly allied to *Tonics;* indeed, in many instances, the most powerful tonics will be obtained from the division Astringents. Much difference of opinion exists as to the *modus operandi* of this class of remedial agents. Since the time of Cullen, it has been generally explained by a reference to their action in *tanning;* for the same substances which, by a peculiar chemical action, harden and condense dead animal matter, operate as astringents on the living system. This hypothesis, in part supported by the fact that our most trustworthy astringents, strictly so called, are notably rich in tannic acid, may, to a certain extent, hold good as to the local action of astringents when applied to a morbidly secreting surface; that is to say, they act by constringing the extreme vessels of the part—as a direct evidence of which, their effect on the tongue when introduced into the mouth may be referred to. But it will not account for their power in checking discharges from remote parts, when they are introduced into the system through the digestive organs; in the latter case we must suppose that they produce some peculiar change in the living principle of the structure generally, which is incompatible with excessive secretion or discharge. In cases where the use of astringents is indicated, it will always be necessary, in the first instance, *to ascertain the cause by which the morbid discharge is produced,* as it often occurs in diametrically opposite states of the system, and therefore very different remedies will in different cases assume the character of an astringent. Thus, where irritability exists, opium, which must be regarded as the type of Narcotics, will often prove the most useful remedy, given either alone or as an adjuvant to some more direct astringent. If a state of plethora of the vascular system exist, bleeding and other depletory measures will be indicated; or if the discharge, as in some forms of diarrhœa, is caused by acrid or acid matter, emollients or demulcents and ant-acids must be employed. In the diarrhœa of difficult dentition, lancing the gums will be found the most useful astringent; whilst in that dependent on some offending particles in the primæ viæ (the diarrhœa of irritation) a brisk cathartic draught containing rhubarb can alone be depended upon. The prolonged use of astringents diminishes remarkably cuticular transpiration and the secretions from the intestinal mucous membrane, while they seem to exert little influence in lessening that from the kidneys; in some cases, even an increased discharge of urine follows their administration, which, however, seems to depend upon their effect on the perspiration. When, therefore, it is requisite that they should be employed for any length of time, their administration ought to be occasionally intermitted, and means taken to restore a healthy condition of the various secretions and excretions, the balance of which may have been interfered with: of the various remedies which may be had recourse to with this view, I have found none so efficacious as tepid or cold salt-water bathing, according to the circumstances of each individual case; indeed, in most instances, cold bathing may be advantageously combined with the use of astringents.

ACETUM. *Vinegar.* (Impure dilute acetic acid, prepared from French wines by the acetous fermentation.)

PREPARATION.—In France vinegar is prepared from the lighter wines, by exposing them to the air in large wooden vessels placed in a room, the temperature of which is raised to between 68° and 80° F. In Britain, various kinds of malt liquor, cider, raw sugar dissolved in water, &c., are substituted for wine. Of late years, a greatly improved process has been used on the Continent, by which vinegar may be made in 36 hours:—strong alcohol is diluted with five or six parts of water, and about a thousandth part of yeast, honey, or impure vinegar added to it; the mixture is heated to 75° or 80° and made to trickle slowly through a mass of beech-wood shavings, contained in a tall cask narrowed at the bottom, and pierced with small holes at the top and lower part, to allow a circulation of air; as soon as the mixture is passed through the barrel three or four times, it is converted into vinegar; the change being effected by the alcohol absorbing oxygen from the atmospheric air; the process taking place very rapidly owing to the great surface over which the liquid is exposed. The theory of *acetification* (the term by which the conversion of alcoholic or saccharine liquors into vinegar is known) is simple in the extreme. Alcohol consists of $C_4H_6O_2$; on being exposed to the air two atoms of oxygen unite with two of the hydrogen to form aldehyd and water ($C_4H_6O_2+2O=C_4H_4O_2+2HO$). The aldehyd, by the absorption of two other atoms of oxygen, is converted into hydrated acetic acid ($C_4H_4O_2+2O=C_4H_3O_3, HO$), this, in a state of dilution with various other ingredients, constitutes the vinegar of commerce.

CHARACTERS.—A liquid of a straw colour and acetous odour. Ammonia added a little in excess generally renders it slightly turbid and more or less purple.

The ammonia test serves to distinguish French from English vinegar; with the former the colour is as described, *purplish;* with the latter either no change in colour is produced, or if produced it is *brownish;* the *turbidity* is due to a minute trace of lime.

TESTS.—Specific gravity 1·008 to 1·022. It is scarcely affected by chloride of barium or oxalate of ammonia, and not at all by sulphuretted hydrogen.

Chloride of barium would indicate the presence of sulphuric acid; oxalate of ammonia, of lime; sulphuretted hydrogen, of metallic impurities, such as lead and copper, derivable from the improper use in its manufacture of vessels made of these metals.

PHYSICAL PROPERTIES.—British vinegar is of a pale reddish-yellow colour, transparent, with a sharp peculiar *(acetous)* odour, and an acidulous refreshing taste. Specific gravity from 1·006 to 1·009. French or wine vinegar is generally of a deeper colour, and has a more fragrant odour than British or malt vinegar; its density also is greater, being from 1·008 to 1·022.

CHEMICAL PROPERTIES.—It is composed of acetic acid, colouring matter, mucilage, water, and a trace of alcohol and of acetic ether. British vinegar contains also sulphuric acid, manufacturers being allowed by law to add a thousandth part by weight of that acid for the alleged purpose of making it keep. In addition to the constituents mentioned above, it generally contains some bitartate and sulphate of potash. The odorous principle of vinegar is conjectured to be acetic ether. Its medicinal virtues depend on the acetic acid it contains.

ADULTERATIONS.—Vinegar varies much in strength, and also frequently contains many impurities. The density does not indicate accurately the quantity of acetic acid present, in consequence of the amount and variety of extraneous matter it contains. This is more correctly ascertained by its neutralizing power over crystallized carbonate of soda, 143 grains of the salt being equal to 51 grains of anhydrous acetic acid. In the application of this test, however, care must be taken to allow for any sulphuric acid present. The strongest vinegar prepared, which is termed *proof vinegar*, is estimated to contain five per cent. of real acid. The impurities most commonly met with in vinegar are metallic matter, generally copper or lead; some acrid vegetable substance, as capsicum, grains of paradise, &c., and sulphuric acid. If the colour be altered on the addition of sulphuretted hydrogen, it contains metallic matter; the presence of an acrid substance may be detected by the taste, the vinegar having been first neutralized with carbonate of soda; the quantity of sulphuric acid contained is indicated by the extent of the precipitate produced with solution of chloride of barium or nitrate of baryta.

THERAPEUTICAL EFFECTS.—Vinegar is an excellent refrigerating astringent, and as such is employed with much benefit in hemoptysis, in hematemesis, and in the colliquative sweating of hectic; taken largely diluted with water, as the usual drink of the patient, it will seldom fail to diminish the excessive discharges. As a local astringent it is used to check hemorrhage from the nose, from the uterus, from hemorrhoidal tumours, and from ulcers. In intestinal hemorrhage, enemas containing vinegar have been employed with advantage, particularly when the bleeding proceeds from the large intestines. Sponged over the head, chest, hands, and feet, it will be found most effectual in controlling colliquative sweating. In relaxation of the uvula and tonsils, it forms an excellent addition to astringent gargles; and, diluted with water, it is beneficially employed as a collyrium in chronic ophthalmia, and especially in relieving the symptoms produced by the introduction of lime within the eyelids. In that most distressing affection, *hiccough*, I have frequently seen benefit derived from a dose of a wine-glassful of vinegar. Finally, in poisoning with the alkalies, or alkaline carbonates, vinegar is one of the best antidotes that can be employed; but in poisoning with most other substances, such as opium, for which at one time it was very frequently used, its administration is in general productive of mischief. (See *Refrigerants.*)

DOSE AND MODE OF ADMINISTRATION.—f℥ij. to f℥ss. For an enema, f℥j. to f℥ij. diluted with f℥ij. to f℥iv. of water. As a drink in hectic, f℥iij. diluted with Oiss. of distilled water may be taken in the course of the day.

ACIDUM ACETICUM DILUTUM. *Dilute Acetic Acid* (Take of acetic acid, one pint; distilled water, seven pints. Mix.)

TESTS.—Specific gravity 1·006. One fluid ounce requires for neutralization 31 measures of the volumetric solution of soda.

This preparation is to be preferred to common vinegar, of which it purports to be the analogue, in consequence of its more equable strength, for external use in lotions, eye-washes, etc. For internal use, in virtue of its more agreeable taste, French vinegar should be preferred. The volumetric test establishes the presence of 15·81 grains in each ounce, equal to 3·59 per cent. of anhydrous acetic acid.

Oxymel. (Take of clarified honey, forty ounces; acetic acid, five fluid ounces; distilled water, five fluid ounces. Liquefy the honey by heat, and mix with it the acetic acid and water.) An excellent addition to astringent gargles.

Antihectic Mixture, AUTHOR.—(Vinegar, f℥ij.; laurel water, f℥ij.; simple syrup, f℥vj.; distilled water, f℥v.; mix.) Dose, f℥j. to f℥ij. every third or fourth hour. An excellent mixture in the profuse sweating of hectic.

ACIDUM SULPHURICUM VENALE. *Sulphuric Acid of commerce.* (Syn.: *Oil of Vitriol, Vitriolic Acid.*) *Monohydrated Sulphuric Acid,* HO,SO_3 (=49).

It would be quite foreign to the scope of this work to give more than an idea of how this acid is prepared, its manufacture being always conducted on the large scale, and full details to be found in any standard work on chemistry. Suffice it to say, that by the combustion of Sicilian sulphur or of pyrites, sulphurous acid (SO_2) is formed, and conducted into large leaden chambers, the bottom of which is covered with a stratum of water. In these chambers the sulphurous acid meets with fumes of nitric acid, and with aqueous vapour conveyed into them for the purpose; the nitric acid is deprived of its oxygen by the sulphurous acid, which is thus converted into sulphuric acid, and which, in consequence of its high specific gravity, falls to the bottom of the chamber, where it is absorbed by the water, and acidifies it. And this process is allowed to go on, ever until the water is so charged with acid as to acquire a specific gravity of from 1·300 to 1·600, the amount varying in almost every manufactory. It is then drawn off, and concentrated in leaden evaporating dishes until it attains a sp. gr. of about 1·700, and from these it is transferred into platinum dishes (as at this density it acts upon lead), where its concentration is completed, and it attains a sp. gr. of from 1·840 to 1·850; it is now introduced into large green glass bottles, termed carboys, and thus sent into commerce under the name of oil of vitriol.

The presence of watery vapour in the leaden chambers is essential to the success of the operation, as the acid fumes would not react upon each other in a dry atmosphere; this reaction may be thus expressed, $SO_2+NO_5=SO_3+NO_4$. The hyponitric acid thus formed with the assistance of the watery vapour is converted into nitric oxide gas, and nitric acid thus: $3NO_4+2HO=2(HO,NO_5)+NO_2$. The nitric acid thus formed continues the action with the sulphurous acid, but the nitric oxide gas robs the atmospheric air of two atoms of oxygen, and is again converted into hyponitric acid thus, $NO_2+2O=NO_4$. And so on the process goes, until the water at the bottom of the chamber has acquired the wished for density. From this statement it will be perceived that, if only a sufficient supply of air be kept up, a very small amount, indeed, of nitric acid will be competent to convert an indefinite quantity of sulphurous, into sulphuric, acid.

TESTS.—Specific gravity 1·84 to 1·85. When the acid mixed with six times its volume of distilled water is placed in contact with pure zinc, and the hydrogen evolved is ignited as it escapes from the capillary extremity of a glass tube, if a dark stain is formed on a piece of porcelain held low down on the flame, the acid contains arsenic, and is to be rejected. When a solution of sulphate of iron is poured cautiously on the surface of the undiluted acid, if a red tint appears at the surface of contact, the acid contains nitrous acid; and if the acid diluted as above becomes turbid, it contains other impurities, and in either case requires purification.

The turbidity produced on dilution is due to the deposition of sulphate of lead, which, though soluble in strong, is insoluble in dilute acid. The explanation of the other *tests* will be found farther on.

Acidum Sulphuricum. Sulphuric Acid. (Syn.: *Acidum Sulphuricum Purum. Pure Sulphuric Acid.*)

To purify the commercial acid the following directions are given in the Pharmacopœia:—

Take of sulphuric acid of commerce, twelve fluid ounces; sulphate of ammonia, in powder, a quarter of an ounce. Having added the sulphate of ammonia to the sulphuric acid, introduce the mixture into a plain retort with a few slips of platinum foil, cover the upper part of the body of the retort with a sheet-iron hood, and distil over one-tenth of the acid into a flask. Remove this flask, and reject its contents; and, having applied a fresh flask, continue the distillation till only a fluid ounce of liquid remains behind. Preserve the product in a stoppered bottle.

The effort to distil sulphuric acid is always attended with convulsive action, if it be not moderated mechanically. This convulsive action is due partly to its high boiling point, partly to its great specific gravity. This action, however, will be regulated by the introduction of slips of platinum, as directed in the text, or of portions of glass. The object with which the first portion is rejected is to get rid of water and volatile impurities; whilst distillation to dryness is interdicted, inasmuch as towards the close of the process the acid would commence to act upon any organic matter accidentally present, and by charring it, thus become discoloured. The sulphate of ammonia is directed to be employed with the view of getting rid of any nitrous acid that may be present; this it does by decomposing it, the hydrogen of the ammonia uniting with the oxygen of the nitrous acid, liberating sulphuric acid, water, and nitrogen, the two latter of which are got rid of during the process of distillation thus, $NO_3 + NH_4O,SO_3 = 4HO, + 2N + SO_3$.

Thus prepared, sulphuric acid may be looked upon as perfectly pure, presuming always that it had not contained arsenic as an original impurity; were this the case, the Pharmacopœial process is insufficient to free it from arsenic. Many processes have been suggested; that at present followed at Lyons is perhaps the best. It consists in treating a rather weak acid with sulphide of barium, by which the arsenious acid is converted into a tersulphide, which, along with the resulting sulphate of barytes, is precipitated thus, $AsO_3 + 3BaS + 3(HO, SO_3) = AsS_3 + 3HO + 3(BaO, SO_3)$. On standing, the acid can be decanted from the precipitates, and by boiling be concentrated to the required density; by this process also any nitrous acid that may be present will be gotten rid of in virtue of the reaction upon it of the sulphide of hydrogen, generated by the action of the sulphuric acid upon the sulphide of barium, by which the nitrous acid will be resolved into nitrogen gas which escapes, sulphur which is precipitated, and water, thus, $NO_3 + 3SH = N + 3HO + S$. The production of the sulphide of hydrogen is thus accounted for, $BaS + SO_3HO = BaO, SO_3 + SH$.

CHARACTERS.—A colourless liquid of oily appearance, intensely acid and corrosive. It evolves much heat on the addition of water, and when thus diluted gives a copious precipitate with chloride of barium.

The heat alluded to is due to the mutual condensation of the water and acid, in virtue of which *latent* heat is eliminated; by *condensation* is meant, that when certain volumes of acid and water are mixed together, the product is always less than the sum of the volumes employed. The maximum amount of condensation results on the admixture of three volumes of acid with two of water, and the elevation of temperature corresponds to 180°. The precipitate produced on the addition of chloride of barium is sulphate of barytes, a salt characteristic of this acid, and insoluble in water or other ordinary solvents. In addition to these characters may be remarked its great weight, readily recognized by even the most uneducated person; the absence of vapours and odour; its charring of organic matter, abstracting from it, in virtue of its intense thirst for water, the hydrogen and oxygen, and developing the carbon; that its boiling point is 617°; that it crystallizes at —29°. Although as described in the Pharmacopœia it should be colourless, strong sulphuric acid very frequently presents a straw, or even darker colour, due to the presence of more or less of organic matter, gradually abstracted, owing to careless keeping, from the atmosphere, in which such is constantly floating about; to its oily appearance is due one of its synonyms—*oil* of vitriol.

TESTS.—Specific gravity 1·846. One fluid drachm requires for neutralization 206 measures of the volumetric solution of soda. Evaporated in a platinum crucible it leaves no residue. When a solution of sulphate of iron is poured upon it, no purple ring is formed at the surface of the two solutions. Diluted with six times its volume of distilled water it gives no precipitate with sulphuretted hydrogen.

The specific gravity indicates 81·54 per cent. of anhydrous sulphuric acid; the volumetric test indicates the presence of 82·40 grs. anhydrous acid in each fluid drachm, figures mutually confirmatory of each other; its thorough evaporation indicates the absence of sulphates, and notably that of lead, derivable from its mode of manufacture; the non-production of the purple ring under the conditions stated predicates the absence of the acid compounds of nitrogen, which if present would produce this colour by converting the proto- into a per-salt of iron, and the consequent development of nitric oxide gas (NO_2), which is absorbed by some of the undecomposed protosulphate of iron; and the non-precipitation with the sulphide of hydrogen argues the absence of arsenic—an important impurity—invariably present if the acid be made from pyrites instead of sulphur. To render this test of value, the dilution is essential, as a stream of sulphide of hydrogen traversing strong sulphuric acid decomposes it, precipitating sulphur, which thus might give rise to an erroneous suspicion of the presence of arsenic. The presence of arsenic can be still further established by *Marsh's* test, for particulars of which see *Arsenious Acid.* The absolute rejection by the Pharmacopœial authorities of an acid so contaminated is justified by the dangerous character of the impurity, and the trouble attendant on its elimination.

THERAPEUTICAL EFFECTS.—Sulphuric acid is a most powerful corrosive poison, destroying the animal tissues wherever it comes in contact with them. Properly diluted it is an excellent tonic astringent, and is employed with very beneficial results in all forms of passive hemorrhages, and to check excessive discharges when they are dependent on debility. Thus it is used with much advantage in hemoptysis, in epistaxis, in slight but protracted bleedings from the uterus, the stomach, or intestines; and in the colliquative sweating and diarrhœa of hectic. In cases of ordinary diarrhœa, dilute sulphuric acid is in my experience one of the best astringents which can be employed, often succeeding in even the most chronic cases when other remedies have completely failed. It has been also used with the best results to check the premonitory diarrhœa of cholera; in leucorrhœa I have found it also very serviceable. In calculous affections, with phosphatic deposits, this acid is administered with much advantage; and in painters' colic it is very generally employed with benefit, both as a prophylactic of the disease, and as a remedy when the attack is present. In some forms of skin disease its exhibition is attended with the happiest results, especially in those where itching dependent on no evident local lesion is a prominent symptom. As a topical astringent, sulphuric acid, largely diluted, was at one time much used to foul and indolent ulcerations of the mouth and fauces; but in consequence of its liability to injure the teeth, it is scarcely ever employed in such cases at present. The internal use of this acid, if continued for any length of time, is apt to derange the digestive functions, causing cardialgia, griping pains and emaciation.

DOSE AND MODE OF ADMINISTRATION.—Sulphuric acid may be prescribed either simply diluted with water, or in combination with one or other of our vegetable bitter tonics. In prescribing any of the dilute mineral acids, it is generally recommended that the patient be directed to suck them through a quill, in order to prevent the production of any injurious effect on the teeth; but Mr. L'Estrange of this city has suggested to me a much more efficacious plan, namely, that a small bit of butter should be rubbed over the teeth, just before the dose is to be taken. This method is of course equally applicable, where other medicines, such as many preparations of iron, iodine, &c., which injure the teeth, are administered; directing the patient, immediately after taking the dose, to wash the teeth with a weak alkaline solution will answer the same purpose.

PREPARATIONS.—Acidum aromaticum, acidum dilutum. Infusum rosæ acidum.

Acidum Sulphuricum Aromaticum. *Aromatic Sulphuric Acid.* (Syn.: *Elixir of Vitriol.*) (Take of sulphuric acid, three fluid ounces; rectified spirit, two pints, or a sufficiency; cinnamon, in coarse powder, two ounces; ginger, in coarse powder, one ounce and a quarter. Mix the sulphuric acid gradually with thirty-five ounces of the spirit, then add the cinnamon and the ginger, and digest for seven days, agitating frequently. Filter, and add sufficient rectified spirit to make up the bulk of two pints.)

TESTS.—Specific gravity 0·935. Six fluid drachms require for neutralization 84·75 measures of the volumetric solution of soda.

The volumetric test indicates the presence in the quantity operated upon of 33·90 grains of anhydrous acid, equivalent to 9·5 per cent. of anhydrous acid—the addition of the spirit and aromatics makes the acid more agreeable to the taste, and frequently to sit more lightly on the stomach. Its dose is from min. x. to min. xxx.

Acidum Sulphuricum Dilutum. *Dilute Sulphuric Acid.* (Take of sulphuric acid three fluid ounces; distilled water, thirty-five fluid ounces. Mix gradually the sulphuric acid and the water, and preserve the product in a stoppered bottle.)

TESTS.—Specific gravity 1·087. Six fluid drachms require for neutralization 100 measures of the volumetric solution of soda.

The volumetric test indicates the presence in the quantity operated upon of forty grains, equivalent to 11·21 per cent. of anhydrous acid. The dose is from min. x. to min. xxx.

INCOMPATIBLES.—The alkalies and their carbonates; most metals, and their oxides; some of the earths, and their carbonates; acetate of lead; chloride of calcium; chloride of barium; nitrates; alcohol, and consequently all tinctures; organic substances; essential oils; and the vegetable astringent infusions or decoctions.

In *poisoning* with this acid we generally meet with the following symptoms:—excessive burning pain in the mouth and throat, extending down the œsophagus into the stomach, excruciating pain in the bowels, nausea and vomiting, great prostration, general coldness of the surface, restlessness, fœtor of breath; the mucous membrane lining the mouth and throat is at first converted into a white, subsequently into a black slough, and the patient dies in a period of time *generally* varying from 18 to 24 hours, exhausted, preserving, however, to the last, his intellectual powers. The best antidotes are the alkaline bicarbonates, or carbonate of magnesia. Chalk and magnesia, though generally recommended, should not be employed, as with the former sulphate of lime is formed, and the combination of sulphuric acid with the latter produces a considerable degree of heat. We should always bear in mind, however successful our treatment may for the time appear, still, that sooner or later our patient will be liable to suffer from resulting stricture of the œsophagus. Not long since I had in the wards of the Meath Hospital an illustration of this statement. The patient had taken oil of vitriol by design, and although the primary symptoms appeared to be mild, in a few months subsequently symptoms of stricture of the œsophagus set in, which finally terminated fatally. Although the sulphuric acid, as in this case, is frequently taken designedly, still it is very frequently taken accidentally—the mistake originating in its resemblance to castor oil. I have known more than one instance where it has been so administered to children. External parts burned with it should be washed with soap and water.

ALUMEN. *Alum.* Sulphate of Alumina and Potash, $AL_2O_3,3SO_3 + KO, SO_3 + 24HO (=474{\cdot}5.)$

Alum is always an article of commerce, and is variously prepared in different localities; in all, however, the principle is the same. It is either obtained from earths which contain it ready formed, or from minerals. In the former case the process is one of lixiviation, evaporation, and crystallization, occupying many months; in the latter, the mineral—which, in general terms, may be stated to consist of sulphuret of iron, alumina, and carbon—is for a long period exposed to the action of the air, which supplies oxygen to the iron and sulphur, converting the former into an oxide; the latter, into sulphuric acid, which unites with the oxide of iron and alumina to form iron alum. This is dissolved and evaporated, when the sulphate of iron crystallizes out of the solution, and to the residual sulphate of alumina is added sulphate of potash, and the salt in question is obtained.

CHARACTERS.—In colourless transparent crystalline masses, exhibiting the faces of the regular octahedron, and having an acid sweetish astringent taste. Its aqueous solution gives with caustic potash a white precipitate, soluble in an excess of the reagent; an immediate precipitate with chloride of barium; and, after some hours, a crystalline precipitate with tartaric acid.

The precipitate produced on the addition of caustic potash is alumina, which is soluble in an excess of the reagent; the precipitate with chloride of barium is sulphate of barytes, demonstrating the nature of the acid constituent of the salt, while the tartaric acid precipitates the potash in the form of bitartrate. In addition, it may be remarked that alum is devoid of smell; that its specific gravity is 1·724; that it effloresces slowly when exposed to the air; that it dissolves in 18·4 parts of cold, and in 0·75 parts of boiling water; and that either solution has a decidly acid reaction.

TESTS.—Not coloured blue by a mixture of the ferrocyanide and the ferridcyanide of potassium; entirely soluble in hot solution of soda, without the evolution of ammonia.

The non-production of a blue colour on the addition of the ferro-cyanides of potassium indicates the absence of iron, which might be present, derivable from the minerals from which alum is originally produced; were it present, the caustic potash used in the *characters* also would precipitate it, but would not redissolve it, whilst the non-evolution of ammonia proves the absence of this alkali, which, from motives of economy, is now-a-days substituted for potash in the manufacture of the salt, and which will yield an alum not to be distinguished by physical inspection from potash alum.

THERAPEUTICAL EFFECTS.—Alum is a powerful astringent, and as such is employed with benefit in the treatment of many diseases, both as a general and topical remedy. Administered internally, it is found useful in the treatment of chronic diarrhœa and dysentery, in atonic mucous discharges, in passive hemorrhages, in the colliquative sweating of hectic, &c. In *pyrosis*, given in large doses frequently repeated, it has proved very successful in the hands of many practitioners; and it has also, when given in full doses (gr. xxx. to gr. cxx.) combined with opium and camphor, been found to be an excellent remedy in the treatment of painters' colic; in cases of dilatation of the heart, and in aortic aneurism, its use has been supposed to have been attended with good results. As a topical astringent, it is employed to arrest bleeding from minute vessels, as in epistaxis, in menorrhagia, in hemorrhage from leech bites, &c. *Dried alum*, in fine powder, is an excellent application in the early stages of the inflammatory sore throat of scarlatina, measles and small-pox, and in diphtheritis; it is best applied by insufflation, that is, by placing a small portion of it in an open glass tube, and blowing it into the throat. Dissolved in water, alum is also used with much advantage as a gargle in relaxation of the uvula and tonsils, in chronic ulcerations of the mouth and fauces, and in excessive salivation; as a collyrium in chronic ophthalmia; and as an injection in gleet and fluor albus.

DOSE AND MODE OF ADMINISTRATION.—*Internally*, gr. x. to ʒss. in powder, or made into pill with extract of liquorice, or it may be given in solution in some aromatic water. *Externally*, gr. lx. to ʒss. or more, dissolved in Oj. of water.

Alumen Exsiccatum. Dried Alum(=258·5.) (Take of alum, four ounces. Heat the alum in a porcelain capsule till it liquefies, raise and continue the heat till aqueous vapour ceases to be disengaged, and then reduce the residue to powder.)

In this process the alum loses twenty-four atoms of water, and is reduced to the anhydrous condition. Care must be taken not to carry the heat too far, else a portion of the acid would be expelled. This preparation is confined to *external* use.

* *Alum whey* (Alum, powdered, gr. x.; new milk, f℥ij.; boil together for ten minutes, and strain to separate the curd.) Sufficient for one dose.

* *Cataplasma aluminis* (Agitate together, so as to form a coagulum, the whites of two eggs and a drachm of alum.) Applied to the eye between two folds of linen, it is highly esteemed by many practitioners for the treatment of chronic or purulent ophthalmia.

* *Liquor aluminis compositus* (Alum; and sulphate of zinc, of each ℥j.; distilled water, Oiij.; rub the salts together; dissolve in the water, and strain.) An excellent astringent lotion, collyrium, or injection.

* *Hemostatic solution*, PAGLIARI. The chief ingredient in this solution being alum, the formula for its preparation is given here. It possesses the property of instantaneously coagulating the blood and converting it into a thick, homogeneous and consistent clot; it is, therefore, a very powerful styptic, and when applied locally constitutes one of the most certain means of checking hemorrhage. (Take of benzoin, eight ounces; sulphate of alumina and potash, one pound; water, ten pounds. Boil together in a glazed earthen vessel for six hours, constantly stirring the resinous mass, and supplying the loss by evaporation by successive additions of hot water, so as not to interrupt the ebullition. Finally, filter the liquid, and preserve it in well-stopped glass vessels. The portion of benzoin which remains undissolved will be found to have lost its odour and inflammability.) The hemostatic water thus obtained is limpid, of a very pale wine yellow colour, has a slightly styptic taste, and a sweetly aromatic odour. It leaves, on evaporation, a transparent deposit, which adheres to the sides of the vessel.

INCOMPATIBLES.—Alkalies, and their carbonates; lime and magnesia, and their carbonates; tartrate of potash; acetate of lead; salts of mercury; vegetable extractive matter; and substances containing tannin.

BELA. *Bael.* Ægle Marmelos, *DC.* Plate *Pharm. Journ.* vol. x. page 166. The half-ripe fruit dried; from Malabar and Coromandel. The ægle marmelos, the source of the Bael fruit, is a tolerably large tree belonging to the natural family *Aurantiaceæ;* with large white flowers; fruit not exactly spherical, 10 to 15 celled. Cells containing a number of seeds, and a quantity of thick tenacious mucus; the bark of the tree is ash-coloured.

CHARACTERS.—Fruit roundish, about the size of a large orange, with a hard woody rind; usually imported in dried slices, or in fragments consisting of portions of the rind and adherent dried pulp and seeds. Rind about a line and a half thick, covered with a smooth pale brown or greyish epidermis, and internally, as well as the dried pulp, brownish orange or cherry red. The moistened pulp is mucilaginous and of slightly astringent taste.

THERAPEUTICAL EFFECTS.—In India all parts of the ægle, flowers, leaves, fruit, bark of root and of stem, are used by the native practitioners, and are looked upon as febrifuge, tonic, diaphoretic, and astringent; but this latter property is supposed principally to reside in the *unripe* fruit, which has now for this purpose been made officinal. Many authorities, but principally those of eastern experience, declare it to be possessed of valuable astringent properties, stating that it arrests diarrhœa, without, as attends the action of other medicines of this class, the subsequent production of constipation. These astringent effects are unanimously attributed to the presence of tannin in the *unripe* fruit; the *ripe* fruit appearing to present quite an opposite physiological action.

DOSE AND MODE OF ADMINISTRATION.—The manner in which it is employed by the native practitioners is either in the form of decoction, extract, or wine. The *decoction* is prepared by digesting two ounces of the dried fruit in a pint of water, and by gentle concoction reducing the product to one-fourth; the dose of this varies with the gravity of the case—in mild diarrhœas, two tablespoonfuls twice or thrice a-day; in severer cases, every second hour. The *extract* is made by the still further concentration of the decoction, and this rubbed up with sherry constitutes the *wine*. Bael seems to have been introduced by the pharmacopœial authorities more out of complaisance to our Indian brethren than from any wonderful success that has attended its use in these countries; the following is officinal:—

Extractum Belæ Liquidum. Liquid Extract of Bael. (Take of bael, one pound; distilled water, twelve pints; rectified spirit, two fluid ounces. Macerate the bael for twelve hours in one third of the water; pour off the clear liquor; repeat the maceration a second and third time for one hour in the remaining two thirds of the water; press the marc; and filter the mixed liquors through flannel. Evaporate to fourteen fluid ounces; and, when cold, add the rectified spirit.) The dose of this preparation is from two to four fluid drachms; two or three fluid ounces of it may be added to an eight-ounce mixture containing tincture of opium ʒi., tincture of catechu or kino ʒiij., and water to complete the quantity, and be administered in ounce-doses every third hour in diarrhœa. Bela, however, is a medicine that I shall not be surprised to see omitted in a future edition of our British Pharmacopœia.

CATECHU NIGRUM. *Black Catechu.* Acacia Catechu, *Willd. Enum.* Plate 66, *Woodv. Med. Bot. (Mimosa Catechu).* An extract of the heart-wood imported from Pegu.

CHARACTERS.—In masses consisting of layers enveloped in rough leaves, blackish-brown, shining, and heavy, bitter and very astringent.

CATECHU PALLIDUM. *Pale Catechu.* Uncaria Gambir, *Roxburgh, Flor. Ind.* Plate 22, vol. ix. *Trans. Linn. Soc. (Nauclea Gambir).* An extract of the leaves and young shoots, prepared at Singapore and in the Eastern Archipelago.

CHARACTERS.—In cubes or masses formed of coherent cubes; the former about an inch in diameter, externally brown, internally ochrey-yellow or pale brick-red, breaking easily with a dull earthy fracture. Taste bitter, very astringent and mucilaginous, succeeded by slight sweetness.

Acacia catechu is a native of several parts of the East Indies; it belongs to the Natural family *Leguminosæ (Fabaceæ,* Lindley), and to the Linnæan class and order *Polygamia Monœcia. Uncaria gambir* is a native of many of the islands of the Indian Archipelago; it is placed in the Natural family *Cinchonaceæ,* and in the Linnæan class and order *Pentandria Monogynia.*

In addition to these two officinal varieties of plants furnishing us with catechu must be signalized the *Areca catechu,* which inhabits most of the Indian continent and islands; it belongs to the Natural family *Palmaceæ,* and to the Linnæan class and order *Monœcia Hexandria.*

BOTANICAL CHARACTERS.—*Acacia catechu;* stem 15-20 feet high, with a brown scabrous bark, and a hard heavy wood, dark-red in the centre; flowers numerous, pale-yellow; legumes 8-seeded. *Uncaria gambir;* a stout scandent shrub; leaves ovato-lanceolate; flowers green and pink, in loose heads, on opposite axillary peduncles. *Areca catechu;* a beautiful palm, between 40 and 50 feet high; leaves 15 feet in length, crowded at the extremity of the stem; flowers in numerous clusters appearing from among the leaves; fruit a handsome orange-coloured ovoid drupe.

PREPARATION.—From the Acacia, catechu is obtained by boiling the red heart-wood cut into chips for some hours in water, until the decoction is sufficiently concentrated to become on cooling a tough extract; it is then divided into small masses, and dried slowly in the shade. The leaves of the *Uncaria gambir* are boiled in water immediately after they are pulled from the tree, the decoction concentrated and run into square or parallelopiped moulds, to constitute the catechu in cubes of commerce. A better quality, however, is procured by bruising the young shoots and leaves in water for some hours until a fecula is deposited; which when inspissated in the sun to the consistence of a paste is dried in moulds of a circular form. In the interior of the fruit of the *Catechu palm* is contained a roundish conical nut, marbled internally brown with whitish veins, commonly known by the name of *betel nut,* and which, with lime and the leaves of the *Piper betel,* constitutes the celebrated masticatory of the East, called *Betel.* These nuts contain a large quantity of tannin, and a decoction of them concentrated and dried forms some of the inferior catechus of commerce.

PHYSICAL PROPERTIES.—A great many varities of catechu occur in commerce, but I shall direct attention only to the two sorts officinal in the Pharmacopœia, and which are also those most usually met with in druggists' shops, the others being chiefly employed for tanning. 1st.—*Brown catechu in irregular masses.* This is the produce of the Acacia catechu; it occurs in irregular-shaped roundish masses, generally covered with rice husks, weighing from three or four ounces to a pound or more each, of a chocolate-brown colour, very friable, with an astringent bitter taste. 2nd.—*Catechu in cubes (Gambier; Terra Japonica; Cubical resinous catechu).* This variety is obtained from the Uncaria gambir; it occurs in cubes, the faces of which are about an inch square; it is of a yellowish-brown colour, with a pale, dull, earthy fracture; is void of odour, but has a very astringent taste, becoming feebly sweetish. A finer quality is imported in small lozenge-shaped masses, flat on one side, and slightly convex on the other; it is of a pale pinkish yellow colour.

CHEMICAL PROPERTIES.—The different varieties of catechu consist principally of *tannin* and of a peculiar acid, which has been named *catechuic acid, catechine,* and *resinous tannin.* Their astringency depends on the tannin, of which the finer qualities contain 55 per cent., while some inferior specimens do not yield more than 28 per cent. Catechu generally does not dissolve completely in boiling water, but when of good quality is almost entirely soluble in alcohol. The watery infusion is of a dark reddish-brown colour, and reddens litmus paper faintly; it gives a greenish-black precipitate with the persalts of iron.

TESTS.—**Entirely soluble in boiling water. The decoction when cool is not rendered blue by iodine.**

ADULTERATIONS.—The varieties of catechu are so numerous and different in quality, and many of them are so very impure, that the only satisfactory test of their relative value is to ascertain the quantity of tannic and catechuic acids contained in them. This may be readily done by acting on a given weight with ether, evaporating the ethereal solution to dryness, treating the extract thus obtained with cold water, and again evaporating; when the proportion soluble in both ether and water should amount at least to from 38 to 40 per cent. of the specimen. The production of a blue colour on the addition of iodine would indicate the presence of some amylaceous impurity.

THERAPEUTICAL EFFECTS.—Catechu is a simple but very efficacious astringent, and is consequently in general use. It may be administered in all cases of increased mucous discharges, where there is no inflammation present. Thus it is employed with benefit in chronic cystirrhœa, in leucorrhœa, in gleet, in chronic catarrh, and in old standing cases of diarrhœa and dysentery, in which it is usually given in combination with opiates. It is also an excellent remedy in passive hemorrhages from the intestines or uterus; as a topical astringent, it is one of the most useful applications in relaxation of the uvula and tonsils, in slight ulcerations of the mouth, and in chaps or excoriations of the nipple in nurses: for the latter purpose the tincture should be applied with a camel's-hair pencil repeatedly in the course of the day. Public speakers and singers employ catechu lozenges with much benefit as a preventive of hoarseness, and as a remedy when it exists.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. lx. in powder, with sugar, or made into a bolus with honey or treacle; or, as directed, in some one or other of the following

PREPARATIONS.—Infusum, pulvis compositus, Tinctura, Trochisci.

The pale or dark varieties are directed to be used indifferently in the first three of these preparations; but in the last *(Trochisci)* the pale alone is ordered to be employed. This is a matter that it is necessary the prescriber should be acquainted with, as possibly affecting the resulting appearance of his prescription. A mixture composed of tincture and infusion of catechu made from catechu *nigrum*, presents a far different appearance from a similar mixture made with an infusion and tincture of the catechu *pallidum;* different as they would be in physical appearance, their physiological effects, nevertheless, would still be the same.

Infusum Catechu. Infusion of Catechu. (Take of catechu, in coarse powder, one hundred and sixty grains; cinnamon, bruised, thirty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for half an hour, and strain.) Dose, from one to two ounces, combined with some astringent tincture. May also be prescribed as an astringent enema.

Pulvis Catechu Compositus. Compound Powder of Catechu. (Take of catechu, four ounces; kino, two ounces; rhatany, two ounces; cinnamon, one ounce; nutmeg, one ounce. Reduce them separately to a fine powder; mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.) Dose, grs. xxx. to gr. cxx.

Tinctura Catechu. Tincture of Catechu. (Take of catechu, in coarse powder, two ounces and a half; cinnamon, bruised, one ounce; proof spirit, one pint. Macerate the catechu and cinnamon, for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, one to two fl. drachms. Usually added to some astringent mixture (as of chalk) in cases of diarrhœa.

Trochisci Catechu. Catechu lozenges. (Take of pale catechu, in powder, two ounces; refined sugar, in powder, one pound; gum Arabic, in powder, one ounce; tincture of capsicum, half a fluid ounce; distilled water, a sufficiency. Add to the catechu sugar and gum Arabic, previously mixed, the tincture of capsicum, and sufficient distilled water to make a proper mass. Mix thoroughly, divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Dose, one at a time to be allowed slowly to dissolve in the mouth.

* *Electuarium Catechu.* (Catechu, ℥iv.; cinnamon, ʒj.; kino, ℥iv.; nutmeg, ʒj.; opium, diffused in a little sherry, ʒiss.; syrup of

ginger, reduced to the consistence of honey, Oiss. : pulverise the solids; mix the opium and syrup; add the powder, and beat them thoroughly into a uniform mass.) A useful astringent in chronic diarrhœa and dysentery. Dose, gr. lx. to gr. cxx. One ounce contains gr. ii¼ of opium.

INCOMPATIBLES.—The alkalies; lime water, salts of iron, and of lead; gelatine; and all vegetable subtances whose active principle is an alkaloid, as an insoluble tannate of the alkaloid will be formed. Christison, however, states, and I fully agree with him, that it is probable the alkaloidal tannates are sufficiently soluble in the acids of the gastric juice.

CREASOTUM. *Creasote.* (A product of the distillation of wood tar.) Creasote, an *oxyhydrocarburet*, is the product of a complicated process, in virtue of which wood or coal tar is subjected to distillation, and of which the following is a brief summary. The wood tar is distilled until a mass resembling pitch alone remains. The distillate, on standing, separates into thin layers, the lowest of which contains the creasote. This is agitated with carbonate of soda to remove acetic acid, allowed to stand, the supernatant oil decanted and redistilled. The first, the lighter portions, are rejected, but the heavier oil is collected and again distilled; the product is treated with a weak solution of phosphoric acid, to remove ammonia, then well washed, and a weak solution of potassa is added, which separates, by dissolving it, the creasote, from the *eupion*, one of the products; and it is exposed for some time to the action of the air, by which a foreign substance that imparts colour to the creasote is oxidized and removed. The solution is now saturated with phosphoric acid, again distilled, and the creasote distils over in company with water, from which on standing it separates in the form of an oily layer. The first portion of this last distillation is usually rejected, on account of the presence of a large amount of water.

CHARACTERS.—A colourless liquid, with a strong empyreumatic odour, sparingly dissolved by water, but freely by alcohol, ether, and acetic acid. Coagulates albumen.

CHEMICAL PROPERTIES.—It is a compound of $C_{26}\,H_{16}\,O_4$ (Gorup-Besanez and Ettling.) It boils at a temperature of 397·4°; and is not congealed at—16·6°; at a temperature a little above its boiling point it is decomposed; it is inflammable, and burns with a very sooty flame. Creasote forms two different compounds with cold water; one a solution of 1·25 parts of creasote in 100 parts of water; the other, a solution of 10 parts of water in 100 of creasote. It dissolves in acetic acid in all proportions, as also in alcohol and ether. It coagulates albumen; dissolves most resins; and has a powerful preservative property with respect to animal substances, whence its name is derived (κρέας σώζω). It should be neutral.

TESTS.—Specific gravity 1·065. A slip of deal dipped into it, and afterwards into hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. Dropped on white filtering paper and exposed to a heat of 212° it leaves no translucent stain.

ADULTERATIONS.—Creasote, from being badly prepared, frequently contains a number of peculiar principles (eupion, picamar, capnomor, &c.) which exist in tar, and it is commonly adulterated with the fixed and volatile oils; its purity may be known by its being colourless (the commercial article, however, presenting generally a more or less degree of colour), by its complete solubility in acetic acid, which does not dissolve the impurities, by its density, and by its leaving no translucent stain on white filtering paper, when dropped on it, and exposed to a temperature of about 212° for ten minutes; indicating the absence of oils.

THERAPEUTICAL EFFECTS.—As an *astringent* creasote is chiefly employed externally, but it is also used as an internal remedy with much benefit in some diseases. Its principal uses as such are in mucous diarrhœa, as a styptic to arrest hemorrhage, which it does very effectually when the bleeding proceeds from small vessels, as in some forms of hematemesis and of bleeding from the intestines. Externally it is used for this purpose in hemorrhage from cuts or abrasions, from leech bites, or from ulcerated surfaces; as an application to indolent ulcers, especially when accompanied by a sanious discharge, or when resulting from a burn; to chronic venereal or phagedenic ulcerations, to ulcerated chilblains, in some forms of chronic skin diseases—its efficiency in which, however, has been much overrated—and as an injection in leucorrhœa. It also forms an excellent gargle in obstinate salivation, in the proportion of a drachm and a-half to a pint of liquid. (See also *Sedatives*.)

DOSE AND MODE OF ADMINISTRATION.—Min. j. to min. ij. gradually increased to min. v., dissolved in at least an ounce or an ounce and a-half of water: the dose should be repeated at short intervals. In the external application of creasote in the form of a wash its little solubility in water should be remembered, for if any excess be present, it will float on the surface, and being thus applied directly, may produce an effect very different from what was intended. For a wash, min. ij. to min. vj. may be dissolved in f℥j. of water. Or the pharmacopœial ointment may be employed.

Mistura Creasoti. Creasote Mixture. (Take of creasote sixteen minims; glacial acetic acid, sixteen minims; spirit of juniper, half a fluid drachm; syrup, one fluid ounce; distilled water, fifteen fluid ounces. Mix the creasote with the acetic acid, gradually add the water, and lastly the syrup and spirit of juniper.) This mixture contains one minim of creasote in each ounce. The acetic acid is added for the purpose of insuring its solubility, the spirit of juniper to mask the taste of the creasote. Dose, one to two ounces.

Unguentum Creasoti. Ointment of Creasote. (Take of creasote, one fluid drachm; simple ointment, one ounce. Mix thoroughly.)

CRETA, *Chalk* (described in the division *Antacids*) is employed as an astringent in the various forms of diarrhœa; its beneficial effects as such depend principally upon its antacid properties (see p. 10). Chalk mixture is very generally used as a vehicle for more active astringents. The following preparation is admirably adapted for the simpler forms of diarrhœa, when unattended with inflammation.

Pulvis Cretæ Aromaticus cum Opio. Syn: *Pulvis Cretæ Opiatus, Pulvis Cretæ Compositus cum Opio. Aromatic Powder of Chalk and Opium.* (Take of aromatic powder of chalk, nine ounces and three quarters; opium, in powder, a quarter of an ounce. Mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.) Dose for adults, gr. x. to gr. xl.; for children, gr. ii. to gr. x. One grain of opium is contained in each 40 grains.

CUPRI SULPHAS. *Sulphate of Copper.* $CuO, SO_3+5HO=124{\cdot}75$. (Syn.: *Blue Vitriol.*) Sulphate of copper (an article of the Materia Medica in the Pharmacopœia) may be obtained in any one of the following ways:—by evaporating the water that runs through copper mines, the sulphuret of copper in this case having been converted into sulphate of copper at the expense of the oxygen of the atmospheric air; by roasting the native sulphuret in a reverberatory furnace, by which process the sulphuret is converted into a sulphate; by digesting oil of vitriol upon sheet copper; and, finally, it is obtained in large quantities in the processes for refining gold and silver.

CHARACTERS.—In oblique prismatical crystals, of a clear blue colour, soluble in water, and reddening litmus. Its solution gives with chloride of barium a white precipitate insoluble in hydrochloric acid, and a maroon-red precipitate with ferrocyanide of potassium.

The chloride of barium proves that it is a salt of sulphuric acid, the precipitate being sulphate of barytes. The *maroon-red precipitate* is ferrocyanide of copper thus accounted for, $2(CuO,SO_3)+K_2FeCy_3=2(KO,SO_3)+Cu_2FeCy_3$. In addition, it may be remarked that a polished piece of steel, plunged for a few moments into an acid solution of copper, speedily becomes coated with a *rose-red* deposit of metallic copper.

TESTS.—An aqueous solution of the salt to which twice its volume of solution of chlorine has been added, when treated with an excess of solution of ammonia, gives a sapphire-blue solution, leaving nothing undissolved.

This test is directed against iron, the only likely impurity. Were it present on the addition of the ammonia, it would be precipitated in the form of sesquioxide, which is insoluble in the excess of ammonia directed; whilst, although the copper is at first precipitated in the form of oxide, yet the precipitate is redissolved in the excess of the reagent employed, yielding the *sapphire* colour alluded to.

PHYSICAL PROPERTIES.—This salt usually occurs in fragments of large crystals, of the oblique rhombic prism series, semi-transparent, of a beautiful blue colour; without odour, but having a styptic astringent metallic taste. Specific gravity, 2·2.

CHEMICAL PROPERTIES.—The crystals are composed of 1 equivalent of protoxide of copper, 1 of sulphuric acid, and 5 of water, ($CuO, SO_3, HO+4HO$). They effloresce slightly in dry air; at a temperature of 212° they part with four equivalents of water, and crumble down into a pale blue-coloured powder; at 400° they become anhydrous and white, slowly, however, if exposed to the air, reabsorbing moisture, and resuming their blue colour; and at a red heat they fuse and lose part of their acid, black oxide of copper being the residue. Sulphate of copper is soluble in 4 parts of cold, and in 2 of boiling water; it is insoluble in alcohol. It has an acid reaction.

ADULTERATIONS.—Sulphate of copper is very often adulterated with sulphate of iron; I have seen some specimens which contained nearly 50 per cent. of that salt. In the crystalline state, the fraud may be readily detected with the naked eye. The best chemical test is the addition of ammonia in excess to a solution of the suspected salt, which has been previously boiled as directed in the pharmacopœial test with liquor chlori; should any iron be present, the precipitate at first thrown down will not be redissolved.

THERAPEUTICAL EFFECTS.—Sulphate of copper in large doses, if it be not rejected by vomiting, is a powerful irritant poison, producing inflammation of the parts with which it comes in contact, and acting remotely on the nervous system, causing death with coma and convulsions. In small but repeated doses it operates as a tonic and astringent; with the latter intention, it is only employed in chronic diarrhœa, especially that of children, and in dysentery, in which it will often succeed in checking the discharges when vegetable astringents completely fail; in croup its use has been found of advantage, checking excessive bronchial secretion. Externally a solution of sulphate of copper is used with benefit as a stimulating astringent to indolent and ill-conditioned ulcers attended with excessive discharge, its employment being recommended in the sore throat of scarlatina, in cancrum oris, and in aphthous ulcers; it is also used as a collyrium in chronic ophthalmia, and as an injection in chronic mucous discharges from the urethra or vagina. In the early stages of gonorrhœa, if the inflammation does not run very high, a weak solution, gr. j. to f℥j. of water, injected three or four times a day, will often succeed in checking the disease. (See, also, *Caustics*, *Emetics*, and *Tonics*.)

DOSE AND MODE OF ADMINISTRATION.—Gr. ss. to gr. ij. or gr. iij. made into pill with conserve of roses. For a lotion, gr. j. to gr. x. in f℥j. of water. For an injection, gr. j. to gr. iv. in f℥j. of water. In the Pharmacopœia it is directed to be purified by a process of crystallization, and this is of course the preparation that should be selected for internal administration; the process is as follows:—

Cupri Sulphas. Sulphate of Copper. (Take of sulphate of copper of commerce, eight ounces; boiling distilled water, one pint. Dissolve the sulphate of copper in the water; filter the solution, and set it by that it may crystallize. Remove the crystals to filtering paper placed upon a porous brick, and, having dried them without heat, enclose them in a bottle.)

INCOMPATIBLES.—The alkalies and their carbonates; lime water; acetate of lead; nitrate of silver; corrosive sublimate; all the salts of iron except the sulphate, and most astringent vegetables.

ANTIDOTE.—In poisoning with this salt, the best antidote is albumen, as the white of egg; and in its absence, wheaten flour. Sugar has also been found beneficial, and iron filings have been recently proposed, so as to precipitate the copper in the metallic state, in which condition it is inert.

ERGOTIN. *Ergotin,* the alcholic extract obtained from Ergot of Rye. The mode of preparation, &c., of this article will be described under the article Ergota in the chapter on Emmenagogues.

M. Bonjean has experimented extensively on the hemostatic powers of *ergotin*—powers to which the attention of the profession was first directed by Dr. Spajrani; and there can be no doubt, from the result of his observations, that, when applied locally, it is a powerful agent in checking hemorrhage. He has found it especially useful when the bleeding proceeds from incised wounds, or from many small vessels, and in all cases where from any cause compression cannot be had recourse to. His method of employing it is as follows:—The ergotin is dissolved in five or six parts of water in ordinary cases: in three or four parts only, where the hemorrhage is severe; and pieces of lint, saturated in this solution, are applied to the part previously well dried, pressure being maintained with the hand until the blood ceases to flow. Should the bleeding continue, the lint is kept constantly wet with the solution; the pressure should be firm, but not sufficient to interrupt the circulation. The lint should not be removed for three or four days. M. Bonjean has also administered ergotin internally in hemorrhages, in doses of from five to ten grains; but its effect is not so decided as when it is employed locally. The freshly-prepared powder, the infusion and tincture of ergot of rye have also proved useful as hemostatics in the hands of some surgeons, but whenever ergotin can be obtained it should be preferred.

FERRI PERCHLORIDI LIQUOR. *Solution of Perchloride of Iron Perchloride of Iron,* $Fe_2Cl_3(=162{\cdot}5)$ *in solution in water.*

PREPARATION.—Take of iron wire, two ounces; hydrochloric acid, ten fluid ounces; nitric acid, six fluid drachms; distilled water, seven fluid ounces. Dilute the hydrochloric acid with five ounces of the water, and pour the mixture on the iron wire in successive portions, applying a gentle heat when the action becomes feeble, so that the whole of the metal may be dissolved. To the nitric acid add the two remaining ounces of water, and having poured the mixture into the solution of iron, evaporate the whole until the bulk is reduced to ten fluid ounces.

EXPLANATION OF PROCESS.—The action of the hydrochloric acid upon the iron is to convert it into a protochloride with the evolution of hydrogen gas, thus $Fe+HCl=FeCl+H$. An excess of hydrochloric acid, however, is employed, which on the subsequent addition of the nitric acid is by its influence decomposed, setting free chlorine, which converts two equivalents of chloride into one equivalent of sesquichloride of iron ($2FeCl+Cl=Fe_2Cl_3$). As the result of this re-action we also have hyponitric acid and water formed thus, $HCl+NO_5=Cl+NO_4+HO$.

CHARACTERS.—An orange-brown solution, without smell, but possessing 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, but not by the ferridcyanide of potassium.

The white precipitate is chloride of silver, the blue, Prussian blue; did the ferridcyanide of potassium yield a precipitate, it would prove that the proto- had not been effectually converted into sesqui-chloride of iron.

TESTS.—Specific gravity 1·338. A fluid drachm diluted with two fluid ounces of water gives, upon the addition of an excess of solution of ammonia, a reddish-brown precipitate, which, when well washed and incinerated, weighs 15·62 grains.

The precipitate yielded on the addition of the solution is peroxide of iron, thus accounted for, $Fe_2Cl_3+3NH_4O=Fe_2O_3+3NH_4Cl$, and the amount of the product resulting upon its being washed and incinerated indicates 31·73 gr. of sesqui-chloride of iron in each fluid drachm. By evaporating this solution we can obtain the sesqui-chloride of iron in a solid state; it is a deliquescent, dark orange-coloured mass, with difficulty assuming a crystalline form; readily soluble in water.

THERAPEUTICAL USES.—This solution is rarely if ever used internally; it is highly styptic and astringent, and may with advantage be employed as a local hæmostatic. Solutions of the *salt* in water have been introduced into practice by M. Pravaz of Lyons, as a local remedy employed in the form of injection for the treatment of aneurisms and varices. These solutions vary in strength, five to ten grains to the fluid drachm of distilled water being considered sufficiently strong for injection into an aneurismal sac, ten to twenty grains for the treatment of varices; in both cases the remedy acts by coagulating the blood. The following preparation is that generally employed for internal exhibition:—

Tinctura Ferri Perchloridi. Tincture of Perchloride of Iron. (Syn. *Tinctura Ferri Sesqui-chloridi, Muriated Tincture of Iron*). (Take of solution of perchloride of iron, five fluid ounces; rectified spirit, fifteen fluid ounces. Mix and preserve in a stoppered bottle. Sp. gr. 0·992. This tincture has one fourth of the strength of tinctura ferri sesquichloridi, *Dub.*)

PHYSICAL PROPERTIES.—This preparation is transparent and of a reddish-brown colour, it has rather an agreeable ethereal odour, and a very acid styptic taste.

CHEMICAL PROPERTIES.—It is a solution of sesqui-chloride of iron in rectified spirit, containing also free hydrochloric acid, and a trace of hydrochloric ether. It reddens litmus paper strongly.

THERAPEUTICAL EFFECTS.—Tincture of the sesqui-chloride of iron if taken in large doses acts as an irritant poison, principally in consequence of the free hydrochloric acid which it contains. It possesses in an eminent degree styptic and astringent properties, on which account it is sometimes used as a topical agent to check bleeding from small vessels. Besides its astringent powers, it possesses also tonic and antispasmodic properties, and has some specific influence over the urinary organs, in many diseases of which it is employed with benefit. Thus it is found useful in irritability of the bladder, especially when occurring in females; in chronic mucous discharges from the urino-genital organs, frequently proving of signal value in old standing gleets, especially when occurring in subjects of a leucophlegmatic temperament; in atonic hemorrhages from the kidneys and bladder; and in spasmodic stricture of the urethra preventing the introduction of the catheter, a class of cases in which its employment was first suggested by Cline. In this latter affection its beneficial effects are generally ascribed to the nausea which it produces, and consequently it is administered in small but frequently-repeated doses, min x. to min. xij. every ten or fifteen minutes. Of late years tincture of the sesqui-chloride of iron has been administered with very successful results in the treatment of erysipelas; and in a recent communication to the *Dublin Quarterly Medical Journal*, Dr. Heslop of Birmingham states that he has found it most useful in the late epidemic of diphtheria, and analogically suggests its employment in puerperal peritonitis and allied diseases.

DOSE AND MODE OF ADMINISTRATION.—Min. x. to min. xv. gradually increased to f℥ss. or f℥j.; it is best administered in f℥j. or f℥ij. of water, or in white wine if nothing forbids the use of the latter; it may be also given in infusion of quassia.

INCOMPATIBLES.—The alkalies and their carbonates; lime water; carbonate of lime; magnesia and its carbonate; solution of gum; and all astringent vegetable preparations.

In poisoning with this preparation, the treatment is the same as in poisoning with hydrochloric acid (which see).

FERRI PERNITRATIS LIQUOR. *Solution of Pernitrate of Iron.* Pernitrate of iron, Fe_2O_3, $3NO_5$ ($=242$) in solution in water.

PREPARATION.—Take of fine iron wire, free from rust, one ounce; nitric acid,

three fluid ounces; distilled water, a sufficiency. Dilute the nitric acid with sixteen ounces of the water, introduce the iron wire into the mixture, and leave them in contact until the metal is dissolved, taking care to moderate the action should it become too violent, by the addition of a little more distilled water. Filter the solution, and add to it as much distilled water as will make its bulk one pint and a half.

EXPLANATION OF PROCESS.—In the reaction that ensues on the addition of the iron wire to the acid solution, a portion of the nitric acid becomes decomposed into nitric oxide gas (NO_2), which escapes, and oxygen. This latter converts the iron into a sesquioxide (Fe_2O_3) which uniting with three equivalents of nitric acid constitutes the salt pernitrate, or, as it is sometimes termed, *persesquinitrate*, of iron, the solution of which constitutes the preparation in question. The annexed equation explains this reaction, $2Fe + 4NO_5 = Fe_2O_3, 3NO_5 + NO_2$. By filtration the carbon, invariably present in every variety of iron, is gotten rid of—the acid not acting upon it.

CHARACTERS.—A clear solution of a reddish-brown colour, slightly acid and astringent to the taste, gives a blue precipitate with the ferrocyanide of potassium. When to a little of it, placed in a test tube, half its volume of pure sulphuric acid is added, and then a solution of sulphate of iron is poured on, the whole assumes a dark-brown colour.

The blue precipitate produced on the addition of ferrocyanide of potassium is Prussian blue ($Fe_4 3FCy_3$), the production of which is thus accounted for, $2(Fe_2O_3, 3NO_5) + 3(K_2FeCy_3) = 6(KONO_5) + (Fe_4 3FeCy_3)$. The dark-brown colour alluded to is due to the absorption, by the solution of the sulphate of iron, of nitric oxide gas produced by the decomposition of the nitric acid developed from the salt on the addition of the sulphuric acid—the decomposition of the nitric acid resulting from the conversion, through its agency, and that of the sulphuric acid, of a portion of the protosulphate into a persulphate of iron—a reaction explained by the following equation, $6(FeOSO_3) + 3SO_3 + NO_5 = 3(Fe_2 3SO_3) + NO_2$.

TESTS.—Specific gravity 1·107. One fluid drachm treated with an excess of solution of ammonia gives a precipitate, which, when washed, dried, and incinerated, weighs 2·6 grains. It gives no precipitate with the ferridcyanide of potassium.

The 2·6 grains yielded on incineration are sesquioxide of iron, and indicate the existence in each drachm of the solution of 7·86 grains of pernitrate of iron. Did the solution afford a precipitate with the ferridcyanide of potassium, it would indicate the presence of *protonitrate* of iron—the ferridcyanide yielding with the protosalts of iron a blue precipitate (Turnbull's blue), whilst with the persalts it gives no precipitate, striking with them but a dark-green colour. (For explanation, see next preparation.)

PHYSICAL PROPERTIES.—A transparent liquid of a fine orange-brown colour, with a weak nitric acid odour, and an acid styptic taste.

CHEMICAL PROPERTIES.—From the solution, large, transparent, colourless crystals may be procured; according to Pelouze their composition is 2 atoms of peroxide of iron (Fe_2O_3), 3 of nitric acid, and $1\frac{1}{2}$ of water. If kept in a bottle not quite filled, or if exposed to heat, the solution is decomposed, peroxide of iron thrown down, and nitrous acid evolved; in which state it is unfit for medical use.

THERAPEUTICAL EFFECTS.—Solution of the pernitrate of iron is an admirable astringent, possessing also tonic properties. It will be found particularly useful in chronic cases of mucous diarrhœa, accompanied by emaciation and loss of appetite; in such I have derived much benefit from its employment, after many other remedies had failed. It is also one of the best preparations of iron that can be used in the case of strumous children with enlarged mesenteric glands and lienteric diarrhœa, for whom it may be prescribed at the same time with cod liver oil. In many cases of phthisis the ordinary astringents fail in checking the colliquative diarrhœa; but this preparation, when local inflammatory action does not forbid its use, acts most beneficially, and becomes an important aid to the oil above referred to. There is also another form of diarrhœa, which may be almost termed nervous, that occurs in females of a delicate and weakly habit, in which the solution of pernitrate of iron is very efficacious: this form of the disease, and the effects of this remedy in it, have been most graphically described by the late Dr. Graves, who was the first in this country to call the attention of the profession to this most useful medicine soon after its introduction into practice by Mr. Kerr of Glasgow. Doctor Montgomery, of this city, informed me that he had used the pernitrate of iron extensively in the treatment of mucous discharges from the vagina, and that in such cases he considered it the best of the ferruginous preparations.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥j. for adults; min. x. to min. xx. for children. It is best given diluted with water and sweetened with *simple* syrup. It may be also administered in the form of enema, in the proportion of f℥ij. of the solution to ℥iv. of mucilage of starch.

INCOMPATIBLES.—All astringent vegetable infusions, decoctions, or syrups.

FERRI SULPHAS. *Sulphate of Iron.* $FeO, SO_3+7HO=140$. (Syn.: *Green vitriol, Copperas.*)

PREPARATION.—Take of iron wire, four ounces; sulphuric acid, four fluid ounces; distilled water, one pint and a half. Pour the water on the iron placed in a porcelain capsule, add the sulphuric acid, and when the disengagement of gas has nearly ceased, boil for ten minutes. Filter now through paper, and after the lapse of twenty-four hours separate the crystals which have been deposited from the solution. Let these be dried, on filtering paper placed on porous bricks, and preserved in a stoppered bottle.

EXPLANATION OF PROCESS.—The reaction that ensues on the admixture of the ingredients is that a portion of the water is resolved into its elements—hydrogen, which escapes in the form of the gas alluded to, and oxygen, which unites with the iron to form protoxide of iron, which, combining with the sulphuric acid, constitutes the salt in question. Thus, $Fe+SO_3HO=FeO,SO_3+H$. The filtration directed is with the object of separating the carbon, the normal impurity of iron, which, unacted upon by the acid, is thus gotten rid of.

CHARACTERS.—In oblique-rhombic prisms, inodorous, of a green colour and styptic taste; insoluble in rectified spirit, soluble in water. The solution gives a white precipitate with chloride of barium, and a blue one with the ferridcyanide of potassium, and on exposure to the air gradually becomes turbid, depositing a reddish-brown sediment.

The white precipitate alluded to on the addition of chloride of barium is sulphate of barytes, demonstrating the fact of its being a salt including sulphuric acid; the blue precipitate on the addition of ferridcyanide of potassium proves it to be one of the protosalts of iron—the precipitate in question being Turnbull's blue thus accounted for, $3(FeO,SO_3)+K_3Fe_2Cy6=Fe_3Fe_2Cy6+3KOSO_3$. Exposure to the air results in the absorption of oxygen, by which it is converted into persulphate and sesqui-sulphate of the sesqui-oxide of iron ($2Fe_2O_3,3SO_3+8HO$. Wittstein), the latter of which constitutes the reddish-brown precipitate alluded to. Thus, $6(FeO,SO_3)+3O=Fe_2O_33SO_3+2Fe_2O_3, 3SO_3$.

TESTS.—Crystals free from opaque, rust-coloured spots, and dissolving in water without leaving any ochry residue. The aqueous solution gives no precipitate with sulphuretted hydrogen, and one nearly white with ferrocyanide of potassium.

CHEMICAL PROPERTIES.—The crystals are composed of 1 equivalent of protoxide of iron, 1 of sulphuric acid, and 7 of water ($FeO, SO_3, HO+6HO$). They effloresce slightly in dry air, but if moisture be present, they attract oxygen and become covered with a brownish-yellow crust of the sesqui-sulphate of the sesqui-oxide of iron. Heated, they fuse in their water of crystallization, 6 equivalents of which they part with at a temperature of 238°; at a red heat they are decomposed, the sulphuric acid driven off, and the red peroxide, *colcothar, caput mortuum,* left. Sulphate of iron requires for its solution twice its weight of cold water, and three-fourths of its weight of boiling water. The solution reddens litmus paper. It is insoluble in alcohol. Sulphate of protoxide of iron is best preserved in pure alcohol. M. Latour has recently called attention to the fact that the protosulphate of iron may be completely prevented from hyperoxidation by chemically combining it with sugar, with which it crystallizes in a regular manner and of a definite composition, in the form of oblique rhombic prisms of the following composition:—Protosulphate of iron, 54·57 parts; sugar, 12·95 parts; and water, 32·5 parts. The formula for the preparation of this *saccharated protosulphate of iron* is given below.

ADULTERATIONS.—The presence of the basic sulphate, which is very common in the commercial salt, is known by the yellowish-brown colour of the crystals. It is often contaminated with copper, which may be readily detected by immersing a polished plate of iron in a solution of the salt, on which the copper, if any be present, will be deposited, of a rose-red colour.

THERAPEUTICAL EFFECTS.—Sulphate of iron in doses of two drachms and upwards, if it be not rejected by vomiting, is an irritant poison; but taken in small doses, frequently repeated, it acts as a tonic and astringent; with the latter intention it is employed in passive hemorrhages, in chronic diarrhœa and dysentery, and in atonic mucous discharges. As a topical remedy it is used to check bleeding from small blood-vessels, and in solution, or in the form of ointment, as an astringent application to ulcers, in chronic ophthalmia, and in chronic discharges from mucous membranes, as in leucorrhœa and gleet. On the Continent, it is also very generally employed locally in the treatment of erysipelas, and, it is stated, with most excellent effect; but those who have used it in this country do not report so favourably of its action. My experience of it, however, is very satisfactory. Velpeau was the first who recommended the use of sulphate of iron in this disease: he employed it both in solution and in the form of ointment. The former, which consists of one part of the salt dissolved in fifteen parts of water, he uses whenever the inflamed parts can be kept covered with lint soaked in it; but when this cannot be conveniently effected, he employs an ointment composed of one part of the sulphate and three or four parts of prepared lard. I am in the habit of using a weaker ointment than this, from gr. x. to ʒss. mixed with ℥j. of lard or some mild ointment and glycerine, with very great benefit in some pustular diseases of the skin. (See, also, *Tonics*.)

DOSE AND MODE OF ADMINISTRATION.—Gr. j. to. gr. v. in pill. For external use, gr. ij. to gr. x. may be dissolved in f℥j. of water. When we are particular as to the administration of this salt in the state of pure protosulphate the following preparation should be selected:—

Ferri Sulphas Granulata. Granulated Sulphate of Iron. (Take of iron wire, four ounces; sulphuric acid, four fluid ounces; distilled water, one pint and a half; rectified spirit, eight fluid ounces. Pour the water on the iron placed in a porcelain capsule, add the sulphuric acid, and when the disengagement of gas has nearly ceased, boil for ten minutes, and then filter the solution into a jar containing the spirit, stirring the mixture so that the salt shall separate in minute granular crystals. Let these, deprived by decantation of adhering liquid, be transferred on filtering paper to porous bricks, and dried by exposure to the atmosphere. They should be preserved in a stoppered bottle.)

The reactions in this instance are the same as those already described, save that advantage is taken of the difference in the respective solubilities of proto and persulphate of iron in rectified spirit, the former being insoluble, the latter soluble in this menstruum So that if by any chance any persulphate is formed as the result of the operation, it is separated from the protosulphate, this latter being precipitated as described, the former being held in solution; in all other respects what has already been written with respect to the sulphate holds good with regard to this preparation.

Solution of Sulphate of Iron. (Take of granulated sulphate of iron, ten grains; boiling distilled water, one fluid ounce. Dissolve. This solution should be recently prepared.) Introduced into the Appendix of the British Pharmacopœia solely as a test.

Ferri Sulphas Exsiccata. Dried Sulphate of Iron. (Take of sulphate of iron, four ounces. Expose the sulphate of iron in a porcelain capsule to a moderate heat, which may be finally raised to 400°, until aqueous vapour ceases to be given off. Reduce the residue to a fine powder, and preserve it in a stoppered bottle.) In this process six out of seven atoms of water are expelled from the sulphate of iron, and thus it is rendered a more convenient preparation for internal use than the crystallized salt; three grains are equal to nearly five of the crystals; Dose, gr. ss. to gr. iij.

* *Ferri Sulphas Saccharatum*, LATOUR. (Pure protosulphate of iron, 200 parts; crystallized white sugar [sugar candy], 50 parts; boiling distilled water, 130 parts: dissolve the sulphate of iron in 100 parts and the sugar in 30 parts of the boiling water; mix the liquors, filter while hot, dry the crystals, which separate on cooling, between folds of blotting paper, and preserve in a dry bottle. By concentration a fresh quantity of crystals may be obtained.) Dose, gr. j. to gr. viij. in pill or solution.

* *Pilulæ Sulphatis Ferri.* (Dried sulphate of iron, 2 parts; extract of taraxacum, 5 parts; liquorice root powder, 3 parts; conserve of red roses, 5 parts; beat them together into a proper mass, which is to be divided into five grain pills.) Each pill contains ⅔rds of a grain of dried sulphate of iron; Dose, one to three pills.

INCOMPATIBLES.—The alkalies, and their carbonates; nitric acid; lime water; nitrate and tartrate of potash; iodide of potassium; borax; chloride of barium and nitrate of baryta; acetate of lead; the soaps, and all vegetable astringents.

GALLA. *Galls.* (Syn: *Nutgalls, Gallnuts.*) Excrescences on Quercus infectoria, *Linn.*, caused by the punctures and deposited ova of diplolepis Gallæ tinctoriæ, *Latr.* Plate 152, *Steph. & Church. Med. Bot.* The oak tree from which galls are procured is a native of Asia Minor; it belongs to the natural family *Cupuliferæ* (*Corylaceæ*, Lindley), and to the Linnæan class and order *Monœcia Polyandria.* Galls are formed on the young branches in consequence of the irritation produced by the puncture of the female of an hymenopterous insect, *Diplolepis* (or *Cynips*) *gallæ tinctorum*, which punctures the bark for the deposition of its eggs.

CHARACTERS.—Hard, heavy globular bodies, varying in size from half an inch to three-fourths of an inch in diameter, tuberculated on the surface, the tubercles and intervening spaces smooth; of a bluish-green colour on the surface, yellowish-white within, with a small central cavity; intensely astringent.

PHYSICAL PROPERTIES.—Galls vary in size from that of a large pea to that of a cob-nut. They are of a greyish-green colour, tuberculated on the surface, the tubercles and intervening spaces smooth; hollow, and of a yellowish-white colour internally. They have an intensely astringent taste, but no odour. Galls are imported principally from Constantinople and Smyrna, but some are brought from the East Indies. In commerce, two kinds of galls are commonly met with, blue or green galls, and white galls; the former are gathered before the escape of the insect, and are the best; the latter are perforated with a small circular hole through which the insect has escaped, are larger, of a paler colour, but are much inferior in astringency.

CHEMICAL PROPERTIES.—Galls are composed of about 26 per cent. of tannic, with a trace of gallic, ellagic, and luteogallic acids, extractive matter, a compound of pectic acid and tannin insoluble in cold water, and tannates and gallates of potash and of lime (*Berzelius*). They yield their astringent property to water, proof spirit, alcohol, and ether. Of these, water is the best solvent; the solution gives a curdy precipitate with solution of gelatine (*tannate of gelatine*, the basis of leather), and a bluish-black precipitate with salts of the sesquioxide of iron (*tanno-gallate of iron*, the basis of ink).

Galls are not liable to adulteration in the English trade.

THERAPEUTICAL EFFECTS.—Galls are among the most powerful vegetable astringents we possess, nevertheless they are but seldom employed internally in medicine; and certainly not so much as they should be, if not alone their medicinal activity but their cheapness be taken into account; they may be used in passive hemorrhages, in chronic diarrhœa or dysentery, in gleet and in leucorrhœa. They or tannic acid are the best antidote in poisoning with tartar emetic, ipecacuanha, emetina, and the vegetable alkaloids generally. Externally galls are employed as topical astringents in hemorrhoids, in relaxation of the uvula and tonsils, in chronic ulcerations of the mouth and fauces, and in atonic mucous discharges.

DOSE AND MODE OF ADMINISTRATION.—*Internally* in powder, gr. v. to gr. xx.

* *Decoctum Gallæ.* (Galls, bruised, ℥iiss.; distilled water, Oij.; boil down to Oj. and strain.) Dose, f℥ss. to f℥ij.; useful also as a local astringent for external application.

* *Infusum Gallæ.* (Galls, powdered, ℥ss.; boiling water, f℥vj.; Infuse for two hours and strain.) Dose, f℥ss. to f℥ij.

Tinctura Gallæ. Tincture of Galls. (Take of galls, bruised, two ounces and a half; proof spirit, one pint. Macerate the galls for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, *internally*, f℥ss. to f℥ij.; *externally*, ℥ij. infused in Oj. of water for a gargle, lotion, or injection.

Unguentum Gallæ. Ointment of Galls. (Take of galls, in very fine powder, eighty grains; simple ointment, one ounce. Mix thoroughly.)

Unguentum Gallæ cum Opio. Ointment of Galls and Opium. (Take of ointment of galls, one ounce; opium, in powder, thirty-two grains. Mix thoroughly.) These two ointments have been introduced for topical applications, principally in cases of piles. The opium in the latter formula is esteemed by some an excellent addition, but I have often found it to cause much irritation, when applied to hemorrhoids that were at all inflamed; and another objection to its use in hemorrhoidal affections is, that being introduced within the rectum it is apt to cause constipation. The addition of from gr. x. to gr. xx. of extract of belladonna to the *simple* ointment of the Pharmacopœia will be found much preferable: from the use of this combination I have seen the best results follow,—the belladonna allaying the irritation which arises chiefly from the spasmodic action of the sphincter ani muscle.

INCOMPATIBLES.—The mineral acids; salts of iron and lead; sulphate of copper; nitrate of silver; carbonates of potash and of soda; lime-water; tartar-emetic; and infusions of cinchona, calumba, cusparia, ipecacuanha, opium, etc.

ACIDUM TANNICUM. *Tannic Acid.* (Syn.: *Tannin, Quercitannic Acid*). An acid, $C_{54}H_{22}O_{34}$,(=618), obtained from galls. A peculiar principle on which the astringent property of vegetable substances chiefly depends.

PREPARATION.—Take of galls in coarse powder, eight ounces; ether, three pints; distilled water, five fluid ounces. Mix the water and the ether by agitation, and after a few minutes pour the ethereal solution in successive portions upon the galls previously introduced into a glass or porcelain percolator, with a receiver so attached as to prevent loss of ether from evaporation. The liquid which accumulates in the receiver consists of two distinct strata; separate the heavier liquid, evaporate it to dryness on a water bath, and complete the drying in a hot-air chamber, the temperature of which should not exceed 212°. From the lighter liquid the ether may be recovered by distillation. By this process the galls are exhausted of their tannic acid, which is recovered by the evaporation directed.

CHARACTERS.—A pale-yellow amorphous powder, inodorous, with a strongly astringent taste, and an acid reaction, readily soluble in water and rectified spirit, very sparingly in ether. Dissolved in water it precipitates a solution of gelatine yellowish-white, and the persalts of iron of a bluish-black colour.

CHEMICAL PROPERTIES.—Exposed to the air it absorbs oxygen, and is almost entirely converted into *gallic acid.* It is insoluble in the fixed and volatile oils; but is very soluble in glycerine, which is taken advantage of with excellent results in prescribing. Its solution reddens litmus paper. One of its most remarkable properties is, that it does not affect the protosalts of iron, but gives a dark-blue precipitate with the salts of the peroxide of that metal. When burned with free access of air, it leaves no residuum.

ADULTERATIONS.—Tannic acid is not liable to adulteration, but by long keeping, especially if exposed to the air, it is apt to be converted into *gallic* acid, a change which may be readily recognized by its having lost its characteristic property of causing a white precipitate in a solution of isinglass, from which gallic acid throws down nothing.

THERAPEUTICAL EFFECTS.—Tannic acid is the most powerful of all vegetable astringents, and has been employed with much success in the treatment of the various forms of atonic hemorrhage, and in chronic mucous discharges; it has been found peculiarly efficacious in menorrhagia, and in the colliquative sweating and diarrhœa of hectic. Its use has been suggested in diabetes, but as yet with no trustworthy results. Tannin forms insoluble compounds with the gastric juice and other matters found in the stomach, and should therefore be used with caution in dyspeptic habits. From its chemical action on gelatine, tannic acid has been recently proposed by Dr. Osborne as a direct anthelmintic, and has been successfully used by him with this intention. In its passage through the system, tannic becomes converted into gallic and pyrogallic acids—a fact first determined by the experiments of Wöhler and Frerichs, and which is effected by its undergoing in the system a process of oxidation, the result of which will be understood on reference to the remarks on the conversion of tannic into gallic acids, under the head of gallic acid. Applied externally in the form of ointment and of lotion, I have derived much benefit from its use in the treatment of various diseases of the skin, especially those attended with much discharge, as some of the forms of eczema, herpes, &c. A lotion of 4 parts of tannin, dissolved in 30 parts of water, is an excellent application to open cancer, more especially in cases attended with hemorrhage. A saturated solution in glycerine applied two or three times daily will be found one of the best local applications in ulcerated sore throat. Ricord occasionally employs it in chancres, and Druitt speaks favourably of its use in cracked nipples. As a *topical* astringent it is to be preferred to gallic acid.

DOSE AND MODE OF ADMINISTRATION.—Gr. ii. to gr. x. in the form of a pill, or dissolved in water. For a gargle, injection, or lotion, gr. v. to gr. viij. of tannin may be dissolved in f℥j. of water; or if a stronger solution be required, gr. xx. may be readily dissolved in f℥j. of glycerine; for an ointment from gr. viij. to gr. xxx. may be combined with ℥j. of white wax ointment, cold cream, or cucumber cerate.

Trochisci Acidi Tannici. Tannin Lozenges. (Take of tannic acid, three hundred and sixty grains; tincture of tolu, half a fluid ounce; refined sugar in powder, twenty-five ounces; gum arabic in powder, one ounce; mucilage of gum arabic, two fluid ounces; boiling distilled water, one fluid ounce. Dissolve the tannic acid in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and with the gum and the sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains half a grain of tannic acid.) Convenient forms for the employment of tannic acid locally in cases of relaxed uvula, sore throat, &c., may be used *ad libitum*.

Suppositoria Acidi Tannici. Tannin Suppositories. (Take of tannic acid, twenty-four grains; glycerine, twenty minims; prepared lard, a sufficiency; white wax, a sufficiency. Melt eighty grains of the lard, and forty grains of the wax in a water bath, and when nearly cold, add the tannic acid previously well mixed with the glycerine. When the mixture has solidified, divide the mass into twelve equal portions to be formed into cones, which are to be allowed to stand till they acquire sufficient firmness. Dip each cone into a mixture of three parts of the wax and eight of the lard, kept melted in the water bath, and set aside in a cool place, that the coating may become hard). Each of these suppositories contains two grains of tannic acid, and is a convenient form for local application.

Dr. Tanner has suggested the following formulary for a *pessary*. Tannin 40 grains; catechu, 60 grains; butter of cacao, ½ oz.; olive oil, f℥j. mix, and divide into four pessaries. Useful in leucorrhœa, &c.

INCOMPATIBLES.—The mineral acids; the alkalies, and their carbonates; lime water; acetate of lead; nitrate of silver; the persalts of iron; tartar emetic; the vegetable alkaloids; gelatin; and emulsions.

ACIDUM GALLICUM. *Gallic Acid.* An acid, $3HO,C_{14}H_3O_7+2HO$, (=188) prepared from galls.

PREPARATION.—Take of galls in coarse powder, one pound; distilled water, a sufficiency. Place the galls in a porcelain dish, pour on as much of the water as will convert them into a thick paste, and keep them in this moistened condition for six weeks, at a temperature of between 60° and 70°, adding distilled water from time to time to supply what is lost by evaporation. At the end of that time, boil the paste for twenty minutes with forty-five fluid ounces of the water, strain through calico, and when the fluid has cooled, collect on a filter the crystalline deposit which has formed and let it drain. Press it strongly between folds of filtering paper, and re-dissolve in ten ounces of boiling distilled water. When the fluid has cooled to 80° pour it off from the crystals which have formed, wash these with three ounces of ice-cold distilled water, and dry them, first by filtering paper, and finally by a temperature not exceeding 212°.

By boiling the undissolved portion of the galls with forty-five additional ounces of water, filtering into a capsule containing the liquor decanted from the crystals in the preceding process, evaporating to the bulk of ten ounces, and cooling to 80°, an additional quantity of acid may be obtained, which, however, is usually a little darker in colour than the product of the previous crystallization.

EXPLANATION OF PROCESS.—It is universally admitted that the astringent principle of galls depends upon the presence of tannic acid, and that gallic acid is present but in very minute quantity indeed; but if tannic acid be exposed for any length of time to the action of the air, it will be converted into gallic acid, the process being at the same time attended with the evolution of carbonic acid—the change being due to the absorption of oxygen, in virtue of which these phenomena occur. The following equation will explain the re-action that so occurs, $C_{54}H_{22}O_{34}+24O=3C_{14}H_6O_{10}+4HO+12CO_2$. From this it will be perceived that one equivalent of tannic acid is sufficient, provided a free access of air be kept up to supply us with three equivalents of gallic acid, four equivalents of water, and twelve of carbonic acid. It is upon this principle that the pharmacopœial process is conducted.

CHARACTERS.—In acicular prisms, sometimes white, but generally of a pale-fawn colour, very sparingly soluble in cold water, but freely so in boiling water, rectified spirit, and ether. It gives a bluish-black precipitate with a persalt of iron.

TESTS.—It leaves no residue when burned with free access of air. Its solution gives no precipitate with gelatine.

PHYSICAL PROPERTIES.—Gallic acid crystallizes in brilliant, satiny, yellowish-white needles, which are unalterable in the air. It is inodorous, but has a slightly acidulous styptic taste, leaving a sweetish impression on the mouth.

CHEMICAL PROPERTIES.—Its composition in the crystalline state is $C_{14}H_6O_{10}+2HO$. It is very sparingly soluble in cold water or in ether, requires but 3 parts of boiling water for its solution, and is also very soluble in alcohol. It reddens litmus paper, and forms tribasic salts with oxides. When pure it does not precipitate gelatine, by which characteristic it may be distinguished from tannic acid, but, like the latter, it gives a bluish-black precipitate with the sesqui-salts of iron. According to Buchner, 7·5 per cent. of gallic acid is produced from galls, and from 50 to 60 per cent from tannin.

THERAPEUTICAL EFFECTS.—Gallic acid is a powerful astringent, its effects being particularly manifested on the urinary organs, which is directly proved by the fact of its presence in the urine of those who have taken it, being, in general, readily manifested by the addition of a sesqui-salt of iron to that secretion, a few hours after the acid has been swallowed. It is, therefore, a remedy of great value in all forms of hemorrhage from the kidneys or bladder, provided no inflammatory symptoms are present, and especially in those forms which are the result of injury When astringent effects are desired to be produced through the constitution, gallic is probably to be preferred to tannic acid, as this latter is changed into the former in its passage through the system, and for the same reason a smaller dose of gallic acid will produce a more decided effect—the proportions indicated by theory being nearly as is 9 to 10. It is also one of our best astringents in hemorrhage from the stomach and bowels, on its efficacy in which I have published some observations in the

Dublin Quarterly Journal of Medical Science.* In hemorrhage from the uterus, also, my experience of it is corroborative of the published observations of Professor Simpson of Edinburgh, and Sir C. Locock of London. In albuminuria, gallic acid is often productive of decided benefit, checking for a time the progress of the disease; the increased secretion of urine and the quantity of albumen in it being sensibly diminished during its administration. It has been also found very useful where fatty matter is present in the urine, an interesting example of its efficacy in which was published by Dr. Bence Jones of London, in the 33rd volume of the Medico-Chirurgical Transactions.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. to gr. xx. two or three times a day in the form of a pill, or suspended in water by means of mucilage; in urgent cases this quantity may be given every hour, or every second hour. Dr. Jones, in the case above referred to, gave ʒj. of it daily for 53 days.

INCOMPATIBLES.—The sesqui-salts of iron.

GRANATUM.—*The bark of the fruit of Punica granatum.* This tree has been described in the division *Anthelmintics.*

PHYSICAL PROPERTIES.—The fruit-rind, although omitted from the British Pharmacopœia, is occasionally used as a domestic astringent, especially by the lower classes, and is met with in the shops in arched irregular pieces, reddish-brown and warty on the outside, yellowish within, about a line in thickness; inodorous; with a bitter astringent taste. The flowers are red, and have a weak astringent taste, but no odour; they are not used at present.

CHEMICAL PROPERTIES.—The rind of the pomegranate consists of 18·8 per cent. of tannin, 17·1 of mucilage, 10·8 of extractive, 30 of lignin, and a trace of resin. It yields its astringency to both water and alcohol.

THERAPEUTICAL EFFECTS.—Pomegranate-rind may be used as an astringent in the same cases as the other vegetable remedies of this class; its efficacy being judged of by the quantity of tannin it contains; at present it is rarely employed.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. xxx. to gr. lx., boiled with from ℥iv. to ℥vi. of milk.

* *Decoctum Granati.* (Pomegranate-rind, ℥ij.; distilled water, Oiss.; boil down to one pint and strain.) Dose, f℥s. to f℥j.

INCOMPATIBLES.—All substances incompatible with tannin.

HÆMATOXYLUM. *Logwood.* Hæmatoxylum Campechianum, *Linn.* Plate 163, *Woodv. Med. Bot.* The heart-wood sliced; imported from Campeachy in Central America, from Honduras, and

* New Series, vol. ix. p. 349.

Jamaica. A native of Campeachy in Central America, now naturalized in Jamaica. It belongs to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Decandria Monogynia*.

BOTANICAL CHARACTERS.—Stem crooked, about 8 inches in diameter, and 40 or 50 feet high; leaves large, pinnate; flowers yellow, in racemes.

CHARACTERS.—The logs are externally of a dark colour, internally they are reddish-brown; the chips have a feeble agreeable odour and a sweetish taste; a small portion chewed imparts to the saliva a dark pink colour.

PHYSICAL PROPERTIES.—The heart-wood of the tree which is of a dark-red colour is alone employed, the bark and alburnum being chipped off. It is imported in billets which are dense and hard, have a feeble agreeable odour, and a sweetish astringent taste.

CHEMICAL PROPERTIES.—Logwood contains a peculiar red, crystalline bitter principle which has been named *hæmatin* or *hæmatoxylin*, resin, volatile oil, some tannin, acetic acid, and various salts. *Hæmatin* is often found in the fissures of the wood in beautiful large red crystals. Logwood yields its active principles to both water and alcohol; the solutions are of a fine purple colour, which is changed to violet by the alkalies; with alum or acetate of lead, a blue precipitate is produced; a dark brown with the sesquisalts of iron; and a reddish with gelatine. It is consequently very much employed as a dye-wood.

ADULTERATIONS.—Various red-coloured woods are substituted for logwood, from which they may be readily distinguished by their not possessing the same agreeable odour.

THERAPEUTICAL EFFECTS.—Logwood is an excellent astringent in chronic diarrhœa and dysentery, for the latter of which it is peculiarly adapted, as, although it checks the excessive discharge, it does not produce constipation. It has been also used in the profuse sweating of phthisis, and in diabetes. In leucorrhœa its use as an injection has been attended with the happiest results, especially when prescribed in combination with alum, lead, &c., the prescriber should, however, bear in mind the action of these salts on the decoction of logwood, and caution his patients with regard to its dyeing properties, else their linen may suffer extensively.

Decoctum Hæmatoxyli. Decoction of Logwood. (Take of logwood, in chips, one ounce; cinnamon, in powder, sixty grains; distilled water one pint. Boil the logwood in the water for ten minutes, adding the cinnamon toward the end, and strain. The product should measure sixteen ounces). Dose, one to two ounces.

In cases of obstinate diarrhœa I have found this decoction used in place of cinnamon water, as the menstruum in *chalk mixture*, a most valuable remedy.

Extractum Hæmatoxyli. Extract of Logwood. (Take of logwood, in fine chips, one pound; boiling distilled water, one gallon. Macerate the logwood in the water for twenty-four hours, then boil down to one half, strain, and evaporate by a water-bath to a proper consistence, stirring with a wooden spatula. Iron vessels should not be used.) Not much used ; it becomes so hard by keeping, that pills made of it pass through the bowels unchanged. The interdict with respect to iron vessels can be readily understood when we remember the action of tannic acid on this metal. Dose, gr. x. to gr. xxx.

INCOMPATIBLES.—The mineral acids; acetic acid; lime water; tartar emetic; sulphates, and acetates.

KINO. *Kino.* Pterocarpus Marsupium, *DC.* Plate 116, *Roxb. Corom.* The juice obtained from incisions in the trunk, inspissated; imported from Malabar.

Various substances have been known in commerce and described as kino—a name originally given by the celebrated Fothergill to a vegetable extract imported into British commerce from the western coast of Africa; in consequence of which, both the botanical source and the part of the world from whence it was obtained were for a long time wrapped in much obscurity. In the present day, nearly all that is imported is brought from Bombay, a very small quantity only being obtained from the coast of Africa, from whence, however, it was originally altogether procured. The former, East India Kino, is the product of the Pterocarpus marsupium, a native of the Malabar coast, belonging to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley,) and to the Linnæan class and order *Diadelphia Decandria.* The latter, African Kino, is obtained from the Pterocarpus erinaceus, a native of Gambia and Senegal. Botany Bay Kino, sometimes met with also, is the inspissated juice of the Eucalyptus resinefera, a native of Australia and Van Diemen's Land; it belongs to the Natural family *Myrtaceæ.*

BOTANICAL CHARACTERS.—*Pterocarpus marsupium:* A lofty tree, with the outer coat of the bark brown, the inner red, fibrous and astringent; Leaves, bifarious, alternate; Leaflets, 5–7, alternate, elliptic, emarginate; Panicles, terminal; Flowers, white, with a yellow tinge; Legumes, long-stalked; Seed, solitary, kidney-shaped.—*Pterocarpus erinaceus:* Leaflets, 11-15, alternate, ovate, oblong, obtuse, or sub-emarginate; Flowers, yellow; Legume, orbicular, membraneous, undulate at the margin.

PREPARATIONS.—"East India Kino is procured when the tree is in blossom, by making longitudinal incisions in the bark round the trunk of the tree, so as to let the gum ooze down into a receiver formed of a broad leaf, so placed and fixed in the bark as to prevent the gum from falling on the ground. From the leaf it is made to run into a receptacle placed under the leaf to receive the gum. When this receptacle is filled, it is removed, the gum is dried in the sun until it crumbles, and then filled into wooden boxes for exportation," (Brown in Royle's Materia Medica, 3rd edition, page 408.) African Kino is procured from incisions made into the trunk and branches of the tree, whence the juice exudes, and gradually concretes into brittle tears. Botany Bay Kino is obtained in a similar manner.

CHARACTERS.—In small, angular, brittle, glistening, reddish-black fragments, translucent and ruby-red on the edges, inodorous, very astringent. When chewed it tinges the saliva blood-red.

PHYSICAL PROPERTIES.—Kino occurs in the form of small, angular fragments or tears, some smaller, none of them larger than a pea, opaque, glistening, and of a reddish-black colour. They are very brittle; when chewed they adhere to the teeth, and give the saliva a blood-red colour. They are void of odour, but have an intensely astringent taste.

CHEMICAL PROPERTIES.—Kino is composed of 75 per cent. of a combination of tannin with a peculiar extractive containing catechuic acid, 24 of red gum, and 1 of insoluble matter. It is only very partially soluble in cold or boiling water; but alcohol dissolves nearly two-thirds of it, and is therefore the best menstruum for its administration in medicine. Alkalies increase its solubility in water, but essentially affect its therapeutical properties as an astringent.

ADULTERATIONS.—Other astringent substances, which bear a general resemblance to Kino, but are of inferior quality, are frequently substituted for it in commerce; none of them, however, have the same glistening, reddish-black colour which is so well seen in the smaller fragments of Kino; the sophistication may, therefore, be readily detected by the eye. By employing the same tests as for catechu (see p. 81), the exact amount of tannin contained in Kino may be readily ascertained.

THERAPEUTICAL EFFECTS.—Kino is an admirable astringent, possessing nearly similar properties to catechu, and may be employed in the same diseases. It is generally supposed to be better adapted for menorrhagia and leuchorrhœa; and as it is more tonic, owing to the extractive which it contains, it should be preferred where great debility exists.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.

Pulvis Kino cum Opio. Powder of Kino and Opium. Syn.: *Pulvis Kino compositus.* (Take of kino, in powder, three ounces and three quarters; opium, in powder, a quarter of an ounce; cinnamon, in powder, one ounce. Mix them thoroughly, and pass the powder through a fine sieve Keep it in a stoppered bottle.) An excellent astringent in chronic diarrhœa and dysentery; it has been also highly praised in pyrosis; gr. xx. contain gr. j. of opium. Dose, gr. x. to gr. xxx.

Tinctura Kino. Tincture of Kino. (Take of kino, in moderately fine powder, two ounces; rectified spirit, one pint. Macerate for seven days, filter, and add sufficient rectified spirit to make one pint.) Dose, f℥ss. to f℥ij. It is frequently combined with tincture of catechu and opium in the chalk mixture as an astringent remedy in diarrhœa. Tincture of Kino when long kept is often converted into an insoluble gelatinous mass; no satisfactory reason has been hitherto assigned for this change taking place. It is best prevented by keeping the tincture in small bottles completely filled, so as to exclude the atmospheric air.

INCOMPATIBLES.—The mineral acids; carbonates of the alkalies; sulphate of iron; nitrate of silver; acetate of lead; and gelatine.

KRAMERIA. *Rhatany.* Krameria triandra, *Ruiz and Pavon, Flor. Peruv.* Plate 72, *Steph. and Church. Med. Bot.* The root dried; imported from Peru. A native of Peru; belonging to the Natural family *Polygalaceæ*, and to the Linnæan class and order *Tetandria Monogynia.*

BOTANICAL CHARACTERS.—Stem, shrubby, procumbent; Leaves, villous, silky, oblong, sessile; Flowers, solitary, reddish; stamens, 3, whence the specific name.

CHARACTERS.—About an inch in diameter, branches numerous, long, brownish-red and rough externally, reddish-yellow internally, strongly astringent, tinging the saliva red.

PHYSICAL PROPERTIES.—Numerous, long, woody root branches, to which the common root-stock about an inch in length is often attached; they consist of a reddish-brown, smooth bark, nearly an eighth of an inch in thickness, and a yellow, hardy, woody centre *(meditullium;)* they are inodorous, the bark has an intensely astringent, somewhat bitter taste, but the woody centre is nearly tasteless.

CHEMICAL PROPERTIES.—The bark of rhatany root consists of nearly 43 per cent. of tannin, a trace of gallic acid, 56 per cent. of gum, extractive, and colouring matter, and a small quantity of a peculiar acid, which has been named *Krameric acid.* It yields its active principles to cold water and to alcohol.

ADULTERATIONS.—True rhatany root has within the last few years become very scarce in commerce, and consequently the roots of other plants which bear a resemblance to it are imported and sometimes offered for sale as rhatany root. Mr. Hanbury of London has recently described two kinds which have been thus substituted,—one a root, chiefly in thick woody pieces, which appears to be an inferior quality of the old sort, and the other a highly astringent root imported from New Granada, and evidently the produce of a distinct species. Occasionally pieces of a yellowish root are found mixed through parcels of the true root. All the spurious roots may be readily detected by their wanting the characteristic beautiful red colour of true rhatany.

THERAPEUTICAL EFFECTS.—Rhatany root is a powerful astringent and tonic, and as such is employed with much benefit in the treatment of chronic diarrhœa and of dysentery, in passive hemorrhages, in menorrhagia, and in atonic mucous discharges. As a topical astringent, it may be applied in the form of powder to indolent ulcers with excessive discharge and as a styptic to arrest hemorrhage, when it proceeds from very small vessels. Rhatany root finely powdered is a constitutent of most tooth powders, it reddens and consolidates the gums, and whitens the teeth. Its tincture also may be used with advantage as a lotion in cases of spongy gums attended with hemorrhage.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.

Extractum Krameriæ. Extract of Rhatany. (Take of rhatany, in coarse powder, one pound; distilled water, one gallon. Macerate the rhatany in a pint and a half of the water for twenty-four hours; then pack in a percolator, and add more distilled water, until the twelve pints have been collected, or the rhatany is exhausted. Evaporate the liquor by a water-bath to a proper consistence). Dose, gr. x. to gr. xl.

Infusum Krameriæ. Infusion of Rhatany. (Take of rhatany, bruised, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) Dose, one to two ounces.

Tinctura Krameriæ. Tincture of Rhatany. (Take of rhatany, bruised, two ounces and a half; proof spirit, one pint. Macerate the rhatany for forty-eight hours, with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint). Dose, f℥j. to f℥ij.

INCOMPATIBLES.—All substances incompatible with tannin.

MATICA. *Matico.* Artanthe elongata, *Miquel, Comment.* Plate 57, *Ruiz and Pavon, Flor. Peruv. (Piper angustifolium).* The dried leaves imported from Peru. This substance was introduced to the notice of the profession some years ago by Dr. Jeffreys of Liverpool. It is stated on the authority of Miquel to be the leaves of *Artanthe elongata (Piper angustifolium,* Ruiz and Pavon*),* a native of Peru, belonging to the Natural family *Piperaceæ,* and to the Linnæan class and order *Diandria Trigynia.*

CHARACTERS.—From two to eight inches long, veined and tessellated on the upper surface, downy beneath, with an aromatic, slightly astringent warm taste, and an agreeable aromatic odour.

PROPERTIES.—The leaves as imported are attached to the stem, and the flowering spike is also often present. They have an aromatic scarcely astringent taste, and an agreeable aromatic odour somewhat resembling that of sage. They yield their active principles to water and to alcohol. According to the analysis of Dr. Hodges, Matico consists of a bitter principle *(Maticine),* and an aromatic volatile oil, soft resin, colouring matter, salts, chlorophylle, gummy matter, and lignin. Two kinds of the herb have been forwarded to this country, the one *green* and the other *yellow;* the latter, which appears to have been gathered when the plant was riper, is much the more active.

THERAPEUTICAL EFFECTS.—This substance is held in high esteem as a styptic and astringent in its native country, and the trials that have been made with it since it was first introduced into England by Dr. Jeffreys, prove that it possesses both these properties. As an astringent it has been employed internally in the same cases as the other vegetable remedies of this class, over which it does not appear to possess any remarkable advantages. I have found the tincture very useful in the treatment of catarrh of the bladder in the aged. It is, however, chiefly as a styptic in external cases of hemorrhage that it has been lauded; and from the numerous cases that have been published in which it has arrested bleeding from small blood-vessels, as from leech-bites, after the ablation of nævi, from incisions, &c.; there can be no doubt of its being a styptic of much power. Like many other good astringents, however much employed on its first introduction, it has latterly fallen almost into disuse. It is, however, to be noted that when the leaf is employed as a local styptic, it is the *under* part which is to be applied to the bleeding vessel—this, which is highly reticulated, is supposed by many to owe its virtue not to any inherent astringency, but to its mechanically entangling the blood, and thus allowing of its coagulation, producing pressure, and so arresting the hemorrhage.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.

Infusum Maticæ. Infusion of Matico. (Take of Matico, cut small, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for half an hour, and strain.) Dose, f℥j. to f℥iij. twice or three times daily.

**Tinctura Maticæ.* (Take of matico leaves in coarse powder, eight ounces; proof spirit, two pints: macerate for fourteen days, strain, express, and filter.) Dose, f℥j. to f℥ij.

INCOMPATIBLES.—The mineral acids; the alkalies; the sesquisalts of iron; acetate of lead; and the tincture or infusion of galls.

*MONESIA.—Under this name an astringent extract was imported into France some years since from South America; it is obtained from the bark of the *Chrysophyllum glycyphlæum* (Casaretti), a native of Brazil, belonging to the Natural family *Sapotaceæ.* The extract is brought over in large cakes which are purified by dissolving them in water, filtering and evaporating; the purified extract is in small fragments resembling kino in appearance, but it has not the peculiar ruby lustre of that substance; the taste is at first sweetish, then astringent, and ultimately acrid; this latter taste especially experienced in the fauces, and usually very persistent; the odour feebly aromatic; it dissolves readily in water, affording a dull brown, somewhat opaque solution; is partly soluble in alcohol, and only very sparingly soluble in ether. According to the analysis of MM. Derosne and Henry, it consists of tannin, red colouring matter, glycirrhizine, a peculiar acrid principle which they have named *Monesine*, and various salts.

Like numerous other medicines when first introduced, Monesia was extravagantly lauded as a remedy possessing powerfully astringent properties; experience has however proved that it is much inferior to either kino or catechu, and it probably may take an intermediate station between these substances and extract of rhatany. It has been used in all cases where astringents are admissible, both externally and internally, but the diseases in which it appears to have been most serviceable are chronic diarrhœa, scurvy, chronic catarrh, and scrofula. *Locally* it has been occasionally used with success in spongy gums and scrofulous ulcers, upon which latter the powdered extract may be spinkled.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. v. to gr. xv.

* *Tinctura Monesiæ*, DONOVAN. (Extract of monesia, ℥j.; proof spirit, f℥ixss.; water, f℥ij.; mix, and when the feces have subsided pour off the tincture.) Dose, f℥j. to f℥ij.

* *Mistura Monesiæ*, (Extract of monesia, ℈ij.; water, f℥viiss.; compound tincture of cardamoms, f℥ss.; mix.) Dose, f℥ss. to f℥ij. two or three times a day.

INCOMPATIBLES.—Mineral acids; salts of iron, zinc, and lead; opium; and sulphate of quina.

PLUMBI ACETAS. *Acetate of Lead.* (Syn.: *Sugar of Lead.*) $PbO, C_4H_3O_3+3HO(=189{\cdot}5)$. Generally an article of the Materia Medica, but for the preparation of which we find in the Pharmacopœia the following directions:—

PREPARATION.—Take of litharge, in fine powder, twenty-four ounces; acetic acid, two pints, or a sufficiency; distilled water, one pint. Mix the acetic acid and the water, add the litharge, and dissolve with the aid of a gentle heat. Filter, evaporate till a pellicle forms, and set aside to crystallize, adding a little acetic acid should the fluid not have a distinctly acid reaction. Drain and dry the crystals on filtering paper, without heat.

The object of the pharmacopœial directions is simply to unite the litharge (PbO) with the acetic acid, and the result of this union is the salt in question, $PbO+\bar{A}=PbO,\bar{A}$.

CHARACTERS.—In white masses of interlaced acicular crystals, slightly efflorescent, having an acetous odour, and a sweet astringent taste. Its solution in water slightly reddens litmus, gives a yellow precipitate with iodide of potassium, and is precipitated white by sulphuric acid, acetic acid being set free.

The *yellow* precipitate alluded to is iodide of lead, the production of which is explained by the annexed equation, $PbO\bar{A},+KI=PbI+KO,\bar{A}$. The *white* precipitate is sulphate of lead, thus accounted for, $PbO,\bar{A}+SO_3=PbO,SO_3+\bar{A}$.

TESTS.—Its solution in distilled water is clear, or has only a slight muddiness, which disappears on the addition of acetic acid. Thirty-eight grains dissolved in water require for complete precipitation twenty measures of the volumetric solution of oxalic acid.

The slight muddiness here alluded to indicates the presence as an impurity of carbonate of lead, which readily disappears under the conditions stated. It is to be remarked that if we attempt to dissolve it in common water this muddiness is sure to appear, in consequence of the existence in it of carbonic acid, or of carbonates, sulphates, or chlorides. Distilled water also, if too long prepared, in consequence of its absorption of carbonic acid from the air, will produce a similar appearance. The volumetric test establishes the presence of 37·90 grs. of acetate of lead in the amount operated upon, an amount tantamount to absolute purity.

PHYSICAL PROPERTIES.—Usually met with in irregular white masses of acicular crystals; having an acetous odour, and a sweetish astringent taste; the crystals are right rhomboid prisms with dihedral summits; density, 2·345.

CHEMICAL PROPERTIES.—Acetate of lead consists of 1 equivalent of protoxide of lead, 1 of acetic acid, and 3 of water, (PbO, $C_4H_3O_3+3HO$). It effloresces slowly by exposure to the air, losing part of its acetic acid and attracting carbonic acid, thereby becoming partially insoluble. By heat, the salt fuses in its water of crystallization, which is all driven off; and if the heat be increased, decomposition takes place. It is soluble in once and a half its weight of water at 60°, in less of boiling water, and in 8 parts of alcohol. The solution reddens litmus paper.

ADULTERATIONS.—This salt is usually met with in commerce sufficiently pure for medical use, the principal impurity being that for which provision has been made in the pharmacopœial test (carbonate of lead). Should it contain sulphate of lead, an occasional impurity, the impurity will be recognized by its insolubility in water, even on the addition of acetic acid.

THERAPEUTICAL EFFECTS.—Acetate of lead taken in large doses acts as an irritant, causing inflammation of the stomach and intestines, with intense pain and vomiting. In medicinal doses it operates as a sedative-astringent, and as such is employed with benefit in the treatment of disease, where the indication is to lower the circulation, and at the same time check excessive discharges. In all forms of passive hemorrhage, whether from the lungs, stomach, bowels, or uterus, it proves singularly serviceable; and when the bleeding is of an active character, it may be beneficially employed in conjunction with antiphlogistic treatment. In the autumnal cholera of this country, acetate of lead, combined with opium, is the remedy on which most reliance is to be placed; and this combination has also proved eminently successful in the treatment of the diarrhœal stage of Asiatic cholera, for which it was first proposed by the late Dr. Graves, rarely failing to check the premonitory diarrhœa when administered sufficiently early; in my experience, however, it is not to be relied upon when the disease is fully developed. In chronic diarrhœa and dysentery it also proves serviceable; but for diminishing expectoration, and checking the colliquative sweating and diarrhœa of phthisis, it is much inferior to dilute sulphuric or acetic acid. In the black vomit of yellow fever its value has been signalized by Dr. Wood. In diseases of the arterial system, such as aneurism, its sedative action has proved of use; it has also been employed with success by Dr. Brachet of Lyons, in the hypersalivation consequent on the use of mercury—a fact since confirmed by the observations of my friend Dr. Wharton, of this city, and by my own experience. Acetate of lead precipitates the active principle of the gastric juice, on which account its use should not be too long continued; and for the same reason it should not be employed as an astringent in dyspeptic disorders. As a topical remedy a solution of this salt is employed with benefit in most forms of superficial inflammation of a phlegmonous character, in ophthalmia, in gonorrhœa, gleet, and leucorrhea, and in cutaneous eruptions attended with surrounding inflammation. A collyrium of the acetate of lead should not be employed in any form of ophthalmia where the cornea is ulcerated, as it produces an indelible white stain which becomes imbedded in the substance of the cornea; an observation first made by Dr. Jacob. It has been successfully applied in the form of powder to the inner surface of the eyelids in granular ophthalmia.

DOSE AND MODE OF ADMINISTRATION.—Gr. ij. to gr. viij. in the form of pill, every second, third, or fourth hour.

Pilula Plumbi cum Opio. Pill of Lead and Opium. (Take of acetate of lead, in fine powder, thirty-six grains; opium, in fine powder, six grains; confection of roses, six grains. Beat them into a uniform mass.) This forms a most useful astringent combination. The formulary is copied from the *Edinburgh Pharmacopœia.* Each four grains contain 3 grs. of acetate of lead, half a grain of opium, and half a grain of the confection of roses; it is an imitation of Graves's pill. Dose, gr. iv. to gr. vi. every third hour. Occasionally, for various reasons, it may become desirable to order such a combination in the form of mixture. When such a case arises, it must be borne in memory that tincture of opium is incompatible with acetate of lead, precipitating with this latter salt a meconate of lead. For the *tincture* should be substituted the acetate of morphia, and the menstruum must be *distilled* water, to which should be added dilute acetic acid, to conserve the acetate from conversion into carbonate of lead. The following prescription may be looked upon as the fluid analogue of this formulary: ℞. Acetatis plumbi, gr. xxiv.; acetatis morphiæ, gr. ij.; acidi acetici diluti, f℥ss.; aquæ distillatæ ad f℥viij. M. Dose, for an adult, one ounce.

Unguentum (Ceratum) Plumbi Acetatis. (Take of acetate of lead in very fine powder, one ounce; ointment of white wax, one pound; melt the ointment with a gentle heat; then add the acetate of lead gradually, and stir the mixture constantly until it concretes.) A soothing and astringent application to irritable ulcers or excoriated parts, the addition to which of a small proportion of glycerine is frequently attended with marked advantage.

INCOMPATIBLES.—Hard water; the mineral acids and their salts;

citric, tartaric, and carbonic acids and their salts; the alkalies; lime-water; iodide of potassium; tincture of galls; opium; albuminous liquids, and such as contain tannic acid; vegetable infusions.

When an overdose of acetate of lead has been taken, sulphate or phosphate of soda, and sulphate of magnesia are the best antidotes; their administration should be succeeded by emetics, and afterwards by active purgatives and opium; for the effects produced by its continued administration, as for those of poisoning by lead generally, see *carbonate of lead.*

PLUMBI CARBONAS. *Carbonate of Lead.* (Syn.: *Cerussa, White Lead).* $2(PbO,CO_2)+HO,PbO(=387{\cdot}5)$.

PREPARATION.—An article of the Materia Medica. On the large scale it is generally prepared by exposing bars or plates of lead arranged transversely in various shapes, and at different altitudes in iron pots to the fumes of strong acetic or pyroligneous acid introduced into them for the purpose, and which is volatilized by the heat generated by placing them in a mixture of dung and tanners' refuse. The acetic acid attacks the lead, and converts it into an acetate, which, in its turn, is changed into carbonate of lead by the action of the carbonic acid generated by the fermenting process set up by the *heating* of the dung and tannin. The carbonate forms on the surface of the lead, and is detached by rolling the plates under water. On the Continent it is also frequently prepared by transmitting a current of carbonic acid gas through a solution of acetate of lead.

CHARACTERS.—A soft heavy white powder, blackened by sulphuretted hydrogen, insoluble in water, soluble with effervescence in diluted nitric acid, forming a solution which is precipitated yellow by iodide of potassium, and white by sulphuric acid.

The black precipitate is sulphide, the yellow, iodide, and the white sulphate of lead.

TESTS.—Dissolves in acetic acid without leaving any residue, and the solution when treated with excess of sulphuretted hydrogen, boiled, and filtered, gives no precipitate with oxalate of ammonia.

ADULTERATIONS.—Carbonate of lead is very much adulterated: the impurities generally found in it are chalk, sulphate of baryta, and sulphate of lead; the two latter may be detected by their insolubility in acetic, as in the Pharmacopœia, or in dilute nitric acid. The presence of chalk may be discovered by dissolving the suspected specimen in either of these acids, throwing down the lead from the solution by sulphuretted hydrogen, filtering, and adding solution of oxalate of ammonia, when, if any chalk had been present, a white precipitate (oxalate of lime) will be produced.

THERAPEUTICAL EFFECTS.—Carbonate of lead is more apt to produce lead-colic than any other of the preparations of this metal; it is consequently never used *internally.* Indeed, according to A. T. Thompson, this is the sole poisonous salt of lead. The modes by which it is ingested into the system are various, occupying rooms recently painted, drinking water conveyed through leaden pipes, handling pigments containing it, &c. It is worthy of remark that the purer the water conveyed through lead pipes, the more likely it is to become impregnated with this substance. The saline impurities ordinarily present in water, chlorides, sulphates, and carbonates, forming with the lead salts, which in virtue of their insolubility line the interior of the tube, and thus protect the water from the action of the lead. The symptoms of poisoning produced by lead, have been arranged by Tanquerel des Planches into what he terms *primitive saturnine intoxication*, the forerunner of more serious sequelæ presently to be mentioned, and the symptoms of which are blue coloration of the gums at their junction with the teeth, *saturnine* taste and breath, saturnine jaundice, emaciation, and constipation. Those prodromi are followed by lead colic, lead arthralgia, lead paralysis, and lead encephalopathy—either occurring as distinct diseases, or more or less intimately complicated. According to this author, in frequency they observe the order in which they have been here enumerated ; and their ratio, the result of his cases, is colic, 1,217; arthralgia, 755; paralysis, 127; and encephalopathy, 72 cases. Lead colic, which in frequency far exceeds all the others put together, is characterized by obstinate constipation, severe colicky pains *relieved* by pressure, a retracted appearance of the abdominal walls, the blue line round the gums, &c., and is best treated by purgatives, such as large doses of castor oil and turpentine, croton oil, sulphate of magnesia, or, on chemical principles, by the administration of such medicines as will convert the lead into insoluble compounds, such as sulphuric acid, sulphate of alum and potash, &c. The lead paralysis is a remarkable lesion, characterized by the loss of voluntary power over the muscles affected, and is most frequently met with in the upper extremity, the muscles generally affected being the extensors, giving rise to the peculiar wrist-drop so characteristic of the condition. The group of muscles constituting what is popularly known as the ball of the thumb is also wasted in a marked manner, and the entire limb presents a wasted appearance, hanging feebly by the patient's side. This condition is best treated at first by purgatives as above, and then by iodide of potassium, followed up with minute doses of strychnine, supporting the limb on splints, by topical counter-irritants, and perhaps above all by the steady employment of the electro-magnetic current. In all cases of lead impregnation, the use of the fluid sulphur bath is by no means to be overlooked, being a most valuable adjuvant. In all these cases the presence of the blue line round the gums is, in my experience, a never-failing symptom. This line is frequently called Burton's blue line, after the name of the gentleman who first described it, and is ascribed to the action on the lead of the sulphide of hydrogen, generated by the decomposition of morsels of food mechanically entangled between the gums and teeth, a view supported by the fact that where the teeth are deficient this line is also absent. *Topically* carbonate of lead acts as a sedative astringent, and is employed in the form of ointment to promote the cicatrization of excoriated parts and slight ulcerations. In the form of powder combined with starch, I have found it an excellent application in the treatment of chronic eczema, and other diseases of the skin attended with itching and excessive discharge. Spread on leather, it is said to prove useful applied over the seat of the pain in local neuralgia.

Unguentum Plumbi Carbonatis. (Take of carbonate of lead, in fine powder, sixty-four grains; simple ointment, one ounce; mix thoroughly.)

PLUMBI SUBACETATIS LIQUOR. *Solution of Subacetate of Lead.* (Syn.: *Plumbi Diacetatis Liquor, Plumbi Diacetatis Solutio. Extractum Saturni. Goulard's Extract.*) Subacetate of lead, $2PbO,C_4H_3O_3$(=274) dissolved in water.

PREPARATION.—Take of acetate of lead, five ounces; litharge, in powder, three ounces and half; distilled water, one pint, or a sufficiency. Boil the acetate of lead and the litharge in the water for half an hour, constantly stirring; then filter, and when the liquid is cold add to it more distilled water, until the product measures twenty fluid ounces. Keep the clear solution in stoppered bottles).

On the addition of the litharge or oxide of lead to the acetate of lead, we find each equivalent of the acetate associating with itself one equivalent of the oxide, and that it is thus converted into subacetate. $PbO,\bar{A} + PbO = 2PbO,\bar{A}$. This salt dissolved in water constitutes the present preparation.

CHARACTERS.—A dense, clear, colourless liquid, with alkaline reaction and sweet astringent taste, becoming turbid by exposure to the air; and forming with mucilage of gum arabic an opaque white jelly. Sulphuric acid in excess gives a white precipitate, acetic acid being set free.

TESTS.—Specific gravity 1·26. Two fluid drachms require for perfect precipitation twenty-seven measures of the volumetric solution of oxalic acid.

The turbidity alluded to on exposure to the air is caused by the absorption by the lead of carbonic acid, and its consequent conversion into carbonate of lead. This can be readily demonstrated by causing our breath to traverse this solution, when a similar result will ensue. The white precipitate produced on the addition of sulphuric acid is sulphate of lead. The volumetric test would establish the presence of 30·5 grains of oxide of lead in the quantity operated upon.

THERAPEUTICAL EFFECTS.—This solution is not used internally; externally, it is employed, diluted with from 20 to 40 parts of distilled water according to circumstances, in the same cases as a solution of acetate of lead; the chief advantage over which it possesses is, that it does not dry up so quickly. A very weak solution, from f℥ss. to f℥j. to f℥xvj. of distilled or elder-flower water I have found one of the best local applications in the inflammatory stages of eczema and of several other diseases of the skin.

Liquor Plumbi Subacetatis Dilutus. Dilute Solution of Subacetate of Lead. (Syn.: *Goulard's Vegeto-Mineral Water.*) (Take of solution of subacetate of lead, two fluid drachms; rectified spirit, two fluid drachms; distilled water nineteen fluid ounces and a half. Mix and filter through paper. Keep the clear solution in a stoppered bottle.) This preparation may be looked upon as identical in its effects with the former, differing from it only in being diluted to the proper strength for local use. In sprains a poultice of crumb of bread well saturated with this lotion is a grateful application.

Unguentum Plumbi Subacetatis. Ointment of Subacetate of Lead. (Take of solution of subacetate of lead, six fluid ounces; camphor, sixty grains; white wax, eight ounces; olive oil, one pint. Melt the wax with sixteen ounces of the oil on a steam or water bath, remove the vessel, and, as soon as the mixture begins to thicken, gradually add the solution of subacetate of lead, and stir the mixture constantly until it cools; then add the camphor dissolved in the rest of the oil, and mix thoroughly.) *Goulard's cerate*, a most useful soothing application in the inflammatory stages of many skin diseases. It is also employed generally as a dressing to alleviate pain and irritation. In pruritus pudendi its use is frequently of great service.

LITHARGYRUM. (Syn.: *Litharge. Plumbi Oxidum. Semi-vitreous Oxide of Lead.*) $PbO (=111{\cdot}5)$. By the application of a proper heat, with sufficient access of air, lead burns, becoming an oxide and forming what is termed *flowers of lead*. If a current of atmospheric air be made to play over lead in a state of fusion, oxide of lead will also be produced, in the form of *massicot*, which, when fused, and then allowed to solidify, forms a crystalline mass, known as litharge; it is also a product in the process of cupellation of such ores of lead as are rich in silver.

CHARACTERS.—In heavy scales of a pale brick-red colour, soluble in nitric and acetic acids; either solution, when neutral, giving a copious yellow precipitate with iodide of potassium.

TESTS.—It dissolves without effervescence in nitric acid diluted with six volumes of water, and the solution, when supersaturated with ammonia and then cleared by filtration, does not exhibit a blue colour.

These *characters* and tests require but little explanation. The *yellow* precipitate produced on the addition of iodide of potassium is iodide of lead; $PbO,NO_5+KI=PbI+KONO_5$. Were a *blue* colour produced under the conditions stated in the *tests*, it would indicate the presence of copper. It is but rarely used *per se*, never being employed internally, and but occasionally externally, as a desiccative or astringent powder, sprinkled over excoriated parts and superficial ulcerations. It is only retained in the Pharmacopœia on account of its pharmaceutical value. It enters into the composition of the following plasters:—

Emplastrum Lithargyri. Litharge Plaster. Syn.: *Emplastrum Plumbi*, Lond. *Diachylon Plaster.* (Take of litharge, in very fine powder, four pounds; olive oil, one gallon; water, three pints and a half. Boil all the ingredients together gently in a copper pan over a clear fire, and keep simmering for four or five hours, stirring constantly until the oil and litharge acquire a proper consistence for a plaster, adding more water during the process if necessary.) In this process the oleic and margaric acids of the oil unite with the oxide of lead to form oleates and margarates of lead, whilst the glycerine is dissolved out by the water employed. In virtue of its mild local action it is used for retaining the edges of fresh wounds in contact; for the purpose of giving support, as in the mode of treating ulcers by strapping, as suggested by Baynton, and as the basis of many other plasters.

Emplastrum Resinæ. Resin Plaster. (Take of resin, in powder, four ounces; litharge plaster, two pounds; hard soap, in powder, two ounces. To the litharge plaster, previously melted with a gentle heat, add the resin and soap, first liquefied, and heat them until they are thoroughly mixed.) The emplastrum adhærens or sticking plaster of the shops is made by spreading this plaster on sheets of calico; its uses are too well known to require comment.

Emplastrum Saponis. Soap Plaster. (Take of hard soap, in powder, six ounces; litharge plaster, two pounds and a quarter; resin, in powder, one ounce. To the litharge plaster, melted by a gentle heat, add the soap and the resin, first liquified; then constantly stirring, evaporate to a proper consistence.) Chiefly used to protect parts showing a tendency to the formation of bed sores, &c.

* PLUMBI NITRAS. *Nitrate of Lead.* $PbO, NO_5 (=165·5)$.

PREPARATION.—Take of litharge, in fine powder, ℥v.; pure nitric acid, f℥ij.; distilled water, Oiij.; dilute nitric acid, a sufficient quantity; to the litharge, placed in a porcelain dish, add the acid with a pint and a half of the water, and applying a sand heat, and occasionally stirring the mixture, evaporate the whole to dryness. Upon the residue boil the remainder of the water, clear the solution by filtration, and having acidulated it by the addition of a few drops of the dilute nitric acid, evaporate until a pellicle begins to form on the surface. The heat being now withdrawn, crystals will form on the cooling of the solution, which should be dried on blotting paper in a warm atmosphere, and preserved in a close bottle.

The reaction here is of the simplest character, the nitric acid uniting with the protoxide of lead to form nitrate of lead. $PbO + NO_5 = PbONO_5$.

CHARACTERS.—In crystals, assuming the regular octohedron shape, or some modification of it. Soluble in water and alcohol, taste sweetish; when thrown on live coal it decrepitates loudly. In its other chemical properties it corresponds with the other soluble salts of lead.

THERAPEUTICAL EFFECTS.—In its effects on the animal economy this salt corresponds closely with the acetate of lead, but is now-a-days rarely if ever employed. More than two centuries ago it was a popular remedy for asthma, and has been also employed to check hemoptysis, Pereira stating that he has been more successful with its use than with that of acetate of lead. It is, however, principally externally that it is now ever employed, constituting the important portion of "Liebert's" remedy for cracked nipples—a solution of ten grains of this salt to each ounce of water, coloured with alkanet. This has been found of great service in these cases; but, with careless nurses, exposing the infant to great risk, inasmuch as it should only be applied after nursing, and the breast should be well washed before again applying the child to it. It has also been employed for the purpose of correcting noisome odours, being the basis of *Ledoyen's* disinfecting fluid, a solution capable of correcting foul smells, but devoid of the power, strictly so understood, of disinfection. Its deodorizing properties depend on its power of decomposing sulphuretted hydrogen, the sulphur uniting with the lead to form sulphide of lead, its oxygen with the hydrogen to form water, and nitric acid being set free, thus, $SH+PbO,NO_5=PbS+HO+NO_5$.

DOSE AND MODE OF ADMINISTRATION.—For internal exhibition, in the form of pill or mixture, gr. ¼ to gr. j.; as a lotion, gr. v. to gr. x., dissolved in fl℥j. of distilled water; as a deodorizer, gr. xxx. to gr. lx., dissolved in fl℥i. of distilled water.

QUERCUS. *Oak Bark.* Quercus pedunculata, *Willd.* Plate 126, *Woodv. Med. Bot. (Q. Robur).* The dried bark of the small branches and young stems; collected in spring, from plants growing in Britain. Belonging to the Natural family *Cupuliferæ (Corylaceæ*, Lindley), and to the Linnæan class and order *Monœcia Polyandria.*

BOTANICAL CHARACTERS.—A large, long-lived tree; Leaves, bright green, deciduous; Flowers, *male*, yellowish; *female*, greenish tinged with brown; Fruit (acorns), 2 or 3 on a long peduncle, surrounded at the base by the cupule.

CHARACTERS.—Covered with a greyish shining epidermis, cinnamon-coloured on the inner surface, inodorous, fibrous, brittle, breaking with a short fracture, and strongly astringent.

CHEMICAL PROPERTIES.—It contains from 15 to 20 per cent. of tannin, with some gallic acid, uncrystallizable sugar, pectin, and salts. The bark is directed to be collected in spring, as at that period it contains a larger amount of tannin, and is also separated with greater facility from the wood. It yields its virtues to both water and alcohol. Its decoction reddens litmus, and is sensibly darkened on the addition of sesquichloride of iron.

THERAPEUTICAL EFFECTS.—Oak-bark is an excellent astringent; and may be employed in the treatment of chronic diarrhœa and dysentery, in alvine hemorrhages, and to check atonic mucous discharges. As a topical remedy, it is used with benefit in the form of decoction; as a gargle in relaxation of the uvula and tonsils; as an injection in fluor albus, and in prolapsus of the uterus or rectum;

and it has been recommended by Lizars as a local application in reducible hernia, *after the hernia has been reduced*, to render the sac more tense.

DOSE AND MODE OF ADMINISTRATION.—In powder, a bad form, ℨss. to ℨj.

Decoctum Quercus. Decoction of Oak Bark. (Take of oak bark, bruised, one ounce and a half; distilled water, one pint and a half. Boil for ten minutes in a covered vessel, and strain.) Dose, f℥j. to f℥iv., a convenient strength for a gargle, injection, or lotion.

INCOMPATIBLES.—All substances incompatible with tannin.

ROSA GALLICA. *Red-rose Petals.* Rosa gallica, *Linn.* Plate 141, *Woodv. Med. Bot.* The unexpanded petals, fresh and dried, from plants cultivated in Britain. *French Rose; Red-rose.*—A native of the middle and south of Europe, now cultivated extensively in our gardens. It belongs to the Natural family *Rosaceæ*, and to the Linnæan class and order *Icosandria Polygynia.*

BOTANICAL CHARACTERS.—An undershrub, very variable in size and character, owing to cultivation; the flowers are of a fine purplish-red colour, spreading.

CHARACTERS.—Colour fine purplish-red, retained after drying; taste bitterish, feebly acid, and astringent; odour roseate, developed by drying.

PHYSICAL PROPERTIES.—The dried petals have a velvetty appearance, an agreeable roseate odour which is developed during desiccation, and a somewhat aromatic, bitter, astringent taste. They should be gathered before the flowers expand, the white claw cut off, and then dried quickly with a stove heat.

CHEMICAL PROPERTIES.—Red rose petals contain volatile oil, tannin, gallic acid, colouring matter, albumen, fatty matter, and some salts. They yield their properties to boiling water, affording a reddish-yellow solution, which is changed to bright red by sulphuric acid, and to greenish brown on the addition of borate or phosphate of soda.

THERAPEUTICAL EFFECTS.—The petals of the red-rose are very mildly astringent, and are chiefly employed in medicine on account of their colour and odour, the officinal preparations forming agreeable vehicles for the administration of more active medicines.

Confectio Rosæ Gallicæ. Confection of Roses. (Take of fresh red-rose petals, one pound; refined sugar, three pounds. Beat the petals to a pulp in a stone mortar, add the sugar, and rub them well together.) A very weak astringent. Dose, ℨj. to ℨij. It is principally used as a basis for pills, for which purpose it is the best material that can be used, as it neither hardens nor becomes candied by keeping. It should not be employed for pills containing a sesquisalt of iron, in consequence of the tannin it contains.

Infusum Rosæ Acidum. Acid Infusion of Roses. (Take of red-rose petals, a quarter of an ounce; dilute sulphuric acid, one fluid drachm; boiling distilled water, ten fluid ounces. Add the acid to the water, infuse the petals in the mixture in a covered vessel for half an hour, and strain). An agreeable refrigerant and mild astringent. Dose, f℥ss. to f℥ij. It forms one of the best vehicles for the administration of the neutral purgative salts. This preparation is copied from the last edition of the Dublin Pharmacopœia, and is stronger than the infusions of the former British Colleges, from which it also differs in not containing sugar.

Syrupus Rosæ Gallicæ. Syrup of Red Roses. (Take of dried red-rose petals, two ounces; refined sugar, thirty ounces; boiling distilled water, one pint. Infuse the petals in the water for two hours, squeeze through calico, and filter. Dissolve the sugar in the liquor by means of heat. The product should weigh two pounds fourteen ounces, and should have the specific gravity 1·335.) Chiefly used for flavouring and imparting its fine red colour to mixtures, &c.

INCOMPATIBLES.—All substances incompatible with tannin.

SODÆ BIBORAS. *Biborate of Soda.* Syn.: *Borax,* $NaO, 2BO_3 + 10HO (=191)$.

PREPARATION.—An article of the Materia Medica; on the large scale it is prepared either by refining crude borax of commerce, *Tincal,* a natural crystalline formation met with on the shores of some lakes in Thibet and Persia; or by saturating native boracic acid, obtained from the lagoons of Tuscany, with carbonate of soda.

CHARACTERS.—In transparent colourless crystals, sometimes slightly effloresced, with a weak alkaline reaction; insoluble in rectified spirit, soluble in water. A hot saturated solution, when acidulated with any of the mineral acids, lets fall, as it cools, a scaly crystalline deposit, the solution of which in spirit burns with a green flame.

PHYSICAL PROPERTIES.—Usually met with in large, translucent, colourless crystals aggregated together; the crystals are either oblique rhombic prisms, or regular octohedrons; inodorous; with a somewhat styptic alkaline taste.

CHEMICAL PROPERTIES.—Crystallized borax consists of 1 equivalent of soda, 2 of boracic acid, and 10 of water ($NaO, 2BO_3 + 10HO$); but *octohedral borax* contains only 5 equivalents of water. Exposed to the air it effloresces slowly; heated it melts in its water of crystallization, which if the heat be increased is driven off, and a light anhydrous salt, *calcined borax,* left; at a still higher temperature it fuses again, and as it cools forms a transparent solid, *glass of borax.* Borax is soluble in 20 parts of cold and 6 of boiling water; the solution is alkaline, changing the vegetable blues to green. In solution this salt is readily recognized by adding sulphuric acid, which precipitates boracic acid in pearly crystalline scales.

TEST.—191 grains dissolved in 10 fluid ounces of distilled water require for saturation 100 measures of the volumetric solution of oxalic acid.

This test allows for no impurity, the proportions used being strictly in accordance with their chemical equivalents.

THERAPEUTICAL EFFECTS.—Borax is employed principally as a topical astringent; as such it is used with benefit in aphthous ulcerations of the mouth and throat, in excessive mercurial salivation, and in some forms of chronic skin disease. A solution of it in distilled vinegar, in the proportion of one drachm to two fluid ounces, has been used by Dr. Christison with good results in the treatment of ringworm. Dr. Brinton has also employed it with great success in an inveterate case of cracked tongue, in the form of 40 grains of borax, an ounce of glycerine, and four ounces of water. (See also *Diuretics.*)

DOSE AND MODE OF ADMINISTRATION.—For a lotion or gargle, gr. xx. to gr. xxx. may be dissolved in f℥j. of water; or ℥j. of the of the following preparation in f℥v. of water.

Mel Boracis. (Borax, in fine powder, gr. lx.; clarified honey, ℥j.; mix.) The best form for applying borax to apthous ulcerations.

INCOMPATIBLES.—The mineral acids, and most of their salts.

* TORMENTILLA. *Tormentil; Root of Potentilla tormentilla.* Indigenous; belonging to the Natural family *Rosaceæ,* and to the Linnæan class and order *Icosandria Polygynia.*

Tormentil-root contains about 18 per cent. of tannin, and consequently is an astringent of some power; it may be used in the same cases as the other vegetable astringents. At present, however, it is scarcely ever employed, except as a domestic remedy, and has consequently been omitted in the British Pharmacopœia. The dose of the powdered root is from ʒss. to ʒj., three or four times a day. The decoction is a better mode of administering it.

* *Decoctum Tormentillæ.* (Tormentil, bruised, ℥ij.; distilled water, Oiss. Boil down to Oj. and strain.) Dose, f℥j. to f℥ij., two or three times a day. In ulcerations of the rectum this preparation has been found of great use by my friend Dr. J. Leech. It is also an excellent astringent lotion or injection.

INCOMPATIBLES.—All substances incompatible with tannin.

UVA URSI. *Bearberry Leaves.* Arctostaphylos Uva Ursi, *Spreng. Syst.* Plate 70, *Woodv. Med. Bot. (Arbutus Uva Ursi).* The dried leaves from indigenous plants belonging to the Natural family *Ericaceæ,* and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A small trailing shrub; leaves obovate; entire, evergreen; flowers rose-coloured, in terminal racemes; berry globose, scarlet, 4-5 seeded.

CHARACTERS.—Obovate entire coriaceous shining leaves, about three-fourths of an inch in length, reticulated beneath, with a strong astringent taste, and a feeble hay-like odour when powdered; the infusion giving a bluish-black precipitate with perchloride of iron.

TESTS.—Leaves not dotted beneath nor toothed on the margin.

PHYSICAL PROPERTIES.—The dried leaves are dark-green, shining, convex above, concave and reticulated on the under surface; they have a very astringent somewhat bitter taste, and emit a faint odour in the process of pulverization.

CHEMICAL PROPERTIES.—They contain 36·4 per cent. of tannin, with some gallic acid, resin, extractive, salts, &c. They yield their astringency to water and to alcohol. A peculiar bitter principle has been recently obtained from the leaves by Kawalier, which has been termed *Arbutin;* it is crystallizable in long, thin, colourless prisms, is soluble in alcohol, ether, and water; fuses when heated, and solidifies into an amorphous mass.

ADULTERATIONS.—The leaves of the red whortle-berry *(Vaccinium vitis-idæa)*, and of the common box *(Buxus sempervirens)*, are often either mixed with, or substituted for uva-ursi; the former are readily distinguished by their under surface being dotted, not reticulate; and the latter, by their want of astringency.

THERAPEUTICAL EFFECTS.—The employment of uva-ursi as an astringent is now altogether restricted to *chronic* diseases of the urino-genital apparatus, attended with mucous discharge, (its use in acute attacks not being admissable) as in the advanced stages of catarrh of the bladder, in gleet, leucorrhœa, &c. To produce any beneficial effects, its use must be persevered in for a considerable time. Very discordant opinions have been expressed on its utility in these affections, by two such eminent authorities as Prout and Brodie; the former speaking favourably of its use, especially when combined with tincture of hyoscyamus, *and if persevered in for a sufficiently long time,* whilst the latter states that he has never met with the good results alluded to by others. I have found it act very beneficially, combined with dried carbonate of soda and Dover's powder, in chronic albuminous nephritis, when there is excessive secretion of urine.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. xx. to ʒj.

Infusum Uvæ Ursi. Infusion of Bearberry. (Take of bearberry leaves, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for two hours, and strain through calico).; substituted for the decoction of former Pharmacopœias. Dose, f℥j. to f℥iij.; both this preparation, however, and the powder are so offensive to many stomachs, that some practitioners prefer administering it in the form of extract, a formulary for which was contained in the last edition of the London Pharmacopœia, but which is no longer officinal; it may, however, be prepared thus:—

* *Extractum Uvæ ursi.* (Uva-ursi, bruised, ℔iiss.; boiling distilled water, cong. ij.; macerate for 24 hours; then boil down to a gallon, and strain the liquor while yet hot; lastly, evaporate to a proper consistence.) Dose, gr. v. to gr. xv. twice or three times a day.

ZINCI ACETAS. *Acetate of Zinc.* $ZnO, C_4H_3O_3+2HO$ (=109·5).

PREPARATION.—Take of carbonate of zinc, two ounces; acetic acid five fluid ounces, or a sufficiency; distilled water, six fluid ounces. Add the carbonate of zinc in successive portions to three ounces of the acetic acid previously mixed with the water in a flask; heat gently, add by degrees the remainder of the acid till the carbonate is dissolved; boil for a few minutes, filter while hot, and set it aside for two days to crystallize. Decant the mother liquor; evaporate to one half, and again set it aside for two days to crystallize. Place the united crystals in a funnel to drain, then spread them on filtering paper on a porous brick, and dry them by exposure to the air at ordinary temperatures.

On the addition of the acetic acid to the carbonate of zinc effervescence occurs, the acid uniting with the zinc to form acetate of zinc, the carbonic acid escaping, thus, $ZnO, CO_2+\bar{A}=ZnO, \bar{A}+CO_2$.

CHARACTERS.—Thin translucent and colourless crystalline plates, of a pearly lustre, with a sharp unpleasant taste, soluble in water; completely precipitated pure white by sulphuretted hydrogen; evolving acetic acid when decomposed by sulphuric acid.

TESTS.—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. After it has been boiled for a few minutes with a little nitric acid, it yields with ammonia a white precipitate entirely soluble without colour in an excess of the reagent.

Did it precipitate on the addition of chloride of barium, it would indicate the presence of sulphate, if with nitrate of silver, of chloride of zinc. Did its *acid* solution precipitate on the addition of sulphuretted hydrogen, the existence of some foreign metal *(lead)* should be inferred, as under such circumstances it does not precipitate. If the precipitate resulting on the addition of ammonia does not redissolve in an excess of the reagent, the presence of *iron* is to be inferred, which though precipitated by ammonia is not redissolved by it; and if the resulting solution is coloured (blue), *copper* is indicated.

PHYSICAL PROPERTIES.—This salt occurs in small white, rhomboidal plates, with a pearly lustre; inodorous, having a bitter styptic taste.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of oxide of zinc, 1 of acetic acid, and 3 of water ($ZnO, C_4H_3O_3+3HO$). Exposed to the air it effloresces slowly. It is very soluble in water and in alcohol.

THERAPEUTICAL EFFECTS.—I regard acetate of zinc as one of our best local astringents; it is especially useful in the treatment of skin diseases attended with much discharge, whether serous or purulent, such as eczema, lupus, and impetigo, as soon as the acute inflammatory action which attends their first stages has been subdued. I have also found it a most excellent remedy applied in the crystalline state (as the nitrate of silver is used) once or twice daily to lupoid ulceration, more especially when it is of the serpiginous character and is located on the scalp. Dissolved in spirit or in water, this salt is used as a topical astringent in ophthalmia, and in chronic mucous discharges. In the very commencement of the disease, or if not used then, as soon as the inflammatory symptoms have subsided, it forms an excellent injection in gonorrhœa. It was the active ingredient in Sir Astley Cooper's favourite injection in the third week of gonorrhœa—six grains of sulphate of zinc and four fluid ounces of liquor plumbi subacetatis dilutus—as the result of which we have sulphate of lead, precipitated, and acetate of zinc held in solution. It has been but little employed internally, but may be used in the same cases as the sulphate.

DOSE AND MODE OF ADMINISTRATION.—Internally, gr. j. to gr. iij. made into pill with conserve of roses, or dissolved in some aqueous vehicle. For a lotion or injection, gr. ij. to gr. x. may be dissolved in f℥j. of distilled water, and for an ointment from four to ten grains reduced to fine powder may be rubbed up with an ounce of wax cerate, of cold cream, or of any other mild unguent.

ZINCI CARBONAS. *Carbonate of Zinc.* $(ZnO, CO_2 + HO) + 2(ZnO, HO)$ (=170·5)

PREPARATION.—Take of sulphate of zinc, ten ounces; carbonate of soda, ten ounces and a half; boiling distilled water, a sufficiency. Dissolve the carbonate of soda with a pint of the water in a capacious porcelain vessel, and pour it into the sulphate of zinc also dissolved in a pint of the water, stirring diligently. Boil for fifteen minutes after effervescence has ceased; and let the precipitate subside. Decant the supernatant liquor, pour on the precipitate three pints of boiling distilled water, agitating briskly; let the precipitate again subside, and repeat the process of affusion of hot distilled water and subsidence, till the washings are no longer precipitated by chloride of barium. Collect the precipitate on calico, let it drain, and dry it with a gentle heat.

In this process double decomposition ensues—the sulphuric acid going to the soda to form sulphate of soda, whilst the carbonic acid goes to the zinc to form carbonate of zinc, which is precipitated. The effervescence alluded to is due to the escape of carbonic acid, the resulting compound being the *basic* carbonate of zinc. This equation will explain the reaction, $3(ZnO,SO_3\ 7HO) + 3(NaO,CO_2 10HO) = (ZnOCO_2HO + 2ZnOHO) + 3(NaOSO_3\ 10HO) + 2CO_2 + 18HO$.

CHARACTERS.—White, tasteless, inodorous, insoluble in water; soluble, with effervescence and without residue, in diluted sulphuric acid, forming a solution which gives a white precipitate with hydrosulphuret of ammonia.

TESTS.—Its solution in dilute nitric acid is not precipitated by chloride of barium or nitrate of silver, and gives with carbonate of ammonia a white precipitate entirely soluble without colour in an excess of the reagent.

These characters and tests have been already explained under the head of *Zinci Acetas.*

PROPERTIES.—This preparation has been introduced as a substitute for *native* calamine, a remedy for many years of established reputation, and which is an abundant ore in many parts of England, as well as on the continent of Europe; but which is so frequently adulterated as to render an officinal preparation of a definite composition a *desideratum*. Calamine is commonly met with in the form of a heavy flesh-coloured powder; when pure, almost entirely soluble with effervescence in sulphuric acid; it is generally, however, as already stated, a very impure salt of zinc, most, if not all, of the carbonic acid having been driven off by the roasting. What is sold in the shops for calamine very frequently does not contain a particle of zinc, being sulphate of baryta coloured with Armenian bole.

THERAPEUTICAL EFFECTS.—Calamine is used, in powder or in the form of ointment, as a mild desiccative and astringent for the treatment of intertrigo, excoriations, and superficial ulcerations. The formula of the Pharmacopœia affords a very pure basic carbonate of zinc, an excellent astringent application in the form of ointment in many affections, especially in the chronic stages of diseases of the skin attended with much discharge. The following is an old established and favourite preparation of calamine :—

* *Unguentum Calaminæ.* ("Prepared calamine and wax, of of each ℥viiss.; olive oil, Oj.; mix the oil with the melted wax; then remove them from the fire, and when first they begin to thicken add the calamine, and stir constantly till they cool.") This preparation, under the name of *Turner's cerate*, although omitted from our national pharmacopœia, is in very general use as a desiccative and healing ointment, especially in cases of superficial burns and excoriations.

ZINCI OXIDUM. OXIDE OF ZINC. (Syn. *Flowers of Zinc, Tutty, Nihil Album, Lana Philosophica, Philosopher's Wool, &c.*) ZnO. (=40·5)

PREPARATION.—Take of carbonate of zinc, six ounces. Place the carbonate of zinc in a loosely covered Hessian crucible, and expose it to a dull red heat until a portion taken from the centre of the contents of the crucible and cooled no longer effervesces when dropped into dilute sulphuric acid. Let the crucible cool, and transfer the product to stoppered bottles.

This process simply resolves itself into expelling the carbonic acid and water from the basic carbonate of zinc, and leaving behind the oxide of zinc.

CHARACTERS.—A soft, white, tasteless and inodorous powder, becoming pale-yellow when heated; and forming with diluted sulphuric acid a solution which gives a white precipitate with hydrosulphuret of ammonia.

TESTS.—Dissolves without effervescence in dilute nitric acid, forming a solution which is not affected by chloride of barium or nitrate of silver, and gives with carbonate of ammonia a white precipitate which dissolves entirely without colour in an excess of the re-agent.

Both characters and tests will be understood on reference to *Zinci Acetas.*

ADULTERATIONS.—As met with in the shops, this preparation frequently contains carbonate or sulphate of zinc, sometimes also lime, copper, and iron. The tests of the Pharmacopœia will detect these impurities.

THERAPEUTICAL EFFECTS.—As an *astringent*, oxide of zinc is only employed externally in the form of powder or ointment to slight excoriations, chapped nipples, intertrigo, superficial ulcerations, cutaneous diseases, and in ophthalmia tarsi. (See also *Tonics*.)

DOSE AND MODE OF ADMINISTRATION.—*Unguentum Zinci oxydi*. (Take of oxide of zinc in very fine powder, eighty grains; simple ointment, one ounce. Add the oxide of zinc to the ointment previously melted with a gentle heat, and stir the mixture constantly until it becomes solid.) This ointment is too strong for general purposes; another objection to its use is its being apt to *cake* on the surface to which it is applied. This may be to a great extent remedied by the addition of glycerine, and some drops of an essential oil when not otherwise objectionable.

ZINCI SULPHAS. SULPHATE OF ZINC. (Syn. *White Vitriol.*) $ZnO,SO_3+7HO(=143{\cdot}5)$.

PREPARATION.—Take of granulated zinc, sixteen ounces; sulphuric acid, twelve fluid ounces; distilled water, four pints; solution of chlorine, a sufficiency; carbonate of zinc, half an ounce or a sufficiency. Pour the sulphuric acid previously mixed with the water on the zinc contained in a porcelain basin, and, when effervescence has nearly ceased, aid the action by a gentle heat. Filter the fluid into a gallon bottle, and add gradually with constant agitation the solution of chlorine, until the fluid acquires a permanent odour of chlorine. Add now with continued agitation the carbonate of zinc until a brown precipitate appears; let it settle, filter the solution, evaporate till a pellicle forms on the surface, and set aside to crystallize. Dry the crystals by exposure to the air on filtering paper placed on porous bricks. More crystals may be obtained by again evaporating the mother liquor.

In this process the primary object is, through the agency of the sulphuric acid and water, to form a sulphate of zinc. The water is resolved into its elements—hydrogen gas, which escapes, giving rise to the effervescence alluded to, and oxygen, which uniting with the zinc forms oxide of zinc, with which the sulphuric acid unites to form sulphate of zinc; thus $Zn+SO_3HO=ZnO,SO_3+H$; but an invariable impurity in the zinc of commerce is iron, which undergoing a similar re-action would be converted into sulphate of iron, and thus contaminate the product: the addition of the chlorine is intended to obviate this. By its action the iron is converted into sesquichloride (Fe_2,Cl_3), which, on the addition of the carbonate of zinc, is converted into sesquioxide of iron (the *brown* precipitate) removed by the filtration directed, and chloride of zinc, thus, $Fe_2Cl_3+(ZnOCO_2HO+2ZnOHO)=Fe_2O_3+3ZnCl+CO_2+3HO$. On continuing the process the chloride is held in solution whilst the sulphate crystallizes out.

CHARACTERS.—In colourless transparent prismatic crystals, with a strong metallic styptic taste. Its solution in water gives white precipitates with chloride of barium and hydrosulphuret of ammonia.

TESTS.—Its watery solution is not tinged purple by tincture of galls; and when acidulated with sulphuric or hydrochloric acid gives no precipitate with sulphuretted hydrogen. After it has been boiled for a few minutes with a little nitric acid, it yields with ammonia a white precipitate which is entirely soluble without colour in an excess of the reagent.

Its not being changed on the addition of the tincture of galls establishes the absence of iron, the most constant impurity. The other tests will be understood by reference to *Zinci Acetas.*

THERAPEUTICAL EFFECTS.—In large doses, unless discharged by vomiting, sulphate of zinc is an irritant poison. In small doses it acts as an astringent, and is beneficially employed as such in chronic diarrhœa and dysentery, in excessive secretion from the bronchial tubes unaccompanied by inflammation, in fluor albus, and in gleet. As a topical remedy, it is very much employed in solution as a collyrium in chronic ophthalmia; as a lotion in old ulcers attended with profuse discharge; and as an injection in the advanced stages of gonorrhœa, in gleet, and in leucorrhœa. (See also *Caustics, Emetics,* and *Tonics*).

DOSE AND MODE OF ADMINISTRATION.—Gr. j. to gr. v. made into pill with conserve of roses, or with some astringent extract. For external use, gr. j. to ʒss. according to circumstances may be dissolved in f℥j. of water. This latter strength is employed in the treatment of gonorrhœa only when we have the *abortive plan* in view; and when we make up our minds to employ with such an object solutions of this strength, we must not be surprised at the pain, hemorrhage, ardor urinæ, &c., which but too frequently ensue; although I am free to confess that we often succeed by such heroic plans of treatment in cutting short the disease. To be successful, however, we must have recourse to them in its earliest stage, before inflammatory symptoms set in.

INCOMPATIBLES.—Alkalies and their carbonates; lime water; acetate of lead; nitrate of silver; astringent vegetable infusions or decoctions; and milk.

In poisoning with this salt, warm demulcent drinks, as infusion of linseed, decoction of barley, &c. should be administered to promote its evacuation by vomiting. If inflammatory symptoms occur subsequently, they are to be combated by the usual antiphlogistic remedies.

CHAPTER V.

CATHARTICS.

(Purgatives—Evacuants.)

THE medicines included in this class may be defined to be agents which quicken or increase alvine evacuations. Cathartics vary much in the manner in which they produce their effects. Some act merely by exciting the muscular fibres of the intestines to increased peristaltic motion, and thus cause their contents to be more quickly and more completely evacuated. Some stimulate the mucous follicles and exhalents, so that a larger quantity of fluids than usual is excreted from the inner coat of the intestinal canal, and thus the fecal evacuations are rendered more liquid and more copious. In many, both these properties are united. And some extend their stimulus to the neighbouring viscera also, and hence produce an increased discharge of the supplementary intestinal secretions, as the bile and pancreatic juice. Cathartics differ also as to the part of the intestinal canal on which they act: the effects of some being confined to the small, and of others to the large intestines; while many of them appear to stimulate the entire tube. They differ, moreover, as to the degree in which they produce their effects, and hence have been generally divided into three classes:—*Laxatives*, which operate so mildly as merely to produce the evacuation of the intestinal contents, without causing increased secretion, or stimulating any of the neighbouring viscera: *Purgatives*, properly so called, which, besides remarkably increasing the peristaltic action of the intestines, occasion increased excretion of the fluids from the exhalent vessels, and from the neighbouring viscera, and also extend their stimulant effects to the system in general: And *Drastic* or *Hydragogue* cathartics, which operate in the same manner as purgatives, but with much greater energy, producing copious watery stools, and which, if given in an overdose, produce inflammation of the intestines, characterized by constant vomiting and purging, and intense pain. Although, for the sake of simplicity in classification, I have arranged the remedies belonging to these three divisions under the one head, *Cathartics;* in prescribing them due attention must be paid to the special characteristics of their mode of operation, so as to fulfil the indications for which they may be administered. These distinctions will be more conveniently considered when treating of the therapeutical effects of the individual remedies of this class. Cathartics may be also divided into two classes, depending on the manner in which their effects are produced, that is to say, whether their operation is caused by a direct or local action on the mucous membrane of the digestive canal in the same manner as irritating or indigestible articles of food occasion diarrhœa; or indirectly by their being first taken into the circulation as is known to occur with regard to rhubarb and other cathartic medicines, which purge if injected into the veins. But this division, however scientific, it is apparent, can be of but little therapeutical value. Cathartic medicines are derived from both the organic and inorganic divisions of the materia medica. The vegetable kingdom yields a very large proportion of them, the cathartic property in such being usually dependant on a resin, an oil, or some acrid principle which produces its effects either directly as a local irritant, or by being first taken into the circulation; their action too varies, that of some being very mildly laxative, of others, decidedly purgative, while several constitute the most powerful hydragogues. The cathartics derived from the inorganic kingdom are with a single exception—sulphur—obtained from the metals; these are usually described in two classes, *mercurials* and *salines*. The former are characterised by the property which they possess of augmenting nearly all the secretions, but especially that of the liver; and the latter by their operation depending on an increased discharge of serum, the evacuations which they produce being consequently termed watery. The prescriber should remember that the effect of cathartics may be much augmented, or their operation modified, by their judicious combination, or by the addition of medicines possessing other properties, as, for example, anodynes such as opium, belladonna, or hyoscyamus; stimulants; or tonics. Indeed I have been convinced by experience, that tonics are not ordered in combination with cathartics as frequently as they ought to be; they not only augment the effect of the cathartic, thus rendering a smaller dose of the latter effectual, but they give tone to the digestive canal, thereby removing a condition of the system on which habitual constipation is so frequently dependent. In some cases, also, where the muscularity of the intestines appears to be deficient in tone, a combination of purgatives with minute doses of strychnine has been attended with the happiest results. Nature has prepared several valuable and most important *combinations* of saline cathartics in the form of mineral waters, which operate effectually and in much smaller doses than when the same salts are taken alone. This is a valuable hint too often overlooked by the prescriber, who will find that a judicious combination of several cathartic medicines acts with more certainty and in much smaller doses than any single drug of this class. Attention also must be paid to the period of the day selected for the administration of purgatives; for instance, when their active principle partakes of a resinous character, when also they are slow in producing their effects, night-time is the proper period to select for their exhibition; but salines are found to act more satisfactorily on an empty stomach, and should consequently be given in the morning. In the treatment of constipation, practitioners should impress on their patients the importance of *regularity* in their efforts to unload the bowels. Inattention to this point is one of the most fertile sources of this disease, and although relief is experienced from the use of purgatives, still such is but temporary, and the constant use at last degenerates into an abuse, and is so eventually treated by the constitution.

ALOE BARBADENSIS. *Barbadoes Aloes.* Aloe vulgaris, *Lam. Encycl.* Plate 109, *Steph. and Church. Med. Bot.* The juice of the leaf, inspissated; imported from Barbadoes.

CHARACTERS.—In yellowish-brown or dark-brown opaque masses; breaks with a dull conchoidal fracture; has a bitter, nauseous taste, and a strong, disagreeable odour; dissolves almost entirely in proof spirit, and during solution exhibits under the microscope numerous crystals. Usually imported in gourds.

Aloe Socotrina. Socotrine Aloes. One or more undetermined species of Aloe, *Linn.* The juice of the leaf inspissated; usually procured from Socotra.

CHARACTERS.—In reddish-brown masses, opaque, or translucent at the edges; breaks with an irregular or smooth and resinous fracture; has a bitter taste, and a strong but fragrant odour; dissolves entirely in proof spirit, and during solution exhibits under the microscope numerous minute crystals.

The different commercial varieties of aloes are obtained from various species of the genus Aloë; they are inhabitants of the East and West Indies, Socotra, Barbary, and the Cape of Good Hope; and belong to the Natural family *Liliaceæ*, and to the Linnæan class and order *Hexandria Monogynia*.

BOTANICAL CHARACTERS.—The species of the genus Aloë, from which the drug is obtained, are generally characterized by having woody stems, with large, fleshy, amplexicaul leaves, glaucous, flat above and convex below, having marginal spines or serratures; Flowers, numerous, in spikes or racemes, tubular, coloured; stamens exserted.

PREPARATION.—It is obtained by cutting the leaves transversely near their base, and evaporating, either in the sun or with the aid of heat the juice, which, lodged in the intercellular passages between the vessels situated immediately under the epidermis, flows spontaneously from them; sometimes the flow of juice from the leaves is aided by plunging them in hot water; and sometimes by pressure, when an inferior sort of aloes in obtained; a still worse description is procured by evaporating a decoction of the leaves.

PHYSICAL PROPERTIES.—Obtained in these different ways, and from various parts of the world, aloes differs very much in its physical properties; consequently several varieties of the drug are met with in commerce. In addition to the two kinds admitted by the pharmacopœial authorities, I shall describe two others, *East Indian and Cape aloes.* 1. Socotrine aloes *(Aloë Socotrina)* is named from its being procured in the island of Socotra, whence it is imported into England either by way of Smyrna or Bombay; it is in masses of a golden-brown colour, having a smooth, glassy fracture, and a translucent garnet-red hue at the edges; the odour is fragrant and aromatic, much heightened by being breathed on, and the taste is bitter; it yields a powder of a beautiful golden-yellow colour which is almost entirely soluble in proof spirit. The following were the characters assigned to Socotrine aloes in the last edition of the London Pharmacopœia:—"Fragile, bitter, of a reddish-brown colour, with an aromatic odour; thin laminæ are translucent when freshly broken." The Edinburgh College stated that it is:—"In thin pieces, translucent and garnet-red, almost entirely soluble in spirit of the strength of sherry. Very rare." Socotrine aloes is most probably procured from the *Aloë Socotrina;* it is imported in skins or in chests.—2. East Indian aloes *(Aloë Indica)* is usually confounded, at least in Ireland, with the foregoing variety. It occurs in large opaque masses, of a dark liver-brown colour, with a dull, waxy fracture; the odour is somewhat similar to, but not so agreeable as, that of Socotrine aloes, and the taste equally bitter; it yields a dull reddish-yellow powder, a great part of which is insoluble in proof-spirit. It is brought to England in skins and chests from Bombay, but it is stated to be originally obtained from the coasts of the Red Sea. It is perhaps obtained from a species of aloe if not identical with, nearly allied to, the *Aloë Socotrina.* It is probable that this is the variety of aloes officinal in the last edition of the London Pharmacopœia under the name of hepatic aloes; the characteristics given for it therein were as follows: "Opaque, of a liver colour, with a bitter taste and disagreeable odour."—3. Barbadoes aloes *(Aloë Barbadensis,* L.E.) is a product of Barbadoes, Jamaica, and other West India Islands, whence it is imported in gourd shells, occasionally in boxes. It is of a dark liver-brown, sometimes almost black colour; the fracture is dull and opaque, the odour strong and disagreeable, resembling that of the human axilla, and the taste very bitter. It is reduced to powder with difficulty, the powder being of a dull dark-yellow colour. It was described in the last edition of the London Pharmacopœia as being "dull and opaque, of a liver colour, with a bitter, nauseous taste, and a very disagreeable odour." This variety is obtained from the *Aloë vulgaris*, and probably from some allied species.—4. Cape aloes *(Aloë Capensis)* is imported in skins and in chests from the Cape of Good Hope, and is very common in English commerce, although never introduced into any of our pharmacopœias. It is of a glossy, resinous appearance (hence its German name, "shining aloes"), a dark-brown colour, with a greenish yellow shade, especially when in small fragments; a strong, disagreeable odour, much increased by breathing on it, and an acrid, bitter taste; it is very brittle, and readily reduced to powder, which is of a shining greenish-yellow colour. It is procured from the Aloë spicata and several other allied species.

CHEMICAL PROPERTIES.—The most important constituent of aloes is a bitter extractive matter *(Aloesin*, Pfaff; *Aloïne*, Meisner), amounting in the finer sorts to nearly 80, in the inferior to about 50 per cent.; it has been supposed generally to be the active principle of the drug, but Robiquet states that pure aloïne prepared by him had not the least purgative action, a statement which more recent experience has entirely failed to substantiate. Aloïne was obtained in large quantity from Barbadoes aloes in 1851 by the Messrs. Smith of Edinburgh, and its employment in medicine has been proposed by these chemists. It may be readily procured from Barbadoes aloes by the following process:—The aloes previously dried is pounded with a quantity of sand, to prevent its agglutinating; the mass is then macerated repeatedly with cold water, and the liquor thus obtained concentrated *in vacuo* to the consistence of a syrup. This is left at rest in a cool place for 2 or 3 days, when it deposits a mass of small granular crystals of a brownish-yellow colour. To purify these crystals—which constitute the aloïne in an impure state—they must be first dried by pressure between folds of blotting-paper, and then repeatedly crystallized out of hot water until they have only a pale sulphur-yellow colour. Care must be taken that the heat of the aqueous solution should not exceed 150° F. as at 212° the aloïne is rapidly oxidized and decomposed. Aloïne is neutral, has a taste at first sweetish, then intensely bitter, and is scarcely soluble in water or alcohol at ordinary temperatures, but is very soluble in ether when slightly warmed. According to Dr. Stenhouse its composition is $C_{34}H_{18}O_{14}$. The finer sorts of aloes contain also resin, and two peculiar acids, *Aloetic* and *Aloeretinic acids;* in addition to these substances, the inferior sorts contain some vegetable albumen. Aloes is almost completely soluble in boiling water, but as the water cools a dark brown substance, insoluble in cold water, is deposited; it is very sparingly soluble in rectified spirit, but dissolves almost entirely in proof spirit, and still more readily in weaker spirit; heated, it fuses imperfectly, and if the heat be continued is converted into a resinous-looking, very friable mass.

ADULTERATIONS.—The only adulteration of aloes is, the mixing the inferior sorts with, or substituting them for, the finer kinds; of this we can judge by the physical characters, particularly the odour when breathed on, or by the solubility in weak spirit.

THERAPEUTICAL EFFECTS.—In moderate doses, from three to ten grains, aloes acts as a stimulating tonic cathartic, influencing especially the large intestines, on which it operates rather by exciting their peristaltic action than by causing increased secretion from their mucous membrane. It produces its effects more slowly than most other medicines of this class, from ten to eighteen hours usually elapsing before it operates, a fact generally attributed to its slow solubility in the gastric juices. The specific action of aloes on the large intestines contraindicates its employment in hemorrhoidal affections, in irritation or inflammation of the pelvic viscera, the prostate gland, or the urethra, in pregnancy or during the menstrual discharge. From its mode of operation it is also evidently not adapted for cases in which we wish to produce increased secretion from the intestinal canal, or where a speedy operation is required. The employment of aloes as a purgative is, nevertheless, very general, and perhaps there are few vegetable cathartics more extensively used, as may be judged from the numerous officinal formulæ for its administration which are contained in the British Pharmacopœia, as well as from the fact of its almost invariably entering into the composition of every empirical pill mass. In ancient pharmacy it was looked upon as a sovereign remedy, its preparations being complimented with most flattering terms, such as *tinctura sacra*, *hiera picra* (the sacred bitter), *beaume de vie*, &c. In torpor of the intestines, especially when accompanied by deficient secretion of bile, it is the most useful of this class of remedies; indeed it appears to be one of our best substitutes for that secretion, and is therefore exhibited with the most beneficial results in jaundice when unaccompanied by hepatic inflammation, mechanical obstruction of the ducts, &c. In habitual costiveness so common in females, aloes is also administered with much benefit, due attention being paid to the circumstances which contraindicate its employment. Christison states that the cathartic property of aloes is much increased by its combination with sulphate of iron, and that its irritating action on the rectum is counteracted by combining it with the extract of hyoscyamus; both of which statements my experience fully confirms.

DOSE AND MODE OF ADMINISITRATION.—*Aloë Hepatica, Aloë Socotrina, Aloë Indica*, gr. iij. to gr. xv.—*Aloë Barbadensis*, gr. ij. to gr. x. It is best administered in the form of pill, made with honey, mucilage, &c. The dose of *Aloïne* is from gr. ss. to gr. ij., in the form of pill According to the Messrs. Smith, in one instance in which four grains were given a very violent action on the bowels was caused. My experience of *Aloïne* is most favourable, and I look forward to seeing it yet far more extensively used than it is at present, and regret its non-introduction into the British

Pharmacopœia. I entertain no doubt of its yet vindicating its right to this position.

The preparations into which Barbadoes aloes enters are these—*enema, extractum, pilula, pilula cambogiæ composita, pilula colocynthidis composita, pilula colocynthidis et hyoscyami.*

The preparations into which Socotrine aloes enters are these:—*decoctum compositum, enema, extractum, extractum colocynthidis compositum, pilula, pilula aloes et assafœtidæ,* (described p. 51), *pilula aloes et myrrhæ, pilula rhei composita, tinctura, tinctura benzoini composita, vinum.*

Decoctum Aloes Compositum. Compound decoction of aloes. (Take of extract of socotrine aloes, ninety grains; myrrh, bruised, sixty grains; saffron, chopped fine, sixty grains; carbonate of potash, forty grains; extract of liquorice, half an ounce; compound tincture of cardamoms, four fluid ounces; distilled water, a sufficiency. Triturate the aloes, myrrh, and carbonate of potash together; add the saffron and extract of liquorice, and boil in fourteen ounces of the water for ten minutes in a covered vessel. Cool, strain through flannel, and add the tincture of cardamoms, with as much water as may be necessary to make up the quantity to sixteen fluid ounces.) This preparation, originally introduced by Leliévre, under the name of *Beaume de Vie* (balm of life), is a valuable mild cathartic possessed of antacid and tonic properties. In amenorrhœa, depending on anemia, it is frequently prescribed in combination with the compound or aromatic iron mixture, in equal proportions. Dose, f℥ss. to f℥ij.

Enema Aloes. Enema of Aloes. (Take of aloes, forty grains; carbonate of potash, fifteen grains; mucilage of starch, ten fluid ounces. Mix, and rub together.) A useful stimulating cathartic in the constipation of amenorrhœa; also employed for dislodging ascarides from the rectum.

Extractum Aloes Barbadensis. Extract of Barbadoes Aloes. (Take of Barbadoes aloes, in small fragments, one pound; boiling distilled water, one gallon. Add the aloes to the water, and stir well until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water bath or a current of warm air to a proper consistence.) Dose, from gr. ij. to gr. xv.

Extractum Aloes Socotrinæ. Extract of Socotrine Aloes. (Take of socotrine aloes, in small fragments, one pound; boiling distilled water, one gallon. Add the aloes to the water, and stir well until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water bath or a current of warm air to a proper consistence.) Dose, from gr. ij. to gr. xv.

Pilula Aloes Barbadensis. Pill of Barbadoes Aloes. (Take of Barbadoes aloes, in powder, two ounces; hard soap, in powder, one ounce; oil of caraway, one fluid drachm; confection of roses, one ounce. Beat all together, until thoroughly mixed.) Dose, gr. iij. to gr. x.

Pilula Aloes et Myrrhæ. Pill of Aloes and Myrrh. (Take of socotrine aloes, two ounces; myrrh, one ounce; saffron, dried, half an ounce; confection of roses, two ounces and a half. Triturate the aloes, myrrh, and saffron together, and sift; then add the confection of roses, and beat together into a uniform mass.) Syn.: *Rufus' Pill*—an excellent stimulating cathartic pill mass, possessing feeble emmenagogue properties. Dose, gr. v. to gr. xv.

Pilula Aloes Socotrinæ. Pill of Socotrine Aloes. (Take of socotrine aloes, in powder, two ounces; hard soap, in powder, one ounce; volatile oil of nutmeg, one fluid drachm; confection of roses, one ounce. Beat all together, until thoroughly mixed.) Dose, gr. v. to gr. xx.

Tinctura Aloes. Tincture of Aloes. (Take of socotrine aloes, in coarse powder, half an ounce; extract of liquorice, one ounce and a half; proof spirit, one pint. Macerate for seven days, filter the liquor, and add sufficient proof spirit to make one pint.) Not so agreeable a preparation as the wine. Dose, min. xxx. to f℥ss.

Vinum Aloes. Wine of Aloes. (Take of socotrine aloes, one ounce and a half; cardamoms, ground, eighty grains; ginger, in coarse powder, eighty grains; sherry, two pints. Digest for seven days, and strain through calico.) An excellent stomachic cathartic. Dose, f℥j. to f℥ss. In the dyspepsia of fashionable life, I find the following a valuable combination—equal parts of the wine of aloes, iron, and rhubarb; a teaspoon full of the mixture in a wine glass full of sherry one hour before dinner.

* *Pilulæ Aloes et Ferri.* (Sulphate of iron, 3 parts; Barbadoes aloes, 2 parts; aromatic powder, 6 parts; conserve of red roses, 8 parts; pulverise the aloes and sulphate of iron separately, and beat into a proper mass, which is to be divided into five grain pills.) Tonic and cathartic, well adapted for chlorosis. Dose, one to three daily.

* *Pilulæ ante cibum,* Paris Codex. (Aloes, 6 parts; extract of cinchona, 3 parts; canella, 1 part; syrup of wormwood, a sufficiency; divide into four grain pills.) One or two before dinner.

CALOMELAS. *Calomel.* Subchloride of Mercury, $Hg_2Cl=235{\cdot}5$ (Syn.: *Submuriate of Mercury, Hydrargyri Chloridum Mite.*)

PREPARATION.—Take of sulphate of mercury, ten ounces; mercury, by weight, seven ounces; chloride of sodium, dried, five ounces; boiling distilled water, a sufficiency. Moisten the sulphate of mercury with the water, and rub it and the mercury together until globules are no longer visible; add the chloride of sodium, and thoroughly mix the whole by continued trituration. Sublime by a suitable apparatus into a chamber of such size that the calomel, instead of adhering to its sides as a crystalline crust, shall fall as a fine powder on its floor. Wash this powder with boiling distilled water, until the washings cease to be darkened by a drop of hydrosulphuret of ammonia. Finally dry at a heat not exceeding 212°, and preserve in a jar or bottle impervious to light.

EXPLANATION OF PROCESS.—On subliming a mixture of metallic mercury, sulphate of mercury and chloride of sodium, we find that the oxygen and sulphuric acid of the sulphate of mercury go to the sodium of the chloride of sodium, converting it into sulphate of soda, whilst the chlorine attaches itself to the two equivalents of mercury, forming the subchloride of mercury thus, $Hg + HgOSO_3 + NaCl = Hg_2Cl + NaOSO_3$. This equation demonstrates the importance of the employment of metallic mercury, as without it corrosive sublimate, ($HgCl$) would be the result, and, indeed, in spite of all precautions, some corrosive sublimate appears during this process, hence the directions to wash the product so long as the washings are darkened on the addition of the hydrosulphuret of ammonia, which precipitates mercury from its solutions in the form of black sulphide of mercury. Thus, $HgCl + NH_4S = HgS + NH_4Cl$.

CHARACTERS.—A dull white heavy and nearly tasteless powder, rendered yellowish by trituration in a mortar; insoluble in water, spirit, or ether. Digested with solution of potash it becomes black; and the clear solution, acidulated with nitric acid, gives a copious white precipitate with nitrate of silver.

PHYSICAL PROPERTIES.—Calomel, obtained as directed in the Pharmacopœia, at once in the state of powder has the colour ascribed to it, but occasionally in the manufacture it is allowed to cake, and is subsequently powdered—in that case the colour will incline to buff. The cake when scratched will give a yellow streak highly characteristic of calomel. Exposure to light also has a tendency to make it assume this buff hue, hence the direction to keep it in vessels impervious to light.

CHEMICAL PROPERTIES.—On digestion with caustic potash calomel becomes decomposed, its chlorine going to the potassium to form chloride of potassium, whilst the oxygen of the potassa unites with the mercury to form black suboxide of mercury, which being insoluble, on standing completely precipitates, leaving a clear supernatant solution containing chloride of potassium, which of course will yield, on the addition of nitrate of silver, a copious white precipitate, chloride of silver. This equation explains the reaction that ensues on the addition of calomel to the solution of potash, $Hg_2Cl + KO = Hg_2O + KCl$. A similar decomposition explicable on the same principles occurs on the addition of calomel to lime water, as in the well known preparation, *black wash*.

TESTS.—Entirely volatilized by sufficient heat. Warm ether which has been shaken with it in a bottle, leaves, on evaporation, no residue.

ADULTERATIONS.—Calomel sometimes contains corrosive sublimate, which may be detected by agitating with sulphuric ether, pouring off the clear liquid and evaporating; if any *sublimate* be present, a crystalline powder is left, which becomes yellow with solution of caustic potash; this adulteration I have repeatedly detected in calomel, my attention having been in some instances first directed to it by the irritation which it produced when administered to patients; a patient to whom calomel thus adulterated was given in the form of powder, complained of a burning sensation in the back of the mouth and pharynx. The presence of any fixed white powder such as carbonate, sulphate and phosphate of lime, sulphate of barytes, and carbonate of lead, the presence of one or other of which at various periods has been announced, may be detected by applying a sufficient heat to sublime the calomel.

THERAPEUTICAL EFFECTS.—Calomel is seldom employed alone as a cathartic, but combined with other remedies of this class it is very frequently used, chiefly in consequence of its action on the secreting organs, stimulating the liver and intestinal glands to increased activity. It is therefore peculiarly adapted for all diseases attended with functional derangement of the hepatic system; as well as for those cases in which there is determination of blood to the vessels of the brain, as in some forms of chronic head-ache, in threatened apoplexy, and paralysis, &c. It is also used with much benefit as a purgative in the early stages of inflammatory diseases and of fevers, more especially in the fevers of warm climates, in which it is generally given in very large doses from 15 to 30 grains, its cathartic action not being increased in proportion to the dose. In doses of from fifty to a hundred grains it is said to act as a powerful diuretic, and it has been thus employed in America. So large a dose, if given at all, should not be repeated more than once daily, nor for a longer period than three days. Calomel is well suited as a purgative for children, being tasteless, and in general producing copious alvine evacuations without pain; in their case, however, a greater *relative* dose is required than for adults, and here also its combination with other purgatives, as jalap or scammony, will be attended with benefit. In verminous diseases it is the best purgative that can be employed, as it not only dislodges the worms from the intestines, but also acts as a poison to them. (See also *Special Stimulants*.)

DOSE AND MODE OF ADMINISTRATION.—In powder or pill, from gr. ij. to gr. vj. A very frequently employed cathartic bolus is made by taking five grains of calomel, twenty of jalap, three of ginger, and treacle as much as is sufficient to make a bolus; the mass constitutes one dose.

PREPARATIONS.—Pilula composita, Unguentum. (See *Special Stimulants*.)

* *Pilulæ Catharticæ compositæ.* United States Pharmacopœia. (Calomel, gr. clxxx.; compound extract of colocynth, in powder, ℥ss.; extract of jalap, gr. clxxx.; gamboge, in powder, gr. xl.; form them into a mass with water, and divide into 180 pills). An excellent purgative, combining efficiency of action, and comparative mildness with smallness of bulk. Each pill contains one grain of calomel; dose, one or two pills.

INCOMPATIBLES.—The alkalies and their carbonates; chloride of sodium; lime water; nitric and muriatic acids; iodide of potassium; sulphuretted hydrogen, and its combinations; soaps, &c.

GAMBOGIA. *Gamboge.* (An undetermined species of Garcinia, *Linn.* The gum resin; imported from Siam.) The plant which yields commercial or Siam gamboge is not yet ascertained; it was conjectured by the Edinburgh College to be a species of Hebradendron nearly allied to the Hebradendron gambogioides, from which plant Ceylon gamboge is procured; but more recent investigations tend to prove that it is the produce of a species of Garcinia as yet unascertained, so that the reference in the last edition of the London Pharmacopœia was correct. The gamboge of medicine was erroneously ascribed by the Dublin College to the Ceylon gamboge tree; it belongs to the Natural family *Guttiferæ* (*Clusiaceæ*, Lindley), and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—A handsome tree of moderate size, with opposite, stalked, leaves; unisexual flowers, sessile and axillary; and a pleasant saccharine fruit, about the size of a cherry, four celled, each cell one seeded.

PREPARATION.—In Ceylon, gamboge is procured by making incisions into the bark of the tree, or removing a piece of it, when a viscid, bright-yellow juice exudes, which, when dried by exposure to the sun in shallow bowls, concretes into a hardened mass. In Siam it is said to be obtained by breaking across the young branches and leaves, and collecting the juice that drops from them: be this as it may, the finer qualities are allowed to dry in the hollow stems of the bamboo-cane, or probably the juice is collected in them; and of late it has been commonly imported in the reeds.

CHARACTERS.—In cylindrical pieces, breaking easily with a smooth conchoidal glistening fracture; colour tawny, changing to yellow when it is rubbed with water; taste acrid.

PHYSICAL PROPERTIES.—Commercial or Siam gamboge is generally met with in two forms; that of cylinders, sometimes hollow, more frequently solid—*Pipe Gamboge;* and in irregular shaped masses—*Cake or Lump Gamboge.* Pipe gamboge is of a rich, reddish yellow colour, generally greenish and dusty externally; inodorous, tasteless at first, but soon causing a sense of acridity in the throat; brittle, with a smooth, glistening, conchoidal fracture. Lump gamboge is of a duller colour, its fracture is splintery with scarcely any lustre, and it contains small fragments of wood and many air-vesicles. *Ceylon Gamboge* (for a specimen of which I am indebted to my friend, Professor Christison) is not an article of English commerce; it is a coarse-looking substance with numerous air-vesicles, of a dull reddish yellow colour, with many dark-brown spots. It would appear to have nearly similar purgative properties to Siam gamboge, but it is much inferior as a pigment, and as this is the chief, almost the only use to which the gum resin is put, some gamboge imported from Ceylon was found to be quite unsaleable, and of late years it has not occurred in commerce.

CHEMICAL PROPERTIES.—Gamboge is composed of resin *(Gambogic Acid)*, soluble gum, and a trace of woody fibre; the proportion of the resin, which is the active principle, varies, according to several of Christison's analyses, from 68 to 75 per cent. Gamboge, although not soluble in water, forms a perfect emulsion with it; it is almost entirely soluble in rectified spirit, and sulphuric ether completely dissolves out the resin, leaving the gum. The alcoholic solution dropped into water precipitates the resin, which, however, will be redissolved on the addition of liquor kali, forming a clear red solution of *gambogiate of potash*; from this solution acetate of lead throws down a yellow precipitate, *gambogiate of lead*, and sulphate of copper a brown precipitate, *gambogiate of copper*.

TEST.—An emulsion made with boiling water, and cooled, does not become green with the solution of iodine.

ADULTERATIONS.—The inferior varieties of gamboge are adulterated with some amylaceous matter, they also generally contain lignin; the former is detected by a cooled decoction becoming greenish on the addition of tincture of iodine, and the presence of the latter may be known by the fracture not being smooth and conchoidal.

THERAPEUTICAL EFFECTS.—Gamboge is a drastic cathartic, producing even in small doses frequent and copious watery evacuations, attended with much irritation of the stomach and bowels; in somewhat larger doses it occasions vomiting, and even sometimes inflammation of the intestinal canal, followed by death; a single drachm has proved a fatal dose in more than one instance, the post-mortem appearances being ulceration and mortification of the intestines. In consequence of the distress caused by even medicinal doses of gamboge, it is seldom employed alone as a purgative, but is frequently added to other remedies of this class, either to augment their power, or to produce increased secretion from the alimentary canal. It is chiefly used as a cathartic in dropsical affections, for which it is well adapted, as it not only causes a large discharge of serum from the intestines, but stimulates the kidneys to increased action. The combination of gamboge with an alkali, as with carbonate of potash, acts as a diuretic of much power, and such a preparation under the name of *tincture of gamboge* is highly praised by many continental writers. The resin of gamboge in somewhat smaller doses has a precisely similar action to the drug itself.

DOSE AND MODE OF ADMINISTRATION.—In powder, pill, or emulsion, gr. ij. to gr. v. which may be repeated every five or six hours until it operates; it should be always finely powdered and combined with some comparatively inert substance, as sugar, sulphate of potash, or cream of tartar.

Pilula Gambogiæ Composita. Compound Pill of Gamboge. (Take of gamboge, one ounce; Barbadoes aloes, one ounce; aromatic powder, one ounce; hard soap, in powder, two ounces; syrup a sufficiency. Pulverize the gamboge and aloes separately, mix them with the aromatic powder, add the soap, and afterwards the syrup; and beat the whole into a uniform mass). A useful cathartic mass, operating effectually in doses of from gr. v. to gr. xv.

* *Tinctura Gambogiæ*, VOIGTEL. (Gamboge, powdered, ℥ss.; carbonate of potash, ℥j.; brandy, f℥xij.; mix the powders intimately,

add the spirit, and digest for four days with a gentle heat). An excellent diuretic. Dose, f℥ss. to f℥j.

In cases of poisoning with gamboge, emollient and demulcent drinks should be given, and similar enemata administered; to be followed by small but repeated doses of opium, and the use of the warm-bath.

CASSIA. *Cassia Pulp.* Cassia Fistula, *Linn.* Purging Cassia. Plate 163, *Woodv. Med. Bot.* (The pulp of the pods; imported from the East Indies; or recently extracted from pods imported from the East or West Indies.) This tree, the *Pudding Pipe Tree,* or *Purging Cassia,* originally a native of Africa, is now generally diffused over the East and West Indies, and grows abundantly near Alexandria, the quantity of the fruit annually exposed for sale in the markets of that town amounting to 50,000 pounds weight. It belongs to the Natural family *Leguminosæ (Fabaceæ,* Lindley), and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A handsome tree, about thirty feet in height; with alternate, pinnate leaves; bright yellow papilionaceous flowers in racemes; and cylindrical legumes or pods, from one to two feet long, of a blackish-brown colour.

PREPARATION.—The pulp of the pod is the part employed in medicine. It is usually prepared by pouring water on the bruised pods, so as to wash out the pulp, pressing through a sieve, and evaporating the solution thus obtained to the consistence of a thick extract. In the last edition of the London Pharmacopœia, the commercial pulp was directed to be further prepared for use in medicine as follows:—*Cassia præparata,* "Cassia, broken lengthwise, ℔j.; distilled water, sufficient to cover it; macerate for six hours, frequently stirring; strain the washed pulp through a hair-sieve, and evaporate in a water-bath to the consistence of a confection."

CHARACTERS.—Blackish-brown, viscid, sweet in taste, and somewhat sickly in odour; usually containing the seeds and dissepiments.

PHYSICAL PROPERTIES.—Cassia pulp is of a reddish-black colour, has a sweetish mucilaginous taste, and but little odour. It consists of sugar, gum, mucilaginous extractive, and colouring matter; no principle possessing purgative properties has as yet been discovered in it. It is almost entirely soluble in both alcohol and water.

ADULTERATIONS.—The pulp is not liable to adulteration; those pods only should be chosen which are heavy, and in which the seeds do not rattle, the rattling being proof demonstrative of the absence of the pulp, in which these seeds are embedded, and upon which its laxative properties depend.

THERAPEUTICAL EFFECTS.—Cassia pulp is a mild laxative, at present but seldom employed; it is only adapted for febrile or inflammatory affections occurring in persons of delicate habit or in children. Combined with manna, its cathartic properties are said to be much increased.

DOSE AND MODE OF ADMINISTRATION.—Of the pulp, ℥ss. to ℥iij.

PREPARATION.—Confectio Sennæ (which see).

* *Confectio Cassiæ.* (Cassia pulp, prepared ℔ss.; manna, ℥ij.; tamarind pulp, prepared, ℥j.; syrup of roses, f℥viij.; bruise the manna and dissolve it in the syrup, then add the pulps and evaporate to a proper consistence.) Although not officinal, and being apt to sour on keeping, this confection, when freshly made, is an admirable aperient for children, who, in consequence of its agreeable taste, will rarely refuse to take it—an important consideration in infantile therapeutics. Dose, gr. cxx. to ℥j.

COLCHICI CORMUS. *Colchicum Corm.* Colchicum autumnale, *Linn.* Plate 177, *Woodv. Med. Bot.* Indigenous. (Syn.: *Meadow-saffron. Naked lady.)* (The fresh corm; collected about the end of June; and the same stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150°.)

COLCHICI SEMEN. *Colchicum Seed.* (The seed, fully ripe.) A common indigenous plant, belonging to the Natural family *Melanthaceæ*, and to the Linnæan class and order *Hexandria Trigynia.*

BOTANICAL CHARACTERS.—Cormus (improperly called bulb), fleshy, covered with a loose, brown membrane; giving origin in the middle of summer to a young cormus, which remains attached to the parent, grows rapidly, and sends up in autumn a naked white tube or flowering stem, terminating in a pale purple, crocus-like flower; the flower soon dies; and the seed-vessel which remains under-ground, springs up with the erect, broadly-lanceolate leaves, in the ensuing February or March.

PREPARATION.—The cormus should be gathered about the end of July or beginning of August, before the flowering stem is sent up. For medical purposes, it is cut transversely into thin slices, the dry coats having been previously removed; the slices are dried in a dark place, exposed to the air, with a heat not exceeding 170°. Mr. Houlton states that the colchicum cormus, when dried entire, retains its active properties much more perfectly, and for a much longer period than if it is sliced. He also recommends it to be dried without artificial heat, which he says may be readily done by stripping off the loose dry coats, and carefully removing the bud or bulb. The seeds are gathered when ripe. The following were the directions contained in the London Pharmacopœia, with reference to its collection and preparation:—"It should be dug up in July before the autumnal bud is developed, and should be dried as follows: the dry envelopes having been removed, it is to be cut transversely into thin laminæ and dried at first with a gentle heat, gradually increased to 150° F."

CHARACTERS.—*Of the Cormus.*—Fresh corm about the size of a chestnut, flattened on one side where it has an undeveloped bud; furnished with an outer brown and an inner yellow coat; internally white; solid and fleshy; yielding when cut a milky acrid, and bitter juice. Dried slices about a line thick, moderately indented on one side, rarely on both, firm, flat, whitish, amylaceous. *Of the Seeds.*—About the size of black mustard seed, very hard, reddish-brown.

PHYSICAL PROPERTIES.—Colchicum cormus is ovoid, about the size of a large walnut, compressed on one side, convex on the other; it may be distinguished from bulbous roots by being solid, and not composed of laminæ or scales. The dry slices are of a greyish-white colour, and firm; and, as remarked in the pharmacopœial characters, indented on one side only, *reniform;* when indented on both sides, *fiddle-shaped,* the specimen is of inferior value, inasmuch as it has, more or less, exhausted itself in the nourishment of its offset.

Dr. A. T. Thompson suggested as a test of the goodness of the slices, that when rubbed with acetic acid first, and then treated with tincture of guaicum, they should yield a blue colour: an effect, as Dr. Maclagan has pointed out, due to the reaction between the test employed and the albumen of the plant, which will not occur if the albumen has been coagulated by an over-heat in the process of drying; so that this test can only be looked upon as of value in determining this point. The seeds are small, rough, nearly round, and of a blackish-brown colour. Both seeds and cormus are odourless, but have a bitter, acrid taste. The flowers have been occasionally employed, both in their fresh and dried state, but they are not so certain in their effects as either the seeds or cormus.

CHEMICAL PROPERTIES.—The cormus consists of fatty matter, a volatile acid, a peculiar, uncrystallizable alkaloid named *veratria* (which will be described under the head of General Stimulants), combined with gallic acid, starch, gum, inulin, and lignin (Pelletier and Caventou). A crystallizable alkaloid, *Colchicia*, was discovered in the seeds by MM. Hess and Geiger; it bears much resemblance to *veratria*, with which it was at first supposed to be analogous; it is bitter, very poisonous, but neither acrid nor sternutatory, and soluble in water, alcohol, and ether. In a very able essay on colchicum, published by Dr. J. L. Maclagan in the *Edinburgh Monthly Journal of Medical Science* (vol. xiii. p. 501), the writer states that he has failed in verifying the observations of the last-named chemists, as to the crystallizable nature of colchicia, the bitter matter which he obtained by their process being invariably deposited in the form of a brown, resinous-looking mass. That the colchicia of Hess and Geiger is uncrystallizable has been also proved by the more recent investigations of M. Oberlin, which have moreover shown it to be a compound substance, and from which this chemist has obtained a neutral crystaline principle, with very active poisonous properties; this he has named *Colchiceine*. The active principles of both cormus and seed are extracted by water, alcohol, vinegar, and wine.

ADULTERATIONS.—From having been gathered at an improper season, or from careless drying or preservation, colchicum cormus is very often nearly inert. The intensity of the bitterness is the best test of the goodness of either the herb or the seeds. If an accurate result be required, it can be obtained only by ascertaining analytically the quantity of the alkaloid contained in a given specimen.

THERAPEUTICAL EFFECTS.—The most constant effect, indeed, in general, the only manifest one, of colchicum, is purging; its cathartic operation being accompanied by great depression of the circulation and much debility. In large or frequently repeated doses it produces nausea, vomiting, hypercatharsis, excessive prostration, and a burning pain along the œsophagus and in the abdomen, together with insufferable thirst. In small doses it is held by many to be diuretic, but this effect is uncertain; at least, diuresis is rarely produced except by the acetous preparations of the drug, nevertheless its supposed action on the urinary secretion has induced some writers to recommend its employment in dropsy, especially in that form attended with albuminous urine. With its purgative properties, Dr. Barlow associates sedative characters, to the combination of which two he ascribes its therapeutical value. Under its use, the quantity of uric acid in the urine is very much augmented; salivation also has ensued upon its use. The principal diseases in which colchicum has been employed are gout and rheumatism; for the former of which it has acquired the character of being a specific—a character which it owes to the exertions of Dr. Want, to prove that it was the active ingredient in the *Eau Medicinale*, a celebrated empirical remedy introduced in the latter quarter of the past century, by a M. Husson, for the treatment of gout, and for the analysis of which various attempts had previously been fruitlessly made; for a most interesting account of the manner in which Dr. Want succeeded in finding out its composition, see the *Pharmaceutical Journal*, vol. xi., p. 436, *et seq*. Administered during a paroxysm of gout, it seldom fails to alleviate the pain and cut short the fit, yet its beneficial effect is more decidedly manifested if it be not administered until the violence of the fit is over; but so far from preventing a return of the attack, most practitioners agree that the employment of colchicum renders the system more predisposed to the disease, indeed, frequently giving rise to irregular or atonic gout. With many practitioners the development of its cathartic effects is considered essential for its success in the treatment of gout: Sir Charles Scudamore's favourite prescription, with this object in view, being, "*Magnesiæ*, gr. xv. to gr. xx.; *Magnesiæ Sulphatis*, gr. lx. to gr. cxx.; *Aceti Colchici*, f℥j. to f℥ij.; *Syrupi Zingiberis*, f℥j. to f℥ij.; *Misturæ Camphoræ*, ad f℥ij." Independent of any such action, however, indeed without any recognizable eliminative effect, it frequently acts like a charm in the relief of the pain and inflammation attendant on a fit of the gout. In rheumatic fever the employment of colchicum requires the greatest caution, and, in the opinion of many eminent authorities, is very seldom admissible, some even going the length of laying at its door the charge of inducing by metastatic action inflammation of the pericardium. My own experience, however, is by no means confirmatory of this view, and I believe that the supervention of pericarditis in such cases is explicable on far different grounds—views, in which I am happy to state that I am confirmed by no less eminent an authority than Dr. Stokes; he being of opinion that the supervention of this symptom is altogether unconnected with the use or non-use of this medicine. Professor Law, also, bears testimony to its value in such cases, combining with its employment the use of moderate venesection. In some of the chronic forms of rheumatism, especially when occurring in gouty habits, it is often used in robust constitutions with benefit; and my friend, Dr. Faussett, of this city, has directed our attention to its value in the treatment of lumbago; in which statement my observations are confirmatory of his. Owing to its effects on the secretion of uric acid, it is employed with the best possible results in those diseases of the urinary organs in which oxalate of lime is present in the urine; also in some forms of prurigo, of urticaria, and of lichen. Colchicum has been also given as an antiphlogistic in febrile and inflammatory diseases; but in the present day its use is almost entirely confined to cases of gout and rheumatism.

DOSE AND MODE OF ADMINISTRATION.—In the administration of colchicum or any of its preparations, we should always begin with small doses and increase them very gradually, as no medicine varies more in its action on different persons, and besides, many of the preparations we meet with in the shops differ much in activity. It is rarely employed in the form of powder; the dose is from gr. ij. to gr. viij.; the powder of the seeds should be preferred to that of the cormus, as being more uniform. In the pharmacopœial preparations we find that the *fresh* cormi are ordered in the *Extractum* and in the *Extractum Aceticum*; the *dried* cormi, in the *Vinum*; and the *Seeds*, in the *Tinctura*.

Extractum Colchici. Extract of Colchicum. (Take of fresh colchicum corms, deprived of their coats, seven pounds. Crush the corms; press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel and evaporate by a water bath at a temperature, not exceeding 160°, to a proper consistence.) On heating, the albumen is coagulated, and is gotten rid of by the subsequent filtration. This will, of course, increase its relative strength as compared with an extract not subjected to this operation. In this and the subsequent preparation, the direction of *fresh* cormi is correct, as by drying and keeping they lose much of their activity. *Carefully* dried cormi, however, possess sufficient virtue: the cormi, according to Mr. Battly, lose in drying 67 per cent. of their weight; so that their relative value is about as one to four. Dose, gr. j. to gr. iij.

Extractum Colchici Aceticum. Acetic Extract of Colchicum. (Take of fresh colchicum corms, deprived of their coats, seven pounds; acetic acid, six fluid ounces. Crush the corms, add the acetic acid, and press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel, and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence.) Acetic acid is supposed to unite with the alkaloid to form an acetate of colchicina. Sir C. Scudamore considered the preparations of colchicum with acetic acid milder in their action than those prepared without it, although most efficient in the treatment of gout. Dose, gr. j. to gr. iij. A combination of gr. x. of this extract, gr. x. of blue pill, gr. xx. of the compound colocynth extract, gr. v. of extract of hyoscyamus, and gr. v. of the dried carbonate of soda, divided into ten pills, two to be taken for a dose, constitutes an excellent aperient in gouty and rheumatic affections.

Tinctura Colchici Seminis. Tincture of Colchicum Seed.

(Take of colchicum seed, bruised, two ounces and a-half; proof spirit, one pint. Macerate the colchicum for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

Vinum Colchici. Wine of Colchicum. (Take of colchicum corm, dried and sliced, four ounces; sherry, one pint. Macerate the colchicum in the wine for seven days, press and strain through calico; pour on the marc sufficient sherry to make up one pint, and having pressed and strained as before, mix the fluids.) Dose, f℥ss. to f℥ij.

* *Succus Colchici.* (Express the juice from fresh cormi, allow it to stand 48 hours to deposit the fecula, and add to the clear liquor a fifth part of rectified spirit.) This is a most active preparation, and keeps well. Dose, min. v. to min. xx.

INCOMPATIBLES.—Acids; tincture of iodine; tincture of guaiacum; and all astringent vegetable infusions and decoctions.

In cases of poisoning with colchicum, emetics followed by demulcent drinks should be immediately administered; and if coma be present, brandy, ammonia, coffee, and other powerful stimulants given. The vegetable astringents have been recommended as antidotes, tannic acid forming an insoluble precipitate with veratria.

COLOCYNTHIS. *Colocynth.* Citrullus Colocynthis, *Schrad.* Plate 175, *Woodv. Med. Bot. (Cucumis Colocynthis).* (The dried decorticated fruit, freed from the seeds; imported chiefly from Smyrna, Trieste, France, and Spain.) This plant, the *bitter cucumber*, is a native of several parts of Asia and Africa, and is cultivated in Greece and Spain; it belongs to the Natural family *Cucurbitaceæ*, and to the Linnæan class and order *Monœcia Syngenesia.*

BOTANICAL CHARACTERS.—A creeping, procumbent, annual; leaves, ovato-cordate; flowers, yellow, axillary, solitary; fruit *(pepo)*, globose, about the size of an orange, yellow when ripe, with a thin solid rind, fleshy, many-seeded.

PREPARATION.—The fruit is gathered when ripe, peeled and dried. In some countries it is dried without being peeled.

CHARACTERS.—Light spongy, white, or yellowish-white, intensely bitter.

PHYSICAL PROPERTIES.—The pulp of the dried fruit, which is the officinal part, is of a pale yellowish-white colour; it is without odour, but has an intensely bitter nauseous taste; is light, spongy, porous, and so tough as to be with difficulty reduced to powder. The unpeeled fruit *(Mogadore Colocynth)*, is imported in small quantities into England, but is only used by druggists for show-bottles.

CHEMICAL PROPERTIES.—Colocynth pulp contains a peculiar bitter principle, which has been named *Colocynthin*, and on which its purgative property is supposed to depend, resin, pectin, gummy matter, and various salts. It yields its active properties to both water and alcohol. According to Meissner's analysis, colocynthin constitutes about 14½ per cent. of the pulp; it is prepared by digesting the watery extract in spirit, evaporating, and treating the resinoid mass thus obtained with a little water, when the impure colocynthin is left. It is a yellowish-brown, translucent, friable, amorphous mass, soluble in 5 parts of cold water and in alcohol and ether, the solutions are intensely bitter.

ADULTERATIONS.—Colocynth pulp is not liable to adulteration; but when of a greyish or brownish colour, it is of inferior quality.

THERAPEUTICAL EFFECTS.—Colocynth operates as a stimulant to the intestinal canal, its influence being specially directed to the large intestines, promoting their secretions as well as increasing their vermicular motion; in large doses it is a dangerous poison, producing intestinal inflammation. In consequence of the drastic properties it possesses when administered alone, it is always combined with other cathartics, in order to mitigate its action, as in the several pharmacopœial preparations, and it is thus exhibited with much advantage in habitual constipation, in passive dropsies, in alvine obstruction, and as a revulsant in determination of blood to the brain. In short, the officinal preparations of this drug are perhaps the most generally employed purgatives of the materia medica. Colocynth is also said to possess diuretic properties.

DOSE AND MODE OF ADMINISTRATION.—In powder (now seldom used), gr. ij. to gr. viij. mixed with some inert powder. Powdered colocynth if sprinkled over a blistered surface, acts as a cathartic nearly as actively as if administered by the mouth, and it may be used with advantage in this way in apoplexy and other diseases in which the patient is unable or unwilling to swallow. Its use must not, however, be pushed too far, as if it does not purge, it is apt to cause inflammation of the intestines.

Extractum Colocynthidis Compositum. Compound Extract of Colocynth. (Take of colocynth, freed from the seeds, six ounces; extract of socotrine aloes, twelve ounces; scammony, or resin of scammony, in powder, four ounces; hard soap, in powder, three ounces; cardamoms, freed from the capsules, in fine powder, one ounce; proof spirit, one gallon. Macerate the colocynth in the spirit for four days; press out the tincture, and add to it the extract of aloes, the soap, and the scammony. Distil off the spirit, and evaporate the residue by a water-bath to a pilular consistence, adding the cardamoms towards the end of the process.) This extract when made as directed in the pharmacopœia with *pure* materials is a valuable preparation; frequently, however, the scammony employed is anything but good. For the usual impurities and mode of detection see *scammony*. Gamboge has been also found as a sophistication; for mode of detection, see *gamboge*. Dose, gr. v. to gr. xv.

Pilula Colocynthidis Composita. Compound Pill of Colocynth. (Take of colocynth, in powder, one ounce; Barbadoes aloes, in powder, two ounces; scammony, in powder, two ounces; sulphate of potash, in powder, a quarter of an ounce; oil of cloves, two fluid drachms; distilled water, a sufficiency. Mix the powders, add the oil of cloves, and beat it into a mass with the aid of the water). Dose, gr. v. to gr. xv.

Pilula Colocynthidis et Hyoscyami. Pill of Colocynth and Hyoscyamus. (Take of colocynth, in powder, one ounce; Barbadoes aloes, in powder, two ounces; scammony, in powder, two ounces; sulphate of potash, in powder, a quarter of an ounce; oil of cloves, two fluid drachms; extract of hyoscyamus, three ounces; distilled water, a sufficiency. Mix the powders, add the oil of cloves and the extract of hyoscyamus, and beat into a mass with the aid of the water.) An excellent preparation, well adapted for persons with irritable bowels. Dose, gr. v. to gr. xv.

* *Enema Colocynthidis.* (Extract of colocynth, gr. xxx.; soft soap, ℥j.; water, Oj.; mix and rub together.) An efficient enema in obstinate constipation and colic.

* *Tinctura Colocynthidis,* (Colocynth, ℥j.; star anise, gr. lx.; rectified spirit, f℥xiv.; digest for three days and filter.) Diuretic. Dose, min. x. to min. xv. in a mixture.

* *Decoctum Colocynthidis,* (Colocynth, gr. lx.; boiling water, f℥vj.; boil for ten minutes, strain, and add sulphuric ether, f℥j.; syrup of orange peel, f℥j.) Diuretic. Dose, f℥ss. two or three times daily.

INCOMPATIBLES.—The fixed alkalies; lime water; sulphate of iron; acetates of lead; nitrate of silver; and corrosive sublimate.

CROTONIS OLEUM. *Croton Oil.* Croton Tiglium, *Linn.* Plate 4, *Steph. and Church. Med. Bot.* (The oil expressed from the seeds in England.) The tree furnishing us with the seeds from which this oil is expressed is a native of the continent of India, the Molucca Islands, and Ceylon; belonging to the Natural family *Euphorbiaceæ,* and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—A moderate-size tree, with a smooth bark: leaves oblongo-ovate, acuminate, with two flat round glands at the base; flowers white, in terminal racemes; fruit ovate and triangular, somewhat bigger than a hazel nut, three celled, each cell one seeded.

PHYSICAL PROPERTIES.—Croton seeds *(Grana Tiglii)* are of an irregularly-oval shape, about 6 lines long, 2½ lines thick, and 3 lines broad; they are of a greyish-brown colour, and marked with the ramifications of the raphé; they contain internally a pale yellowish white albumen, which envelopes the embryo with its large leafy cotyledons. From the kernels croton oil is obtained by pressure; it is thicker than castor oil, of a pale amber colour, has a feeble sickly odour, and an intensely acrid taste. The kernels yields about half their weight of oil.

CHEMICAL PROPERTIES.—Croton oil consists of a peculiar acid named *Crotonic acid* dissolved in a bland fixed oil; it was for a long time generally supposed that the properties of the oil were due to this acid, but Mr. Redwood has shown that neither crotonic acid nor its salts possess any cathartic action. In an essay lately read before the Academy of Medicine of Paris, by M. Dublanc, it is stated that the acid of croton oil is fixed and not volatile, and that the acrid volatile principle which exists in it is not of an acid nature. East Indian croton oil, on agitation with alcohol, forms a milky-looking mixture, which on the application of heat clears and becomes transparent, but on cooling and standing for some time it again separates, the oil subsiding; it is also very soluble in sulphuric ether, and in the fixed and volatile oils. Croton oil, expressed at home from the imported seeds, is soluble in an equal volume of alcohol without the aid of heat, forming an uniform transparent mixture which does not separate on standing, unless exposed to a very cold atmosphere.

TESTS.—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.

ADULTERATIONS.—Castor and perhaps jatropha oil, are the only substances likely to be employed to adulterate croton oil; it was supposed that the former sophistication might be readily detected by its solubility in alcohol, the test adopted by the pharmacopœial authorities. The statements made above on this point prove that this is a fallacious test, especially as croton oil expressed in England is more active than that imported. These observations, originally made by Mr. Redwood, were subsequently verified on examination of numerous samples by the late Dr. Pereira; and I myself in my lectures have repeatedly demonstrated their accuracy before my classes; a consideration of these statements leads us to imagine that the pharmacopœial test should refer to Indian, though applied to British oil.

THERAPEUTICAL EFFECTS.—Croton oil is an acrid cathartic, operating speedily, and producing frequent watery evacuations; it does not in general give rise to nausea or griping, and is consequently to be preferred in most cases to other cathartics of equal power. It is used chiefly in obstinate constipation, in comatose affections, and in dropsy. In the various forms of convulsive and neuralgic diseases, it is a most valuable cathartic; given in such affections in small doses, repeated daily for some time, I have in several cases found it a very efficacious remedy. Croton oil should not be employed in extreme debility, or where there is any tendency to inflammation in the digestive organs. (See, also, *Epispastics*.)

DOSE AND MODE OF ADMINISTRATION.—Min. j. or min. ij. In cases where the patient is unable or unwilling to swallow, it may be dropped on the tongue, or having been dissolved in ether may be rubbed on the abdomen. If it can be avoided, however, croton oil should never be administered in a fluid form, as it causes a most dis-

10

agreeable acrid impression in the back of the throat; it may be made into pill with conserve of roses or liquorice powder, or one or two minims may be added to any of the common purgative pill masses, and thus given in divided doses until it operates. The late Professor Macnamara, in the case of a patient labouring under furious mania, suffering from severe constipation, and doggedly resolute in refusing to take any medicine, hit on a happy contrivance for the administration of this remedy. He plucked a few grapes off a bunch, gently squeezed out some of the juice, and dexterously substituted for it a drop of croton oil, the patient, thrown off his guard, greedily swallowed the grapes so prepared, with, of course, the subsequent production of active catharsis.

* *Sapo Crotonis.* (Croton oil, 2 parts; liquid caustic soda, 1 part.) Dose, gr. j. to gr. iij. In this preparation the alkali is stated to have the effect of modifying the acrimonious properties of the oil, without interfering with its purgative action.

In an overdose, croton oil acts as a violently acrid purgative; its operation being attended with marked depression. The treatment should consist in removing the oil without loss of time from the stomach, then the administration of bland mucilaginous fluids. Diarrhœa must be checked by opium, and if symptoms of gastro-intestinal inflammation ensue, they are to be treated on the usual principles.

PREPARATION.—*Linamentum crotonis* (which see).

ELATERIUM. *Elaterium.* Ecbalium officinarum, *Richard.* Squirting Cucumber. Plate 34, *Steph. and Church. Med. Bot.* A sediment from the expressed juice of the fruit. *(The feculence from the juice of the fruit of Ecbalium agreste,* D.—*Of Momordica elaterium,* E. *The fresh unripe fruit of Ecbalium officinarum,* L.) The wild or squirting cucumber is a native of Greece, and other parts of the south of Europe, and is cultivated in the British Isles; it belongs to the Natural family *Cucurbitaceæ*, and to the Linnæan class and order *Monœcia Monodelphia.*

BOTANICAL CHARACTERS.—An annual, trailing plant, with a thick branching stem about two feet in length; greyish, rugose leaves, and yellow, axillary flowers; Fruit (*Pepo*), is about an inch and a half long, elliptical, green, covered with soft prickles; on quitting the foot-stalk when ripe, it suddenly discharges with considerable force many brown seeds and a slimy juice through the aperture at its base, whence its name *Spirting* or *Squirting* Cucumber. This curious phenomenon is thus explained:—In the centre of the fruit are the seeds, embedded in a *thick* mucus, and surrounded with a thin membrane, on all sides of which is situated externally a *thin* fluid. So, contained in the cucumber we have two fluids of different densities, separated from each other by a membrane—the very conditions necessary for the process known to physiologists as *Endosmosis* and *Exosmosis.* The passage of the thinner fluid to the thicker eventuates in so distending the sac, that at last it yields at its *weakest* point, and that is where the fruit articulates with its peduncle; the over-distended sac then in virtue of its elasticity contracts, and its contents are expelled as before-described.

PREPARATION.—Take of the fruit of squirting cucumber, very nearly ripe, one pound. Cut the fruit lengthwise, and slightly press out the juice. Strain it through a hair sieve; and set it down to deposit. Carefully pour off the supernatant liquor; pour the sediment on a linen filter; and dry it on porous bricks with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way.

CHARACTERS.—In light, friable, slightly-incurved cakes, about one line thick, greenish-grey, acrid and bitter; fracture finely granular.

PHYSICAL PROPERTIES.—Elaterium is in thin, flat, or slightly curled pieces or fragments, light and friable; of a pale, greenish-grey colour, with a very faint odour, but an intensely acrid and bitter taste; the pieces generally bear on the surface an impression of the linen on which they have been dried. An inferior quality, sometimes met with, is of a brownish or dark green colour, very hard and curled, and broken with difficulty. This variety seems to owe these properties to the fruit, in its preparation, having been subjected to greater pressure than prescribed, in virtue of which its mucilaginous matter has been also expressed.

CHEMICAL PROPERTIES.—According to Hennell's analysis, elaterium consists of a crystalline substance *(Elaterin)*, green resin, starch, woody fibre, and saline matters. Elaterin, the active principle of the drug, may be obtained by exhausting elaterium thoroughly with boiling rectified spirit, concentrating this solution so long as no separation takes place, and then pouring it while hot into a weak boiling solution of potash; on cooling, the elaterin crystallizes in minute colourless, satiny crystals; its formula is said to be $C_{20}H_{14}O_5$; the quantity obtained varies, in proportion to the quality of the drug employed, from 5 to 26 per cent.

TESTS.—Does not effervesce with acids; yields half its weight to boiling rectified spirit. This solution concentrated and added to warm solution of potash, yields on cooling not less than twenty per cent. of elaterine in colourless crystals.

ADULTERATIONS.—Elaterium is seldom expressly adulterated, but it varies much in strength, owing probably to the different degrees of care bestowed on its preparation; the best test for ascertaining its goodness is the process given above, under the head of *Chemical Properties*, for obtaining its active principle; the quantity of *elaterin* thus procured should weigh from a seventh to a fourth of the elaterium. Reference to these remarks will explain the *rationale* of the potash test; its non-effervescence on the addition of an acid demonstrates the absence of chalk, an occasional impurity, not found in English, but constantly present, as well as starch, in Maltese elaterium. Iodine will detect the starch in this latter variety.

THERAPEUTICAL EFFECTS.—Elaterium is a most powerful drastic cathartic even in minute doses, 1-16th of a grain sometimes producing considerable purging, and 1-4th of a grain, in dropsical cases, generally causing a discharge of several pints of fluid by the bowels; its operation is characterized by nausea, sometimes vomiting, and considerable depression of the circulatory and nervous systems. The chief use of elaterium is in passive dropsies, especially ascites and hydrathorax, when it is deemed advisable to attempt the removal of the effused fluid by the bowels. It will also be generally found that diuresis is more freely established after the operation of elaterium. The administration of elaterium requires the greatest caution in debilitated habits.

DOSE AND MODE OF ADMINISTRATION.—1-16th to 1-4th of a grain in pill, (it should be always given at first in small doses), in combination with some tonic extract, as of gentian or chamomile.

* *Pulvis Elaterii compositus,* (Elaterium, gr. iv.; bitartrate of potash, gr. c.; ginger, gr xl.; mix.) Thirty-six grains contain one grain of elaterium. Dose, gr. v. to gr. x.

* *Tinctura Elaterii,* (Elaterium, gr. viij.; rectified spirit, f℥viij; dissolve.) Dose, f℥ss. to f℥ij.

* *Solutio Elaterinæ,* STIRLING. (Elaterin, gr. j.; rectified spirit, f℥j.; nitric acid, min. iv.; dissolve.) Dose, min. xxx. to min. xl.

In poisoning with elaterium the same treatment should be followed as in poisoning with gamboge.

* EUPHORBIA LATHYRIS. *Caper Spurge.* An indigenous biennial, belonging to the Natural family *Euphorbiaceæ,* and to the Linnæan class and order *Monœcia Monandria.* It is not officinal in the British Pharmacopœia, but an oil obtained from the seeds is contained in the Paris Codex, as a cheap and efficient substitute for croton oil; it is procured by simple pressure from the ripe seeds, 44 parts of oil being obtained from 100 parts of the seeds. It is very fluid, of a clear yellow colour, with an acrid taste and a peculiar odour; soluble in ether, but insoluble in alcohol.

Calderini, an Italian physician, has used this oil extensively. He says that its effect is certain and prompt; that it may be considered as a mild cathartic, not producing either vomiting, colic, or tenesmus; and that it is adapted for all cases in which it is desirable to purge gently but effectually, and with a small dose of medicine. I have tried some experiments with the oil of the caper-spurge, thinking that it might be an indigenous cathartic of some value, but the results I have arrived at do not at all corroborate the statements of the French and Italian physicians, which may probably depend on some difference in the oil extracted from the seeds of the plant cultivated in our temperate climate, and that obtained from plants grown in warmer countries. The dose is from min. iv. to min. viij., it may be administered in syrup.

When applied externally it is said to possess rubefacient properties similar to those of croton oil.

* HELLEBORUS. *Root and rhizome of Helleborus niger; Black Hellebore, or Christmas rose.* The black hellebore, the Melampodium of the ancients, a native of the middle and southern parts of Europe, belongs to the Natural family *Ranunculaceæ* and to the Linnæan class and order *Polyandria Polygynia.*

BOTANICAL CHARACTERS.—Herbaceous; leaves all radical, pedatisect; scape leafless, one to two flowered; flowers large, white.

PREPARATION.—The root should be dug up in February, after the plant is done flowering, and dried quickly.

PHYSICAL PROPERTIES.—As met with in the shops the root consists of two parts, a black root-stock, and numerous undivided fibres or radicals which arise from it; the latter are the active part, and should only be used, notwithstanding both were officinal in the last edition of the London Pharmacopœia. They are cylindrical, about the thickness of a crow-quill, brownish-black externally, whitish within, brittle; with a faint unpleasant odour, and a somewhat acrid, bitter taste, but the acridity is much lost in drying.

CHEMICAL PROPERTIES.—Black hellebore root contains a volatile oil, an acrid volatile acid, and other unimportant substances. Both water and alcohol extract its active properties, which probably depend on the volatile acid.

ADULTERATIONS.—Various other roots are substituted for, or intermixed with, black hellebore root on the continent; but in consequence of the limited employment of the drug, the fraud is but very rarely practised in this country, nevertheless I have recently had an instance of it brought under my notice. The root should be constantly renewed, as it loses its properties by keeping.

THERAPEUTICAL EFFECTS.—This substance is classed among the vegetable irritant poisons, but in medicinal doses it operates as a drastic cathartic; and although little esteemed in modern practice, was highly prized by the ancients as a purgative in cerebral and nervous disorders and in dropsy; it was also said to possess emmenagogue and anthelmintic properties. Not only did they prize it, but they were well acquainted with the fact of its deteriorating on keeping. Never, probably, were the properties of any medicine so admirably summed up as of this by Bergius. "*Recens*, venenata, rubefaciens, resiccans; *recenter siccata*, emetica, purgans, antiphthisiaca, sternutatoria; *diu conservata*, vix purgans, alterans, diuretica." An empirical remedy, used under the name of its inventer, "Bacher's pills," gained such reputation as an emmenagogue that the receipt was purchased from him by the king of France. It was found to be composed of hellebore, myrrh, and carduus benedictus. However, once known, it speedily lost its reputation, and fell into disuse, making one other instance of *omne ignotum pro magnifico*.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. iij. to gr. xij.

* *Tinctura Hellebori.* (Hellebore, bruised, ℥v.; proof spirit, Oij.; macerate for 7 days, express and strain.) Dose, fʒj. to fʒij.

HYDRARGYRUM CUM CRETA. *Mercury and Chalk.*

PREPARATION.—Take of mercury, by weight, one ounce; prepared chalk, two ounces.

Rub the mercury and chalk in a porcelain mortar until metallic globules cease to be visible to the naked eye, and the mixture acquires an uniform grey colour.

PHYSICAL PROPERTIES.—A greyish, heavy, insoluble powder; void of odour, but having an astringent, metallic taste.

CHEMICAL PROPERTIES.—According to the recent investigations of many celebrated chemists, this preparation appears to consist of metallic mercury in a state of minute division, suboxide of mercury, and carbonate of lime combined mechanically; but in what proportion the metal and oxide exist has not been yet ascertained. On the addition of the stronger acids to the powder effervescence takes place; and by exposure to heat the mercury is volatilised.

THERAPEUTICAL EFFECTS.—A gentle cathartic and alterative, peculiarly adapted for infancy and childhood, promoting and improving the secretions of the liver, pancreas, and intestines. In combination with rhubarb and aromatic powder, it is employed with much benefit in the diarrhœa of children when the stools are clay-coloured, and when there is acidity of the primæ viæ. Prescribed with dried carbonate of soda, it is our most useful alterative in the cutaneous affections of infancy and childhood. (See also *Special Stimulants.*)

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. j. to gr. v., for children; it is seldom prescribed as a cathartic for adults, the dose would be from gr. x. to gr. xxx., in which quantity salivation would probably result from its administration.

INCOMPATIBLES.—The mineral acids; acetic acid; and all sulphates.

* HYDRARGYRUM CUM MAGNESIA. *Mercury with Magnesia.* Prepared in a similar manner to the last, carbonate of magnesia being employed instead of prepared chalk. Its properties and doses would appear to be nearly similar, but it acts with greater certainty as a cathartic, and is consequently to be preferred in many cases. (See also *Special Stimulants.*)

HYDRARGYRI PILULA. *Mercurial Pill.* (Syn.: *Blue Pill.*)

PREPARATION.—Take of mercury, two ounces; confection of roses, three ounces; liquorice root, in fine powder, one ounce. Rub the mercury with the confection of roses, until metallic globules are no longer visible, then add the liquorice, and mix the whole well together.

PHYSICAL PROPERTIES.—A soft pill mass, of a dark blue colour, and agreeable odour.

CHEMICAL PROPERTIES.—This preparation, like the two last, probably consists of metallic mercury in a state of minute division combined with the suboxide of mercury. Three grains of the pill contain one grain of mercury.

ADULTERATIONS.—If the pill mass be prepared with confection of roses to which sulphuric acid had been added, as is sometimes done to brighten its colour, it will contain subsulphate of mercury which possesses very irritating properties. This may be detected by triturating the mass with boiling water, and adding to the filtered liquor solution of nitrate of baryta; if any sulphate be present, a white precipitate insoluble in nitric acid will be produced. The blue pill mass sold in the United States, and which is often exported from England, is constantly largely adulterated with a blue earthy matter, and with Prussian blue, starch, &c.; this fraud, which is easy of detection, has been but very rarely practised in this country.

THERAPEUTICAL EFFECTS.—Although blue pill is most generally employed to produce the specific effect of the mercurial preparations, in full doses it operates as a cathartic. In consequence of its general alterative powers, and the peculiar property it possesses of improving and stimulating the biliary secretions, it is commonly prescribed in combination with the different cathartic pill masses, particularly the compound colocynth pill. Thus combined, taken at night, and followed by an active purgative draught in the morning, it is found especially useful in the milder forms of derangement of the biliary organs. The five-grain blue pill at night, and black draught the following morning, still maintain in public estimation the position originally conferred on them by the celebrated Abernethy. (See also *Special Stimulants.*)

DOSE AND MODE OF ADMINISTRATION.—Given alone as a cathartic, gr. v. to gr. xv.; combined with other purgatives, gr. ij. to gr. v.

JALAPA. *Jalap.* (Syn.: *Mexican Bindweed.*) *Exogonium Purga*, Bentham. Plate 4280, vol. lxxv. *Bot. Mag.* The tubers dried; imported from Mexico. *Root (Tuber) of Exogonium purga* (Bentham), *of Ipomœa purga* (Nees Von Esenbeck), *Jalap.* The officinal jalap root is now well known to be obtained from the plant indicated above according to the nomenclature of different botanists. It is a native of Mexico, from a town of which, *Xalapa*, its name is derived, and of Vera Cruz; and belongs to the Natural family *Convolvulaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Roots tuberous, incrassated; stems, herbaceous, smooth, climbing; leaves, greenish, alternate, petioled, cordiform; flowers, large, one to three, on axillary peduncles; corolla, large, campanulate, white, with a reddish-purple centre.

PREPARATION.—The root is dug up, at the time the young shoots begin to appear, and dried by exposure to the air, or suspended in net bags over a fire.

CHARACTERS.—Varying from the size of a nut to that of an orange, ovoid, the larger tubers frequently incised, covered with a thin brown wrinkled cuticle; presenting when cut a yellowish-grey colour, with dark-brown concentric circles.

PHYSICAL PROPERTIES.—Jalap root is met with in commerce, in pieces varying much both in size and form. The entire tubers are ovoid, from the size of a nut to that of an orange, generally incised more or less deeply, and in different directions; externally rugose, compact, dark-brown; whitish or yellowish within, marked with concentric zones. The flat pieces are merely transverse slices of the entire tubers. The fracture of jalap root is marbled and compact, presenting many brilliant points (resin); the odour is faint, but very nauseating; the taste, nauseous and acrid. It is pulverised with difficulty.

CHEMICAL PROPERTIES.—Jalap is composed of hard and soft resin, bitter extractive, gummy extractive, albumen, uncrystallizable sugar, gum, mucilage, starch, and colouring matter. The resin, its active principle, exists in the proportion of from ten to fourteen per cent.; it is soluble in alcohol, while water dissolves only the gummy non-cathartic components of the root; to this latter principle a diuretic effect has been ascribed by some practitioners. The starch is often eaten by insects; such pieces are said to be worm-eaten, they are the most active, as they contain in proportion to their weight more resin. Jalap resin is of a slightly yellow colour, odourless and tasteless when pure; insoluble in water, but readily soluble in alcohol. It assumes a beautiful crimson colour when moistened with strong sulphuric acid, and allowed to stand for a quarter of an hour, which colour disappears on the addition of water. The soft resin may be readily separated from the hard acid resin, the former being soluble in ether, while the latter is not.

ADULTERATIONS.—Jalap root, as met with in English commerce, can be scarcely said to be adulterated; at one time slices of white Bryony root were mixed with it, but the white colour and intense bitterness of the spurious root rendered the fraud easy of detection. On the Continent many forms of spurious or counterfeit jalaps are mixed with the true root; they may, for the most part, be distinguished by being very rugose, of a reddish or rose colour internally, not compact, with a faint odour, and almost insipid. The purity of jalap resin may be readily ascertained by its action with sulphuric acid, as the beautiful crimson colour above described is not manifested if any other resin be present: the most ordinary adulteration is with resin of guaiacum. This admixture gives a red colour with sulphuric acid, which becomes greenish on the addition of water, if even the sixtieth part of guaiacum resin be contained in the specimen tested.

THERAPEUTICAL EFFECTS.—Jalap is a powerful cathartic, operating principally upon the small intestines; administered in too large a dose, it causes violent hypercatharsis and inflammation. In medicinal doses it is certain in its operation, increasing the peristaltic action, and promoting the secretions and exhalations of the alimentary canal, without causing any irritation; consequently it is frequently and beneficially prescribed for children. Occasionally, however, it causes great nausea, even vomiting, and during its cathartic action gives rise to unpleasant griping, hence the necessity for combining it with ginger, or some such aromatic. Its chief use as a cathartic is in simple constipation *without inflammation*, in ascites, in scrofulous affections, and in verminous diseases: in the two latter it is beneficially combined with calomel; in dropsy, with cream of tartar. It sometimes causes salivation, if its use be long persisted in. Jalap produces purging if applied to a wound or to the surface of the body, the cuticle having been previously removed by means of a blister.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx. for an adult; gr. ij. to gr. viij. for children; it may be given made into a bolus, or suspended in water or any simple decoction.

PREPARATIONS.—Extractum, Pulvis compositus, Pulvis Scammonii compositus. (See *Scammony*.) Resina, Tinctura.

Extractum Jalapæ. Extract of Jalap. (Take of jalap, in coarse powder, one pound; rectified spirit, four pints; distilled water, one gallon. Macerate the jalap in the spirit for seven days; press out the tincture, then filter, and distil off the spirit, leaving a soft extract. Again macerate the residual jalap in the water for four hours, express, strain through flannel, and evaporate by a water-bath to a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140°, to a proper consistence.) In this operation the spirit exhausts the jalap of its resin, whilst the water takes up its gummy and mucilaginous principles. According to Mr. Brande, when thus doubly exhausted, jalap yields 66 per cent. of extract, composed of 16 resinous, and 50 gummy extractive; a statement from which it appears that the resin constitutes one-fourth the weight of the entire extract, a fact of importance to practitioners in the habit of using the extract prepared according to the formulary of the Edinburgh Pharmacopœia, in which water was not employed, consequently this present preparation has but one-fourth its activity. The only advantage that the presence of the watery extract seems to possess is that of diluting and thus modifying in its griping properties the resin, as my observations do not tend to corroborate the opinion entertained of its diuretic properties; certainly they are not well marked. Dose, gr. v. to gr. xx.

Pulvis Jalapæ Compositus. Compound Powder of Jalap. (Take of jalap, in powder, five ounces; acid tartrate of potash, nine ounces; ginger, in powder, one ounce. Rub them well together, and pass the powder through a fine sieve.) An active hydragogue cathartic. Dose, gr. xv. to gr. xxx.

Jalapæ Resina. Resin of Jalap. (Take of jalap, in coarse powder, eight ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Macerate the jalap with sixteen fluid ounces of the spirit in a covered vessel, at a gentle heat for twenty-four hours; then transfer to a percolator, and, when the tincture ceases to pass, pour into the percolator successive portions of spirit until the jalap is exhausted. Add to the tincture four fluid ounces of the water, and distil off the spirit by a water-bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this two or three times with hot water, and dry it on a porcelain plate, by a stove or water bath.)

CHARACTERS.—In dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale-brown powder, sweetish in odour, acrid in the throat; easily soluble in rectified spirit, but only partially so in ether, and insoluble in oil of turpentine.

Resin of jalap may be distinguished from that of scammony by *not* forming an emulsion on being rubbed up with milk. That portion of jalap resin which ether does *not* dissolve is the jalap resin properly so called, *Rhodeoretin;* whilst jalapic acid, and *Pararhodeoretin,* a resinous principle obtained from the Ipomæa Orizabensis, are each soluble in both spirit and ether. Its non-solubility in oil of turpentine indicates the absence of coniferous resins. A solution in spirit of jalap resin sophisticated with guaiacum resin, (a possible impurity) will strike a blue colour with the freshly cut surface of a raw potato; whilst a bit of paper moistened with it will yield a blue colour on being exposed to the fumes of nitric oxide gas. The reaction already described between jalap resin and sulphuric acid, is very characteristic. Dose, gr. j. to gr. v. I have found the addition of one grain of this resin to each of the ordinary gingerbread cakes of the confectioners a very convenient and useful method of administering purgative medicine to *recalcitrant* children. Pereira gives a formulary for this purpose, but practitioners will find it more convenient to get an obliging confectioner to prepare them, and the palate must be very fastidious which will detect the fraud.

Tinctura Jalapæ. Tincture of Jalap. (Take of jalap, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the jalap for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij. A safe, active cathartic, generally combined with infusion of senna and sulphate of magnesia *(black draught)*, the appearance of which, however, it does not improve, in consequence of the precipitate yielded by the resin on the dilution of the spirit.

* *Sapo Jalapinus,* (Castile soap; and jalap resin, equal parts; rectified spirit, a sufficiency; dissolve and evaporate with a gentle heat to the consistence of a conserve.) Dose, gr. xij. to gr. xx. for adults; gr. iij. to gr. vj. for children.

MAGNESIA. *Magnesia* (described in the division *Antacids,* which see) given in full doses operates as a gentle cathartic; its effect, however, being by no means uniform or certain, depending probably on the quantity of free acids in the stomach, by union with which it forms soluble magnesian salts. It does not increase the secretions of the intestines, but by stimulating their muscular fibres, causes the evacuation of their contents. Magnesia is very generally employed as a purgative in infantile diseases, and by females and persons of a delicate habit of body; it is most usually combined with rhubarb, a combination frequently employed and with much benefit in the early stages of diarrhœa, particularly when dependent on irritation or acidity of the primæ viæ. Magnesia, when taken for a long period, has in some instances accumulated to a great extent, and even formed concretions in the bowels. Should it therefore be thought advisable to continue its use for any time, it will be necessary to administer an active cathartic occasionally. Dose, gr. xx. to gr. lx. for adults; gr. ij. to gr. x. for children.

MAGNESIÆ CARBONAS. *Carbonate of Magnesia* (described in the division *Antacids*, which see) is a still milder cathartic; it is employed in the same cases, but is used less frequently than magnesia, in consequence of its producing flatulence from the disengagement of carbonic acid in the stomach. Dose, gr. lx. to gr. cxx. for adults; gr. x. to gr. xx. for children. Some French practitioners have stated that they noticed the disappearance of warts from the hands of persons who had been taking the carbonate of magnesia for some time, and have consequently recommended its use to individuals affected with these unsightly growths. A mildly laxative effervescing draught may be prepared with a drachm of carbonate of magnesia, the juice of one lemon, and a wineglassful of water. The solution of the bicarbonate of magnesia acts as a gentle laxative in doses of from f℥ij. to f℥iv.; its activity may be increased and an agreeable effervescing draught of citrate of magnesia formed by the addition of lemon juice or citric acid. The latter in the proportion of gr. xxx. of the crystals dissolved in water for each ounce of the fluid magnesia.

MAGNESIÆ SULPHAS *Sulphate of Magnesia.* (Syn.: *Epsom Salts, Bitter Purging Salt.*) $MgO, SO_3 + 7HO (= 123.)$

PREPARATION.—An article of the Materia Medica; it was formerly prepared by evaporating the waters of the Epsom springs, whence one of its synonyms; at present various processes are followed by different manufacturers, which it would be out of place to do more than allude to here. Two principal sources exist for the production of this salt,—one, *dolomite*, or the magnesian limestone, a mixture of the carbonate of lime and magnesia; the other, *bittern*, or the liquor which remains after the extraction of common salt from sea water. From the first of these it is procured by a process which consists first in calcining the dolomite, by which is obtained lime and magnesia; these are next converted into hydrates, the lime separated by one or other of many different processes, such as the addition of acetic, nitric, or hydrochloric acids, &c., so as to remove it but not the magnesia, which is now converted by sulphuric acid into the sulphate of magnesia. From *bittern* it is obtained by evaporation and crystallization, the resulting crystals being purified by repeated solution, evaporation, and crystallization.

CHARACTERS.—In minute colourless and transparent rhombic prisms, possessing a bitter taste. It readily dissolves in water, and the solution gives copious white precipitates with chloride of barium, and with a mixed soluion of ammonia, hydrochlorate of ammonia, and phosphate of soda.

The white precipitate produced on the addition of chloride of barium is sulphate of barytes, thus, $MgOSO_3 + BaCl = BaOSO_3 + MgCl$. The precipitate on the addition of the mixed salts is the ammoniaco-magnesian phosphate ($NH_4O,2MgO,PO_5$), thus accounted for, $2NaO\ HO\ PO_5 + 2MgO\ SO_3 + NH_4O = NH_4O,2MgOPO_5 + 2NaOSO_3 + HO$; the hydrochlorate of ammonia is not introduced into the equation, as the only part it plays is to prevent the premature precipitation of the magnesia by the ammonia.

PHYSICAL PROPERTIES.—Usually met with in small acicular crystals, transparent and colourless; inodorous; with an extremely bitter, disagreeable taste. By slow crystallization tolerably large crystals are readily obtained; their form is the four-sided rhombic prism, with reversed dihedral summits, or four-sided pyramids. Specific gravity 1·66.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of magnesia, 1 of acid, and 7 of water ($MgO, SO_3, HO + 6HO$). It is permanent in the air, but in a slightly increased temperature effloresces, losing 6 equivalents of water at a temperature considerably under 300°, first fusing in its water of crystallization; if the temperature be raised still higher it becomes anhydrous, and undergoes the igneous fusion, but is not decomposed. It dissolves in its own weight of water at 60°, and in three-fourths of its weight of boiling water. It is insoluble in alcohol.

TESTS.—Its aqueous solution at ordinary temperatures is not precipitated by oxalate of ammonia. The precipitate given by carbonate of soda, when obtained from a boiling solution of one hundred grains of the salt, should, when well washed, dried, and heated to redness, weigh 16·26 grains.

The non-precipitation on the addition of oxalate of ammonia argues the absence of lime, whilst the remainder of the test is devoted to the establishing of the quantity of oxide of magnesia which 100 grs. should yield, which is as stated 16·26 grains. So the test allows of no impurity.

ADULTERATIONS.—At present this salt is met with in a state of great purity; sometimes, however, when prepared from bittern it contains chloride of magnesium, which being very deliquescent is readily recognized. On the continent in the present day, and formerly also in this country, crystals of sulphate of soda, which is a much cheaper salt, are fraudulently mixed with those of sulphate of magnesia; the sophistication will be detected by the test of the Pharmacopœia, which is intended to show that the full proportion of magnesia is present.

THERAPEUTICAL EFFECTS.—Sulphate of magnesia is a refrigerant cathartic, operating mildly but effectually, augmenting the secretions and promoting the peristaltic action of the intestinal canal; the evacuations are watery, and are not attended with either nausea or griping. It is consequently more generally employed at present than perhaps any other medicine of this class; it has also the advantage of great cheapness. This salt is peculiarly adapted for all forms of febrile and inflammatory affections, especially when accompanied by constipation. In short, there are but few diseases in which cathartics are indicated, that it may not be employed in with benefit. Sulphate of magnesia forms the active ingredient in many mineral waters.

DOSE AND MODE OF ADMINISTRATION.—gr. cxx. to ℥j. dissolved in seven or eight times its weight of water. Its cathartic properties are promoted by dilution; therefore a smaller dose than usual will suffice, if dissolved in a large quantity of water; tincture of some aromatic bitter, as of cascarilla, calumba, orange peel, &c. may be added with advantage to the solution to conceal its nauseous taste; this is best done, however, by the addition of ten or twelve minims of dilute sulphuric acid, or by administering the salt in the acid infusion of roses (two ounces of the salt dissolved in eight ounces of the infusion), f℥j. each three hours for a dose; the *red bottle* of the hospitals, an elegant and beneficial form as an aperient in the commencement of febrile diseases. In such cases its beneficial effects are sensibly increased by the addition of one grain to each eight ounces of this mixture of tartar emetic. In consequence of their resemblance, oxalic acid has been frequently sold by mistake for this salt. For diagnostic characters see *Oxalic Acid*.

Enema Magnesiæ Sulphatis. Enema of Sulphate of Magnesia. (Syn.: *Enema Catharticum,* Ed. Dub.) (Take of sulphate of magnesia, one ounce; olive oil, one fluid ounce; mucilage of starch, fifteen fluid ounces. Dissolve the sulphate of magnesia in the mucilage of starch, add the oil, and mix.) A very generally used and most efficient cathartic enema—the entire quantity intended for administration in the case of an adult.

* *Pulvis Salinus compositus.* Pure chloride of sodium, and sulphate of magnesia, of each, ℥iv.; sulphate of potash, ℥iij.; dry the salts with a gentle heat, and pulverise them separately; then triturate them well together, and keep in a well-closed vessel. Dose, gr. cxx. to ℥ss. dissolved in Oss. of water. In the preparation of this powder, instead of the sulphate of potash, I have employed ℥iv. of sulphate of soda, using a sufficiently high temperature to expel all the water of crystallization from each of the salts, and found the resulting compound a more effectual cathartic in smaller doses; gr. lx. dissolved in half a pint of water, and taken in the morning before breakfast, in general operating freely and with perfect safety.

* *Pulvis Salinus Aperiens Effervescens.* A more agreeable form than the preceding, but in every other respect closely imitating it, will result from the following combination suggested by E. Durand

as an imitation of *Moxon's Efferverscing Magnesia*—"carbonate of magnesia, gr. lx.; sulphate of magnesia, bicarbonate of soda, tartrate of soda and potash, and tartaric acid, of each gr. cxx.; expel all the water of crystallization from the salts, and mix"; dose, one to two teaspoonfulls in half a tumbler of water whilst effervescing. If this mixed saline is to be kept, the direction to expel the water of crystallization is essential, else effervescence would spontaneously ensue. The addition of a lump of sugar and a drop of oil of lemons to each dose will make this a most agreeable as it is a most valuable laxative.

INCOMPATIBLES.—The alkaline carbonates; lime water; muriate of ammonia; chloride of calcium; chloride of barium; the acetate of lead; and nitrate of silver. The bicarbonates of the alkalies are not incompatible with sulphate of magnesia, unless at the temperature of boiling water.

* MANGANESIÆ SULPHAS. *Sulphate of Manganese.* This salt, which is left as the residue in the preparation of oxygen gas by heating together black oxide of manganese and sulphuric acid, acts as a cathartic when administered in doses of from one to six drachms dissolved in a large quantity of water. It seems to stimulate the parenchymatous viscera of the abdomen, particularly the liver, to increased secretion, as the evacuations caused by it contain a large quanty of bile. It is rarely used at present, but some years since was brought under the notice of the profession by Dr. Ure of London, as likely to prove a useful purgative in gouty affections. In several cases in which I tried it I found its action very uncertain, and its disagreeable styptic taste a great objection to its use. Sulphate of manganese should be always combined with some other cathartic, as with senna, for if given alone it is apt to produce vomiting. The salts of manganese have been recently highly commended by some French writers as useful adjuncts to preparations of iron when circumstances indicate the administration of the latter. This matter will be referred to in the chapter on Tonics, when treating of the therapeutical uses of that metal.

MANNA. *Manna.* Fraxinus Ornus *Linn.* and Fraxinus rotundifolia, *DC.* Plate 53, *Steph. and Church. Med. Bot.* (A concrete exudation from the stem, obtained by incisions; imported from Sicily and the south of Europe.) Nearly all the species of the genera fraxinus and ornus yield manna, but the greater portion of what occurs in commerce is obtained from the Fraxinus rotundifolia; a native of the south of Europe, chiefly of Sicily and the south of Italy. It belongs to the Natural family *Oleaceæ*, and to the Linnæan class and order *Diandria Monogynia.*

BOTANICAL CHARACTERS.—Fraxinus ornus is a small tree; Leaves opposite, pinnate; Panicles, large, many-flowered; Flowers, small, polygamous, white; the whole tree resembles much in appearance the common ash of our climate. Fraxinus rotundifolia is by many considered to be a variety of fraxinus ornus; the chief difference between them is in the shape of the leaves.

PREPARATION.—The juice of the stem exudes spontaneously either from fissures in the bark, through the punctures of insects, or more usually from incisions made expressly with a hooked knife. It concretes rapidly on the tree, and is then removed by the hand.

CHARACTERS.—In stalactiform pieces from one to six inches in length, and one or two inches in width, uneven, porous, and friable, furrowed on one side, of a yellowish-white colour, with a faintly nauseous odour, and a sweetish taste; soluble in water and rectified spirit.

PHYSICAL PROPERTIES.—Two sorts are commonly met with in the shops. 1st.—Flake manna, *Manna cannellata;* it occurs in stalactiform pieces, from one to six inches in length, and one or two inches in width, uneven, rugged, porous and friable; of a dull yellowish white colour; concave on the surface by which they adhere to the tree, on which side they are usually somewhat soiled; convex on the other. It has a faint, somewhat nauseous odour, and a sweetish insipid taste. 2nd.—Fatty manna, *Manna pinguis;* it is in soft, viscid fragments of a brownish-yellow colour, much soiled and mixed with impurities; its odour is very nauseous, and its taste viscid and disagreeable.

CHEMICAL PROPERTIES.—Manna consists of a peculiar saccharine principle named *Mannite,* uncrystallizable sugar, gummy matter, nitrogenous matter and moisture; it contains about 40 per cent. of mannite and about ten per cent. of sugar. It softens with the heat of the hand, and melts at a temperature a little higher; is soluble in three parts of water at 60°, and in eight parts of rectified spirit. Mannite, its active principle, may be obtained by boiling manna in alcohol, and pouring off the spirit, from which as it cools the mannite is deposited in crystals. Its composition is $C_{12}H_{14}O_{12}$. Two important differences distinguish it from sugar properly so called—first, its solutions do not possess the property of *rotatory polarization;* second, it is not susceptible of the vinous fermentation when mixed with yeast.

ADULTERATIONS.—Flake manna, which is alone employed in medicine, is not liable to adulteration.

THERAPEUTICAL EFFECTS.—Manna is a very mild laxative, occasionally, however, giving rise to flatulence and griping; it is principally employed in the diseases of children and delicate females; in the present day it is seldom employed alone, being generally used for sweetening cathartic mixtures. When first gathered, manna does not possess any laxative properties, and is employed as a nutritive article of diet in the countries where it is produced.

DOSE AND MODE OF ADMINISTRATION.—For children, gr. lx. to ʒss.; for adults, ℥j. to ℥ij.—*Mannite,* for children, gr. xxx. to gr. cxx.; for adults, ʒss. to ʒj. Manna which has become hard by keeping forms an excellent excipient for forming the more active insoluble powders into pills.

MEL. *Honey.* Apis mellifica, *Linn.* The Hive Bee. (A saccharine secretion deposited by the insect in the honeycomb; British and imported.) Honey is secreted by the nectaries of most flowers, from whence it is collected by the bee, an insect belonging to the order *Hymenoptera;* in the honey-bag of the insect, which is a dilatation of the œsophagus, it probably undergoes some alteration previously to its deposition in the cells of the honey-comb.

CHARACTERS.—A viscid, semitranslucent liquid, of a brownish-yellow colour, with a peculiar heavy odour, and a very sweet taste.

TESTS.—Boiled with water for five minutes and allowed to cool, it does not become blue with the solution of iodine.

Honey is too well known to need description; it is composed of grape-sugar, cane-sugar, mannite, acetic acid, aromatic principle, wax, &c. It is sometimes adulterated with sand, with starch, or with wheaten or pea flour; the first adulteration may be detected by its incomplete solution in water, the sand, &c. remaining behind; the others, by the action of tincture of iodine on the cooled decoction, which is rendered blue if any fecula be present. Dissolved in a large quantity of water, honey possesses demulcent and cooling properties; in a small portion of water it operates as a mild laxative. It is now but little used in medicine; nevertheless, eaten at breakfast it is found very beneficial by persons liable to habitual constipation. The honey most esteemed by connoisseurs is Narbonne honey; the flavor of which can be imitated by the introduction of a sprig of rosemary into the hive. I have frequently seen a curious idiosyncracy connected with honey in the persons of those partaking of it, the induction by it of a plentiful crop of hives. Honey has in some instances proved poisonous, in consequence of having been collected by bees from poisonous flowers. This honey, which comes from Trebizond, is said by Tournefort to owe its noxious properties to the bees having collected it from a poisonous plant—the Azalea Pontica. By melting honey in a water bath and straining while hot through flannel, Clarified Honey, *Mel Depuratum,* is prepared. Both the flavour and odour of honey are injured by this process.

Mel Depuratum. Clarified Honey. (Take of honey, five pounds. Melt the honey in a water bath, and strain, while hot, through flannel previously moistened with warm water.)

OLEUM OLIVÆ. *Olive Oil.* Olea Europæa, *Linn.* Plate 15, *Steph. and Church. Med. Bot.* (The oil expressed from the fruit in the south of Europe.) This tree, originally a native of Asia Minor, now grows freely on the borders of the Mediterranean, and is cultivated all over the south of Europe, especially in Provence. It belongs to the Natural family *Oleaceæ,* and to the Linnæan class and order *Diandria Monogynia.*

BOTANICAL CHARACTERS.—A moderately-sized tree with hard, veined wood;

Leaves, in pairs, acute, hoary beneath, giving a whitish character to the foliage; Flowers, small, white; Drupe, elliptical, dark bluish-green, with a hard nut generally one-seeded.

PREPARATION.—The finer sorts of the oil are obtained by simply pressing the fresh ripe fruit in a mill; a second sort, by moistening the marc, left after the first expression, with boiling water, and repressing it; and a third, and very inferior sort, by boiling this cake in water, and submitting it to very strong pressure.

CHARACTERS.—Pale yellow, with scarcely any odour, and a bland oleaginous taste; congeals partially at about 36°.

PHYSICAL PROPERTIES.—Olive oil is a transparent, limpid, unctuous fluid, of a yellow colour, pale or greenish according to quality (the finer sorts being of a lighter shade); when good, odourless, with a bland, sweetish taste: by keeping it acquires both a rancid odour and taste, more slowly, however, than the other fixed oils. Specific gravity, ·911 at 77° F.

CHEMICAL PROPERTIES.—It is composed of 72 parts of *elaine*, and 28 of *margarin*. Olive oil readily saponifies: exposed to the air, even in thin layers, it thickens but does not dry. It congeals at 36° F.; is insoluble in water or in alcohol, but at 59° it dissolves in once and a half its weight of ether.

ADULTERATIONS.—Cheaper vegetable oils, as poppy-oil, sesame oil, cocoa-nut oil, and rape-seed oil, are commonly employed to adulterate olive oil. The best test for ascertaining its purity is that of Poutet, by means of which 5 per cent. of adulteration can be detected; it was adopted in the last edition of the Edinburgh Pharmacopœia:—"Mix with a twelfth of its volume of solution of nitrate of mercury, prepared by dissolving with a gentle heat, ℥iv. of mercury in f℥ixss. of nitric acid (density, 1380 to 1390); if pure, it becomes in three or four hours like a firm fat, without any separation of liquid oil." For ordinary purposes the presence of other fixed oils may be more readily ascertained by shaking the oil in a bottle half filled, when, if it be pure, the surface of the oil soon becomes smooth by repose, but if it be adulterated, a number of air bubbles, *beads*, remain.

THERAPEUTICAL EFFECTS.—It is seldom given by the mouth as a cathartic, but forms an admirable addition to *laxative enemata*, in inflammation or spasms of the intestines, in dysentery, or in irritation of the urino-genital organs. (See also *Emollients*.) The leaves of the olive tree have been often administered as a febrifuge with excellent effect.

DOSE AND MODE OF ADMINISTRATION.—f℥j. to f℥ij. by the mouth; f℥ij. to f℥iv. in an enema with decoction of barley.

PREPARATIONS.—Linimentum calcis, linimentum camphoræ (which see).

PODOPHYLLUM. *Podophyllum.* (Syn.: *May apple, Mandrake.*) Podophyllum peltatum, *Linn.* Plate 1819, *Bot. Mag.* (The root dried; imported from North America.) An herbaceous plant indigenous in the United States, growing extensively and luxuriantly in moist shady places, and in low marshy grounds. It belongs to the Natural family *Ranunculaceæ*, Juss.; *Podophylleæ*, Lindley; and to the Linnæan class and order *Polyandria Monogynia.*

BOTANICAL CHARACTERS.—Stem about a foot high, erect, divided at top into two petioles, supporting at the fork a solitary one-flowered peduncle. Each petiole bears a large peltate, palmate leaf, with six or seven wedge-shaped lobes, yellowish-green on upper, pale on lower surface; calyx, three leaves, deciduous; corolla, six to nine petals, white, fragrant; fruit, a pulp (from its colour and shape called the *wild lemon*); seeds, twelve, ovate; officinal part, the rhizome.

CHARACTERS.—In pieces of variable length, about two lines thick, mostly wrinkled longitudinally, dark reddish-brown externally, whitish within, breaking with a short fracture; accompanied with pale brown rootlets. Powder yellowish-grey, sweetish in odour, bitterish, subacrid, and nauseous in taste.

CHEMICAL PROPERTIES.—It is composed of albumen, gum, starch, extractive matter, lignin, gallic acid, fixed oil, traces of volatile oil, salts of potassa and lime, and two resinous principles, one soluble in alcohol and ether, the other soluble in alcohol alone; both resins possess active cathartic properties. (J. R. Lewis' *Am. Journ. of Pharmacy*, xix. 165.)

THERAPEUTICAL EFFECTS.—The powder of the root is possessed of cathartic, approaching chologogue, properties, producing copious alvine evacuations, occasionally attended with griping, nausea, and even vomiting. It seems to possess marked action over the hepatic functions; according to some authorities, so well marked that it would almost entitle it to the designation of *vegetable calomel.* It has been found peculiarly useful in the sluggish livers of those who indulge too freely in the pleasures of the table, acting efficiently according to the dose employed. I know no medicine, however, so uncertain in this last respect, the dose appearing to vary with almost every individual case,—in some half a grain of the *resin* acting with energy, others requiring three or four grains,—so much so that it becomes a matter of necessity cautiously to feel the way, and adjust the dose to each particular constitution. The dose of the powder varies from five to twenty grains; in this form, however, it is not used here, the resin being invariably selected for administration.

Podophylli Resina. Resin of Podophyllum. (Take of podophyllum, in coarse powder, one pound; rectified spirit, three pints, or a sufficiency; distilled water, a sufficiency; hydrochloric acid, a sufficiency. Exhaust the podophyllum with the spirit by percolation; place the tincture in a still, and draw off the spirit. Acidulate the water with one twenty-fourth of its bulk of hydrochloric acid, and slowly pour the liquid which remains after the distillation of the tincture into three times its volume of the acidulated water, constantly stirring. Allow the mixture to stand for twenty-four hours to deposit the resin. Wash the resin on a filter with distilled water, and dry it in a stove.) A pale greenish-brown amorphous powder, soluble in rectified spirit and in ammonia; precipitated from the former solution by water, from the latter by acids. Almost entirely soluble in pure ether. Dose, gr. ¼ to gr. iij. (see *formulæ*).

POTASSÆ ACETAS. *Acetate of Potash.* (Syn.: *Foliated Earth of Tartar.*) $KO, C_4H_3O_3(=98.)$

PREPARATION.—Take of carbonate of potash, twenty ounces; acetic acid, two pints, or a sufficiency. To the acetic acid, placed in a tin porcelain basin, add gradually the carbonate of potash; filter; acidulate, if necessary, with a few additional drops of the acid, and, having evaporated to dryness, 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 it into stoppered bottles.

EXPLANATION OF PROCESS.—In this case the carbonate of potash is decomposed by the acetic acid, which unites with the potash to form acetate of potash, whilst the carbonic acid escapes, thus, $KOCO_2 + \bar{A} = KO\bar{A} + CO_2$.

CHARACTERS.—White foliaceous satiny masses, very deliquescent, with a watery solution of which tartaric acid causes a crystalline precipitate; sulphuric acid, the disengagement of acetic acid, and a dilute solution of perchloride of iron strikes a blood-red colour.

The precipitate produced on the addition of tartaric acid (*bitartrate of potash*) proves the salt to be one of potash, whilst the development of acetic acid on the addition of the sulphuric acid establishes the fact of its being the acetate. The blood-red colour alluded to is due to the production of the sesquiacetate of iron on the addition of the perchloride, thus, $Fe_2Cl_3 + 3KO\bar{A} = Fe_2O_33\bar{A} + 3KCl$.

PHYSICAL PROPERTIES.—Masses of white, needle-shaped, satiny crystals, odourless when dry, but emitting a faint acetous odour when moistened; they have a pungent, somewhat acrid but cooling taste, and are soapy to the touch. Specific gravity, 2·10.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of potash, and 1 of anhydrous acetic acid ($KO, C_4H_3O_3$); it deliquesces on exposure to the air, and is very soluble both in water and in alcohol; by heat it is fused, and if the heat be increased is decomposed, *pyro-acetic spirit* being driven off and *carbonate of potash* left.

ADULTERATIONS.—This salt is scarcely liable to adulteration; it should be snow-white, and perfectly neutral. The following are the tests for it contained in the Pharmacopœia, its not being affected by the hydrosulphuret proving the absence of metallic impurities accidentally introduced from the employment in its preparation of metallic vessels.

TESTS.—Neutral to test paper, entirely soluble in rectified spirit. Its solution is unaffected by hydrosulphuret of ammonia.

THERAPEUTICAL EFFECTS.—Scarcely ever used as a cathartic, nevertheless in sufficient doses it operates effectually, producing watery evacuations, and is therefore, independently of its diuretic properties, well adapted for dropsical diseases. (See also *Diuretics*.)

DOSE AND MODE OF ADMINISTRATION.—As a cathartic, ℥ss. to ℥j. dissolved in a large quantity of water.

INCOMPATIBLES.—The mineral acids and their soluble salts; and tartaric acid.

POTASSÆ SULPHAS. *Sulphate of Potash.* (Syn.: *Sal Polychrest.*) $KO,SO_3(=87.)$

PREPARATION.—Take of the residue of the process for nitric acid, one pound; slaked lime, eight ounces; boiling distilled water, half a gallon; carbonate of potash, sixty grains; dilute sulphuric acid, six fluid drachms, or a sufficiency. Dissolve the residue of the nitric acid process in the water, and gradually add to it the slaked lime, until reddened limus paper immersed in it is restored to a blue colour. Filter the solution through calico, and, having heated it to the boiling point, add the carbonate of potash as long as there is any precipitate. Filter again, add the dilute sulphuric acid, so as to produce a neutral or slightly acid solution, and, having evaporated this till a film forms on the surface, set it by for twenty-four hours. The crystals, which will then have formed, should be dried on filtering paper, and preserved in a bottle.

EXPLANATION OF PROCESS.—The residue of the nitric acid process is a varying mixture of sulphate and bisulphate of potash; the object of the present process is to remove the second atom of the sulphuric acid from the bisulphate, and reduce it to the state of sulphate. This is done by the addition of the slaked lime, which abstracts the second atom of sulphuric acid, and is converted into sulphate of lime, which precipitates, and is removed on filtration thus, $KO2SO_3+CaO=KOSO_3+CaOSO_3$; but during this operation a portion of lime is dissolved, and would contaminate the product were it not for the addition of the carbonate of potash, which converts it into carbonate of lime (removed by the second filtration) and caustic potash, thus, $CaO+KOCO_2=CaOCO_2+KO$. This latter is saturated on the addition of the sulphuric acid, and the process is completed by crystallization.

CHARACTERS.—In colourless hard six-sided prisms, terminated by six-sided pyramids, which decrepitate strongly when heated, and are sparingly soluble in water. Its solution, acidulated with hydrochloric acid, is precipitated white by chloride of barium, and yellow by bichloride of platinum.

PHYSICAL PROPERTIES.—A solid white salt, crystallizing usually in single or double six-sided prisms, terminated by six-sided pyramids; inodorous, with a slightly bitter saline taste. The crystals are very hard, and are therefore employed in pharmacy for triturating and dividing vegetable powders. Specific gravity, 2·4. The white precipitate alluded to in the *Characters* is sulphate of baryta, proving that it is a salt of sulphuric acid, whilst the yellow precipitate on the addition of bichloride of platinum proves it to be a salt of potash. This precipitate is a double chloride of potassium and platinum, *potassio bichloride of platinum* $(KCl,PtCl_2)$. To explain its production we will require three equivalents of bichloride of platinum and two of sulphate of potash, which, in virtue of the potassium taking the place of one of the equivalents of platinum, yield two equivalents of the salt in question, one equivalent of the sulphate of the *binoxide* of platinum, and one atom of free sulphuric acid. Thus, $3PtCl_2+2KOSO_3=2(KCl,PtCl_2)+PtO_2SO_3+SO_3$.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of potash, and 1 of sulphuric acid (KO,SO_3); is unalterable in the air; heated, it decrepitates, and at a strong red heat fuses, but is not decomposed; it requires 9 parts of water at 60° and 5 of boiling water for its solution, but is insoluble in alcohol.

TESTS.—Neutral to test paper; its solution is not affected by oxalate of ammonia.

ADULTERATIONS.—Sulphate of potash is seldom adulterated in this country; on the continent, however, it has been often found to contain sulphates of copper, of zinc, or of iron, and in some instances corrosive sublimate. Were its solution affected by the addition of oxalate of ammonia, the presence of lime would be indicated. The best tests of its purity are, the neutrality of the solution, and its not precipitating with gallic acid, with ammonia, with hydro-sulphate of ammonia, or with nitrate of silver.

THERAPEUTICAL EFFECTS.—In doses from two to four drachms, this salt has occasionally produced symptoms of irritant poisoning; it is nevertheless a mild cathartic, generally operating effectually, and with scarcely any disturbance of the system, but on account of its little solubility it is not much employed alone. It is not adapted for children, as it is apt to produce vomiting if given to them in even a moderate dose. Sulphate of potash is an excellent purgative for females after delivery, when it is wished to diminish the secretion of milk.

DOSE AND MODE OF ADMINISTRATION.—Gr. lx. to ℥ss. dissolved in warm water, or in powder combined with rhubarb, with which in prescriptions it is almost invariably combined.

INCOMPATIBLES.—Nitric and hydrochloric acids; tartaric acid; chloride of calcium; chloride of barium; the acetate and diacetate of lead; nitrate of silver; corrosive sublimate; and sulphate of magnesia.

POTASSÆ TARTRAS. *Tartrate of Potash.* (Syn.: *Neutral Tartrate of Potash, Soluble Tartar.*) $2KO,C_8H_4O_{10}$(=226.)

PREPARATION.—Take of acid tartrate of potash, twenty ounces, or a sufficiency; carbonate of potash, nine ounces and a quarter, or a sufficiency; boiling distilled water, two pints and a half. Dissolve the carbonate of potash in the water; add by degrees the acid tartrate of potash, and if, after a few minutes boiling, the liquid is not neutral to test paper, make it so by the careful addition of more of the carbonate or of the acid tartrate. Then filter, concentrate till a pellicle forms on the surface, and set it aside to cool and crystallize. More crystals may be obtained by evaporating and cooling the

mother liquor. Drain the crystals, dry them by exposure to the air in a warm place, and preserve them in a stoppered bottle.

EXPLANATION OF PROCESS.—On the addition of the acid tartrate to the carbonate of potash effervescence takes place, due to the decomposition of the latter by the former salt; the acid tartrate takes up a second atom of potash from the carbonate, and is converted into the neutral tartrate, thus, $HO,KO\bar{T}+KOCO_2=2KO,\bar{T}+CO_2+HO$. The filtration is directed with the view of getting rid of *tartrate of lime,* an impurity derived from the bitartrate, in which it is always present.

PHYSICAL PROPERTIES.—A solid white salt, crystalline, but generally met with in the form of a granular powder; the crystals are small right rhombic prisms. It is inodorous, and has a cooling saline taste. Specific gravity, 1·556.

CHARACTERS.—In small colourless four or six-sided prisms. Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas, and the odour of burned sugar. Hydrochloric acid added sparingly to its solution causes the separation of a white crystalline precipitate.

The destructive action of the sulphuric acid on the tartaric acid results in the production of a black color, the sulphuric acid removing the hydrogen and oxygen in the form of water from the tartaric acid, and setting free its carbon. The white crystalline precipitate is bitartrate of potash, produced by the abstraction by the hydrochloric acid from the tartrate of potash of one of its atoms of base, thus, $2KO,\bar{T}+HCl=KCl+HO,KO\bar{T}$.

CHEMICAL PROPERTIES.—It is composed of 2 equivalents of potash, and 1 of tartaric acid. It attracts moisture in a damp atmosphere, but does not deliquesce. It is soluble in an equal weight of cold water, whence the name *soluble tartar* is applied to it; it is likewise soluble in alcohol.

TESTS.—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 100 measures of the volumetric solution of oxalic acid.

ADULTERATIONS.—This salt is not unfrequently adulterated with the bitartrate, which may be known by its not being soluble in its own weight of water at 60°. It also sometimes contains carbonate or sulphate of potash, or chloride of potassium; any of which may be detected by the precipitates occasioned in it by chloride of barium or acetate of lead not being soluble in dilute nitric acid. When heated to redness the elements of the tartaric acid are resolved into carbonic acid which unites with the potash, forming carbonate of potash, the *alkaline residue,* and oxygen, carburetted hydrogen, carbonic oxide, and carbonic acid gases, which are burned off. The gaseous products are complicated, but the following equation will give a general idea of them, $2KO,C_8H_4O_{10}=2KOCO_2+C_2H_4+2CO+2CO_2$; but as each 226 grains of tartrate of potash include the materials for two equivalents of carbonate of potash, it is evident that half that amount, or 113 grains, will yield one equivalent of carbonate of potash, which will require for saturation 100 measures of the volumetric solution as stated in the *tests*.

THERAPEUTICAL EFFECTS.—A mild but efficient purgative; in its passage through the system becoming converted into carbonate of potash, and thus possessing the power of rendering the urine alkaline. Not much employed in the present day. By accelerating the operation of the resinous purgatives, it is said to correct their griping properties.

DOSE AND MODE OF ADMINISTRATION.—Gr. cxx. to ℥j. in solution, or in some of the vegetable purgative infusion such as that of senna.

INCOMPATIBLES.—All acids, and most acidulous salts; lime water; chloride of calcium; nitrate of silver; and acetate of lead.

POTASSÆ TARTRAS ACIDA. *Acid Tartrate of Potash.* (Syn.: *Potassæ Bitartras.—Crystals of Tartar; Crude Tartar; Cream of Tartar.)* $HO, KO, C_8H_4O_{10}$ (=188.)

PREPARATION.—Bitartrate of potash is an article of the Materia Medica; it is obtained by dissolving and recrystallizing *argol*, an obscurely crystalline substance, which concretes on the inside of casks in which new wine has been kept. A purer salt is produced by redissolving these crystals, evaporating the solution slowly, and removing the crust as it forms on the surface, whence the name *cream of tartar*.

CHARACTERS.—A finely gritty white powder, or fragments of cakes crystallized on one surface; of a pleasant, acid taste, sparingly 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. This effervesces with dilute hydrochloric acid, and forms a solution which, when filtered, gives a yellow precipitate with bichloride of platinum, and when neutralized by ammonia is rendered slightly turbid by oxalic acid.

PHYSICAL PROPERTIES.—This salt is met with in the form either of a fine white powder, or a semi-transparent crystalline mass, the crystals being oblique rhombic prisms; it is without odour, but has an agreeable acid taste. Specific gravity, 1·953. In the *pharmacopœial* characters the yellow precipitate proves it to be a salt of potash, $(KCl+Pt,Cl_2)$, whilst the *slight turbidity* is due to the presence of lime. For further explanation of characters see p. 166.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of potash, and 1 of tartaric acid, combined with 1 of water $(HO,KO,C_8H_4O_{10})$; it is unalterable in the air, and is soluble in 184 parts of water at 68°, and in 18 parts of boiling water, the solution having a strongly acid reaction. By heat the salt is decomposed, and converted into a compound of charcoal and carbonate of potash (*Black Flux*).

TESTS.—188 grains heated to redness till gas ceases to be evolved leave an alkaline residue, which requires for exact saturation 100 measures of the volumetric solution of oxalic acid.

ADULTERATIONS.—This salt in the state of powder is very much adulterated; the substances commonly employed for this purpose are, finely powdered marble, detected by oxalate of ammonia; alum and bisulphate of potash, detected by chloride of barium; and wheaten flour or starch, detected by iodine. Should it fulfil the pharmacopœial test it may be understood as being perfectly pure. The test will be understood by reference to the preceding preparation.

THERAPEUTICAL EFFECTS.—In full doses cream of tartar operates as an active cathartic, producing many watery evacuations without much irritation. It is seldom prescribed singly, but, in general, with some of the milder vegetable cathartics. Thus, combined with sulphur in the form of electuary, it is an exceedingly useful purgative in hemorrhoidal affections and in various other diseases; and with jalap it forms an excellent cathartic in dropsies. (See also *Diuretics*.)

DOSE AND MODE OF ADMINISTRATION.—Gr. clxxx. to ℥ss. made into an electuary with honey or treacle. Its solubility in water may be much increased without impairing its medicinal activity, by adding to it a fourth of its weight of boracic acid or borax.

* *Effervescing aperient with cream of tartar* (Cream of tartar, gr. clxxx.; carbonate of soda, in crystals, gr. cl.; water, f℥viij.). For one dose.

INCOMPATIBLES.—The mineral acids; the alkalies; lime water; the carbonates of potash and of soda; acetate of lead; and magnesia and its sulphate.

PREPARATIONS.—Confectio sulphuris, pulvis jalapæ compositus (described p. 153).

PRUNUM. *Prune.* Prunus domestica, *Linn.* *The Plum.* Plate 85, *Woodv. Med. Bot.* (The dried drupe from plants cultivated in southern Europe.) The plum tree, originally a native of Syria, is now cultivated extensively in the temperate regions of Europe, and in the British Isles; it belongs to the Natural family *Rosaceæ* (*Drupaceæ*, Lindley), and to the Linnæan class and order *Icosandria Monogynia*.

CHARACTERS.—About an inch long, ovate, wrinkled, black, sweet, and somewhat austere.

The fruit dried in the sun constitutes *prunes;* they are imported principally from Bordeaux. Prunes are mildly laxative, and are sometimes added to infusion of senna to conceal its nauseous taste. They enter into the composition of the confection of senna of the Pharmacopœia.

PREPARATION.—Confectio sennæ.

* RHAMNI BACCÆ. *Buckthorn berries. Fruit of Rhamnus catharticus. Rhamni Succus. Juice of the fruit of Rhamnus catharticus.* An indigenous shrub belonging to the Natural family

Rhamnaceæ, and to the Linnæan class and order *Pentandria Monogynia*.

BOTANICAL CHARACTERS.—Stems, about ten feet high, branching, spiny; leaves, ovate, sharply serrated; flowers, small, yellowish-green, diœcious; fruit, a berry.

PHYSICAL PROPERTIES.—The berries are about the size of peas, black, shining, four-seeded, with a green juicy parenchyma; they have an acrid, nauseous taste, and when bruised emit a faint unpleasant odour. The juice is preserved in the form of syrup.

CHEMICAL PROPERTIES.—The juice consists of a peculiar colouring matter, acetic acid, mucilage, sugar, and nitrogenous matter. A purgative principle exists in the berries, which has been named *Cathartin;* it differs, however, from the cathartin of senna leaves, being more nearly allied to aloetin both in a chemical and therapeutical point of view. Trenkler has prepared it from the unripe green berries, by treating the inspissated juice with alcohol and ether,—℔xij. yield ℥viij. of impure cathartin. By evaporating to dryness the juice mixed with lime or with alum, the pigment, *sapgreen*, is obtained.

ADULTERATIONS.—The berries of the *Rhamnus frangula* are often substituted for, or mixed with buckthorn berries; they may be detected by having only *two* seeds.

THERAPEUTICAL EFFECTS.—The fresh berries or their expressed juice operate as a powerful cathartic, producing many watery evacuations; but, in consequence of the severity of their operation, frequently accompanied by severe tormina, thirst, and distressing nausea, although in former days much vaunted in the treatment of dropsy, they are at present scarcely ever used.

DOSE AND MODE OF ADMINISTRATION.—Of the fresh berries, 10 to 20. The dose of *Cathartin* is from gr. j. to gr. iij.

* *Syrupus Rhamni.* (Fresh juice of buckthorn berries, Oiv.; ginger, sliced; and pimento, bruised, of each, ℥vj.; pure sugar, ℔iv.; let the juice rest three days, pour off the clear liquor and strain it. Digest the pimento and ginger in Oj. of the strained liquor at a gentle heat for four hours, and filter. Boil down the rest of the juice to Oiss., mix the two liquors, add the sugar, and dissolve it with heat.) Dose, f℥ss. to f℥j.

RHEUM. *Rhubarb.* (One or more undetermined species of rheum, *Linn.* The root, deprived of the bark and dried; from Chinese Thibet, and Tartary.) The exact species of the genus rheum, from which the different varieties of rhubarb met with in commerce are obtained, is as yet unknown. They inhabit the northern regions of Asia, from the shores of the Caspian Sea to the Chinese wall, and are cultivated in most of the countries of Europe. The genus is placed in the Natural family *Polygonaceæ*, and in the Linnæan class and order *Enneandria Monogynia.* The following species of rheum have been referred to by different authorities as yielding rhubarb of one kind or another, viz:—*Rheum palmatum; R. australe; R. rhaponticum; R. compactum; R. emodi; R. webbianum; R. spiciforme; R. moorcroftianum; R. crassinervium; R. leucorrhizum; R. undulatum, &c.* But Sievers, sent specially by Catherine II. of Russia, to investigate the subject, after four years of laborious travel, could only succeed so far as to enable him to declare that not one of these varieties was the true species, at the same time acknowledging that he himself had failed in arriving at the true species. Dr. Royle believes that the rhubarb-producing country is in the very centre of Thibet, a region as yet unexplored by naturalists, which in some measure accounts for our present state of ignorance upon this point.

BOTANICAL CHARACTERS.—All the species are characterized by having a perennial root, which sends up annual root leaves, usually very large, deeply incised, and wavy at the edges, generally cordate; a herbaceous flowering stem, from two to four feet high; flowers, small; calyx, petaloid, six-parted, withering.

PREPARATION.—The root is dug up when the plant is five or six years old, washed, scraped, and cut into various sized pieces to facilitate the drying; the pieces are then pierced, strung upon cords, and dried differently in various localities; sometimes on stone tables heated beneath by a fire, sometimes in the sunshine, sometimes slowly under sheds by a current of air, while in Tartary the Moguls are *said* to hang them about their tents or on the horns of their sheep (?).

PHYSICAL PROPERTIES.—Three varieties of rhubarb are ordinarily met with in British trade, each of which shall be considered separately, viz.—Russian, Chinese or East Indian, and English Rhubarb.

1. RUSSIAN RHUBARB; *Turkey Rhubarb;* it is met with in irregular shaped pieces, from an inch to three inches in breadth, roundish, sometimes flattened on one side, angular, heavy, of a bright-yellow colour, without any traces of epidermis; generally perforated with conical, not cylindrical holes, in some pieces extending completely, in others only partially through their substance; internally compact, beautifully marbled with yellow, red, and white streaks or points. The odour is strong and peculiar; the taste is bitter and faintly astringent; chewed it feels gritty under the teeth, owing to the presence of crystals of the oxalate of lime, and tinges the saliva yellow; it may be readily pulverized; the powder is of a bright yellow colour. This description of rhubarb is collected by the Bucharians on the mountains of Tartary, brought by them to the Russian town of Kiachta for barter, whence it is conveyed to St. Petersburgh, where it is sorted, packed into boxes or cases, which are covered on the outside with a hide, and then exported to the different countries of Europe and to the British Isles.

2. CHINESE, OR EAST INDIAN RHUBARB, is met with in globular or flat pieces, rounded, not angular on the surface, of a brownish-yellow colour, usually presenting some traces of epidermis; somewhat heavier than Russian rhubarb; perforated with cylindrical holes, in many of which are found pieces of cord by which the roots

were suspended while being dried; internally they are close and compact, marbled and spotted yellowish-brown and whitish; the odour is somewhat stronger than that of Russian rhubarb, the taste similar; the powder is not of so bright a colour. This description is the product of the northern provinces of China; it is imported in chests directly from Canton or by way of Singapore.

3. ENGLISH RHUBARB. Two kinds are commonly met with.—1st. *Stick Rhubarb;* which occurs in pieces about five or six inches long, and half an inch in diameter, round, striated, of a dirty-yellowish-brown colour externally, blackish internally with reddish streaks; its odour is faint, and its taste astringent, not gritty.—2nd. *Trimmed Rhubarb;* this sort is often sold for Turkey Rhubarb, which it is prepared to represent; its texture, however, is in general soft and spongy, it has a pinkish hue, is mucilaginous, and is pulverized with difficulty; its taste is astringent, its odour faint, and it is not gritty under the teeth, containing but few crystals of oxalate of lime; occasionally, however, we meet with specimens of English rhubarb that give as gritty a sensation as even the best Russian—a fact conclusive of the worthless character of this test in estimating the value of any variety of rhubarb.

The following sorts of rhubarb are of such rare occurrence in the English market, that a mere mention of them will suffice:—*French rhubarb, Bucharian rhubarb, Siberian rhubarb, Canton-stick rhubarb*, and *Himalayan rhubarb.*

CHARACTERS.—Trapezoidal, roundish, cylindrical, or flattish pieces, frequently bored with one hole, yellow externally, internally marbled with fine waving greyish and reddish lines, finely gritty under the teeth; taste bitter, faintly astringent and aromatic; odour strong and very peculiar.

CHEMICAL PROPERTIES.—According to the extended analysis of Brandes in 1836, rhubarb consists of a peculiar principle, named by him *Rhabarberic acid (Rhein, Rheumin, Rhabarberin, Caphopicrite, Chrysophanic acid*, of other chemists), gallic and tannic acids, uncrystallizable sugar, starch, gummy extractive, colouring extractive, pectic acid, malate and gallate of lime, oxalate of lime, inorganic salts, silica, iron, and woody fibre. More recently rhubarb has been carefully analysed by Schlossberger and Doppig, and later still by Schroff of Vienna. The former chemists ascertained that the various so-called active principles above enumerated under different names were all compound, and contained *Chrysophanic acid* as their base; and they also isolated from the spirituous extract three different resins which they termed *Aporetine, Phaoretine*, and *Erythoretine*. Schroff's experiments were chiefly directed to ascertain in what peculiar principle the purgative property of the drug depended, but this he completely failed in doing, chrysophanic acid, rhein, and rhabarberine being much less active as purgatives than the powder of rhubarb. It is hence manifest that the chemistry of this important medicine is still to be investigated. Rhubarb yields its active principles to both cold and boiling water, to proof spirit, to alcohol, and to ether.

TESTS.—**Free from brown specks externally and internally, without cavities. Boracic acid does not turn the yellow exterior brown. In the powder, adulterations are detected with difficulty.**

ADULTERATIONS.—The inferior sorts, especially British rhubarb, are frequently mixed with, or substituted for the finer kinds; the fraud may be detected by attending to the characters given above for the different varieties. Powdered Turkey, or East India rhubarb, is very generally adulterated with British rhubarb; the sophistication is difficult of detection, but the fresh powder of the finer sorts is always of a bright *yellow* colour. The pharmacopœial test with boracic acid is directed against turmeric, an occasional impurity in *powdered* rhubarb, and which, if present, would be turned brown by boracic acid. English is said to differ from Chinese rhubarb in containing a larger amount of starch and a smaller amount of raphides, in consequence of which iodine strikes a deeper and more permanent blue with its infusion than it does with the infusion of Chinese rhubarb, and on being chewed it feels less gritty under the teeth; nevertheless we meet with many samples of English rhubarb as rich in raphides as the best Chinese, and we meet with specimens of Chinese rhubarb, the infusions of which react with iodine in a manner not to be distinguished from those of English origin. In many instances, however, I have found the iodine test to act satisfactorily.

THERAPEUTICAL EFFECTS.—Rhubarb acts upon the whole tract of the digestive canal as a mild tonic, cathartic, and astringent. In small doses it manifests its tonic properties only, promoting the digestive process, as evidenced by increased appetite and an improvement in the quality of the alvine secretions. In full doses it operates as a mild cathartic, stimulating to increased activity the muscular coat of the whole of the intestinal canal, more especially that of the duodenum, but scarcely, if at all, augmenting the secretions. Its astringent properties are manifested after the cathartic action has ceased, constipation usually following its purgative effects. The combination of these properties, as well as the safety and mildness of its operation, renders rhubarb a remedy of much value in many diseases. Thus in the treatment of the early stages of the *diarrhœa of irritation*, it is the most efficacious purgative we can employ; it is also peculiarly adapted as a cathartic for infancy and childhood, and as a general laxative for persons with enfeebled digestion, and in all cases of debility of the digestive organs. For the same reasons rhubarb is inadmissible in the treatment of febrile and inflammatory affections. Rhubarb is absorbed in the course of its operation, and its peculiar odour and yellow colouring matter may be recognised in the urine, in the sweat, in the serum of the blood, and in the milk of nurses, to the latter of which it imparts a purgative property.

DOSE AND MODE OF ADMINISTRATION.—In powder as a stomachic tonic, gr. v. to gr. x.; as a cathartic, gr. xx. to gr. xl. A few drops of the essential oil of nutmegs rubbed up with powdered rhubarb masks its disagreeable odour.

Extractum Rhei. Extract of Rhubarb. (Take of rhubarb, sliced or bruised, one pound; rectified spirit, ten fluid ounces; distilled water, five pints. Mix the spirit and the water, and macerate the rhubarb in the mixture for four days; then decant, press, and set by, that the undissolved matter may subside; pour off the clear liquor, filter the remainder, mix the liquors, and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence.) Dose, gr. v. to gr. xx.

Infusum Rhei. Infusion of Rhubarb. (Take of rhubarb, in thin slices, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) Stomachic, mildly laxative, a good vehicle for more active cathartics. Dose, f℥ss. to f℥ij.

Pilula Rhei Composita. Compound Rhubarb Pill. (Take of rhubarb, in fine powder, three ounces; Socotrine aloes, in fine powder, two ounces and a quarter; myrrh, in fine powder, one ounce and a half; hard soap, one ounce and a half; English oil of peppermint, one fluid drachm and a half; treacle, by weight, four ounces. Reduce the soap to a fine powder, and triturate it with the rhubarb, aloes, and myrrh, then add the treacle and oil of peppermint, and beat the whole into a uniform mass.) A most valuable pill mass, tonic, and aperient. Dose, gr. v. to gr. xx.

Pulvis Rhei Compositus. Compound Powder of Rhubarb. (Take of rhubarb, in powder, two ounces; light magnesia, six ounces; ginger, in powder, one ounce. Mix them thoroughly, and pass the powder through a fine sieve.) A useful antacid powder, well known under the name of "Gregory's Powder." It is found specially useful in the diseases of children, and inasmuch as it keeps well, is deservedly a popular domestic remedy. Dose *for children*, gr. v. to gr. x.; *for adults*, gr. xxx. to gr. lx.

Tinctura Rhei. Tincture of Rhubarb. (Take of rhubarb, bruised, two ounces; cardamoms, bruised, a quarter of an ounce; coriander, bruised, a quarter of an ounce; saffron, a quarter of an ounce; proof spirit, one pint. Macerate the rhubarb, cardamoms, coriander, and saffron for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) A valuable cordial cathartic, frequently added to aperient draughts. Dose, f℥ss. to f℥iij.

* *Tinctura Rhei et Aloes.* (Rhubarb in moderately fine powder, ℥iss.; Socotrine, or East Indian aloes, in moderately fine pow-

tity employed—a fact first noticed by Cullen, and since his time confirmed by numerous observers. The following are a few of the cases in which its use as a cathartic is particularly indicated; inflammatory or spasmodic diseases of the intestinal canal or of the urino-genital apparatus; hemorrhoidal affections; stricture of the rectum; during pregnancy and after delivery; in diseases of infancy and childhood; after surgical operations about the pelvis or abdomen, &c. If castor oil be at all rancid it becomes very acrimonious, causing much irritation, and sometimes even troublesome diarrhœa.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥ij., by the mouth or in the form of enema; it is best taken floating on the surface of water to which some aromatic tincture, as of cascarilla or of orange peel, has been added; or it may be made into an emulsion with yolk of egg or with mucilage and flavoured with syrup of orange peel. In fact the methods of administering it may be reduced under two heads—the *domestic*, and the *pharmaceutical*. In the former it is administered in boiled milk (the least objectionable way), coffee, in brandy, port wine, &c.; in the latter, in the form of emulsion. M. Parola has proposed the substitution of an ethereal or alcoholic tincture of castor oil seeds for the oil itself. He states as the result of numerous trials he has made, that the tinctures are four times as strong as the oil, than which they are less irritant and less apt to produce vomiting. The tinctures (for which M. Parola does not give any formulæ) may be readily prepared by macerating ℥viij. of the fresh seeds, freed from the seed-coats and bruised, in Oj. of rectified spirit or of ether for seven days and filtering: the dose of either would be from fℨij. to fℨiij. But from some experiments which I made with these tinctures, their action appears to be very uncertain.

* *Castor oil purgative emulsion,* (Castor oil, f℥j.; yolk of egg, 1; peppermint water, f℥ss.; water, f℥ij.; syrup of orange peel, f℥j.; mix.) Sufficient for one dose, but objectionable from its bulk.

* *Castor oil draught,* RIGHINI. (Gum arabic, in fine powder, ℨij.; pure water, f℥ij.; make a mucilage with a small quantity of the water, and add, of castor oil, f℥j.; mix carefully and pour in the rest of the water with constant agitation; and finally add the filtered juice of one orange and f℥j. of simple syrup.) The nauseous taste of the oil is completely concealed in this draught, the only objection to which is its bulk.

* *Castor oil draught,* MACNAMARA. (Castor oil, fℨvi.; essential oil of lemons, min. x.; essential oil of cloves, min. ij.; simple syrup, fℨiss.; solution of caustic potash, fℨj.; orange flower water, f℥j. M.) If carefully prepared this will make a perfect emulsion that will not separate for a long time, and in which the taste of the oil is well masked. The eructation, which, in the generality of cases, brings back so vividly and so unpleasantly the taste of the castor oil, in this instance will carry but the flavour of lemons; whilst the clove gives it an agreeable sense of warmth in the stomach. In com-

pounding it the oils should first be mixed and then be rubbed up with xx. minims of the liquor kali; next, the syrup should be well incorporated, and then xx. more minims of the liquor be added; then, four drachms of the water; then, the last xx. minims of the potash solution; and, finally, the remainder of the water—diligent trituration of the mixture being kept up during the addition of the water. In addition to its agreeable taste it has the great advantage of carrying in small bulk an efficient dose of castor oil.

SCAMMONIÆ RADIX. *Scammony Root.* Convolvulus Scammonia, *Linn.* Plate 5, *Woodv. Med. Bot.* (The dried root; from Syria.) A native of Greece, and various parts of the Levant, where it is found growing in hedges and bushy places. It is placed in the Natural family *Convolvulaceæ,* and in the Linnæan class and order *Pentandria Monogynia.*

CHARACTERS.—Tap-shaped roots, sometimes three inches in diameter at the top, brown without, white within, slightly odorous but tasteless. Ether agitated with the powder and evaporated leaves a residue having the properties of scammony resin.

BOTANICAL CHARACTERS.—Root, very thick, fusiform, fleshy, abounding in a milky juice; Stems, smooth, herbaceous, climbing; Leaves, pointed, hastate; Flowers, on long, solitary peduncles, yellowish, with purple stripes.

This root, hitherto quite a stranger to our Pharmacopœias, has been introduced now with the praiseworthy object of supplying us a source from whence we could obtain the *resin* of scammony in a state of purity. Previously we were obliged to have recourse to the gum-resin scammonium, as procured from the living root and imported to us; but the constant impurity of which rendered desirable some other source for procuring the resin. The pharmacopœial authorities still, however, recognize scammony, and describe it as "SCAMMONIUM, a gum-resin obtained by incision from the living root in Syria." The following is the course pursued for its preparation :—

PREPARATION.—The inspissated juice of the root, which constitutes scammony, is procured as follows:—The earth having been cleared away, the top of the root is sliced off obliquely with a sickle-shaped knife from an inch to an inch and a-half below where the stems spring from it; as the juice flows out, it is received in mussel shells and exposed to the air until it thickens; the best roots, although generally four feet in length and three or four inches in diameter, yield only about two drachms of scammony.

CHARACTERS.—Ash-grey and rough externally; fresh fracture resinous, splintery, shining, black when dry; odour and flavour cheesy; causes, when chewed, a slight prickly sensation in the back of the throat; easily triturated into a dirty-grey powder, and converted with water into a smooth emulsion.

PHYSICAL PROPERTIES.—In the market three different articles are met with under the name of scammony—first, *pure* scammony; second, *adulterated* scammony; third, *factitious* scammony. Fine scammony, *Virgin scammony,* is in amorphous masses, weighing from two ounces to half a pound each, very porous, friable, and of an ash-grey colour externally; its fracture is conchoidal, very resinous, porous, and of a dark greenish-black colour; the odour is strong, peculiar, resembling somewhat that of old cheese, heightened by being breathed on, and the taste is acrid and nauseous; specific gravity, 1·210. This variety of scammony is scarce, and when met with bears a very high price. Scammony as it commonly occurs comes under the second head, and is a more or less impure article; it is usually imported in boxes or drums, seldom in cakes; it is heavier than virgin scammony, more compact, and of a pale, ash-grey colour; its fracture is earthy, dull, not porous, and of a greyish-black colour; in some specimens presenting numerous white specks (chalk); its odour and taste are the same as of pure scammony; specific gravity, from 1·276 to 1·543. The *factitious* variety, as its name implies, is a mixture of various resins, starches, gums, &c., made up so as to imitate the genuine article.

CHEMICAL PROPERTIES—According to Christison's analysis, fine specimens of virgin scammony consist of 81 to 83 per cent. of resin, 6 to 8 per cent. of gum, and some woody fibre, sand, moisture, and sometimes a trace of starch. In the best specimens which I have had an opportunity of examining, I have found but 76 per cent. of resin. The *resin* is the active principle of the drug; it may be readily obtained by treating scammony with sulphuric ether and evaporating to dryness, or by the process of the Pharmacopœia given below; in mass it is of a reddish-yellow colour, shining and semi-transparent; its powder is pale straw colour; it is void of odour and taste when quite pure. It is soluble in alcohol, ether, and oil of turpentine, and forms with unskimmed milk a fine uniform emulsion. By the latter characteristic and also by its solubility in oil of turpentine it is distinguished from resin of jalap.

TESTS.—It does not effervesce with hydrochloric acid. Boiling water agitated with the powder, cooled, and filtered, does not strike a blue colour with tincture of iodine. Ether removes from 80 to 90 per cent. of resin; and what remains is chiefly soluble gum, with a little moisture.

ADULTERATIONS.—No drug is more generally and more uniformly adulterated than scammony; it is indeed very difficult to meet with it in a perfectly pure state. And to so great an extent is the adulteration practised, that in many specimens which I have examined I have frequently found not more than from 28 to 35 per cent. of resin present. The substances used to adulterate the drug are chalk and flour either separately or conjointly, guaiacum resin, and gum tragacanth. Chalk and flour may be readily detected; the former, by the effervescence produced when hydrochloric acid is dropped on a small fragment; the latter, by a cooled and filtered decoction of the powder being rendered blue by tincture of iodine. The adulteration with guaiacum resin has been practised only within the last few years, but I have met with it in many samples. Its presence may be discovered by pouring a few drops of an alcoholic tincture of scammony on the fresh-cut surface of a raw potato, when, if guaiacum be present, a blue colour will be produced: or by exposing paper moistened with the tincture to nitrous acid fumes (obtained by pouring a little nitric acid over some slips of copper), which will be rendered blue if this fraud has been practised. I have never found tragacanth in scammony, but this sophistication is stated to have been detected in one instance. It may be discovered by first separating the resin with sulphuric ether, and then treating the residue with cold water, when, if any gum tragacanth be present, a thick mucilage will be formed. From these observations the reader will be in a condition to understand the pharmacopœial tests.

THERAPEUTICAL EFFECTS.—Scammony, when pure, is a powerful cathartic, operating as a direct irritant to the intestinal mucous membrane, and producing copious watery evacuations. It is well adapted for cases of habitual constipation arising from a torpid state of the intestinal canal, for passive dropsies, for apoplectic affections, and as an active purgative for children, for whom it is beneficially combined with calomel. If there be any tendency to inflammation of the digestive organs, scammony is contraindicated as a cathartic. From the difficulty of procuring the drug in a pure state, scammony has of late years fallen into much disrepute.

DOSE AND MODE OF ADMINISTRATION.—In powder, if the scammony be pure, for an adult, gr. v. to gr. x., but as usually met with, double that quantity; it should be prescribed in combination with some bland powder, or made into an emulsion with milk.

PREPARATIONS.—Of the root, *Resina*. Of the resin, *Confectio*, *extractum colocynthidis compositum*, already described, p. 143; *Mistura;* of the Gum Resin Scammonium, *confectio*, *Extractum colocynthidis compositum*, already described, p. 143; *Pilula colocynthidis composita*, already described, p. 144; *Pilula colocynthidis et hyoscyami*, already described, p. 144; *Pulvis compositus*. It thus appears that in two of the preparation the confection and compound colocynth extract, scammony or its resin is indifferently directed.

Scammoniæ Resina. Resin of Scammony. (Take of scammony root, in coarse powder, eight ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Macerate the scammony root with sixteen fluid ounces of the spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and, when the tincture ceases to pass, pour into the percolator successive portions of spirit until the root is exhausted. Add to the tincture four fluid ounces of the water, and distil off the spirit by a water-bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this two or three times with hot water, and dry it on a porcelain plate by a stove or water-bath.)

CHARACTERS.—In brownish translucent pieces, brittle, resinous in fracture, of a sweet, fragrant odour if prepared from the root.

TESTS.—It cannot form singly an emulsion with water. Its tincture does not render the fresh-cut surface of a potatoe blue. Ether dissolves it entirely.

The resin of scammony is a most valuable preparation, and especially adapted for children, in consequence of the tasteless form in which it may be administered. Dose, for an adult, gr. ij. to gr. v.; best administered according to the following formula.

Mistura Scammonii. Scammony Mixture. (Take of resin of scammony, four grains; milk, two ounces. Triturate the resin of scammony with a little of the milk, and continue the trituration, gradually adding the remainder of the milk until a uniform emulsion is obtained.) The addition to this draught of four minims of cherry laurel water and gr. cxx. of sugar will make it a most palatable medicine—in this form it is an imitation of *Planche's* purgative potion; f℥ss. may be given to children, who will rarely object to take it.

Confectio Scammonii. Confection of Scammony. (Take of scammony, or resin of scammony, in fine powder, three ounces; ginger, in fine powder, one ounce and a half; oil of caraway, one fluid drachm; oil of cloves, half a fluid drachm; syrup, three fluid ounces; clarified honey, one ounce and a half. Rub the powders with the syrup and the honey into a uniform mass, then add the oils, and mix.) A cordial, stimulating cathartic, well adapted as an addition to the black draught. Each three grains contains one of scammony. Dose, from gr. vj. to gr. xv. As ordinarily met with in our shops it is highly adulterated, the impurities being traceable to the employment of impure scammony.

Pulvis Scammonii Compositus. Compound Powder of Scammony. (Take of scammony, four ounces; jalap, three ounces; ginger, one ounce. Reduce them separately to fine powder; mix them thoroughly, and pass the powder through a fine sieve.) This powder differs from that contained in the last edition of the Dublin Pharmacopœia, in not containing any cream of tartar. Dose, for a child, gr. ij. to gr. iv.; for an adult, gr. vi. to gr. xij.

* *Scammony biscuits* (Scammony resin, in fine powder, gr. lx.; castile soap, gr. v.; white sugar, gr. xl.; reduce to a fine powder and mix intimately with ℥j. of powdered biscuit; make into a stiff paste with a few drops of water; divide into portions of gr. lx. each, and dry in the air.) Each sixty grains contains gr. vj. of scammony resin.

INCOMPATIBLES.—All acids.

SENNA ALEXANDRINA. *Alexandrian Senna.* Cassia lanceolata, *Lamark, Encyc.;* Plate 345, *Nees, Plant. Med.;* and Cassia obovata, *Colladon,* Plates 347 and 348 (*C. Senna*), *Nees, Plant. Med.* (The leaves, imported from Alexandria; carefully freed from the flowers, pods, and leafstalks of the same, and from the leaves, flowers, and fruit of Solenostemma (*cynanchum*) Arghel, *Heyne.*)

SENNA INDICA. *Tinnivelly Senna.* Cassia elongata, *Lemaire.* Plate 37, *Royle, Bot. Himal.* (The leaves; from plants cultivated in Southern India.) A certain amount of confusion still exists as to the species of the genus cassia which yields the senna leaves of commerce. They are inhabitants of the North of Africa, particularly Egypt; of Arabia, and of the Indian peninsula, where probably the plant has been introduced, and is now naturalized; it is also cultivated in the South of Europe, and in some of the West Indian Islands. The genus belongs to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Decandria Monogynia*.

BOTANICAL CHARACTERS.—Shrubs or herbs, frequently annual; leaves, simply and abruptly pinnate; petioles, frequently glanduliferous; leaflets, opposite; sepals, five, more or less unequal; petals, five, unequal; stamens, ten, free, unequal; ovary, stalked, frequently arched; legumes, various.

PREPARATION.—Senna leaves are gathered by the Arab tribes in Ethiopia, Arabia Felix, Abyssinia, Nubia, and Sennaar, where the shrub is chiefly indigenous. The harvest begins about the end of September; the branches are cut off the trees and exposed to the sun until the leaves begin to fade, when they are placed on high ground and on rocks, so as to be dried as quickly as possible. When quite dry, the branches are laid in heaps and beaten with sticks until the leaves fall off. The method followed in India for the preparation of senna is similar to that used in Egypt.

CHARACTERS.—*Of Senna Alexandrina.*—Lanceolate or obovate leaflets, about an inch long, unequally oblique at the base, brittle, greyish-green, of a faint peculiar odour, and mucilaginous sweetish taste.

TESTS.—The unequally oblique base, and freedom from bitterness, distinguish the senna from the arghel leaves, which are also thicker, stiffer, greyer, and more wrinkled.

CHARACTERS.—*Of Senna Indica.*—About two inches long, lanceolate, acute, unequally oblique at the base, flexible, entire, green, without any admixture; odour and taste those of Alexandrian senna.

PHYSICAL PROPERTIES.—Three sorts of senna are commonly known in the English market, Alexandrian senna, Tripoli senna, and East Indian senna. 1st.—ALEXANDRIAN SENNA, the produce of Nubia and Upper Egypt, is imported in large bales and barrels from Alexandria; it consists of greyish-green leaflets usually much broken, mixed with the flowers and fruits of the various species from which it is obtained; containing also a large quantity, generally about a tenth of the weight of the leaves, flowers, and fruit of the *Cynanchum arghel;* and sometimes a considerable number of pods, with a few leaves of the *Tephrosia apollinea.* Within these past few years either what is sent into commerce is a better article, or on arrival here it is more carefully picked; for I have not found anything like the same amount of impurities in it; nor do I think it as much broken as it used formerly to be. The odour of Alexandrian senna is heavy and disagreeable, yet resembles in some respects that of tea; the taste is viscid and nauseous. 2nd.—TRIPOLI SENNA; it scarcely differs from that just described, for which it is indiscriminately sold; the leaflets are perhaps more broken down, smaller, and of a greener colour; it seldom contains either cynanchum or tephrosia leaflets. 3rd.—EAST INDIAN SENNA, *Tinnivelly senna;* this occurs in large unbroken leaflets, from one to two inches long, and half an inch broad, thin and flexible, and of a fine green colour; the leaflets, however, in some specimens acquire a black tinge or yellowish colour on exposure to the air, which probably arises from imperfect drying; both odour and taste are similar to, but a little weaker than Alexandrian senna.

CHEMICAL PROPERTIES.—According to MM. Lassaigne and Feneulle, Alexandrian senna is composed of *cathartin*, chlorophylle, yellow colouring matter, mucus, albumen, malic acid, and some salts. *Cathartin*, supposed to be the purgative principle, is an uncrystallizable deliquescent substance, with a peculiar odour and a bitter nauseous taste; it is soluble in water and in alcohol, but insoluble in ether. The experiments of Christison on this substance, prepared by himself, would appear to show that it is nearly if not altogether inert, and, therefore, cannot be the active principle of senna. Senna leaves yield their active properties to both cold and warm water, to proof spirit, and to alcohol; warm water extracts about a third of the weight of the leaves.

ADULTERATIONS.—In Egyptian senna, as met with in British commerce, the only adulteration that is practised has been before indicated, namely, with arghel, and sometimes with tephrosia leaflets. The former are readily distinguished by their paler yellowish colour, their coriaceous texture, their under surface being reticulated with veins, their upper surface somewhat rugose, and by their being equal-sided; the leaflets of all the true sennas being unequal at the base. Tephrosia leaflets are easily known by their silky surface, and by the lateral veins proceeding parallel to each other to the very edge of the leaf without ramifying. Two other adulterations are common on the continent, but have never been met with, as far as I am aware, in the British market; one is with the leaflets of the *Colutea arborescens*, or bladder senna, which may be at once distinguished by their regularity at the base; the other, perhaps a more serious fraud in consequence of the supposed poisonous property of the substance employed, is with the leaflets of the *Coriaria myrtifolia;* they are known by presenting three very prominent longitudinal nerves, and chemically by their infusion producing with solution of sulphate of iron a blackish precipitate *(tannate of iron)*, and with gelatin a heavy whitish precipitate *(tannate of gelatin)*. Senna adulterated with the leaves of the *Vaccinium vitisidæa*, containing so much as 75 per cent. of them, has been offered for sale in the French market; the fraud is one easily detected by the character of the leaves, particularly by the reticulated surface and the equality at the base of the latter.

THERAPEUTICAL EFFECTS.—Senna is an active cathartic, holding a middle place between the milder and more active medicines of this class, operating effectually, yet safely, though often producing nausea, griping, and flatulence. Its action is somewhat stimulating, increasing the secretions, and exciting the peristaltic action chiefly, but not alone, of the small intestines. Senna is adapted for all cases requiring an effectual purgative; but it should be combined with the active saline cathartics, for which the infusion is a good vehicle, if it be wished to diminish arterial action or produce general antiphlogistic effects. The only circumstance contra-indicating its employment is an inflammatory condition of the mucous membrane of the alimentary canal. The cathartic principle of senna is absorbed before its operation is produced, as is proved by the action on the intestines when an infusion is injected into the veins, and also by its imparting a purgative property to the milk of nurses.

DOSE AND MODE OF ADMINISTRATION.—Senna is not administered in the form of powder. Gr. cxx. to ℥ss. infused in f℥ij. of boiling water for half an hour and the clear infusion poured off will be sufficient for a dose; its taste is much concealed by the addition to the infusion of some black tea, or what I have found still better, coffee, and it may be sweetened with sugar, and milk added; it is in this way readily taken by children. In the following preparations Alexandrian *or* Indian senna are ordered to be employed indifferently:—

Confectio Sennæ. Confection of Senna. (Take of 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. Boil the figs gently in the water in a covered vessel for four hours, then express and strain the liquor; and having added more distilled water to make up the quantity to twenty-four fluid ounces, put into it the prunes, and boil as before for four hours. Add the tamarinds and the cassia; macerate for a short time; and press the pulp through a hair sieve. Dissolve the sugar and the extract of liquorice in the mixture with a gentle heat; and, while it is still warm, add to it gradually the mixed senna and coriander, and stir diligently until all the ingredients are thoroughly combined. The resulting confection should weigh sixty ounces.) Commonly known as *lenitive electuary*, a mild but efficacious compound in doses of gr. cxx. to ℥ss.; generally badly prepared, and very liable to adulteration, the true preparation being both troublesome and expensive.

Infusum Sennæ. Infusion of Senna. (Take of senna, half an ounce; ginger, sliced, thirty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for one hour, and strain.) Dose, f℥j. to f℥iv. The common cathartic mixture, *Black Draught*, of the hospitals, is prepared by adding ℥j. of sulphate of magnesia to f℥iv. of this infusion.

Syrupus Sennæ. Syrup of Senna. (Take of 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 mark 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 two pounds ten ounces, and should have the specific gravity 1·310.) An agreeable cathartic for children, in doses of from f℥j. to f℥iv., or as an addition to cathartic mixtures for adults, in doses of f℥ss. to f℥j.

Tinctura Sennæ. Tincture of Senna. (Syn.: *Elixir Salutis.*) (Take of senna, broken small, two ounces and a half; raisins, freed from seeds, two ounces; caraway, half an ounce; coriander, half an ounce; proof spirit, one pint. Macerate the senna and the other ingredients for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) A stimulating and cordial cathartic, in doses of f℥ss. to f℥j., only fit for cold leucophlegmatic habits; more generally prescribed as an adjunct to infusion of senna, or other cathartic mixtures, in doses of f℥j. to f℥ij. to correct their griping qualities.

* *Fluid Extract of Senna,* DUNCAN. (Tinnivelly senna, ℔xv.; exhaust with boiling water by displacement—about four times its weight of water is sufficient; concentrate the infusion *in vacuo* to ℔x.; dissolve in the product ℔vj. of treacle previously concentrated over the vapour-bath till a little of it becomes nearly dry on cooling; add of rectified spirit (Dens. ·835), f℥xxiv. and if necessary add water (f℥xvj.) to make Oxv.) Every fluid ounce of this extract corresponds to one *avoirdupois* ounce of senna: the dose is f℥ij. for an adult. This is an excellent preparation, operating effectually, and seldom causing griping or any other annoyance. Alexandrian senna may be used instead of Tinnivelly, the Cynanchum leaves having been previously removed by picking.

INCOMPATIBLES.—The mineral acids; lime water; acetate of lead; tartar emetic; corrosive sublimate; and nitrate of silver.

* SODÆ HYPOSULPHIS. *Hyposulphite of Soda; Sulphuretted Sulphite of Soda.* ($NaOS_2O_2+5HO=124$.)

PREPARATION.—Take of carbonate of soda, dried and powdered, 500 parts; sublimed sulphur, 100 parts; mix, and heat in a glass or porcelain capsule until the mass is completely fused, stirring constantly so as to expose every part of it to the contact of the air. When cold, dissolve in water, filter, and having added more sulphur, boil for a few minutes. Filter again and evaporate with a gentle heat so as to obtain crystals.—WALCHNER.

PHYSICAL PROPERTIES.—Hyposulphite of soda occurs in beautiful, rectangular, flattened prisms, transparent, inodorous, with a bitter saline, somewhat hepatic taste.

CHEMICAL PROPERTIES.—It is composed of one equivalent of soda, one of hyposulphurous acid, and five of water (NaO,S_2O_2+5HO).

It is soluble in less than its weight of cold water; but is insoluble in alcohol. Sulphuric acid added to a solution of hyposulphite of soda disengages sulphurous acid gas, and precipitates sulphur.

THERAPEUTICAL EFFECTS.—This salt produces effects very nearly similar to those of sulphate of soda, acting as an active cathartic when given in a sufficient dose. In France it is generally preferred to the other neutral salts as a purgative in cutaneous affections, and in these cases has been used both internally and externally in the form of lotion and bath, with the view of producing specific effects. It has also been recommended by Dr. R. Neale in that curious form of stomach affection accompanied with yeasty vomiting containing *Sarcinia Ventriculi*. In biliary calculi its use has been suggested, it being stated to possess solvent powers over these concretions.

DOSE AND MODE OF ADMINISTRATION.—Internally, from gr. xx. to gr. cxx. dissolved in water, to which some aromatic tincture is added; externally, in the proportion of ℥j. in a gallon of water, to be used as a bath.

INCOMPATIBLES.—The mineral acids, and most salts.

SODÆ PHOSPHAS. *Phosphate of Soda.* *(Tasteless Purging Salt.)* $2NaO,HO,PO_5+24HO$ (=358.)

PREPARATION.—Take of bone-ash, in powder, ten pounds; sulphuric acid of commerce, fifty-six fluid ounces; distilled water, four gallons and a half, or a sufficiency; carbonate of soda, sixteen pounds, or a sufficiency. Place the bone-ash in a capacious earthenware or leaden vessel, pour on the sulphuric acid, and stir with a glass rod until the whole powder is thoroughly moistened. After twenty-four hours, add gradually and with constant stirring a gallon of the water; digest for forty-eight hours, adding distilled water from time to time to replace what has evaporated. Add another gallon of the water, stirring diligently, digest for an hour, filter through calico, and wash what remains on the filter with successive portions of distilled water, till it has almost ceased to have an acid reaction. Concentrate the filtrate to a gallon, let it rest for twenty-four hours, and filter again. Heat the filtrate to near the boiling point, add the carbonate of soda previously dissolved in two gallons of the water, till it ceases to form a precipitate, and the fluid has acquired a feeble alkaline reaction. Filter through calico, evaporate the clear liquor till a film forms on the surface, and set it aside to crystallize. More crystals will be obtained by evaporating the mother liquor, a little carbonate of soda being added if necessary to maintain its alkalinity.

Dry the crystals rapidly and without heat on filtering paper placed on porous bricks, and preserve them in stoppered bottles.

EXPLANATION OF PROCESS.—Bone-ashes consist essentially of two salts of lime, one carbonate, the other insoluble phosphate of lime ($3CaO,PO_5$). In the reactions that ensue between the sulphuric acid and their salts, the first, the carbonate of lime, is resolved into sulphate of lime, which is removed by the filtration directed, and carbonic acid which escapes, thus, $CaOCO_2+SO_3=CaOSO_3+CO_2$; whilst the reaction between the sulphuric acid and the insoluble phosphate of lime results in the formation of more sulphate of lime, which is also removed by the filtration, and of the *soluble* phosphate of lime ($2HO,CaO,PO_5$) which passes through, thus, $3CaO,PO_5+$

$2SO_3HO = 2CaOSO_3 + 2HO,CaO,PO_5$. On the addition to this solution of the carbonate of soda it is decomposed, its carbonic acid escapes, and the soda unites with a portion of the phosphoric acid of the soluble phosphate of lime to form phosphate of soda ($2NaOHO PO_5$), by which reaction another portion of the soluble is converted back again into insoluble phosphate of lime. The entire of this reaction is expressed in the following equation, $3(2HO,CaO,PO_5) + 4NaO,CO_2 = 3CaO,PO_5 + 2(HO,2NaO,PO_5) + 4HO + 4CO_2$. The subsequent stages of the operation require no explanation.

CHARACTERS.—In transparent, colourless, rhombic prisms, terminated by four converging planes, efflorescent, tasting like common salt. It imparts a yellow colour to flame. Its solution gives a yellow precipitate with nitrate of silver, the resulting fluid acquiring an acid reaction.

The yellow colour imparted to flame is characteristic of its base, *soda;* the yellow precipitate yielded with nitrate of silver is phosphate of silver ($3AgO,PO_5$.) How this is produced, and why the resulting solution should be *acid,* will be understood by reference to the annexed equation, $3AgONO_5 + 2NaO,HO,PO_5 = 3AgO,PO_5 + 2NaONO_5 + NO_5 + 3HO$.

PHYSICAL PROPERTIES.—Transparent colourless crystals, the form of which is the oblique rhombic prism; inodorous, with a cooling, saline, not unpleasant taste. Specific gravity, 1·333.

CHEMICAL PROPERTIES.—It is composed of 2 equivalents of soda, 1 of phosphoric acid, 1 of basic water, and 24 of water of crystallization ($HO,2NaO,PO_5 + 24HO$); it effloresces and becomes opaque by exposure to the air; moderately heated it fuses in its water of crystallization, which, if the heat be increased, is driven off. Phosphate of soda dissolves in four times its weight of cold water, and in twice its weight of boiling water; the solution has a feeble alkaline reaction; this salt is nearly soluble in alcohol.

TESTS.—Heated to dull redness it loses sixty-three per cent. of its weight, leaving a residue, which, when dissolved in water, gives with chloride of barium a precipitate entirely soluble in dilute nitric acid.

ADULTERATIONS.—Phosphate of soda is in general tolerably pure. When heated to dull redness, as directed in the *test,* it is converted into the pyrophosphate of soda ($2NaO,PO_5$), and the result stated is in close approximation to what theoretically it should be (62·85 p.c.). If the precipitate occasioned in a solution by chloride of barium be not entirely dissolved by nitric acid, a sulphate is present; and if that caused by nitrate of silver be not dissolved by nitric acid, a chloride is present.

THERAPEUTICAL EFFECTS.—A mild saline cathartic, resembling in its operation the sulphates of magnesia and soda, to either of which it should be preferred for children and delicate persons, in consequence of the mildness of its taste. It is particularly adapted as a cathartic for individuals affected with deposits of uric acid in the urine, as it possesses a remarkably solvent action on that acid.

DOSE AND MODE OF ADMINISTRATION.—℥ss. to ℥ij.; it may be given in water or in any of the cathartic vegetable infusions; or it is readily taken by children dissolved in broth or soup, to which it imparts only a saline taste.

INCOMPATIBLES.—The mineral acids; lime water; magnesia; chloride of barium; nitrate of silver; and the acetates of lead.

SODÆ ET POTASSÆ TARTRAS. *Tartrate of Soda and Potash.* (Syn.: *Rochelle Salt.*) $NaO,KO,C_8H_4O_{10}+8HO$ (=298.)

PREPARATION.—Take of acid tartrate of potash, in powder, sixteen ounces, or a sufficiency; carbonate of soda, twelve ounces, or a sufficiency; boiling distilled water, four pints. Dissolve the carbonate of soda in the water, add gradually the acid tartrate of potash, and if after being boiled for a few minutes the liquid has an acid or alkaline reaction, add a little carbonate of soda or acid tartrate of potash till a neutral solution is obtained. Boil and filter; concentrate the liquor till a pellicle forms on the surface, and set it aside to crystallize. More crystals may be obtained by again evaporating as before.

EXPLANATION OF PROCESS.—On the addition of the acid tartrate of potash ($HO,KO,\overline{T}$) to the carbonate of soda effervescence ensues, due to the escape of the carbonic acid of the latter salt, and its soda replaces the *basic* water in the composition of the acid tartrate, resulting in the production of the salt in question, thus, $HOKO\overline{T}+NaOCO_2=NaO,KO,\overline{T}+HO,+CO_2$.

PHYSICAL PROPERTIES.—This salt occurs in large, beautiful, transparent crystals, which are right rhombic, six and twelve-sided prisms, generally produced in halves; inodorous, with a saline, somewhat bitter taste. Specific gravity, 1·757.

CHARACTERS.—In colourless transparent prisms, or halves of prisms of the right rhombic order, generally eight sided; tasting like common salt. Heated with sulphuric acid it blackens, evolving inflammable gases and the odour of burnt sugar. It imparts a yellow colour to flame. A strong solution gives a crystalline precipitate with a small quantity of dilute sulphuric acid.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of soda, 1 of potash, 1 of tartaric acid, and 8 of water ($KO,NaO,C_8H_4O_{10}+8HO$.) The action of sulphuric acid on these vegetable salts is simply one of *charring*, as already explained (vide, p. 166); the yellow colour of the flame characterizes the salt as one of soda, whilst the crystalline precipitate, cream of tartar ($HO,KO,\overline{T}$), proves it to be a salt of potash; the precipitate is accounted for by the sulphuric acid removing the soda from the salt in the form of sulphate of soda, and substituting for it an equivalent of water; thus, $NaO,KO,\overline{T}+SO_3HO=NaO,SO_3+HO,KO,\overline{T}$. In very dry air it effloresces slightly; exposed to a moderate heat it fuses in its water of crystallization; by a strong heat it is decomposed, and converted into a mixture of charcoal and the carbonates of soda and potash. It dissolves in two and a half parts of cold, and one of boiling water.

TESTS.—Entirely soluble in cold water. Forty-seven grains heated to redness till gases cease to be evolved leave an alkaline residue, which requires for its neutralization thirty measures of the volumetric solution of oxalic acid.

ADULTERATIONS.—As this salt is generally sold in crystals, it is not liable to adulteration, and the volumetric may be said to allow of none.

THERAPEUTICAL EFFECTS.—A mild cooling laxative, not so active as most of the other saline cathartics, than which also its taste is less disagreeable; it is seldom prescribed alone, but is in very general use as the active ingredient in the commonly called Seidlitz (*Seignettes ?*) powders.

DOSE AND MODE OF ADMINISTRATION.—Gr. cxx. to ℥ss. or ℥j. dissolved in a large quantity of water. *Seidlitz* powders consist of gr. cxx. of tartrate of soda and potash, and gr. xl. of bicarbonate of soda, reduced to powder and mixed, contained in a blue paper, and gr. xxxv. of powdered tartaric acid in a white paper; they are taken, dissolved in from a half tumbler to a tumbler of water, while the liquid is in a state of effervescence; when an active purgative is required, it will be requisite to use double the quantity of the tartrate of soda and potash. They form an agreeable and mild cooling aperient.

INCOMPATIBLES.—Most acids and acidulous salts; lime water; the salts of lime; and the acetates of lead.

* SODÆ SULPHAS. ($NaOSO_3 + 10HO = 161.$) *Sulphate of Soda. (Glauber salts.)*

PREPARATION.—This salt, although no longer an article of the Materia Medica in the Pharmacopœia, can be readily procured by the following process:—Take of the salt which remains after making pure muriatic acid, ℔ij.; boiling water, Oiij.; white marble, in powder, a sufficiency; dissolve the salt in water, add the marble so long as effervescence takes place; boil the liquid, and when neutral filter it; wash the insoluble matter in boiling water, adding the water to the original liquid; concentrate till a pellicle begins to form, and then let the liquid cool and crystallize.

The residual salt after the manufacture of hydrochloric acid, as will be seen by reference to this acid, is bisulphate of soda, more or less mixed with *sulphate* of soda; the excess of acid is saturated by the chalk employed, and as the result, on filtration, we obtain sulphate freed from bisulphate of soda.

PHYSICAL PROPERTIES.—A solid, white salt, crystallized either in small acicular crystals or in long prisms, the sides of which are often channelled; inodorous; with a cooling, saline, very bitter taste. Specific gravity, 2·246.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of soda, 1 of acid, and 10 of water ($NaO, SO_3 + 10HO$). By exposure to the air it effloresces rapidly, loses all its water of crystallization, and a white powder is left. Heated it fuses, but at the temperature of 210° it becomes a white solid, which is again liquefied at a red heat but is not decomposed. Sulphate of soda is soluble in three parts of water at 60°, and in all proportions in boiling water. It is insoluble in alcohol. As a salt of soda it can be recognized by the yellow colour it communicates to flame; as one of sulphuric acid, by the insoluble precipitate it yields on the addition of any of the soluble salts of barytes.

THERAPEUTICAL EFFECTS.—An active saline cathartic, increasing remarkably the intestinal secretions; in its mode of operation it resembles sulphate of magnesia, and may be used in the same cases; in consequence, however, of its more disagreeable taste, and its tendency in some habits to produce griping, it is not so frequently employed as that salt.

DOSE AND MODE OF ADMINISTRATION.—℥ss. to ℥ij. dissolved in from two to four ounces of water; ten or twelve drops of dilute sulphuric acid added to the solution conceal to a great extent its disagreeable taste. The effloresced salt is about twice as active as the crystals.

INCOMPATIBLES.—Carbonate and bicarbonate of potash; the salts of lime and of baryta; the acetate and diacetate of lead; acetate of potash; and nitrate of silver, if the solution be strong.

SULPHUR SUBLIMATUM. *Sublimed Sulphur.* (Syn.: *Flowers of Sulphur.*) S. (=16). *Sulphur* or *Brimstone* is an elementary substance, found in large quantities in an impure state in the neighbourhood of volcanoes; it is also found combined with metals in many parts of the earth, from which it can be obtained by a process of roasting, generally, however, in this case contaminated with arsenic; and it is also found associated with hydrogen in many mineral waters. It is also found in the vegetable kingdom, in some essential oils, as of mustard; and in the animal kingdom, as in the hair, the bile, etc. Crude sulphur is imported into Britain from Italy and Sicily. *Precipitated sulphur,* which was at one time very generally employed instead of sublimed sulphur, has nearly fallen into disuse in consequence of the very impure state in which it is usually sold; it has however been introduced into the British Pharmacopœia as an article of the materia medica, and a formulary also has been given for its preparation.

CHARACTERS.—A slightly gritty powder of a fine greenish-yellow colour; without taste, and without odour unless heated; burning in open vessels with a blue flame and the evolution of sulphurous acid.

PHYSICAL PROPERTIES.—Two kinds of sulphur are commonly met with in commerce, roll-sulphur or brimstone, and flowers of sulphur or sublimed sulphur. *Roll sulphur* is in cylindrical pieces from two to three inches long, and about an inch in diameter, obscurely crystallized in the centre; highly electric, in consequence of its being a bad conductor both of electricity and of heat, in consequence of which latter property it cracks when held in the warm hand; very friable, and breaking with a shining crystalline fracture. *Sublimed sulphur* is in the form of a fine powder, which when examined by the microscope is seen to be composed of crystalline grains; both kinds are of a bright, yellowish-green colour, with an almost imperceptible taste, and a faint peculiar odour when rubbed. Specific gravity, 1·98. Atomic weight, 16. Precipitated sulphur is a soft, pale-yellow powder, without odour or taste.

CHEMICAL PROPERTIES.—Sulphur is a simple substance, insoluble in water and in alcohol. It fuses at 126°, and between that temperature and 280° it forms a clear liquor of an amber colour; at 320° it thickens, assumes a reddish tint, and if the heat be continued becomes a thick tenacious mass; from 482° to its boiling point, 824°, it becomes again more fluid, and finally rises in vapour before it is completely fused. Sulphur, if ignited, burns with a lambent blue flame, and is converted into sulphurous acid gas. Precipitated sulphur when fused by a gentle heat evolves a little hydrosulphuric acid, otherwise it corresponds chemically to sublimed sulphur.

TESTS.—Entirely volatilized by heat; does not redden moistened litmus paper. Solution of ammonia agitated with it, and filtered, does not on evaporation leave any residue.

ADULTERATIONS.—Flowers of sulphur seldom contain any impurities; those of a fixed nature may be detected by subliming; if any adhering sulphuric acid be present, which, unless washed after sublimation (and for which no directions are given in the Pharmacopœia), is very likely, distilled water agitated with sulphur will redden litmus paper. Roll-sulphur, obtained from pyrites, usually contains a large quantity of orpiment (*tersulphide of arsenicum*), and therefore should not be used in medicine. Provision has been made in the Pharmacopœia for detecting this impurity, by directing it to be treated with solution of ammonia; if it be present, the ammonia will dissolve it out, and on evaporation it appears as a *yellow* residue. This impurity never is found in Sicilian sulphur, which consequently should be exclusively employed as a therapeutical agent, as well as for the manufacture of *medicinal* sulphuric acid. The most ordinary adulteration of precipitated sulphur is with sulphate of lime, of which it frequently contains from 40 to 50 per cent. The presence of this impurity may be readily detected by heating any quantity of the preparation on a metallic plate, when the whole of the sulphur will be sublimed and any sulphate of lime it may contain left.

THERAPEUTICAL EFFECTS.—In large doses sulphur acts as a mild cathartic, producing its effects by stimulating the muscular coat of the intestines, the evacuations caused by it being usually solid. In consequence of the mildness but certainty of its operation, it is generally employed in hemorrhoidal diseases, and in stricture or other painful affections of the rectum. That it is also eliminated by the skin is evidenced by the blackening of articles of silver, due to the formation of sulphide of silver, in the pockets of those taking it. From being converted into sulphuretted hydrogen in the intestines, the evacuations and the insensible perspiration of the individual, during and for some time after its operation, occasionally become insupportably fetid, which is consequently a great drawback upon its otherwise undoubted value. By the majority of medical men, even up to the present time, sulphur is esteemed as the best cathartic in diseases of the skin; the origin of which opinion I can only trace to its efficacy when applied locally in the treatment of scabies (see *General Stimulants*), in which disease its beneficial action is due to a direct effect on the itch insect. My own experience, a rather extended one in this class of diseases, is decidedly adverse to its employment as a purgative where there is the least tendency to inflammatory action in the skin.

DOSE AND MODE OF ADMINISTRATION.—As a cathartic, gr. cxx. to ℥ss. made into an electuary with honey or treacle; it is usually given in combination with jalap and bitartrate of potash. The dose of precipitated sulphur is the same; it is less disagreeable to the smell or taste, and more uniform in its operation when pure. I have found steaming the rectum by sitting over the vapour of warm water upon which a tablespoonful of flowers of sulphur had been sprinkled, a most valuable remedy in what is popularly known as a "fit of the piles."

Sulphur Præcipitatum. Precipitated Sulphur. (Syn.: *Lac Sulphuris.*) (Take of sublimed sulphur, five ounces; slaked lime, three ounces; hydrochloric acid, eight fluid ounces, or a sufficiency; distilled water, a sufficiency. Heat the sulphur and lime, previously well mixed, in a pint of the water, stirring diligently with a wooden spatula, boil for fifteen minutes, and filter. Boil the residue again in half a pint of the water and filter. Let the united filtrates cool, dilute with two pints of the water, and, in an open place or under a chimney, add in successive quantities the hydrochloric acid previously diluted with a pint of the water, until effervescence ceases and the mixture acquires an acid reaction. Allow the precipitate to settle, decant off the supernatant liquid, pour on fresh distilled water, and continue the purification by affusion of distilled water and subsidence, until the fluid ceases to have an acid reaction and to precipitate with oxalate of ammonia. Collect the precipitated sulphur on a calico filter, wash it once with distilled water, and dry it at a temperature not exceeding 120°.)

EXPLANATION OF PROCESS.—On heating sulphur and lime together, six equivalents of the former react upon three equivalents of the latter, forming two equivalents of bisulphuret of calcium ($2CaS_2$) and one of hyposulphate of lime (CaO,S_2O_2), thus, $3CaO+6S=2CaS_2+CaO,S_2O_2$. These two salts are resolved by the hydrochloric acid into sulphur, chloride of calcium, and water, thus, $2CaS_2+CaO,S_2O_2+3HCl=3Ca,Cl+6S+3HO$. The sulphur thus precipitated is freed from the resulting chloride of calcium by diligent elutriation, which process is continued so long as the washings yield a precipitate on the addition of oxalate of ammonia, which would indicate the continued presence of chloride of calcium. Sulphuric acid would precipitate the sulphur as effectually as hydrochloric acid, but with this inconvenience, precipitating also sulphate of lime, a salt, from its great insolubility, not nearly so easily removed as the soluble chloride of calcium. The directions as to performing the operation under a chimney are given to guard against the deleterious effects of sulphuretted hydrogen gas, an incidental product resulting on the reaction between a portion of the bisulphuret of calcium and the hydrochloric acid, thus, $CaS_2+HCl=CaCl+SH+S$.

CHARACTERS.—A greyish-yellow soft powder free from grittiness, and with no smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid.

TESTS.—Entirely volatilized by heat; under the microscope it is seen to consist of opaque globules, without any admixture of crystalline matter. Otherwise corresponds with sublimed sulphur.

Precipitated is preferred to sublimed sulphur by many practitioners for external use in the form of ointment, in consequence of its lighter colour and greater degree of fineness. Its tendency to become acid on keeping, however, is an objection to its internal administration. In every other respect its therapeutical history may be considered identical with that of precipitated sulphur.

Confectio Sulphuris. Confection of Sulphur. (Take of sublimed sulphur, four ounces; acid tartrate of potash, in powder, one ounce; syrup of orange peel, four fluid ounces. Rub them well together.) This preparation, long employed by practitioners, under the name of sulphur electuary, in the treatment of hemorrhoidal and skin affections, was introduced into the last Dublin, from which it has been copied into the British, Pharmacopœia. The dose of it is from ʒss. to ʒj.

TAMARINDUS. *Tamarind.* Tamarindus indica, *Linn.* Plate 166, *Woodv. Med. Bot.* (The preserved pulp of the fruit; imported from the West Indies.) A native of the East Indies, from whence it has been carried into Africa, where it now grows plentifully in Upper Egypt; it is also cultivated in the West Indian islands, and in South America. It belongs to the Natural family *Leguminosæ* (*Fabaceæ,* Lindley), and to the Linnæan class and order *Diadelphia Triandria.*

BOTANICAL CHARACTERS.—A beautiful tree, about thirty feet in height, branching superiorly; leaves, abruptly pinnate, alternate; flowers in terminal, pendent racemes, of a lemon-yellow colour. Fruit, a legume, stalked, from three to four inches long, and nearly an inch broad, slightly compressed, 3-12 seeded; it is composed of a dry, brittle, brown shell, filled with a reddish, acidulous pulp, in which are embedded the smooth quadrangular seeds.

PREPARATION.—The pulp of the fruit is freed from the husk, and with the contained seeds is packed in layers in barrels, and boiling syrup poured over it; the drier and dark-coloured East Indian tamarinds are said to be preserved without sugar (*Pereira*).

CHARACTERS.—A brown, sweetish, subacid pulp, preserved in sugar, containing strong fibres, and brown shining seeds, each enclosed in a membranous coat.

TEST.—A piece of bright iron, left in contact with the pulp for an hour, does not exhibit any deposit of copper.

PHYSICAL PROPERTIES.—Tamarinds, as imported, are of a reddish-yellow (*West Indian*), or reddish-brown (*East Indian*) colour, of the consistence of candied honey, consisting of the pulp, the seeds, and numerous vegetable fibres; they have a slightly vinous odour, and a sweet, very acid, somewhat astringent but very agreeable taste.

CHEMICAL PROPERTIES.—Tamarind pulp is composed of citric, tartaric, and malic acids, bitartrate of potash, sugar, vegetable jelly, and parenchyma. It yields its properties to water, affording an acid solution.

ADULTERATIONS.—Tamarinds, as imported, frequently contain an appreciable quantity of copper; sulphuric acid is also sometimes added to tamarinds which have not been well preserved or have been too long kept, to give them an acid taste. The contamination with copper may be detected by plunging a plate of polished iron, as a knife, into the tamarinds, when, should any copper be present, the iron will receive a coating of that metal. Sulphuric acid may be detected by a strained decoction giving with solution of chloride of barium or nitrate of baryta a white precipitate, insoluble in nitric acid. In the French market tamarinds are often met with which contain large quantities of animal charcoal; its presence may be readily detected by agitating the fruit with cold water.

THERAPEUTICAL EFFECTS.—Tamarind pulp is refrigerant and gently laxative, but though adapted for mild febrile or inflammatory affections occurring in children, it is seldom employed alone. Its combinations with senna have been before mentioned.

DOSE AND MODE OF ADMINISTRATION.—℥ss. to ℥iss.—Tamarind whey is prepared by boiling ℥j. of tamarinds with Oj. of new milk, and straining; it is an excellent, cooling, mild laxative drink in febrile disease.

INCOMPATIBLES.—The salts of potash; alkaline carbonates; lime water; tartar emetic; and the acetates of lead.

PREPARATION.—Confectio Sennæ (which see, p. 183).

TEREBINTHINÆ OLEUM. *Oil of turpentine* (described in the division *Anthelmintics*), given in large doses, acts as an active cathartic; when administered alone, however, its action is uncertain, and consequently it is usually prescribed in combination with castor oil; in this form it proves a most effectual purgative in obstinate constipation, especially when dependent on affections of the brain;

in spasmodic diseases, as in chorea, hysteria, epilepsy, and tetanus; in sciatica and other neuralgic affections; in tympanitis; in passive hemorrhages; and in purpura hemorrhagica: in the latter disease, administered in large doses, I have used it for years with very great success (See *Dublin Journal of Medical Science*, vol. xxviii. p. 189). The dose of oil of turpentine as a cathartic is from f℥ij. to f℥ij., either given by the mouth or in the form of enema. (See also *Diuretics*, *Epispastics*, and *General Stimulants*.)

* VIOLA. *The fresh petals of the Viola odorata.* An indigenous plant; belonging to the Natural family *Violaceæ*, and to the Linnæan class and order *Pentandria Monogynia*.

BOTANICAL CHARACTERS.—An humble perennial creeper; leaves very numerous; cordate, nearly glabrous; runners flagelliform; flowers appearing in March and April, blue, (after expansion turning deep purple), often white.

PREPARATION.—The flowers are gathered as soon as they expand, and dried with a stove heat between folds of bibulous paper; their properties are best preserved in the form of the syrup of violets of the pharmacopœias.

PHYSICAL PROPERTIES.—"Violet flowers are so remarkable for their odour and colour, that they have given a name to both." *(Duncan.)*

CHEMICAL PROPERTIES.—They are composed of an odorous principle, blue colouring matter, sugar, gum, albumen, and some salts. Violets yield their active principles to water, but not to alcohol. The infusion is a delicate test for both acids and alkalies—the former changing its fine blue colour to red and the latter to green, and as such is much employed by chemists.

THERAPEUTICAL EFFECTS.—Violet flowers possess mildly laxative properties, and in the form of syrup are sometimes administered to new-born infants, and to young children.

DOSE AND MODE OF ADMINISTRATION.—Only as follows:—

* *Syrupus Violæ.* (Fresh violets, ℔j.; boiling water, Oiss.; pure sugar, ℔viiss.; infuse the flowers for twenty-four hours in a covered glass or earthenware vessel; strain without squeezing, and dissolve the sugar in the filtered liquor.) Dose, f℥j. to f℥iv.

* *Mel Violæ,* (Fresh violet flowers, one part; honey, five parts.) A mild laxative readily taken by children. Dose, gr. lx. to ℥ss.

CHAPTER VI.

CAUSTICS.

(Escharotics.—Cauterants.—Catheretics.)

CAUSTICS are substances which, applied to the human body, disorganise and destroy the parts with which they come in contact. They are usually grouped in two classes :—*Escharotics*, which completely destroy the life of the part to which they are applied, affecting also the deeper seated tissues to a greater or less degree, according to the energy of the substance, and the quantity of it that may be applied, and producing an *eschar*, whence their name ; and *Catheretics*, which are milder in their operation, acting more superficially, and not effecting complete destruction of the parts with which they are placed in contact. The action of caustics is chemical, as they destroy the life of the part, either by combining with the animal matter so as to form a new compound, or by causing the elements of the animal tissues to enter into new combinations, whereby their cohesion is subverted, and their composition changed. The effects produced by caustics are more or less rapid, according to the properties of the substance that is used; if it be very powerful the change of structure effected is so immediate, that surrounding inflammation takes place only after the death of the part; while, on the contrary, inflammation is the direct consequence of the less energetic caustics. The action of this class of remedies is generally local, but some of them (as arsenious acid), may become absorbed, and thus produce constitutional symptoms. The various purposes for which caustics are employed will be noticed when treating of the individual remedies of the class. Lately attention has been very much directed to the most effectual method of the application of caustics for the destruction of malignant growths, especially cancer, in consequence of some experiments which have been carried on by an American medical practitioner in one of the London hospitals, under the sanction of the surgeons of the institution. The only general result of therapeutic importance which has been arrived at is, that more decided effects will be obtained from the employment of these agents when their application is combined with the use of incisions with the knife into the parts to be removed, so as to extend the action of the caustic through the tissues as their vitality is destroyed.

ACIDUM ACETICUM GLACIALE. *Glacial Acetic Acid.* (Syn.: *Acidum Aceticum,* Ed.) Monohydrated Acetic Acid, $HO,C_4H_3O_3$ (=60).

PREPARATION.—Take of acetate of soda, twenty ounces; sulphuric acid, eight fluid ounces. Place the acetate of soda in a porcelain basin on a moderately warm sand bath, apply heat till it liquefies, and continuing the heat, stir until the salt becomes pulverulent; let the heat be now raised so as to produce fusion, and then instantly remove the salt from the fire. As soon as it has cooled break up the mass, and place it in a stoppered retort capable of holding three pints, and connected with a Liebig's condenser. Pour the sulphuric acid on the salt, quickly replace the stopper, and when the distillation of acetic acid begins to slacken continue it with the aid of heat until six fluid ounces have passed over. Mix one fluid drachm of the acetic acid thus obtained with a fluid drachm of the solution of iodate of potash previously mixed with a little mucilage of starch; and, if it gives rise to a blue colour, agitate the whole product of distillation with a quarter of an ounce of black oxide of manganese perfectly dry and in fine powder, and re-distil.

EXPLANATION OF PROCESS.—On heating and fusing acetate of soda its water of crystallization is expelled. In this stage of the process great care is required in the management of the heat; as if too energetic, the salt will become charred. By the action of sulphuric acid on this salt the monohydrated acetic acid is expelled, and sulphate of soda left in the retort. This equation explains the reaction, $NaO\bar{A}+SO_3HO=NaO,SO_3+HO,\bar{A}$. The blue colour alluded to would be due to the presence, as an impurity, of sulphurous acid (SO_2), that might be possibly generated by the action of the sulphuric acid on the vegetable acid, and which is detected by the test directed; as by abstracting oxygen from the iodate of potash it sets free iodine, which produces its characteristic blue colour with the starch, forming with it an iodide of starch; thus, $Am+KO\ IO_5+5SO_2=AmI+KO\ SO_3+4SO_3$. In this equation starch is represented by Am, the initial letters of *amylum.* Rectification with black oxide of manganese frees the acetic acid from this impurity; the *sulphurous* acid abstracting from it one atom of oxygen, and so becoming *sulphuric* acid, which unites with the resulting protoxide of manganese to form sulphate of manganese; thus, $MnO_2+SO_2=MnO\ SO_3$.

CHARACTERS.—A colourless liquid with a pungent acetous odour, converted, when cooled to nearly 32°, into colourless prismatic crystals. Specific gravity 1·065, which is increased by adding to the acid 10 per cent. of water.

To this property of producing crystals at a low temperature it owes it name *glacial* acetic acid; the fact of its specific gravity being *raised* on the addition of water is a curious phenomenon requiring a word of explanation. Acetic acid is an acid having what is termed a point of maximum density, a fact first pointed out by Mollerat; this is 1·0735, and according to Mohr the acid is composed of 80 p.c. of glacial acetic acid. Between that point, however, and 1·0635 we may have two acids of very different strengths, for instance, we may have an acid of 1·065, containing but 57 per cent. of glacial acetic acid; on increasing its strength its specific gravity will rise until it reaches the point of maximum density, 1·0735, but on still further increasing its strength, the specific gravity commences to fall until it reaches again a specific gravity of 1·065, when it will be glacial acid; on diluting this, its specific gravity commences to rise until it reaches the point of maximum density, when it will commence to fall. So that from this statement it appears that specific gravity can be no test of the strength of any acid ranging between 1·065 and 1·0735, *unless we know whether it has reached its point of maximum density;* this is ascertained, as directed in the Pharmacopœia, by the addition of water; if the specific gravity *rises* it is the stronger, if it *falls*, the weaker acid.

TESTS.—One fluid drachm requires for neutralization 97 measures of the volumetric solution of soda. It does not give rise to a blue colour, when added gradually to an equal volume of the solution of iodate of potash previously mixed with a little mucilage of starch.

By the volumetric test is established the presence in each fluid drachm of gr. 49·47, equivalent to gr. 84·93 per cent. of *anhydrous acetic acid.* The non-production of the blue color under the conditions stated has been already explained.

DOSE AND MODE OF ADMINISTRATION.—Glacial acetic acid is a powerful caustic, but is very rarely employed even with that intention, the strong acetic acid of commerce being generally selected for use. I shall, therefore, reserve further observations on this point for that preparation, which see. The pharmacopœial authorities have directed its use in the creosote mixture, with the object of ensuring the solubility of the creosote. (See p. 84.)

Acidum Aceticum. Acetic Acid. (Syn.: *Purified Pyroligneous Acid. Acetic Acid of Commerce.*) An acid liquid prepared from wood by destructive distillation, and containing 28 per cent. of anhydrous acetic acid.

PREPARATION.—By the destructive distillation of wood in closed vessels, we have many products resulting, viz. tar, creosote, enpyreumatic oils, *crude* pyroligneous acid, &c. This latter is a dark colored fluid consisting of water and acetic acid, contaminated to a greater or lesser degree with the other products of the distillation. To this liquor cream of lime is added, and, as the result, we have acetate of lime formed; the solution of this salt is then mixed with a strong solution of sulphate of soda, in virtue of which, by double decomposition, we get sulphate of lime, which precipitates, and acetate of soda held in solution, thus, $CaO,\bar{A}+NaO,SO_3=CaO,SO_3+NaO,\bar{A}$. This latter salt is purified by repeated solution, evaporation, and crystallization, and then acted upon by sulphuric acid, when the commercial acid is distilled over.

CHARACTERS.—A colourless liquid with a strong acid reaction, and odour of vinegar.

TESTS.—Specific gravity 1·044. One fluid drachm requires for neutralization 31·5 measures of the volumetric solution of soda. It leaves no residue when evaporated; gives no precipitate with sulphuretted hydrogen, chloride of barium, or nitrate of silver; and does not give rise to a blue colour when added gradually to an equal volume of the solution of iodate of potash previously mixed with a little mucilage of starch.

The volumetric test indicates the presence in each fluid drachm of gr. 16·065, equivalent to 28·14 per cent. of anhydrous acetic acid, figures corresponding with Mohr's table, which gives 33 per cent. of *monohydrated* acetic acid, to an acid of this density. Its not leaving any residue on evaporation proves the absence of any fixed impurity; if it yields a precipitate on the transmission of a stream of sulphuretted hydrogen, the presence of lead is to be inferred (PbS); if it precipitates with chloride of barium, sulphuric acid is present (BaO,SO_3); if with nitrate of silver, muriatic acid is present (AgCl); if a blue colour is presented under the conditions stated, sulphurous acid is present. This latter test has been already explained (see p. 196).

USES.—Acetic acid undiluted acts quickly and powerfully on the skin, causing redness and vesication, and destroying the life of the part if left sufficiently long in contact with it. It has been employed as a ready means of producing vesication; but its chief use is as a caustic to destroy corns, condylomata, and warts, especially when of syphilitic origin; it is also a valuable application to that form of skin affection popularly known as scalded head or ringworm. It should be applied with a piece of linen wrapped round a stick; it gives temporary pain, but acts as an efficient caustic. (See, also, *Epispastics and General Stimulants.)*

PREPARATION.—Acidum dilutum, Oxymel (already described, see pp. 70, 71).

ACIDUM HYDROCHLORICUM. *Hydrochloric Acid.* (Syn.: *Acidum Muriaticum purum. Chlorhydric Acid. Spirits of Salt.)* Hydrochloric acid gas, HCl (=36·5) dissolved in water.

PREPARATION.—Take of chloride of sodium, dried, three pounds; sulphuric acid, forty-four fluid ounces; water, thirty-six fluid ounces; distilled water, fifty fluid ounces. Dilute the sulphuric acid with thirty-two ounces of the water, and when the mixture has cooled pour it upon the chloride of sodium previously introduced into a flask having the capacity of at least one gallon. Connect the flask by corks and a bent glass tube with a three-necked bottle, furnished with a safety tube, and containing the remaining four ounces of the water; then, applying heat, conduct the gas into a second bottle containing the distilled water, by means of a bent tube dipping about half an inch below its surface; and let the process be continued until the product measures sixty-eight ounces. The bottle containing the distilled water must be carefully kept cool during the whole operation.

On the addition of the sulphuric acid and water to the chloride of sodium, the water is resolved into its elements—oxygen, which unites with the sodium to form soda, which unites with the sulphuric acid, forming sulphate of soda; whilst the hydrogen unites with the chlorine of the chloride of sodium to form hydrochloric acid gas, which is conveyed into the water where it is absorbed—resulting in the acid in question. To ensure the thorough decomposition of the salt, as also to facilitate, by getting a more soluble salt, the removal of the residuum from the flask, two equivalents of acid are used to one of salt, resulting in the production of *bisulphate* of soda. This equation explains the reactions, $NaCl+2SO_3HO=(NaO,2SO_3)+2HO+HCl$. The sulphuric acid is allowed to cool after its admixture with the water to obviate the tendency to frothing of the materials, due to the tumultuous extrication of gas that would ensue were this precaution not adopted.

CHARACTERS.—A colourless and strongly acid liquid, emitting at ordinary temperatures white vapours having a pungent odour. It gives with nitrate of silver a curdy white precipitate, soluble in excess of ammonia, but not in nitric acid.

The white vapours emitted by this acid can be intensified by bringing them into contact with the vapour of caustic water of ammonia, in virtue of which we have sal-ammoniac formed in a fine cloud. $NH_3 + HCl = NH_4Cl$. The curdy white precipitate is chloride of silver, produced thus, $AgO,NO_5+HCl=HO\,NO_5+AgCl$. Its solution in ammonia is due to the formation of ammonio-chloride of silver; thus, $AgCl+2NH_3=AgCl,2NH_3$.

TESTS.—Specific gravity 1·17. One fluid drachm of the acid requires for neutralization 60·25 measures of the volumetric solution of soda. When evaporated it leaves no residue; when diluted with four 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.

The specific gravity indicates a per-centage of 33·55 of anhydrous acid. The volumetric test establishes the presence of gr. 21·99 of anhydrous acid in each fluid drachm. Its not leaving any residue on being evaporated to dryness proves the absence of any fixed impurity, such as iron, which, however, is invariably present in the commercial article in the form of sesquichloride, communicating to it a yellowish color, and derived from the iron vessels employed in its manufacture. This impurity can be readily recognized by diluting the suspected acid with four times its bulk of water, and adding to it a few drops of the solution of ferrocyanide of potassium, when, if iron be present, a blue colour will be struck; the rationale of this test has been already given (see p. 90). Were lead, derivable from the employment of vessels of this metal in its manufacture, or arsenic, a possible impurity in the sulphuric employed, present, the sulphuretted hydrogen will precipitate them respectively as sulphide of lead (PbS), or tersulphide of arsenicum (AsS_3); its not tarnishing bright copper foil is demonstrative of the absence of even a trace of arsenic—this, which is *Reinsch's* test, will be fully described in the article arsenious acid (which see). None of these impurities however, can be present if the acid be prepared according to the pharmacopœial directions. Should the sulphuric acid employed contain nitrous acid, a very general impurity in the commercial acid, chlorine will be found in the hydrochloric acid; the reaction in virtue of which under these conditions chlorine is developed as an impurity, is that an atom of oxygen of the nitrous acid unites with an atom of hydrogen of the hydrochloric acid to form water, and, as the result, we have nitric oxide and chlorine gas set free, thus, $NO_3 + HCl = Cl + NO_2 + HO$. No provision has been made in the pharmacopœial tests for its detection, which, however, can be readily effected by its power of discharging the color of a dilute solution of sulphate of indigo.

PREPARATION.—Acidum dilutum, acidum nitro-hydrochloricum dilutum.

USES.—As a caustic, hydrochloric acid has been used with much effect to destroy the false membranes which are formed in diphtheritis, to check the spreading of the mortification in cancrum oris, and as an application to obstinate ulcers of the tongue, and in phagadenic ulcerations of the tonsils. It has been also employed as an external application in hospital gangrene. It may be applied by means of a bit of sponge attached to whalebone, or wood.

In cases of poisoning with this acid, the antidotes are chalk, and magnesia or its carbonate, combined with demulcent or emollient drinks.

ACIDUM NITRICUM. *Nitric Acid.* (Syn.: *Aquafortis.*) $3HO, 2NO_5 (=81.)$

PREPARATION.—Take of nitrate of potash, two pounds; sulphuric acid, seventeen fluid ounces. Pour the sulphuric acid upon the nitrate of potash previously introduced into a plain retort; pass the neck of the retort at least five inches into the glass tube of a Liebig's condenser, and distil over the acid with a heat, which towards the end of the process must be raised so as to liquefy the contents of the retort.

EXPLANATION OF PROCESS.—On treating nitrate of potash with sulphuric acid its nitric acid is dislodged, the sulphuric acid uniting with the potash to form sulphate of potash, and the nitric acid distilling over. To facilitate the extraction of the nitric acid, to render a lower heat for the thorough decomposition of the salt effectual, as also to render the resulting salt more soluble, an excess of sulphuric acid is employed, in virtue of which the resulting salt is not sulphate, but bisulphate of potash, thus, $KO,NO_5 + 2SO_3HO = HO,KO,2SO_3 + HO,NO_5$.

CHARACTERS.—A strongly acid and corrosive yellowish liquid. When diluted with three times its volume of water and poured upon copper it gives off a colourless gas, which, upon contact with the air, becomes an orange vapour, and, when conducted into a solution of sulphate of iron, communicates to it a dark colour.

Strong nitric acid presents always the colour indicated in the

Pharmacopœia, in virtue of the presence in it of hyponitric acid, (NO_4); from this it may be freed by boiling, but at the expense of diminished strength; and no matter how colourless it may originally have been procured, on keeping, by the action of solar light, it becomes deoxidized, and again assumes an orange yellow colour, due to the development in it of this acid. The *colourless* gas produced by its action upon copper filings is nitric oxide gas, resulting from the action of the nitric acid in oxidizing the copper to enable it to unite with the base, so produced, to form nitrate of copper, thus, $3Cu+4NO_5=3CuONO_5+NO_2$. Nitric oxide gas is colourless, but is changed to an orange colour on exposure to the air, a change due to its conversion into hyponitric acid (NO_4), by the absorption from the atmosphere of two of its atoms of oxygen, thus, $NO_2+O_2=NO_4$. The action of this gas upon a solution of sulphate of iron has been already explained (see p. 90). In addition to these properties may be noted its action upon morphia, changing its colour to a deep orange, and the yellow colour it stains the cuticle, (*xanthoproteic* acid), a stain resembling that produced by iodine, from which, however, it may be distinguished by its persistency—not being discharged by iodide of potassium, as that with iodine is.

TESTS.—Specific gravity 1·5. One fluid drachm of the acid requires for neutralization 121·5 measures of the volumetric solution of soda. Evaporated, it leaves no residue. Diluted with six volumes of distilled water, it gives no precipitate with chloride of barium, or nitrate of silver.

The specific gravity indicates the presence of 80 per cent. and the volumetric test in each fluid drachm of gr. 65·61 of anhydrous acid, figures which correspond to an acid of this composition, three of water and two of acid, ($3HO+2NO_5$.) The acid of commerce, known as *Aquafortis*, is somewhat weaker than this, and may be described as having this composition, $2HO+NO_5$, a strength equivalent to 75 per cent. of anhydrous acid. Its non-precipitation with chloride of barium indicates the absence of sulphuric, with nitrate of silver, of hydrochloric acids, impurities derivable, the former from its being employed in its manufacture, the latter from the fact that nitrate of potash of commerce frequently is contaminated with chloride of potassium, a contamination which will yield hydrochloric acid, in virtue of a reaction similar to that already described in the manufacture of this acid from chloride of sodium (see pp. 198, 199). Directions, however, are given in the Pharmacopœia sufficient to eliminate this source of impurity. (See *Nitrate of Potash.*)

USES.—As a caustic, strong nitric acid is employed to destroy corns and warts, as an application to poisoned wounds, to parts bitten by rabid animals, and to phagedenic ulcers; its application to certain forms of hemorrhoids also has been favourably mentioned by the late Dr. Houston of this city, (See *Dublin Journal of Medical Science*, 1st series, vol. xxiii. p. 102.) In its application for any of the above purposes, the neighbouring parts should be smeared with olive oil, or some resinous ointment so as to confine the action of the acid. M. Rivallié has recently proposed what he terms *solidified nitric acid* as a substitute for the ordinary nitric acid as a caustic. He prepares it as follows:—some lint is placed in an earthen vessel, and a certain quantity of nitric acid in its highest degree of concentration is gradually dropped upon it, a gelatinous paste is the result, and to this a shape in keeping with the tissues to be cauterized is given. It is applied by means of a long (wooden) forceps, and left on according to the desired effect, from 15 to 20 minutes; in cases, however, where the surgeon wishes to destroy a large surface, as, for example, in encephaloid cancer, it may be left on for 24 hours. The advantages which M. Rivallié states this caustic to possess are, that it is not so painful as liquid nitric acid, and that its action is limited to the part to which it is applied, and does not spread to the neighbouring tissues.

In cases of poisoning with this acid, the antidotes are the same as for hydrochloric acid.

PREPARATION.—Acidum dilutum, acidum nitro-hydrochloricum dilutum.

* ACIDUM NITROHYDROCHLORICUM. (Syn.: *Acidum Nitromuriaticum. Nitromuriatic Acid. Aqua regia.*)

PREPARATION.—Take of pure nitric acid, f℥j.; pure muriatic acid, f℥ij.; mix in a green glass bottle, furnished with an accurately ground stopper, and keep in a cool place.

This acid, which is constantly described as a simple mechanical mixture of the two acids employed in its preparation, cannot with justice be looked upon as such, when we reflect upon the reactions that ensue on their admixture. A portion of the nitric acid, operating upon a portion of the hydrochloric acid, robs it of its equivalent of hydrogen at the expense of an atom of its own oxygen, in the form of water, by which it is itself reduced to the state of hyponitric acid, and chlorine is set free; so that the resulting solution is a mixture of undecomposed nitric and muriatic acids, charged with chlorine, hyponitric acid, and water. The production of these latter three is expressed in the following equation, $HCl+NO_5=Cl+NO_4+HO$. This action is only limited by the absorbent powers of the solution with respect to chlorine, and the accuracy with which the bottle is stoppered.

PROPERTIES.—This liquor has a deep yellow colour, an intensely acid taste, and exhales an odour both of chlorine and nitrous acid. One of its most remarkable properties is its power of dissolving the metals gold and platinum, by which it may be readily distinguished from other acids.

USES.—Although not generally included amongst our caustics, and omitted in its concentrated form from the Pharmacopœia, there being directions given for making a *dilute* acid only, still I regard this acid as, *if not the most*, certainly one of the most valuable and efficient remedies of this class at the surgeon's command. It may be used as a substitute for the other mineral acids described in this section in all cases suited for their employment; in cases of phagadena, in sloughing ulcers of the tonsils, in cancrum oris, no remedy of this class is more effectual, if as valuable. In the ulcerated sore throat of scarlatina I believe it to be *par excellence* the application. It can be applied on a piece of sponge or lint firmly attached to a glass rod or a piece of whalebone. In applying it to the throat, in this case, as in every other where we are employing strong mineral acids, we should take the precaution of seeing, whilst the sponge, &c. is sufficiently charged with the remedial agent, that a drop of it is not *pendulous*, to fall into the larynx, and by producing spasm of the glottis risk the life of our patient; as a still further precaution, we should direct our patient to make a *deep inspiration*, and only apply the acid on its termination, so that if an accident of this kind were to occur, the returning expiration will expel with it the acid. (See also *Tonics*.)

ACIDUM SULPHURICUM. *Sulphuric Acid* (described in the division *Astringents*) possesses powerfully caustic properties, destroying the animal tissues wherever it is brought in contact with them. It is used as a caustic to the integument of the eyelid in *entropium* or inversion of the lid, and to the conjunctiva reflected on the eyelid in *ectropium* or eversion of the lid. It is also employed to destroy warts, and as an application to poisoned wounds. M. Velpeau speaks most highly of a caustic paste prepared by mixing 2 parts of concentrated sulphuric acid with 1 part of saffron. He uses it chiefly as an application to cancerous and other malignant ulcerations. In consequence of the expense of saffron, however, this caustic cannot be generally used; Mr. Syme employs saw-dust instead, and he states with good results. (See also *Epispastics*.)

AMMONIÆ LIQUOR FORTIOR. (Syn.: *Ammoniæ Aqua Fortior, Concentrated Aqueous Solution of Ammonia. Strong Ammonia.*) This preparation has been already described in the division *Antacids*.

USES.—As a caustic it has been only used locally, in the bites of rabid animals. (See also *Epispastics*.)

ANTIMONII TERCHLORIDI LIQUOR. *Solution of Terchloride of Antimony*. Terchloride of Antimony, $SbCl_3$(=228·5) dissolved in hydrochloric acid.

PREPARATION.—Take of prepared sulphuret of antimony, one pound; commercial hydrochloric acid, four pints. Place the sulphuret of antimony in a porcelain vessel; pour upon it the hydrochloric acid, and, constantly stirring, apply to the mixture, beneath a flue with a good draught, a gentle heat, which must be gradually augmented as the evolution of gas begins to slacken, until the liquid boils. Maintain it at this temperature for fifteen minutes; then remove the vessel from the fire, and filter the liquid through calico into another vessel, returning what passes through first, that a perfectly clear solution may be obtained. Boil this down to the bulk of two pints, and preserve it in a stoppered bottle.

EXPLANATION OF PROCESS.—In this case three equivalents of hydrochloric acid react upon one of tersulphide of antimony (SbS_3); the hydrogen of the acid unites with the sulphur to form sulphide of hydrogen gas (*sulphuretted hydrogen*), which escapes, whilst the chlorine unites with the antimony to form terchloride of antimony ($SbCl_3$), thus, $SbS_3 + 3HCl = 3SH + SbCl_3$. The directions with regard to the flue are intended to protect the operator from the deleterious effects of this highly poisonous gas.

CHARACTERS.—A heavy liquid, usually of a yellowish-red colour. A little of it dropped into water gives a white precipitate, and the filtered solution lets fall a copious deposit on the addition of nitrate of silver. If the white precipitate formed by water be treated with sulphuretted hydrogen it becomes orange.

The colour of commercial specimens is usually darker than that described in the Pharmacopœia, in consequence of the presence of *sesquichloride of iron*, due to the employment in their manufacture of vessels of this metal. The precipitate produced on its addition to water is an *oxychloride of antimony*, or *Algarothi's powder*, a varying mixture of teroxide and terchloride of antimony. The composition of this powder has been variously stated by different chemists, the results apparently being much influenced by the amount of water employed. The most constant proportion, perhaps, that they hold to each other is as ten parts of teroxide to one of terchloride of antimony; the teroxide is produced by the mutual reaction that ensues between the water and the terchloride, in virtue of which the former is resolved into its elements, the hydrogen laying hold of the chlorine of the terchloride to form hydrochloric acid, whilst the oxygen unites with the antimony to form teroxide of antimony, which is precipitated, and in its subsidence carries down with it some of the terchloride which has escaped this decomposition, thus, $SbCl_3 + 3HO = 3HCl + SbO_3$, and $10SbO_3 + SbCl_3 =$ *pulvis Algarothi*. By protracted washing the adhering atoms of terchloride of antimony will eventually be also converted into teroxide, a result which will, however, be more rapidly obtained by using a weak alkaline solution in the first instance, and subsequently removing by elutriation the resulting salt. In this case the oxygen of the alkali goes to the antimony of the terchloride to form teroxide of antimony, whilst the chlorine unites with the alkaline base to form a chloride; an operation of this kind is had recourse to in the Pharmacopœia in the preparation of the *Antimonii oxidum*. The alkali employed being carbonate of soda, in this case the following equation explains the result, $SbCl_3 + 3NaO,CO_2 = SbO_3 + 3NaCl + 3CO_2$. The *copious precipitate* produced on the addition of nitrate of silver to the filtered solution is chloride of silver, resulting from the action of the resulting hydrochloric acid on the salt, thus, $AgO,NO_5+HCl=AgCl+HO,NO_5$. The yellow colour produced by treating the white precipitate with sulphuretted hydrogen gas is tersulphide of antimony, the gas being resolved into its elements, its sulphur uniting with the antimony to form tersulphide of antimony (SbS_3), whilst its hydrogen unites with the oxygen to form water; thus, $3SH+SbO_3=SbS_3+3HO$. Exposed to the air it evaporates, forming a yellowish-white mass of butyraceous consistence, hence one of its names, *butter of antimony*, the form, indeed, in which it was employed as a caustic by the older surgeons.

TESTS.—Specific gravity, 1·47. One fluid drachm mixed with a solution of a quarter of an ounce of tartaric acid in four fluid ounces of water, forms a clear solution, which, if treated with sulphuretted hydrogen, gives an orange precipitate, weighing when washed and dried at 212° at least 22 grains.

The solubility of the teroxide of antimony in solutions of tartaric acid is one of its characteristics, by which we are assisted in distinguishing between the precipitates resulting on the addition of the solution of terchloride of antimony to water, and a similar precipitate hereafter to be described, resulting on the addition of a solution of ternitrate of bismuth to water. The action with sulphuretted hydrogen gas has been already described; the 22 grains of tersulphide of antimony represent the existence of 30·65 grains of terchloride of antimony in each fluid drachm.

USES.—It is employed as a caustic to parts bitten by rabid animals, its liquidity enabling it to penetrate into the deepest portions of the wound: the wound should be first dried as well as possible with pieces of lint, as all liquids immediately decompose this preparation. It is also advantageously employed in the treatment of sloughing ulcers, as for instance those situated on the tonsils, and may be generally employed in all cases where an energetic caustic is indicated. One great advantage attends its use—that it is not painful; nor is its application followed by much inflammatory action, and on the separation of the slough the surface generally presents a healthy appearance. Pure terchloride of antimony has been used as an application to staphyloma by some German surgeons (*Richter, Beer, &c.*); a camel's-hair pencil or a point of lint is dipped in the deliquescent salt and applied to the tumour until a whitish crust is perceived, when the whole is washed away by means of a large camel's-hair pencil dipped first into milk and afterwards into milk and water.

In cases of poisoning with the solution of the terchloride of antimony the same treatment should be employed as in poisoning with hydrochloric acid.

ARGENTI NITRAS. *Nitrate of Silver.* (Syn.: *Caustic; Lunar Caustic.*) $AgO,NO_5(=170)$.

PREPARATION.—Take of refined silver, three ounces; nitric acid, one fluid ounce and three quarters; distilled water, five fluid ounces. Add the nitric acid and the water to the silver in a flask, and apply a gentle heat till the metal is dissolved. Decant the clear liquor from any black powder which may be present into a porcelain dish, evaporate, and set aside to crystallize; pour off the liquor, and again evaporate and crystallize. Let the crystals drain in a glass funnel, and dry them by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate in rods, fuse the crystals in a dark room in a capsule of platinum or thin porcelain, and pour the melted salt into proper moulds. Nitrate of silver must be preserved in bottles furnished with accurately ground stoppers.

EXPLANATION OF PROCESS.—Three atoms of silver are acted upon by four of nitric acid, one of the equivalents of nitric acid is resolved into nitric oxide gas (NO_2), which escapes, and three atoms of oxygen, which unite with the three equivalents of silver to form three equivalents of oxide of silver; these unite with the remaining three atoms of nitric acid to form three equivalents of nitrate of silver, thus, $3Ag+4NO_5=3AgONO_5+NO_2$. The directions with respect to organic matter and a dark room are to obviate the *blackening* of the salt, resulting from these causes, and due to a partial reduction of the nitrate. According to Mr. Scanlan, however, nitrate of silver enclosed in a hermetically sealed glass tube will not undergo discoloration on exposure to solar light. In his opinion this effect being produced by contact with organic matter, independent of the action of light. It probably is also due to the presence in the surrounding atmosphere of minute traces of sulphuretted hydrogen gas, producing with the silver the black sulphide of silver. The black powder from which it is to be decanted is gold, a metal intimately associated in its metallurgical history with that of silver.

CHARACTERS.—In colourless tabular right rhombic prisms, or in white cylindrical rods, soluble in distilled water, and in rectified spirit; gives with hydrochloric acid a curdy white precipitate, which darkens by exposure to light, and is soluble in solution of ammonia. A small fragment heated on charcoal with the blow-pipe first melts, and then deflagrates, leaving behind a dull white metallic coating.

The white precipitate produced with hydrochloric acid is chloride of silver ($AgCl$), thus, $AgO,NO_5+HCl=AgCl+HO,NO_5$. The darkening of this salt on exposure to light is due to the escape of a portion of its chlorine, and the consequent production of a subchloride, $2AgCl=Ag_2Cl+Cl$. (*Wetzlar.*) Its solubility in solution of ammonia is a property shared by it in common with other of the salts of silver, such as the cyanide and oxalate; independant of other differential characters, these two latter salts are distinguished from it, the first by its solubility in boiling, the latter by its solubility in both boiling and cold nitric acid, in neither of which the chloride is soluble; the dull white coating is metallic silver. The deflagration under such circumstances is a phenomenon characteristic of the *nitrate* salts.

TESTS.—Ten grains dissolved in two fluid drachms of distilled water give with hydrochloric acid a precipitate, which, when washed and thoroughly dried, weighs 8.44 grains. The filtrate when evaporated by a water-bath leaves no residue.

ADULTERATIONS.—Nitrate of silver, as met with in commerce, is frequently adulterated with nitrates of potash, lead, zinc, and copper, and with black oxide of manganese. The latter is detected by dissolving the salt in water, when it is left in the form of a black powder; the nitrates of lead, zinc, and copper are detected by precipitating a solution of the salt with excess of solution of chloride of sodium; the precipitate is insoluble in ammonia if lead be present, and the liquid part gives with sulphuretted hydrogen a white precipitate if any zinc be present, but a black one if the impurity be copper. Nitre is detected by precipitating the silver with hydrochloric acid, filtering and evaporating, when, if any be present, it will be obtained in the crystalline state. Latterly this impurity is more frequently met with, especially in pencils of nitrate of silver, inasmuch as its presence renders the preparation less brittle.

USES.—As a caustic, nitrate of silver possesses many advantages over the other remedies of this class, and consequently is much more frequently employed; applied to the skin or to the mucous membranes, it produces a whitish stain which rapidly becomes greyish, and if exposed to light, finally black; and at the same time the part to which it is applied is deprived of vitality; the first of these changes in colour (whitish), is due to the coagulation of the albumen of the tissues; the final black colour is due to the reduction of the salt to the state of suboxide. The chief value of nitrate of silver as a caustic depends on its great manageableness in consequence of its solid form, on its property of not deliquescing, and on its mild but effectual action, the pain produced by it, although sometimes acute, being but of short duration. Its uses are very numerous: it is employed to destroy warts, corns, and many small tumours, to reduce in size hypertrophied tonsils—a plan of treatment in my opinion far to be preferred to ablation, and which in my hands has never failed, requiring for success but perseverance; to check hemorrhage occurring from small vessels, as in the bleeding from leech-bites in children, in which cases its value in my opinion is more than problematical, heretical though this statement must sound in many ears; to repress exuberant granulations; and, applied to the sound skin above the inflamed part, to stop the spread of erysipelas, as suggested by Higginbotham, who attributes the failures occasionally reported, to the employment of nitrate of silver contaminated with nitrate of potash, this latter preparation according to him not being nearly so effectual as the pure nitrate; to produce this result it must be applied freely so as to destroy the rete-mucosum as well as the cuticle. In the first stage of chancre, when the ulcer is very minute, nitrate of silver (though far inferior to caustic potash, to which it never should be preferred, inasmuch as this latter produces a *slough*, which, if anything can abort the disease, must be effectual) applied freely may check the disease and prevent it from spreading further; indeed in all sores about the prepuce or glans, whether of syphilitic origin or not, its application is for the most part beneficial. In threatening paronychia the diligent application of the solid stick to the affected part has frequently in my hands succeeded in *aborting* the disease. In large indolent ulcers applied over the whole surface, it acts with excellent effect; in many instances, as soon as the eschar which it produces peels off, the sore is found to be healed. A strong solution from gr. xl. to gr. lx. in an ounce of distilled water is the best application in relaxation with enlargement of the uvula and tonsils, and in the follicular inflammation of the mucous membrane of the pharynx and larynx. In the tonsil and uvular relaxations of public singers, the application of nitrate of silver solution is attended with curious results; it gives immediate but *temporary* relief, followed the next day with an aggravation of the symptoms. I have so frequently verified this statement in patients of this class, that I now invariably, in cases of hoarseness depending upon this cause, inquire whether it is more important for them "to sing to-night or to-morrow night?" If "to-night," I use the solution of nitrate of silver; if "to-morrow night," I have recourse to some other remedy. This is explicable on consideration of the effects produced on mucous membranes by nitrate of silver. When the disease affects the lining membrane of the larynx, it has been proposed by Dr. Horace Green, of New York, to introduce the solution within the rima glottidis, and thus apply it directly to the mucous membrane of the organ; and this practice is now often adopted with excellent effect: the operation is easily performed by means of a piece of sponge attached to a curved whalebone rod. The same treatment has been proposed for croup in its acute stage; and more recently still Dr. Green has injected a solution into the bronchial tubes in obstinate chronic bronchitis. As a topical application in the solid state or in the form of a strong solution, it is most valuable in ulcerations of the cornea, and in purulent and gonorrhœal ophthalmia; in this latter disease, being one of our sheet anchors, its introduction into the eye being attended with the production of a white colour (chloride of silver). A weaker solution, gr. ij. to gr. v. to f℥j. of water, may be employed in both acute and chronic conjunctivitis; it is, however, liable to produce specks on the cornea, or dark stains on the conjunctiva, as first observed by Professor Jacob of this city. Nitrate of silver has been also used in the solid state to remove strictures of the urethra and œsophagus, applied by means of a bougie, into the point of which it is inserted *(armed or caustic bougie)*, but the practice is attended with danger. In gonorrhœa occurring in females, a pencil of nitrate of silver is applied freely to the mucous membrane of the vagina, it is said with much benefit; and in the same disease in males, an injection, varying in strength from gr. ij. to gr. xx. dissolved in f℥j. of water, is injected into the urethra. Such treatment, however, is not unattended with risk. Its use in *spermatorrhœa,* first suggested by Sir E. Home, and subsequently urged by Lallemand and Ranking, has proved of great service; here it can be employed applied directly to the prostatic portion of the urethra with the aid of catheters devised for the purpose, either in the fluid or solid form. Nitrate of silver is also employed with benefit as a topical application in many forms of ulcerations of the gums, the tongue, and the fauces; also, to prevent *pitting* in small-pox, its use has been recommended by Brettonneau, Velpeau, and others; the apex of the pustule is to be removed, and a sharp pencil of nitrate of silver to be introduced into each—a plan of treatment that I cannot recommend, as I have seen it produce both pain and inflammation, and as we have at our command more efficacious plans for producing the same result, unattended with these inconveniences; in excoriations of the nipples; in the chronic stages of eczema, impetigo, and other diseases of the skin; and in the acute stage of herpes preputialis, and herpes labialis. In conclusion, it may be of some use to sum up the changes in coloration produced by this salt on application to the living tissue. When a solution is introduced into the *eye,* we have a white color as the result, due to the production of chloride of silver, resulting from the action of nitrate of silver upon the chloride of sodium contained in the lachrymal secretion: applied to an *ulcer,* a white colour, due partly to the coagulation of the albumen of the secretion *(albuminate of silver),* partly to the production of the chloride resulting on the presence of chlorides in these secretions: applied to the *cuticle,* at first a whitish colour, due to the coagulation of its albumen; secondarily a black colour, resulting from the ultimate reduction of the salt to the state of suboxide. (See, also, *Tonics.*)

* *Unguentum Nitratis Argenti. Ointment of Nitrate of Silver* (GUTHRIE). (Argenti nitratis, gr. x.; adipis, gr. lx.; solutionis plumbi subacetatis, min. xv. Reduce the salt to an impalpable powder *(an important consideration),* and then thoroughly incorporate it with the lard and liquor plumbi). To be applied with a camel's hair brush. At first this application gives rise to great pain, which, after a few hours, however, subsides, and in general much relief ensues.

ACIDUM ARSENIOSUM.—*Arsenious Acid.* (Syn.: *Arsenicum Album,* Ed.; *White Oxide of Arsenic; Arsenic.*) $AsO_3(=99)$. Arsenious acid is an article of the Materia Medica; it is prepared by roasting metallic ores in which the metal is contained, especially the arseniuret of cobalt, in a reverberatory furnace to which is attached a long chimney in a horizontal direction; the arsenic is deposited on the floor of the chimney in the form of a grey powder, which is refined by sublimation for the purpose of freeing it from earthy matter, such as sulphate and carbonate of lime, very frequent impurities. 14

PREPARATION.—Take of arsenious acid of commerce, one hundred grains. Introduce the commercial arsenious acid into a thin porcelain capsule of a circular shape; and, having covered this as accurately as possible with a glass flask filled with cold water, apply the heat of a gas lamp. Sublimed arsenious acid will be found adhering to the bottom of the flask. Should a larger quantity be required, the commercial arsenious acid should be sublimed by the heat of a gas lamp or of burning charcoal, from a small Florence flask, the neck of which is passed into a second flask of larger size; and the flask containing the commercial arsenious acid should be furnished with a hood of sheet iron to counteract the cooling influence of the atmosphere. These processes should be conducted in the vicinity of a flue with a good draught, so as to carry off any vapours of arsenious acid which may escape.

CHARACTERS.—A heavy white powder, which, when slowly sublimed in a glass tube, forms minute brilliant and transparent octohedral crystals. It is sparingly soluble in water, and its solution gives with ammonio-nitrate of silver a canary-yellow precipitate insoluble in water, but readily dissolved by ammonia and nitric acid.

PHYSICAL PROPERTIES.—In addition to the pharmacopœial characters, it may be also stated that we meet with arsenious acid in the form of large vitreous cakes or masses, whitish, sometimes having a yellow tinge; transparent, but on exposure to the air soon becoming opaque like enamel, the opacity gradually extending to the centre of the masses—the cakes are moderately hard and brittle; that it is inodorous; that it is also nearly tasteless, but that when the tongue is kept for a few moments in contact with a piece of arsenic, a slightly bitter and acrid taste, afterwards becoming sweetish, may be perceived. Its specific gravity, when transparent, is 3·733 and when opaque, 3·699.

TESTS.—Entirely volatilized by heat. Four grains of it dissolved in boiling water with eight grains of bicarbonate of soda discharge the colour of 80·8 measures of the volumetric solution of iodine.

CHEMICAL PROPERTIES.—It is composed of one equivalent of the metal arsenic, and three equivalents of oxygen (AsO_3). Exposed to a heat of 380° F. it sublimes unchanged, and as it cools condenses into small transparent crystals of adamantine lustre, which are regular octohedrons. At ordinary temperatures water dissolves from an 800th to a 400th of its weight of powdered arsenious acid; boiling water dissolves nearly a ninth of its weight, and on cooling to 60°, retains a 35th (Christison). The solution reddens litmus paper slightly. The chemical characteristics of arsenious acid are as follows:—thrown on red-hot charcoal or cinders it evolves a scarcely visible vapour, *metallic arsenic*, which has a strong alliaceous odour, and which at the distance of a few inches from the charcoal is converted into a dense white *odourless* smoke, *arsenious acid;* great stress was formerly placed on the production of this alliaceous odour, to which, however, we now attach but little importance. Heated with carbonaceous matter in a glass tube, it is reduced and the metal sublimed, forming a greyish-black ring in a cooler part of the tube, and which by the application of heat to the outside of the glass is resublimed in the form of asenious acid; in this case the carbon deoxidizes the arsenious acid, forming carbonic acid and metallic arsenic, thus, $2AsO_3+3C=3CO_2+2As$. Its solution precipitates lemon-yellow with ammonio-nitrate of silver, *arsenite of silver* ($2AgO, AsO_3$), *Hume's test*—in this test (a most delicate one) we have the ammoniaco-nitrate of silver ($AgO,2NH_3NO_5HO$) decomposed by the arsenious acid, the oxide of silver precipitating with the arsenious acid in the form of arsenite of silver, and nitrate of ammonia, free ammonia and water held in solution, thus, $2(AgO,2NH_3NO_5HO)+AsO_3=2AgO,AsO_3+2NH_3NO_5+2NH_3+2HO$—grass-green with ammonio-sulphate of copper, *arsenite of copper* ($2CuO,AsO_3$), *Scheele's green*: in this test the ammoniaco-sulphate of copper ($CuO, 2NH_3SO_3HO$) is decomposed by the arsenious acid, the oxide of copper precipitating in combination with the arsenious acid in the form of arsenite of copper, and sulphate of ammonia, free ammonia and water are held in solution, thus, $2(CuO,2NH_3SO_3HO)+AsO_3=2CuO,AsO_3+2NH_3SO_3+2NH_3+2HO$—and sulphur yellow with sulphuretted hydrogen; three atoms of sulphuretted hydrogen decomposing the arsenious acid, the three hydrogens uniting with the three oxygens to form water, and the three sulphurs uniting with the one arsenicum to form the tersulphide of arsenicum, thus, $3SH+AsO_3=3HO+AsS_3$. Put into a proper apparatus, as a Marsh's test tube, or a Döbereiner's lamp, with zinc and sulphuric acid, arseniuretted hydrogen will be evolved, which, being ignited as it passes through the fine aperture of the exit tube, deposits metallic arsenic on a plate of glass or porcelain held in the flame, and arsenious acid if held a little above the flame; in this case the three atoms of oxygen of the arsenious acid are removed by three atoms of the hydrogen, developed by the action of the sulphuric acid and water on the zinc, and three other atoms of hydrogen unite with the arsenicum to form arseniuretted hydrogen gas, thus, $AsO_3+6Zn+6SO_3HO=AsH_3+6ZnOSO_3+3HO$. The flame consists of two portions, an external and internal one; on the exterior the gas meets with oxygen, and on combustion is converted into arsenious acid. This condition does not exist in the interior of the flame, where consequently we meet with arsenic deprived by combustion of its hydrogen, but in the metallic form, accounting for those two different appearances produced either as we hold the plate *above* the flame, when arsenious acid (AsO_3), resulting from the oxidation of the metal, will be deposited upon it, or *cutting* the flame, when we will get the metal. Similar appearances to these will be furnished by *antimoniuretted* hydrogen, a gas produced in precisely a similar way, a soluble salt of *antimony* being substituted for one of arsenic, but in this case we have a ready means of ascertaining to which metal the gas belongs. If the deposit be *arsenical*, on persevering with the experiment we will gradually find the glass or porcelain reappearing in the centre of the sublimate, a phenomenon due to the volatility of the sublimate, and which does not occur in the case of antimony; in addition to which, if we moisten the plate with the solutions of ammoniaco-nitrate of silver and of ammoniaco-sulphate of copper, we get their characteristic reaction. Finally, if an aqueous solution of arsenious acid be boiled with pure hydrochloric acid, and clean copper foil, or fine copper gauze, or copper wire, the latter acquires an iron-grey coating of metallic arsenic *(Reinsch's test)*. The reactions that occur are these, the hydrochloric acid is decomposed, its chlorine uniting with the copper to make a dichloride of copper (Cu_2Cl), whilst its hydrogen unites with the oxygen of the arsenious acid to form water, and metallic arsenic is as a consequence developed, thus $AsO_3+6Cu+3HCl=3Cu_2Cl+3HO+As$.

ADULTERATIONS.—Arsenious acid seldom contains any impurities ; as sold in the form of powder, it is sometimes adulterated with chalk or sulphate of lime, or it may accidentally contain a little oxide of iron ; any of them may be detected by the application of heat, which sublimes the acid and leaves the impurity.

USES.—Arsenious acid is a powerful caustic, producing death of the part to which it is applied, which subsequently separates by sloughing ; in consequence, however, *of the danger which may occur from its absorption*, (many fatal cases being on record where the symptoms were as indubitably those of arsenical poisoning as if the mineral had been swallowed), it is but seldom employed in regular practice in the present day. The cases in which it has been found of use are malignant or cancerous ulcerations, especially of the skin of the face, in lupus, in onychia maligna, and in hospital gangrene. It may be applied in the form of ointment made with axunge or spermaceti, powdered opium being added to allay the pain produced Dangerous symptoms are less likely to arise from its absorption, if an ointment containing a tenth or a sixth of its weight of the acid be employed than if a weaker preparation be used, in consequence of its action being localised by the lymph thrown out all around, in virtue of the inflammation it in this case excites. (See, also, *Tonics*.)

* *Arsenical Paste*, CAZENAVE. (Arsenic, 2 parts ; sulphate of mercury, 1 part ; animal charcoal, 2 parts ; mix.) When required for use, a few drops of water are added to this powder so as to form it into a thin paste, which is spread upon the surface to be acted on ; this should never exceed an inch in diameter on each application.

* *Arsenical Paste*, FRÈRE COME. (Ten grains of arsenious acid ; forty grains of red sulphuret of mercury ; ten grains of charcoal) to be made into a paste with water as required.

* *Arsenical Paste*, MISS PLUNKET. (Ranunculus acris and ranunculus flammula, of each one ounce ; arsenious acid, one drachm ; sulphur, five scruples. Beat altogether up into a paste, and dry in the sun.) This is a celebrated empirical remedy, even to the present day highly valued by our Irish country *quacks*. When required for use, a portion of it is to be rubbed up with yolk of egg, and spread upon a piece of pig's bladder. The object of using the ranunculi is by their acrid juice to produce an excoriated surface for the arsenious acid to act upon with greater energy.

* *Arsenical Caustic Powder*, DUBOIS. (Arsenious acid, 8 parts; dragon's blood, 22 parts; and cinnabar, 70 parts; mix and reduce to a fine powder.) This powder is made into paste with a little saliva or gum-water just before it is applied.

* *Arsenical Powder*, DUPUYTREN. (Calomel, ninety grains; arsenious acid, from four to ten grains), applied either in the form of paste or as powder dusted over the surface.

Although I have thus given numerous preparations for the external exhibition of arsenic, still I cannot too forcibly impress on the reader's attention the danger attendant on their employment; fatal cases are on record following the use of most, if not all of them; where the symptoms before death were those of arsenical poisoning, where the pathological lesions were similar, even to the inflamed appearance of the stomach, and where toxicological research has succeeded in detecting the poison in organs remote from the seat of its original application. In no case should it be applied to a recently cut surface. If used at all, I believe the following *dictum* to be sound, that it should be only used on diseased surfaces of *very limited extent*, and that then, for reasons already stated, it should be applied *in large quantities*, in fact a quantity sufficient to ensure the thorough death of the part.

* CUPRI SUBACETAS. (Syn.: *Ærugo. Subacetate of Copper; Verdigris; Impure Diacetate of Copper. Diacetate of Copper.*) ($2CuO,\bar{A},6HO = 184{\cdot}5$)

PREPARATION —Is not now contained in the Materia Medica, but is obtained by placing plates of copper in contact with the fermenting marc of the grape, or with cloths dipt in vinegar. The Dublin College directed this article to be prepared for medical use by the following process:—*Cupri subacetas præparatum*, take of subacetate of copper, a convenient quantity; reduce it to powder by careful trituration in a porcelain mortar, and separate the finer parts for use by means of a sieve.

PHYSICAL PROPERTIES.—In coarse masses or in powder, either of a beautiful pale bluish-green colour *(green verdigris)*, or of a rich blue *(blue verdigris)* with a disagreeable acetous odour, and a styptic metallic taste.

CHEMICAL PROPERTIES.—*Blue* verdigris is the hydrated diacetate of copper, and *green* verdigris consists of the subsesquiacetate and the trisacetate (Berzelius). Verdigris is permanent in the air; heated it first loses water, then acetic acid, and the residue contains metallic copper; water resolves it into a soluble acetate and an insoluble trisacetate, a good reason why we should not prepare it as formerly directed by elutriation. It is dissolved entirely by both sulphuric and hydrochloric acids.

ADULTERATIONS.—The slight impurities, metallic copper, or earthy matters present in commercial verdigris are of no importance; they may be detected by its solubility in sulphuric or hydrochloric acid.

USES.—As a caustic it is applied to indolent ulcers, to venereal warts, and to fungous growths; it is also a useful application in ophthalmia tarsi; and has been employed in chronic diseases of the scalp, when they are of an indolent and obstinate character. It may be used in powder, or in either of the following forms:—

* *Linimentum Æruginis.* Syn.: *Mel Ægyptiacum, Mel Æruginis.* (Verdigris, in powder, ℥j.; vinegar, f℥vij.; honey, ℥xiv.; dissolve the verdigris in the vinegar, strain through a linen cloth; add the honey, and boil to a proper consistence.) A mild caustic, applied to venereal ulcers of the mouth and tonsils, to malignant ulcers of the tongue, and to the ulcerated sore throat of scarlatina. Although an old established favourite, this preparation is not a good keeping one. After some time its copper is deposited in the metallic form, and its sugar also undergoes molecular changes.

* *Unguentum Cupri Subacetatis.* Syn.: *Unguentum Æruginis.* (Prepared subacetate of copper, gr. xxx.; ointment of white wax, grs. ccccl.; triturate the subacetate of copper with the ointment until they are intimately mixed.) A better keeping preparation than the preceding one, for which it may be substituted in all cases suited for either application.

In cases of poisoning with verdigris, resulting as they generally do from the use of food, &c. prepared in vessels of this metal not properly cleaned, the best antidote is albumen.

* CUPRI CARBONAS. *Carbonate of Copper.* ($2CuO,CO_2HO = 100{\cdot}5$.) This preparation, obtained by precipitating a solution of sulphate of copper with carbonate of soda, though not contained in the British Pharmacopœia deserves a short notice, in consequence of the success said to be obtained from its use in the chronic forms of impetigo and eczema of the scalp, by M. Devergie, in the *Hôpital Saint Louis* at Paris; he employs it in the form of ointment, prepared by mixing intimately gr. cxx. of the powder with ℥j. of axunge.

* CUPRI NITRAS. *Nitrate of Copper.* $CuONO_5 + 3HO = 120{\cdot}75$.

PREPARATION.—Digest dilute nitric acid upon copper wire, until the metal dissolves. Evaporate and crystallize.

EXPLANATION OF PROCESS.—Three atoms of copper are reacted upon by four of nitric acid. One of the acids is resolved into nitric oxide gas, which escapes, and three atoms of oxygen, which unite with the three equivalents of copper to form three oxides of the metal, which unite with the remaining three atoms of acid to make three equivalents of nitrate of copper, thus, $3Cu + 4NO_5 = NO_2 + 3CuONO_5$.

PHYSICAL PROPERTIES.—Beautiful blue crystals; highly deliquescent; styptic, caustic, and corrosive taste; cupreous smell.

CHEMICAL PROPERTIES.—Recognized as a salt of copper by the tests already given for that metal (see p. 85), and as one of nitric acid by its chracteristics (see p. 201).

USES.—This preparation is not employed internally. Externally it is a most valuable detergent caustic, and in cases of syphilitic ulcers presenting a foul unhealthy appearance was a favourite application with Sir Philip Crampton, under whose directions, when serving my time to him as an apprentice, I frequently applied it with most beneficial results. My friend Mr. Fleming, of this city, also speaks of it in high terms, having recorded its value in ulcers situated on the tongue in the following terms:—"I have tried many local applications, and amongst others the acid nitrate of mercury, but I have found none equal to the nitrate of copper. It is most invaluable as an application to this class of ulcer; and I may remark that it will be found equally so in many of those small excavated ulcers of a semi-phagedenic or lupoid character, which occur in the fauces, and on the genital organs both of the male and female. It is a very deliquescent salt, and can be applied only in the liquid state, dissolved in its own water of crystallization. The surface of the ulcer should be well dried before and after it is applied, and afterwards covered with oil; and it should be borne in mind, as regards the tongue, that the superficial appearance of the ulcerated surface is often most deceptive, as the disease burrows very deeply. The best mode of fixing the tongue, for the purpose of applying the caustic is by means of the fingers and thumb, a portion of lint, linen, or a towel being interposed, so that it cannot slip; and the best instrument for the application is a small piece of cedar, as prepared for paint-brushes, the ends of which may be covered with lint or French wadding, one end being dipped in the nitrate of copper, the other in the oil, whereby no delay or confusion can ensue. I find, moreover, after 24 or 36 hours, a lotion in the proportion of *one* drop to the ounce of water, or even less in some cases, a most efficient promotive to cure."—*Dublin Quarterly Journal, N. S.*, vol. x., p. 101.

CUPRI SULPHAS. *Sulphate of Copper* (described in the division *Astringents*) is used in the solid state as a caustic, to repress excessive granulations, to destroy venereal warts, in chronic diseases of the conjunctiva, and to excite a new action in indolent ill-conditioned ulcers; it is also applied with much benefit to chancres in their early stage.

* *Cuprum Aluminatum.* (*Pierre Divine.*) (Sulphate of copper, nitrate of potash, and alum, of each ℥iij. Reduce them to powder, heat them in a glass or porcelain vessel until they melt, then add gr. lx. of camphor in fine powder; mix intimately, and pour out on an oiled slab; when cold, break into convenient sized fragments, and preserve in a well stoppered bottle); a mild escharotic, occasionally

used in ophthalmic surgery; a solution of two grains to the ounce of rose water makes a useful astringent collyrium *(collyre du pierre divine.)*

HYDRARGYRI OXIDUM RUBRUM. *Red Oxide of Mercury.* (Syn.: *Hydrargyri Nitrico-Oxidum, Red Precipitate.*) $HgO(=108)$.

PREPARATION.—Take of mercury, by weight, eight ounces; nitric acid, three fluid ounces; water, two fluid ounces. Dissolve half the mercury in the nitric acid diluted with the water, evaporate the solution to dryness, and with the dry salt thus obtained triturate the remainder of the mercury until the two are uniformly blended together. Heat the mixture in a porcelain capsule, with repeated stirring, until acid vapours cease to be evolved, and, when cold, enclose the product in a bottle.

EXPLANATION OF PROCESS.—To give a satisfactory explanation of the reaction that ensues in this process it is necessary to divide it into two stages, in the first of which we have a nitrate of the suboxide of mercury formed (Hg_2O,NO_5), the mercury being oxidized at the expense of a portion of the nitric acid employed, whilst the remainder of the nitric acid unites with the suboxide so produced to form this salt, thus, $6Hg+4NO_5=3(Hg_2O, NO_5)+NO_2$. On heating this salt we have it decomposed, the nitric acid parting with an atom of its oxygen, to convert the sub- into a per-oxide of mercury, and the hyponitric acid so produced escaping in the form of the *acid vapours* alluded to; thus, $Hg_2O,NO_5=2HgO+NO_4$. In the pharmacopœial formulary we are directed, from motives of economy, not to employ all the mercury at once, but to incorporate the second portion previous to applying the heat, so that it also may undergo a reaction similar to that described, at the hands of the nitric acid, ere it be finally driven off.

PHYSICAL PROPERTIES.—In brilliant, micaceous masses, varying in colour from orange-yellow to bright scarlet; inodorous, with a taste at first faintly, then strongly, caustic and metallic. Specific gravity, 11·074. In fine powder its colour is yellow.

CHARACTERS.—An orange-red powder, readily dissolved by hydrochloric acid, and yielding a solution which, with caustic potash added in excess, gives a yellow precipitate, and with solution of ammonia a white precipitate.

CHEMICAL PROPERTIES.—It is composed of one equivalent of mercury and one of oxygen, generally containing a little undecomposed nitrate of mercury; exposed to red heat, the oxide of mercury is entirely volatilized in the form of oxygen and metallic mercury. It is very sparingly soluble in water, boiling water dissolving about a 7000th of its weight; is very soluble in hydrochloric, acetic, and hydrocyanic acids; but is insoluble in alcohol. Its solution in hydrochloric acid is chloride of mercury; this yields with caustic potash the *yellow* peroxide of mercury, thus, $HgCl+KO=KCl+HgO$. The white precipitate is the *hydrargyrum ammoniatum* (which see).

TESTS.—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 are perceived. Dissolves without residue in hydrochloric acid.

ADULTERATIONS.—The nitric-oxide of mercury sometimes contains nitric acid, which is indicated by the ruddy fumes evolved when the salt is heated; it is often adulterated with red oxide of iron, red oxide of lead, or brick dust; they may be all detected by exposing the salt to the heat directed in the Pharmacopœia; if pure, it is entirely sublimed.

THERAPEUTICAL EFFECTS.—As a mild caustic, this preparation is applied to indolent ulcers, to spongy granulations, to venereal warts, to the eyelids in chronic inflammation of their edges, &c. It may be used in powder, sprinkled over the surface, or in ointment, as follows:—

Unguentum Hydrargyri Oxidi Rubri. Ointment of Red Oxide of Mercury. (Syn.: *Red Precipitate Ointment.*) (Take of red oxide of mercury, in very fine powder, sixty-four grains; simple ointment, one ounce. Mix thoroughly.)

HYDRARGYRI NITRATIS LIQUOR ACIDUS. *Acid Solution of Nitrate of Mercury.* (Nitrate of Mercury, HgO, NO_5(=162), in solution in Nitric Acid.)

PREPARATION.—Take of mercury, four ounces; nitric acid, three fluid ounces and a quarter; distilled water, three fluid ounces. Mix the nitric acid with the water in a flask; and dissolve the mercury in the mixture without the application of heat. Boil gently for fifteen minutes, cool, and preserve the solution in a stoppered bottle.

EXPLANATION OF PROCESS.—In this preparation three atoms of mercury are acted upon by four of nitric acid, ; one atom of nitric acid is resolved into nitric oxide gas (NO_2), which escapes, and three atoms of oxygen, which uniting with the three equivalents of mercury, form peroxide of mercury, which unites with the other three atoms of nitric acid to form the nitrate of mercury, which is held in solution by the excess of nitric acid employed. This equation explains the reaction, $3Hg+4NO_5=NO_2+3HgONO_5$.

CHARACTERS.—A colourless and strongly acid solution, which gives a yellow precipitate with solution of potash added in excess. 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.

The precipitate produced on the addition of caustic potash is peroxide of mercury, the nitric acid going to the potash to form nitrate of potash, and the oxide of mercury being precipitated, thus, $HgONO_5 + KO = KONO_5 + HgO$. The dark colour produced on the addition of the crystals of sulphate of iron is due to the conversion of a portion of the proto- into a per-salt of iron by the nitric acid, and the absorption of the nitric oxide gas so produced by a portion of the undecomposed sulphate of iron (*vide*, p. 90).

TESTS.—Specific gravity, 2·246. Does not give any precipitate when a little of it is dropped into hydrochloric acid diluted with twice its volume of water.

On being dropped into hydrochloric acid the pernitrate of mercury is converted into chloride of mercury, which is soluble, $HgONO_5 + HCl = HO + HgCl + NO_5$. Were any nitrate of suboxide of mercury (Hg_2ONO_5) present, calomel would be formed, which being insoluble would precipitate, thus, $Hg_2ONO_5 + HCl = Hg_2Cl + HO + NO_5$.

A dense caustic solution, very much employed latterly, especially on the continent, to destroy malignant ulcerations, particularly when of a cancerous nature; and as a caustic application to lupus, and to ulcers of the cervix uteri; Bennett recommending its use in this latter affection where the "inflammation is intense, the ulceration large, and the granulations unhealthy." It is best applied by means of a brush or a piece of lint fastened to a bit of whalebone or stick. It has been known, when thus locally applied, to cause salivation: in one instance Breschet states that he witnessed salivation to be produced by a single application to the ulcerated neck of the womb.

POTASSÆ BICHROMAS. *Bichromate of Potash.* $KO2CrO_3 = 123{\cdot}5$. This salt, although mentioned in the *Appendix* to the Pharmacopœia, can scarcely be said to be an article of the Materia Medica, inasmuch as it is evidently introduced with a view to its pharmaceutical uses, not with any idea of its therapeutical employment; however, as both it and its acid are alluded to as caustic agents in continental surgery, I have thought proper to make some more particular allusion to them here.

PREPARATION.—Bichromate of potash is obtained from the chromate of potash ($KOCrO_3$) by acting upon it with sulphuric acid, in the proportion of two atoms of chromate of potash to one of acid; one of the atoms of potash unites with the sulphuric acid to form sulphate of potash, and the two chromic acids unite with the remaining equivalent of potash to form this salt, thus, $2KOCrO_3 + SO_3 = KO,SO_3 + KO2CrO_3$. On being set aside the bichromate crystallizes out of the solution. Chromate of potash itself is prepared by igniting chrome iron ore ($FeOCr_2O_3$) with nitrate of potash, the nitric acid of which converts the sesquioxide of chrome into chromic acid, which unites with the potash, and on subsequent solution and evaporation crystallizes out.

PHYSICAL PROPERTIES.—Orange red, prismatic, quadrangular crystals, permanent in the air; of a metallic taste; paper impregnated with it forms good tinder.

CHEMICAL PROPERTIES.—It is an anhydrous salt, composed of one atom of potash and two of chromic acid ($KO2CrO_3$); soluble in ten parts of cold, and much less of hot water. At a red heat it fuses into a transparent liquid, which on cooling forms a congealed mass, that subsequently falls into powder. Heated with sulphuric acid it evolves oxygen, with the formation of chrome alum (*vide* p. 62). The solution in water gives with chloride of barium a yellowish-white *(chromate of baryta)*, and with nitrate of silver an orange *(chromate of silver)* precipitate; both of which are entirely soluble in dilute nitric acid.

THERAPEUTICAL EFFECTS.—In small doses bichromate of potash is alterative; in larger doses, emetic. With the first of these objects in view, it has been employed by various continental practitioners in the treatment of secondary syphilis (Heyfelder, Robin, Vicente, &c.). In its action it resembles the mercurial preparations, occasionally even producing salivation, and its employment in such cases in their hands has been attended with encouraging results; but in these countries I believe it to be but rarely so employed, its use being restricted to external application as a caustic. Its employment as such was originally suggested by Dr. Cumin, who employed saturated solutions of it in water to tubercular elevations, excrescences, and warts. It has also been found useful in promoting the cicatrization of ulcers, especially of a scrofulous character, and has afforded relief in cancer of the uterus. The *neutral* Chromate of potash has also been used with similar views, and seems in its physiological effects closely to approach the bichromate. It has been employed by Jacobson, Holscher, Jensen, &c. both internally and externally; internally, as an emetic, in place of tartar emetic, from the action of which it differs in not so frequently producing purgation; also as an expectorant and diaphoretic in catarrh, seemingly possessing some special effects over the naso-pulmonary mucous membranes: according to Gmelin, in large doses inflaming them and much increasing their secretions. These effects appear to be worthy of more extended study.

DOSE AND MODE OF ADMINISTRATION.—Of either salt, *internally*, as an alterative, expectorant, or diaphoretic, one-eighth to one-fourth of a grain; as an emetic, gr. ij. to gr. iv. *Externally*, as a *caustic*, either in the form of powder, or saturated solution; or as a cleansing lotion, from gr. x. to gr. xx. in an ounce of distilled water. Bibulous paper soaked in a saturated aqueous solution of this salt, rolled into cones and fastened with mucilage, has been used as a *moxa*. Both salts in solution seem to possess some antiseptic properties.

PHARMACEUTICAL USES.—In making valerianate of soda (*vide* p. 62) and in preparing the volumetrical solution of bichromate of potash. (See Supplementary Agents.)

POTASSA CAUSTICA. *Caustic Potash.* (Syn.: *Potassæ Hydras, Potassa, Potassa fusa, Lapis Infernalis.*) Hydrate of Potash, KOHO (=56).

PREPARATION.—Take of solution of potash, two pints. Boil down the solution of potash rapidly in a silver, or clean iron vessel, till all ebullition ceases, and a fluid of oily consistence remains. Pour this into proper moulds, and when it has solidified, and while it is still warm, put it into stoppered bottles.

PHYSICAL PROPERTIES.—In flat, irregular pieces, or more generally in pencils or sticks of various lengths and about the thickness of a writing pen, which should be white, but frequently are greyish or bluish; inodorous; having a very acrid alkaline taste. Specific gravity, 1·8.

CHARACTERS.—In hard white pencils, very deliquescent, powerfully alkaline and corrosive. A watery solution acidulated by nitric acid gives a yellow precipitate with bichloride of platinum, and scanty white precipitates with nitrate of silver and chloride of barium.

CHEMICAL PROPERTIES.—Caustic potash is composed of 1 equivalent of potassium, 1 of oxygen, and 1 of water ($KO+HO$); exposed to the air it deliquesces rapidly, and soon becoming liquid, attracting carbonic acid at the same time, is converted into the carbonate. It is soluble both in water and alcohol, water dissolving nearly an equal weight; during the solution heat is evolved. It possesses the properties of an alkali in an eminent degree. The production of a yellow precipitate on the addition of bichloride of platinum has been already explained (see pp. 164, 165). The precipitates produced on the addition of nitrate of silver *(chloride of silver)*, and on the addition of chloride of barium *(sulphate and carbonate of barytes)*, indicate as impurities traces of chloride, sulphate, and carbonate of potash.

TESTS.—Fifty-six grains dissolved in water leave only a trace of sediment, and require for neutralization at least ninety measures of the volumetric solution of oxalic acid.

ADULTERATIONS.—It generally contains various impurities, such as oxide of iron; silica; and chloride, sulphate and carbonate of potash; their presence, however, is of little consequence with reference to its medical uses. The iron and silica may be detected by the residue left on dissolving it in water or in alcohol; the chlorides, sulphates, and carbonates by the tests directed in the *Characters*.

USES.—Caustic potash is a powerful caustic, but so unmanageable in consequence of its deliquescent property, that it is not often employed. Its chief use is for making an issue, which is effected by covering the part with two or three layers of adhesive plaster, in the centre of which an aperture is cut, somewhat *less* than the size of the intended issue; the caustic potash is rubbed on the part until the surface is destroyed, which may be judged to have occurred when it assumes an *ash-grey* colour; the part should then be washed with vinegar and water and a linseed-meal poultice applied, and when the slough separates (which will occur from the fourth to the ninth day) a pea is inserted. Issues never should be inserted over prominent points of bone or over the seat of large blood-vessels or nerves. Their shape should vary according to their site. When applied in the spinal region, as frequently and beneficially done in cases of Pott's curvature, they should be oblong; when over joints, such as the hip or knee, they should be circular. According to Pott, their value depends upon the purulent drain they establish;

according to Brodie, it is to be attributed to the counter-irritation they produce. Perhaps a combination of both these opinions will be about the truth. These issues will be found of great service as auxiliaries in the opening of chronic abscesses. In these cases they can be employed either with the view of discharging their contents on the natural separation of the slough, or of opening them by a puncture made through the eschar the day after the caustic has been employed: either course is attended with the great advantage of being less likely to be followed with the great amount of constitutional irritation that but too frequently ensues on the other plans of treatment suggested for the discharge of these collections—a fact I have frequently put to the test in the wards of the Meath Hospital. Pencils of caustic potash, not deliquescent, may be readily prepared, according to M. Robiquet, by combining it with gutta percha in the following manner. He first reduces the caustic potash to a pulverulent state by exposing it to a red heat until completely melted, pouring on a slate so as to cool it rapidly, then pulverizing in a warmed iron mortar and passing through a wire sieve. This powder must be put at once into a well-stoppered bottle. The gutta percha is melted with the lowest possible temperature—that of warm cinders for example—and mixed quickly with its own weight of the powdered caustic potash in a quantity not exceeding 10 to 12 drachms. Should the mixture not be pliable enough, it may be softened by the addition of a few drops of melted wax and mixed anew. It can then be rolled into cylinders, which, previous to use, should be dipped for a few seconds into spirits of wine. In the abortive plan of treating primary syphilitic ulcers, potassa fusa is the caustic which should be preferred, inasmuch as it forms a *slough*, and thus gives us a chance of eliminating the virus.

* *Potassa Caustica cum calce.* (Take of caustic potash; fresh burned lime, of each, one ounce; rub them both rapidly to powder in a warm mortar, and introduce the mixture with as little delay as possible into a bottle furnished with an air-tight stopper.) For producing issues this preparation is preferred by many to caustic potash, as being more manageable, in consequence of not being so deliquescent.

* *Caustic of Filhos.* This preparation is exceedingly useful for cauterizing the neck of the uterus, and is also very generally employed by French surgeons for many other purposes. Some nicety is required for its formation; tubes of lead from 3 to 4 lines in diameter and from 1 to 2 yards in length, are procured, and divided into portions of a convenient length by means of a piece of cord attached at both extremities to a fixed point, and rolled evenly around the tube where it is wished to cut it. By this method the parietes of the tube are bent inwards, and a small opening only left, which is easily closed by means of a hammer and a mandril introduced into the tube; great care must, however, be taken that the smallest fissure be not left, as this would render the tube useless. The tubes thus

prepared are placed in sand or moist clay and filled with the following caustic:—Heat 120 parts of *Potassa cum calce* in a clean iron spoon until it is perfectly fused, when the spoon acquires a dull red heat; and add to it gradually 40 parts of fresh quick-lime, stirring with an iron rod until the whole is intimately mixed. It must be poured while fluid into the tubes. When cold, the parietes of the tubes are thinned with a file as much as possible, care being taken not to penetrate them. These caustic pencils are kept in glass tubes with a little finely powdered quick-lime, the orifices being securely closed with corks, a little cotton being placed between the cork and the pencil. More recently M. Robiquet has proposed a much more simple method for preparing these tubes, and his plan has been approved of in a Report to the French Academy of Medicine. The fused caustic is poured into iron moulds, removed as soon as cold, and enveloped in slips of gutta-percha paper gently heated to make them adhere, which is readily effected by rolling on a table. The same precaution is requisite in their preservation as when the lead envelopes are used.

* *Caustic Powder of Vienna, Vienna Paste.* (Take of *Potassa cum calce,* 50 parts; quick lime, 60 parts; powder the two substances separately in a warm mortar, and mix them intimately and rapidly; keep in well-stoppered bottles.) When required for use, this powder is made into a soft paste with a little spirit and applied to the part it is wished to cauterize.

In cases of poisoning with caustic potash, the best antidotes are, vinegar, lemon-juice, or the fixed oils.

ZINCI CHLORIDUM. *Chloride of Zinc.* (Syn.: *Butter of Zinc.*) $ZnCl(=68)$.

PREPARATION.—Take of granulated zinc, sixteen ounces; hydrochloric acid, forty-four fluid ounces; solution of chlorine, a sufficiency; carbonate of zinc, half an ounce, or a sufficiency; distilled water, one pint. Put the zinc into a porcelain basin, add by degrees the hydrochloric acid, previously mixed with the water, and aid the action by gently warming it on a sand bath until gas is no longer evolved. Boil for half an hour, supplying the water lost by evaporation, and allow it to stand on a cool part of a sand bath for twenty-four hours, stirring frequently. Filter the product into a gallon bottle, and pour in the solution of chlorine by degrees, with frequent agitation, until the fluid acquires a permanent odour of chlorine. Add the carbonate of zinc, in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter through paper into a porcelain basin, and evaporate until a portion of the liquid, withdrawn on the end of a glass rod and cooled, forms an opaque white solid. Pour it out now into proper moulds, and when the salt has solidified, but before it has cooled, place it in closely-stoppered bottles.

EXPLANATION OF PROCESS.—On pouring hydrochloric acid on zinc the acid is resolved into its elements, the hydrogen escaping, whilst the chlorine unites with the metal to form chloride of zinc, thus, $Zn+HCl=ZnCl+H$; but the zinc of commerce invariably contains iron, which would appear as an impurity in the resulting salt, were it not for the subsequent steps of the operation, and which will be understood by what has been already written under the head of *Zinci Sulphas* (p. 123).

PHYSICAL PROPERTIES.—In solid pieces; snow white; inodorous; having a strongly styptic metallic taste; very deliquescent.

CHARACTERS.—Colourless opaque rods or tablets, very deliquescent and caustic; soluble almost entirely in water, alcohol, and ether. The watery solution is precipitated white by hydrosulphuret of ammonia and nitrate of silver; but, if first acidulated with hydrochloric acid, is not affected by sulphuretted hydrogen.

CHEMICAL PROPERTIES.—Chloride of zinc is composed of 1 equivalent of chlorine and 1 of metallic zinc (ZnCl); exposed to the air it deliquesces rapidly, being said by many chemists to be the most deliquescent of salts. It is fusible at 212°, and is volatilized at a red heat. It is soluble in water, alcohol, and ether; the solutions being acid. Hydrosulphuret of ammonia yields a characteristic white precipitate with the salts of zinc, the *sulphide of zinc*, thus, $ZnCl + NH_4S = ZnS + NH_4Cl$. Nitrate of silver of course precipitates this salt white, in virtue of the chlorine it contains.

TESTS.—Its watery solution is not affected by chloride of barium or oxalate of ammonia, and is not tinged blue by the ferrocyanide or ferridcyanide of potassium. Ammonia throws down a white precipitate entirely soluble in an excess of the reagent.

ADULTERATIONS.—It may contain sulphate of zinc, or salts of lime or iron. If it contains the sulphate, a precipitate will be yielded on the addition of chloride of barium *(sulphate of barytes)*; if lime, on the addition of oxalate of ammonia a precipitate will appear *(oxalate of lime)*; if a protosalt of iron, ferridcyanide of potassium will precipitate it ($Fe_3Fe_2Cy_6$); if a persalt, ferrocyanide of potassium will precipitate it ($Fe_4 3FeCy_3$). The *white* precipitate is oxide of zinc, thus accounted for, $ZnCl + NH_4O = ZnO + NH_4Cl$. The oxide is entirely soluble in an excess of ammonia.

USES.—Chloride of zinc is a powerful caustic, destroying the vitality of the part with which it is placed in contact; the process being attended with violent burning pain which lasts for five or six hours. It has not been so much employed in this country as on the continent, where it is in very general use for the formation of issues; to destroy fungous growths, *nævi materni*, &c.; and as an application to open cancer, in which disease it is said to be productive of the best effects, by inducing a new action in the neighbouring parts; it has been also applied to fungus hematodes, and to various forms of malignant ulcerations. Lately, in consequence of the experiments recently carried on in London, which have been alluded to in the general observations at the commencement of this chapter, its efficacy in the destruction of cancerous growths seems to be much better established. In tooth-ache caused by caries, a minute portion of chloride of zinc introduced into the cavity of the tooth, the carious parts having been previously removed with a silver probe, affords almost immediate relief; the neighbouring surface must be protected with lint, and a small portion of lint is to be put into the hollow of the tooth after the chloride has been applied.

It may be used in the form of lotion, prepared by dissolving the salt in distilled water in different proportions, from gr. xxx. to gr. cxx. to the ounce, according to the effect required to be produced; or in the form of paste, made by mixing the chloride with from two to five parts of flour. In applying the paste of chloride of zinc, a small space only should be covered with it at a time; and it should be spread in a layer not thicker than from one to two lines. It may be left on from six to eight hours. Caustic pencils of chloride of zinc may be readily prepared by combining it with gutta percha, in a manner precisely similar to that described at page 168 for the preparation of pencils of caustic potash.

* Zinci Chloridi Liquor. *Solution of Chloride of Zinc.*

PREPARATION.—Take of sheet zinc, ℔j.; muriatic acid of commerce; water, of each, Oiiss, or as much as may be sufficient; solution of chlorinated lime, f℥j.; prepared chalk, ℥j. To the zinc, introduced into a porcelain capsule, gradually add the muriatic acid, applying heat until the metal is dissolved. Filter the liquid through calico, and, having added to it the solution of chlorinated lime, concentrate at a boiling temperature, until it occupies the bulk of one pint. Permit the solution now to cool down to the temperature of the air, place it in a bottle with the chalk, and having first added distilled water, so that the bulk of the whole may be a quart, shake the mixture occasionally for twenty-four hours. Finally, filter, and preserve the product in a well-stopped bottle. The specific gravity of this liquor is 1593.

EXPLANATION OF PROCESS.—Reference to what has been already written on *Zinci Chloridum* will account for the action of muriatic acid on zinc. The object of using chlorinated lime is to free the zinc from iron, which is effected by the development of chlorine in virtue of the action of the acid upon it; the rest of the process will be understood by reference to p. 123.

USES.—May be employed as a caustic, but is principally used as a deodorising agent, for which purpose it was first proposed by Sir William Burnett; and its effects as such are most valuable.

Zinci Sulphas. *Sulphate of Zinc* (described in the division *Astringents*) has recently been very highly commended as a caustic by Professor Simpson. He uses it in the anhydrous state and finely levigated, applying it either in the form of powder, of a paste made with glycerine in the proportion of a drachm of glycerine to an ounce of the powder (this paste keeps for any length of time), or of an ointment prepared by pounding together two drachms of prepared lard with one ounce of the powder. In a case of epithelioma occurring recently under my friend Mr. Porter's care in the wards of the Meath Hospital, its use was attended with the happiest results. Anhydrous sulphate of zinc does not act as a caustic on surfaces when the epithelium is entire, or the skin unbroken.

CHAPTER VII.

DIAPHORETICS.

(Sudorifics; Diapnoïcs.)

MEDICINES which augment the cutaneous exhalation are termed Diaphoretics; when they increase it to such a degree as to cause sweating, they are denominated Sudorifics; but as the same remedies are capable of producing both effects, which differ in degree only, I have included them under the one title. Obstructed perspiration, or diseases in which diaphoresis proves useful, may be associated with fever and inflammation, or may occur with a slow languid circulation; the former is indicated by the morbid heat of the surface of the body, and by increased vascular action; the latter by the coldness of the surface, and by general depression of the circulation. It is evident, therefore, that very different remedies will act as diaphoretics in these opposite states of the system. In the former case those medicines are to be selected for use which appear to act by *relaxing* the morbid constriction of the cutaneous capillaries, and at the same time have a direct tendency to *lower* the action of the heart and arteries; such as *antimonials*, and the *alkaline* and *saline diaphoretics*. In the latter those remedies are to be employed which, while they act as *stimulants* to the cutaneous capillaries, also increase the general action of the vascular system, of which class, perhaps, alcoholic remedies are the best type. But there is yet a third class, seemingly composed of these two, including medicines whose *primary* action is stimulant, the *secondary* sedative, and thus productive of relaxation, of which opium is an example, and perhaps Dover's Powder the type. In addition to the medicines described in this division, other means are resorted to for the production of diaphoresis: the more important of these are increased muscular action, as produced by active exercise; warm water, warm vapour, and warm air baths; the cold affusion; the wet sheet packing of hydropathy, one of the most potent of diaphoretices, the value of which should not on account of its hydropathic origin be overlooked, *fas est et ab hoste doceri;* and the use of tepid diluent drinks, for example, water, gruel, whey, &c. During the administration of diaphoretics, it is essential that the surface of the body should be kept warm, and for this purpose a bad conductor of heat, such as flannel, ought to be employed as a covering; care also must be taken to avoid the application of cold, either by exposing the surface of the body to cold air, or by the use of cold drinks, while the perspiration continues, or for some time after it has ceased; lastly, when it is wished to check the diaphoresis, this must be done gradually, by drying the surface of the body with warm towels, by diminishing the covering, and by cautiously exposing the hands and arms to the air.

AMMONIÆ ACETATIS LIQUOR. *Solution of Acetate of Ammonia.* (Syn.: *Mindererus' Spirit.*) Acetate of Ammonia, $NH_4O, C_4H_3O_3$, (=77), dissolved in water.

PREPARATION.—Take of strong solution of ammonia three fluid ounces and a half, or a sufficiency; acetic acid, ten fluid ounces, or a sufficiency. Mix gradually, and if the product is not neutral to test papers, make it so by the addition of the proper quantity of either liquid.

EXPLANATION OF PROCESS.—On adding acetic acid to strong solution of ammonia, the two unite to form acetate of ammonia, thus, $NH_4O+\bar{A}=NH_4O,\bar{A}$. This is a still further step in the direction of *simplicity* in the complicated process formerly pursued in the preparation of the "spiritus Mindereri," of which this purports to be the analogue. It was originally prepared by the destructive distillation of animal matter, in virtue of which, amongst other products, ammonia was developed together with some animal oil, which communicated an extremely offensive smell to the product; to this vinegar was added, and the resulting solution was anything but agreeable to the sense either of taste or smell. Sesquicarbonate of ammonia was subsequently employed to saturate the vinegar in this preparation, and continued to be so until the appearance of the present Pharmacopœia, where we find substituted for it strong solution of ammonia, and for the vinegar, acetic acid. The feeling that actuated this change no doubt was twofold; first, that no matter which method be pursued, the chemical composition of the resulting salt is still the same; and second, the practical difficuly experienced in ascertaining the point of saturation when the alkaline *carbonate* is operated upon—a difficulty arising from this circumstance, that although on the addition of the acid to the salt, carbonic acid is set free, and the greater portion of it escapes, still some of it is mechanically entangled in the solution, and would give an acid reaction to the test paper, even though all the sesquicarbonate were not decomposed, a most important consideration in a therapeutical point of view, inasmuch as sesquicarbonate of ammonia is a powerful stimulant, the exhibition of which in cases suited for the employment of Mindererus' spirit would be a serious mistake indeed. On the other hand, some advantages attend upon the employment of vinegar and sesquicarbonate of ammonia in this preparation; its taste is pleasanter, a circumstance due to the more agreeable flavour of vinegar than that of acetic acid, as also to the presence in the solution, *when prepared without heat*, of carbonic acid, which tends to conceal its otherwise vapid taste; the carbonic acid itself also possesses slight diaphoretic properties. These, however, after all are but minor considerations; a more agreeable taste can at all times be communicated by the employment of various flavoring agents to this solution, which, no matter how made, has at the best of times but a sorry taste; and although a careful pharmaceutist can easily overcome the difficulties attendant upon the point of saturation, still when we reflect upon the therapeutic importance of reaching that point, and contrast the facilities afforded by this method of determining that question with those by the former plan, we must candidly confess that of two difficulties the lesser has been chosen; I, myself, have frequently met with solutions coming even from first-class establishments, in which there was a palpable predominance of the alkaline element. When any such misgiving exists in the prescriber's mind, the doubt can be solved by the addition of half an ounce of vinegar to the eight ounce mixture, as it must be evident that if error is to lie on either side, it is safer that it should be on that of the acid rather than of the alkaline element.

PHYSICAL PROPERTIES.—A transparent colourless liquid, with a very faint acetous odour, and a cooling, saline, disagreeable taste.

CHARACTERS.—A transparent colourless liquid, with a saline taste. Treated with caustic potash it gives off an ammoniacal, and with sulphuric acid an acetous odour.

CHEMICAL PROPERTIES.—This is a solution of acetate of ammonia ($NH_4O+C_4H_3O_3$). The solution should be perfectly neutral, but is usually faintly acid, which is rather an advantage in relation to its employment in medicine. By careful evaporation crystals of the salt may be obtained; they are very deliquescent. On adding a few drops of sulphuric acid to the solution, an acetous odour is evolved, due to the union of the acid with the ammonia, and the consequent liberation of acetic acid, thus, $NH_4O\ \bar{A}+SO_3=NH_4O\ SO_3+\bar{A}$. Caustic potash disengages an ammoniacal odour, due to the union of the potash with the acetic acid, and the consequent liberation of the ammonia, thus, $NH_4O\ \bar{A}+KO=KO\bar{A}+NH_4O$.

TESTS.—Specific gravity, 1·06. One fluid ounce treated with excess of hydrochloric acid, and evaporated to dryness by a water bath, leaves a residue of hydrochlorate of ammonia weighing 100 grains. It has no action on litmus, and is not rendered turbid by solution of lime. Diluted with four volumes of water, it gives no precipitate with chloride of barium or nitrate of silver. This solution contains about five times as much acetate of ammonia as liquor ammoniæ acetatis, *Lond.*, and six times as much as liquor ammoniæ acetatis, *Dub. Ed.*

ADULTERATIONS.—This solution seldom if ever contains any impurity; nevertheless tests are given for detecting the presence of carbonate of ammonia and of sulphuric or hydrochloric acid:—the first by solution of lime, which, were it or any other carbonate present, would precipitate as carbonate of lime; and the acids, the former by chloride of barium, the latter by nitrate of silver. The solution should be perfectly colourless, and of the prescribed density. The volumetric test establishes the presence of gr. 143·92 in each fluid ounce. If too long kept, or in bottles badly stoppered, it undergoes decomposition, and various flocculent vegetable matters are developed in it.

THERAPEUTICAL EFFECTS.—Water of acetate of ammonia acts as a diaphoretic with much certainty, and is very generally employed with that intention in the commencement of febrile and inflammatory affections. Its operation should be promoted by the use of warm drinks and by the surface of the body being kept warm, as otherwise it is apt to pass off by the kidneys. This solution possesses the advantage of not exciting the circulation in any considerable degree, a property which renders it peculiarly adapted for employment in the first stages of febrile diseases. If prescribed in too large doses, it usually acts on the kidneys, and consequently does not produce diaphoresis. My attention has been directed by my friend Dr. Jameson, of this city, to a remarkable property possessed by it (when administered in this form, gr. lx. of sesquicarbonate of ammonia dissolved in an ounce of vinegar) of controlling drunkenness. He has frequently employed it with remarkable success in treating such cases in Mercer's hospital. The patient, at first furiously drunk, after a few doses appearing to be comparatively *sobered*. In a remarkable case in which I administered it with this object in view, the treatment was not successful. In that case, however, I used not his formulary, but the common Mindererus' spirit.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥j., repeated every fifth or sixth hour.

* *Diaphoretic Mixture* (liquor of acetate of ammonia, f℥v.; simple syrup, f℥j.; orange flower water, f℥j.; camphor mixture, ad f℥viij.; mix.) Dose, f℥j. every fourth hour.

INCOMPATIBLES.—Acids; potash and soda and their carbonates; lime water; nitrate of silver; acetate of lead; and the metallic sulphates.

* AMMONIÆ CITRATIS LIQUOR. *Solution of Citrate of Ammonia.*

PREPARATION.—Citric acid, ℥iij.; distilled water, Oj.; sesquicarbonate of ammonia, ℥iiss. or a sufficiency; dissolve the acid in the water, and add the sesquicarbonate to saturation.

PHYSICAL PROPERTIES.—Solution of the citrate of ammonia is very generally employed in medicine, being usually prepared extemporaneously by the addition of lemon-juice to sesquicarbonate of ammonia dissolved in water; it was, however, introduced into the last edition of the London Pharmacopœia, and the above directions given for its preparation. The solution is transparent and colourless, inodorous, with a mawkish alkaline taste.

CHEMICAL PROPERTIES.—It is a solution of citrate of ammonia ($3NH_4O+C_{12}H_5O_{11}$) in water. This salt cannot be obtained in a solid form, as on the application of heat ammonia is at once driven off from its solution; f℥j. of this preparation contains grs. lxxvii. of anhydrous neutral citrate of ammonia.

ADULTERATIONS.—It is not liable to adulteration.

THERAPEUTICAL EFFECTS.—Mildly diaphoretic and cooling, and consequently in very general use as a febrifuge. The extemporaneous solution, however, prepared with ninety grains of sesquicarbonate of potash, as much fresh lemon-juice as is necessary for saturation, and water, to eight ounces is much to be preferred, the more especially as the preparation does not keep well, soon undergoing decomposition. The quantity of lemon-juice required to saturate this amount of sesquicarbonate will, of course, depend on its richness in citric acid, but may be stated to be on an average three and a half ounces. Dose of this mixture, one ounce every three hours.

DOSE AND MODE OF ADMINISTRATION.—f℥ij. to f℥j every third or fourth hour.

INCOMPATIBLES.—The acids; most salts; and alkalies and their carbonates.

ANTIMONII OXIDUM. *Oxide of Antimony.* Teroxide of antimony, SbO_3 (=166).

PREPARATION.—Take of solution of terchloride of antimony, sixteen fluid ounces; carbonate of soda, five ounces; water, two gallons; distilled water, a sufficiency. Pour the antimonial solution into the water, mix thoroughly, and set aside until the precipitate which forms shall have subsided. Remove the supernatant liquid by a siphon, add one gallon of distilled water, agitate well, let the precipitate subside, again withdraw the fluid, and repeat the processes of affusion of distilled water, agitation, and subsidence, until the fluid has only a feeble acid reaction on litmus paper. To the precipitate add the carbonate of soda previously dissolved in two pints of distilled water, leave them in contact for half an hour, stirring frequently, collect the deposit on a calico filter, and wash with boiling distilled water until the washings cease to give a precipitate with a solution of nitrate of silver acidulated by nitric acid. Lastly, dry the product at a heat not exceeding 212°.

EXPLANATION OF PROCESS.—Reference to what has been already written on terchloride of antimony will enable the reader to understand the reaction that takes place in this process. (See page 204.)

PHYSICAL PROPERTIES.—A heavy white powder, sometimes semicrystalline; inodorous, and perfectly tasteless when pure.

CHARACTERS.—A white powder, fusible at a low red heat, insoluble in water, but readily dissolved by hydrochloric acid. The solution, dropped into distilled water, gives a white deposit, at once changed to orange by sulphuretted hydrogen.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of antimony, and 3 of oxygen (SbO_3), Graham. It is permanent in the air, exposed to heat it becomes yellow, and fuses at a red heat, concreting slowly as it cools into a crystalline mass; by a stronger heat it is sublimed in white vapours which condense in the form of crystalline needles. Oxide of antimony is insoluble in water; it is soluble in hydrochloric, tartaric, and acetic acids. Its solution in hydrochloric acid is terchloride of antimony ($SbCl_3$) thus produced, $SbO_3 + 3HCl = 3HO + SbCl_3$. The further reactions will be understood on reference to p. 204.

TESTS.—Does not yield any sublimate when fused in a test tube; dissolves entirely when boiled with an excess of the acid tartrate of potash.

ADULTERATIONS.—Not liable to any; that it has been properly prepared is shown by the tests of the Pharmacopœia. Did it yield a sublimate it would probably be arsenious acid, recognizable by the tests already given, pp. 210, 211; boiled with the acid tartrate of potash it entirely dissolves in the form of tartar emetic.

THERAPEUTICAL EFFECTS.—Originally introduced into the Dublin Pharmacopœia only for the preparation of tartar emetic; but of late years it has been used as a diaphoretic in the same cases as James' powder. The action of this preparation on the system, which it appears to resemble much, will be explained in the next article.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. to gr. x.; in some instances so large a dose as gr. xxx. has proved inert; this, however, must have been owing to faulty preparation. It may be given in the form of pill made with the conserve of roses, or in the form of powder.

PREPARATIONS.—Antimonium tartaratum; Pulvis Antimonialis.

ANTIMONII PULVIS. *Pulvis Antimonialis. Antimonial Powder.*

PREPARATION.—Take of oxide of antimony, one ounce; precipitated phosphate of lime, two ounces. Mix them thoroughly.

PHYSICAL PROPERTIES.—A dull white powder, tasteless, and odourless; feeling gritty under the teeth in consequence of its being in general rather coarsely-powdered, a defect which, however, does not exist in the present preparation, as it is obtained by precipitation.

CHEMICAL PROPERTIES.—Antimonial powder is intended as a substitute for the empirical preparation, *James's Powder*, a medicine introduced many years back by Dr. James of Exeter, and for the protection of which he obtained a patent, the specification of which was lodged in such ambiguous terms that no person ever since has succeeded in producing by the plan there described as perfect a product. For years its composition formed a favourite study for analytical chemists; and long since it was ascertained that it was composed of preparations varying according to the testimony of different authorities, of teroxide of antimony, antimonious acid, antimonite, and phosphate of lime. In Dr. James's patent he described his process as being one of roasting sulphuret of antimony mixed with nitre, and subsequent elutriation of the product; but Pearson pointed out as the result of his analysis that it contained lime; and the process, for years subsequently pursued, was adopted, that of incineration of bones, in virtue of which we have phosphate of lime produced, and of sulphuretted antimony, which results in the removal of its sulphur in the form of sulphurous acid, and in the production not only of teroxide of antimony and antimonite of lime, but also of antimonious acid (SbO_4), an inert substance, which, however, largely predominated in the mixture. Up to the appearance of the last Dublin Pharmacopœia, all the British Colleges adopted some modification or other of this plan, but with a resulting compound varying in its chemical composition and always of therapeutic uncertainty; in some cases the powder acting with energy, in others proving perfectly inert, a result not to be wondered at when we reflect on the varying composition of the product. According to the accurate experiments of Dr. Douglas Maclagan of Edinburgh, the composition of all these preparations appears to be similar, but the proportions of the different ingredients present vary remarkably in different specimens. They consist of from ½ to 2½ per cent. of the antimonite of lime, and from 4 to 10 per cent. of sesquioxide of antimony; to the presence of both of which, chiefly the latter, the activity of the preparation is due, and in which James's powder is richer than the old pharmacopœial preparations, and to which its greater uniformity of action is due; the remainder is inert antimonious acid and phosphate of lime. Boiling water dissolves the antimonite of lime, which is deposited as the solution cools; hydrochloric acid dissolves the sesquioxide of antimony and the phosphate of lime. In 1801, Chenevix suggested the idea of preparing it by precipitation, an idea, however, not acted upon until the appearance of the last edition of the Dublin Pharmacopœia, when a method founded upon this principle was first made officinal, and which is that now adopted in the British Pharmacopœia.

In instituting comparative experiments as to the respective values of James's and antimonial powders prepared by *incineration*, the balance of evidence is in favour of the former, a fact only to be explained on the supposition that greater care is bestowed on the regulation of the heat in the manufacture of the former than the latter preparation. Still even it is uncertain and varying in the effects produced, a fact for the explanation of which a plausible theory has been broached, to wit, that the energy of its action will depend upon the amount of free acid in the stomach. However, even James's powder is far inferior in certainty and uniformity of action to that which we have now introduced. When administered in three-grain doses repeated every three hours, the present preparation almost invariably establishes well-marked diaphoresis unattended with nausea or vomiting. In five-grain doses it produces copious diaphoresis, occasionally attended with nausea and vomiting. Of the certainty with which these effects are produced, I can speak from repeated clinical experience, and I cannot avoid thinking the present mode of procedure a vast improvement upon any of its predecessors. I have used it with the most satisfactory results in cases of febrile exacerbations, in catarrh, influenza, in fact in all cases where it is desirable to induce diaphoresis, and to reduce inflammatory action. The late Dr. Cheyne employed James's powder with excellent effect in the after-treatment of apoplexy, to equalize the circulation, and thereby prevent a return of the fit; and his practice has been very generally adopted by the physicians of this city with the most beneficial results. He at first gave two grains for a dose at bed-time and increased it by half a grain every night, until eighteen grains were taken at one dose, unless vomiting or purging were sooner produced. I have in similar cases substituted for James's powder this preparation, and am at the present moment using it in such a case in two-grain doses three times a day, with most encouraging results.

DOSE AND MODE OF ADMINISTRATION.—In powder, from gr. iij. to gr. v., repeated every four or five hours; or it may be made into pill with conserve of roses or any of the vegetable extracts. A large dose will produce vomiting. It is carefully to be borne in mind that all former statements as to the large doses administered with impunity (gr. xxx. to gr. lx., or more, by Elliotson and others) refer not to this modern preparation, but to the old antimonial powder prepared by calcination.

ANTIMONII SULPHURETUM PRÆPARATUM. *Sulphuret of Antimony, Prepared.* (Syn.: *Antimonii Tersulphuretum. Sulphuret of Antimony. Crude Antimony.*) Tersulphuret of antimony, SbS_3 (=170), reduced to fine powder.

PREPARATION.—Prepared by fusing the ore in a perforated crucible placed over another destined to receive the melted mass.

PHYSICAL PROPERTIES.—In small conical masses or loaves, of a bluish-grey colour, staining the fingers or paper black, with a brilliant, metallic, crystalline fracture; it is inodorous and tasteless, is easily pulverized, and yields a black powder. Specific gravity, 4·6.

TEST.—Almost entirely soluble in boiling hydrochloric acid.

CHEMICAL PROPERTIES.—It is composed of one equivalent of antimony, and 3 of sulphur, (Sb+3S), Graham; is permanent in the air, exposed to a moderate heat fuses, and at a red heat volatilizes. Tersulphuret of antimony is insoluble in water; with the aid of heat it is completely dissolved by hydrochloric acid with the disengagement of sulphuretted hydrogen gas, $SbS_3 + 3HCl = SbCl_3 + 3SH$.

ADULTERATIONS.—Although not liable to adulteration, as met with in commerce it contains many impurities; most of these are detected by dissolving in hydrochloric acid; but there is one of much importance which this test will not detect, and which is seldom wanting, namely, arsenic: its presence may be shown by the reduction test as before described for arsenic (page 210), the sulphuret having been previously mixed with charcoal and carbonate of soda.

THERAPEUTICAL EFFECTS.—This preparation is scarcely ever used in medicine at present; it was formerly administered as a diaphoretic in doses of from gr. x. to gr. cxx. in cutaneous and scrofulous diseases, and in gout and rheumatism. It is employed in pharmacy for preparing the other antimonial compounds, and is only introduced with that view into Appendix A of the Pharmacopœia, for the preparation of the terchloride of antimony.

ANTIMONIUM SULPHURATUM. *Sulphurated Antimony.* (Syn.: *Antimonii Oxysulphuretum*, Lond. *Antimonii Sulphuretum Aureum*, Ed. *Antimonii Sulphuretum Præcipitatum*, Dub. *Golden Sulphuret of Antimony.*) *Tersulphuret of Antimony,* SbS_3 *with a small and variable amount of Teroxide of Antimony,* SbO_3.

PREPARATION.—Take of prepared sulphuret of antimony, ten ounces; solution of soda, four pints and a half; dilute sulphuric acid, a sufficiency; distilled water, a sufficiency. Mix the sulphuret of antimony with the solution of soda, and boil for two hours with frequent stirring, adding distilled water occasionally to maintain the same volume. Strain the liquor through calico, and, before it cools, add to it by degrees the dilute sulphuric acid till the latter is in slight excess. Collect the precipitate on a calico filter, wash with distilled water till the washings no longer precipitate with chloride of barium, and dry at a temperature not exceeding 212°.

EXPLANATION OF PROCESS.—On boiling tersulphuret of antimony with caustic soda we have two double salts formed, one *hypantimonite* of soda (NaO,SbO_3); the other the *hyposulphantimonite* of sodium ($3NaS,SbS_3$), this equation accounts for their production, $2SbS_3 + 4NaO = NaO,SbO_3 + 3NaS,SbS_3$. On the addition of the dilute sulphuric acid these salts are decomposed, the soda of the hypantimonite of soda (NaO,SbO_3), is removed by the sulphuric acid in the form of sulphate of soda with the precipitation of the teroxide; and the hyposulphantimonite ($3NaS,SbS_3$) is also decomposed by the sulphuric acid, three atoms of water being resolved into three oxygens which unite with the three sodiums to form soda, which also unite with the sulphuric acid to form sulphate of soda, whilst the three hydrogens unite with its three sulphurs to form sulphuretted hydrogen gas, and the tersulphuret of antimony is precipitated; all the sulphuretted hydrogen gas, however, does not escape; a portion of it reacts upon part of the teroxide of antimony, the hydrogen removing its oxygen in the form of water, and the sulphur uniting with the antimony to form tersulphuret of antimony, thus, $SbO_3+3SH=3HO+SbS_3$, and upon the extent to which this reaction proceeds will depend the amount (always a varying one) of teroxide of antimony found in the preparation. The resulting compound is washed with distilled water so long as the washings precipitate with chloride of barium, in other words, until all the resulting sulphate of soda is removed.

PHYSICAL PROPERTIES.—A soft light powder of a bright orange colour; odourless, and tasteless when pure.

CHARACTERS.—An orange-red powder, readily dissolved by caustic soda, also by hydrochloric acid with the evolution of sulphuretted hydrogen, and the separation of a little sulphur. The acid solution dropped into water gives a copious white precipitate.

CHEMICAL PROPERTIES.—According to Wittstein its chemical composition is 2 of antimony and 5 of sulphur (Sb_2S_5); in the Pharmacopœia it is stated to be a mixture or compound of tersulphuret and teroxide of antimony. When kept in a dark place it is permanent in the air, but if exposed to light and air is slightly decomposed and becomes of a paler colour, some sulphur being set free; heated in close vessels sulphur is sublimed; but if heated in contact with the air, it burns with a greenish-blue flame, evolving sulphurous acid and leaving a greyish residuum. Tersulphuret of antimony is insoluble in water, and only partially soluble in dilute acids; its solution in hydrochloric acid and the reactions that ensue on the addition of this solution to water have been already explained, *vide*, p. 204; with the aid of heat it is nearly all dissolved by solutions of the alkalies.

TESTS.—Sixty grains of this preparation, dissolved in hydrochloric acid and dropped into water, give a white precipitate, which, when washed and dried, weighs about 53 grains.

ADULTERATIONS.—This preparation often contains oxide of iron and sulphur, and is frequently coloured with Brazil-wood or red Sander's-wood; all these impurities are readily detected by the *tests*.

THERAPEUTICAL EFFECTS.—The golden sulphuret of antimony possesses diaphoretic properties, in large doses producing nausea and vomiting; it is seldom employed alone, but in the following preparation is in very general use as a diaphoretic and alterative :—

Pilula Calomelanos Composita. Compound Pill of Calomel. (Take of calomel, one ounce; sulphurated antimony, one ounce; guaiac resin, in powder, two ounces; castor oil, one fluid ounce. Triturate the calomel with the antimony, then add the guaiac resin and castor oil, and beat the whole into a uniform mass.) This compound is commonly known as *Plummer's Pill;* it is an excellent diaphoretic and alterative, well adapted for some cutaneous eruptions, especially those of a syphilitic origin. It has also been found of use in old-standing rheumatic affections. Dose, gr. v. to gr. x. or gr. xv. Five grains contain one grain each of calomel, and of the golden sulphuret of antimony.

INCOMPATIBLES.—Acids; and acidulous salts.

ANTIMONIUM TARTARATUM. *Tartarated Antimony.* (Syn.: *Antimonii Potassio Tartras,* Lond; *Tartar Emetic.*) *Tartrate of Antimony and Potash,* $SbO_3,KO,C_8H_4O_{10}+2HO(=343.)$

PREPARATION.—Take of oxide of antimony, five ounces; acid tartrate of potash, in fine powder, six ounces; distilled water, two pints. Mix the oxide of antimony and tartrate of potash with sufficient distilled water to form a paste, and set aside for twenty-four hours. Then add the remainder of the water, and boil for a quarter of an hour, stirring frequently. Filter, and set aside the clear filtrate to crystallize. Pour off the mother liquor, evaporate to one-third, and set aside that more crystals may form. Dry the crystals on filtering paper at the temperature of the air.

EXPLANATION OF PROCESS.—Acid tartrate of potash is composed of one atom of water, one of potash, and one of tartaric acid, $(HO,KO,\bar{T})$ on mixing it with the oxide of antimony it takes the place of the water in the tartrate of potash, and converts it into *tartar emetic*, thus, $SbO_3+HO,KO,\bar{T}=HO+SbO_3KO\bar{T}$. This is dissolved in the water, and yields the salt by crystallization.

PHYSICAL PROPERTIES.—Tartar emetic is met with in the shops either in the form of a white powder, or in transparent colourless crystals, which are octohedrons with a rhombic base. It is inodorous, but in large quantities has a styptic, nauseous, metallic taste.

CHARACTERS.—In colourless transparent crystals, exhibiting triangular facets, soluble in water and less so in proof spirit. It decrepitates and blackens upon the application of heat. Its solution in water gives with hydrochloric acid a white precipitate, which is not formed if tartaric acid be previously added.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of potash, 1 of teroxide of antimony, 1 of tartaric acid, and 2 atoms of water $(KO,SbO_3,C_8H_4O_{10}+2HO)$. The crystals effloresce in the air, and soon become white and opaque, losing their water of crystallization. Upon the application of heat it blackens, due to the *charring* of the vegetable acid. *Strongly* heated the salt is decomposed, and an alloy of antimony and potash is obtained. It is soluble in 14 parts of cold and in 2 parts of boiling water; but is insoluble in alcohol. The solution in water, which is acid, gives *white* precipitates with hydrochloric, oxalic, and sulphuric acids, caustic potash, and lime-water; *straw coloured* with infusion of nutgalls; and *bright orange-red* with sulphuretted hydrogen or the soluble hydrosulphates (*tersulphide of antimony*); the latter is the most characteristic test. Introduced along with zinc and sulphuric acid into Marsh's apparatus for the detection of arsenic, instead of arsenic it yields *Antimoniuretted Hydrogen* (already described, p. 211).

TESTS.—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.

ADULTERATIONS.—In the crystalline state, this salt is seldom adulterated; in a few instances I have found crystals of sulphate of potash mixed with those of tartar emetic, evidently an intentional fraud, but one easy of detection, as crystals of tartar emetic when dropped into a solution of sulphuretted hydrogen have an orange-coloured deposit formed on them. The powder is very commonly adulterated with cream of tartar, and from being badly prepared frequently contains a large quantity of the oxide of iron; both impurities are readily detected by the tests of the Pharmacopœia, which require the salt to be absolutely pure to yield the amount of tersulphide of antimony indicated in the tests.

THERAPEUTICAL EFFECTS.—In properly regulated doses, tartar emetic produces diaphoresis more uniformly and more certainly than any other of the antimonial preparations; nausea sometimes accompanies its diaphoretic action, but this is attended with the advantage of placing the system in a condition in which sweating is more freely produced. In all the varieties of febrile diseases, especially when a determination of blood to the head forbids the use of the more stimulating diaphoretics, tartar emetic is employed with great benefit. In simple erysipelas it is a very favourite remedy—one grain dissolved in a pint of whey to be drank *ad libitum*—constituting Desault's favourite plan of treatment. In acute epididymitis we find its use of great service, as also in the inflammatory stages of gonorrhœa. In the hæmoptysis of phthisis, especially if symptoms of inflammation be present, it was Cheyne's favourite remedy. In all forms of acute inflammation of the large joints, of the mammæ, &c. its use is of essential value. It has been also used with advantage in obstinate cutaneous diseases of an inflammatory character, given in decoction of elm bark or some other tonic, if signs of constitutional debility exist. The employment of the antimonial preparations generally is contra-indicated in diseases attended with gastric irritation. (See also *Emetics, Epispastics, Expectorants,* and *Sedatives.*)

DOSE AND MODE OF ADMINISTRATION.—1-12th to 1-6th of a grain frequently repeated; it may be administered dissolved in a large quantity of distilled water, without any flavouring adjunct; thus gr. j. may be dissolved in f℥x. of water, and f℥j. of this taken every hour until sweating is produced; given in the form of pill, however, it is less apt to excite vomiting than when in solution. The addition, also, of the compound tincture of lavender to mixtures containing this salt is of great service in preventing the supervention of its emetic properties. The following is used as a substitute for James' powder:—Tartar emetic, gr. j.; sulphate of potash, in fine powder, gr. xx.; mix. Dose, gr. ij. to gr. iij. every hour.

PREPARATIONS.—Unguentum (see *Epispastics*), Vinum.

Vinum Antimoniale. Antimonial Wine. (Take of tartarated antimony, forty grains; sherry, one pint. Dissolve.) Every fluid ounce contains gr. ij. of tartar emetic. Dose as a diaphoretic, min. xx. to min. xxx., every hour.

INCOMPATIBLES.—The acids; the alkalies, and their carbonates; lime water; chloride of calcium; the earths; some of the metallic oxides; hydrosulphurets; the acetates of lead; corrosive sublimate; decoctions and infusions of most of the bitter and astringent vegetables containing tannin, as those of cinchona,* rhubarb, galls, catechu, &c. The solution in water spoils by keeping, becoming covered with a soft, mucilaginous mass, an algaceous plant, termed by Kützing *Sirocrocis Stibica.*

The best antidotes in cases of poisoning by tartar emetic are tannic acid and preparations containing it, subsequently followed up by appropriate antiphlogistic remedies.

DULCAMARA. Solanum Dulcamara, *Linn.* (Syn.: *Bitter-sweet. Woody Night Shade.*) Plate 14, *Flor. Lond.* (The young branches dried; from indigenous plants which have shed their leaves.) Indigenous, growing in hedges and thickets. It belongs to the Natural family *Solanaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Stems, shrubby, twining and branching; leaves, cordate, upper ones hastate; flowers, elegant, purple, in drooping clusters; anthers, large, yellow, united into a pyramidal or cone-shaped figure; berries, scarlet, juicy.

PREPARATION.—The stems or young shoots are gathered in autumn, when the leaves have fallen off, and dried with the heat of a stove. Those stems of the thickness of a goose-quill are usually selected.

PHYSICAL PROPERTIES.—The twigs as met with in the shops are dark-brown externally, white within, light and spongy in the centre; when fresh, they have a faintly nauseous odour, which is lost by drying; the taste is at first bitter, afterwards sweetish, whence the name bitter-sweet is applied to the plant.

CHARACTERS.—Light, hollow, cylindrical, about the thickness of a goose-quill, bitter and subsequently sweetish to the taste.

CHEMICAL PROPERTIES.—According to the analysis of Desfosses dulcamara contains, besides some salts of lime and potash and other unimportant substances, a peculiar alkaline principle, insoluble in water, soluble in alcohol and ether, pulverulent, inodorous, white, permanent in the air, which he has called *Solania;* it appears to be an acrid narcotic, but its medical properties have not been as yet

* Although strictly speaking chemically incompatible with the preparations of cinchona, Dr. Adams, of this city, finds such a combination of great service in cases of erysipelas of an adynamic type, in which statement my experience fully corroborates his.

fully examined; its composition is $C_{84}H_{68}NO_{28}$? This alkaloid is found in large quantities in the young shoots of the potato—*Solanum Tuberosum;* and is also found in the *Solanum nigrum.* Bitter-sweet yields its active properties to both water and alcohol.

THERAPEUTICAL EFFECTS.—A decoction and infusion have been employed as diaphoretics in rheumatic and venereal affections, and in chronic diseases of the skin. Its medical properties are generally regarded as being very feeble, and in the present day it is not much used in this country; in my experience, however, the infusion taken in large quantity is an excellent vehicle for the preparations of iodine or of arsenic in obstinate cutaneous affections.

Infusum Dulcamaræ. Infusion of Dulcamara. (Take of dulcamara, bruised, one ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for one hour, and strain.) Dose, f℥j. to f℥iij

GUAIACI LIGNUM. *Guaiac Wood.* Guaiacum officinale, *Linn.* (Syn.: *Lignum Vitæ.*) Plate 90, *Steph. and Church. Med. Bot.* (The wood sliced or coarsely turned; imported from St. Domingo and Jamaica.)

GUAIACI RESINA. *Guaiac Resin.* (The resin obtained from the stem by natural exudation, by incisions, or by heat.) This tree is a native of Jamaica, of St. Domingo, of many other West India islands, and of British Guiana; it belongs to the Natural family *Zygophyllaceæ*, and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A tree attaining a height of 30 or 40 feet, with a crooked stem, and a hard, heavy wood; leaves, evergreen, bijugate; flowers, pale-blue, in clusters in the axillæ of the upper leaves; fruit, yellow, obovate, coriaceous.

PREPARATION.—The wood is divided into logs and billets. The resin is obtained, as a spontaneous exudation from cracks or fissures in the stem, or by incisions made into it; or artificially procured, by heating one end of billets of wood which have been previously bored lengthwise, until the resin flows out of the opposite extremity; or by boiling the chips and raspings of the wood in a strong solution of common salt, when the resin swims on the surface of the liquid.

CHARACTERS.—*Of the Wood*—Extremely hard; the young or outer wood is pale-brown, the old or central wood is greenish-brown.

TESTS.—Nitric acid applied to the dark wood produces a bluish-green colour.

PHYSICAL PROPERTIES.—GUAIACUM WOOD, commonly termed Lignum-vitæ, is imported in logs and billets about nine inches in diameter and of various lengths; it is extremely hard, consisting of an outer circle of young wood *(alburnum)* of a pale yellow colour, and a centre of old wood *(duramen* or *heart-wood)* of a dark-green colour; its density is 1·333, so that it sinks when thrown into water. For medical use the wood is rasped or shaven into coarse powder *(scobs vel rasura guaiaci)*; in which state it has an acrid, resinous taste, and a peculiar aromatic odour.

CHARACTERS.—*Of the Resin.*—In large masses of a brownish or greenish-brown colour; fractured surface resinous, translucent at the edges.

TESTS.—A solution in rectified spirit strikes a clear blue colour when applied to the inner surface of a paring of raw potato.

PHYSICAL PROPERTIES.—Guaiacum resin is a semi-transparent solid, breaking with a vitreous fracture; the fractured surface varies much in colour, being partly brownish, partly reddish, and partly greenish, but it always becomes green when exposed to the light and air. The odour and taste are similar to but stronger than those of the wood. The specific gravity is 1·29.

CHEMICAL PROPERTIES.—Guaiacum wood consists of its proper resin, and a peculiar acrid principle, besides gummy matter, mucous extractive, lignin, &c. Its active properties are probably, in some slight degree, due to the acrid matter as well as to the resin. The latter, the physical properties of which have been described above, as met with in commerce, consists of the true resin—*Guaiacic acid (Guaiacyle)*, with a trace of gum, extractive matter, and woody fibre; it is insoluble in water and in the fixed oils, but is soluble in alcohol and in solutions of the alkalies. The alcoholic solution is precipitated by water and by hydrochloric acid, but not by acetic acid; nitric acid occasions no change at first, but after some hours the liquid becomes green, then blue, and at last a brown precipitate falls down; dropped on flour or on a transverse slice of a potato, a blue colour is produced on exposure to the air. Guaiacum resin is fused by heat. According to M. Deville its composition is $C_{12}H_8O_6$.

ADULTERATIONS.—Various resinous substances are frequently mixed with, or substituted for guaiacum resin; the substitution may be readily detected by applying the tests of the Pharmacopœia for the true resin. The adulteration with colophony or any of the pine resins may be detected by the partial solubility of the suspected article in hot oil of turpentine, which does not act on the true resin. The shavings may be distinguished from those of any other wood by the action of nitric acid, which communicates to them a temporary bluish-green colour.

THERAPEUTICAL EFFECTS.—Guaiacum wood and its resin are stimulating diaphoretics, and are consequently inadmissible in all states of excitement or acute inflammations of the system; occasionally a mild salivation follows their administration, as also a measly-like eruption. They are well adapted for chronic rheumatism of the old or debilitated; for the atonic stages of gout; for chronic diseases of the skin, especially those of a syphilitic origin, or occurring in scrofulous habits; and for all the forms of secondary syphilis, provided there is no irritation or inflammatory tendency in the alimentary canal. When first introduced into the practice of medicine they gained great reputation in consequence of relieving the celebrated Ulrich Von Hutten of an old standing syphilitic affection, and were believed to possess anti-venereal virtues, little if at all inferior to mercury. The resin is a constituent of the compound calomel pill. (See page 234.)

DOSE AND MODE OF ADMINISTRATION.—The resin may be given in powder in doses of from gr. x. to gr. xxx.; it can be administered in the form of bolus made with treacle or conserve of roses, or suspended in water by means of mucilage, or in the form of electuary, as in the form given below. The wood is not administered in powder, and inasmuch as its principal remedial efficacy depends upon the *resin which is insoluble in water*, decoctions and infusions of it can be of but little value.

PREPARATION.—*Of the wood*, decoctum sarsæ compositum (which see).

PREPARATIONS.—*Of the resin*, mistura, pilula calomelanos composita (already described, see p. 234), tinctura ammoniata.

Mistura Guaiaci. Guaiac Mixture. (Take of guaiac resin, in powder, half an ounce; sugar, half an ounce; gum Arabic, powdered, a quarter of an ounce; cinnamon water, one pint. Triturate the guaiac with the sugar and the gum, adding gradually the cinnamon water.) In this preparation the sugar and gum on being rubbed up with the guaiacum resin and cinnamon water, make an emulsion in virtue of which the resin is suspended. Dose, f℥j. to f℥ij. three times a day.

Tinctura Guaiaci Ammoniata. Ammoniated Tincture of Guaiac. (Take of guaiac resin, in fine powder, four ounces; aromatic spirit of ammonia, one pint. Macerate for seven days in a well-closed vessel and filter, then add sufficient aromatic spirit of ammonia to make one pint.) An admirable preparation, particularly suited for cases of atonic gout and rheumatism, coupled with general debility and languor. Dose, min. xxx. to min. lx.; it is decomposed by water, and should, therefore, be suspended in aqueous vehicles by means of sugar or mucilage; in such cases as those mentioned above, thirty minims may be administered with great advantage three times a day in half a wine-glassful of sherry.

* *Chelsea Pensioner.* (Resin of guaiacum, ℥ss.; acid tartrate of potash, ℥j.; sublimed sulphur, ℥ij.; powdered rhubarb, ℥j.; ginger, ℥ss.; powdered nutmegs, gr. cxx.; honey or treacle as much as will make an electuary.) Dose, one or two tea-spoonfuls night and morning. This which I give as an imitation of the nostrum bearing this name, is an admirable remedy in old chronic, gouty, and rheumatic affections, in which I have frequently found it of very great value indeed. It originally gained its reputation by curing Lord Amherst of rheumatism, and is even still, I believe, a favourite remedy with the veterans of Chelsea Hospital.

* *Decoctum Guaiaci.* (Guaiac turnings, ℥iij.; sassafras, rasped, ℥j.; liquorice root, bruised, ℥j.; raisins, ℥ij.; water, Oviij.; boil the guaiac and raisins in the water down to Ov., adding the liquorice and sassafras towards the close; strain the decoction.) The old *decoction of the woods*, a sudorific in doses of f℥iv. two or three times a day; but for reasons already stated, so far as the guaiacum is concerned, of but little use.

* *Syrupus Guaiaci*, AUGUSTIN. (Ammoniated tincture of guaia-

cum, f℥ij.; mucilage; and syrup of almonds, of each, f℥j.; mix.) An elegant formula. Dose, f℥j. to f℥ij. in water.

INCOMPATIBLES.—The mineral acids; and spirit of nitric ether.

MEZEREUM. *Mezereon*. Daphne Mezereum, *Linn*. Mezereon. Plate 65, *Steph. and Church Med. Bot. or,* Daphne Laureola, *Linn*. Spurge Laurel. Plate 119, vol. ii. *Eng. Bot.* (The bark dried.) An indigenous shrub belonging to the Natural family *Thymelaceæ*, and to the Linnæan class and order *Octandria Monogynia*.

BOTANICAL CHARACTERS.—Stem woody, branching, covered with a smooth greenish grey cuticle; leaves, scattered, smooth, lanceolate; flowers pale rose colour, highly fragrant, appearing before the leaves in little tufts on the naked branches; berries scarlet.

PREPARATION.—Although the Colleges formerly directed the bark of the root alone to be employed, and although it appears to be more acrid to the taste than that from the branches, still, as met with in the shops, it appeared to have been removed as well from the branches as from the roots. Now the Pharmacopœia permits apparently of the employment of the bark from all parts of the tree. The bark is collected in Spring, being then most active, and dried with a stove heat.

CHARACTERS.—In strips or quilled pieces of various lengths, tough and pliable, olive-brown on the surface, white within, fibrous, odour faintly nauseous, taste hot and acrid.

PHYSICAL PROPERTIES.—The root is generally entire, of various lengths, sometimes branching, covered externally with the bark, which is of a brown colour, smooth and wrinkled; in the centre is the white, hard, tasteless wood; between it and the outer bark is the white and cottony inner bark: the thickness of the root varies from that of a quill to that of the little finger. The bark *(cortex mezerei)* is in pieces of various lengths, quilled, tough, and pliable; it is covered with the olive-brown, tasteless epidermis; the true bark is of a greenish-white colour, and fibrous. Mezereon root-bark has a slight nauseous odour; the taste is at first faint, but leaves a hot acrid impression upon the tongue and fauces; in the fresh state the bark has a very acrid taste.

CHEMICAL PROPERTIES.—The inner bark of the mezereon contains a neutral crystalline principle which has been named *daphnin*, and an acrid resin, in combination with wax, sugar, colouring matter, woody fibre, &c. It yields its active principles to water and to alcohol.

ADULTERATIONS.—Various similar barks and roots are either mixed with, or substituted for, mezereon; they may be distinguished by not having the same acrid taste. The woody part, which constitutes the greater portion of the root, is perfectly inert, and consequently should not be employed.

THERAPEUTICAL EFFECTS.—Mezereon is a stimulating diaphoretic, but its properties as such are very feeble in comparison to its acridity, in consequence of which it is not much employed at present. It was formerly in high repute as an efficacious remedy for venereal nodes, and in other forms of secondary syphilis. (See also, *Epispastics.*)

DOSE AND MODE OF ADMINISTRATION.—In decoction, in doses of f℥ij. or f℥iv., three or four times a day.

* *Decoctum Mezerei,* (Mezereon bark, gr. cxx.; liquorice root, bruised, ℥ss.; water, f℥xl.; boil down to f℥xx., and strain.) This decoction has been omitted from the Pharmacopœia.

PREPARATION.—Decoctum Sarsæ compositum (which see).

POTASSÆ CITRAS. *Citrate of Potash.* $3KO,C_{12}H_5O_{11}$ (=306).

PREPARATION.—Take of carbonate of potash, eight ounces, or a sufficiency; citric acid, in crystals, six ounces, or a sufficiency; distilled water, two pints. Dissolve the citric acid in the water, add the carbonate of potash gradually, and, if the solution be not neutral, make it so by the cautious addition of the acid or the carbonate of potash. Then filter, and evaporate to dryness, stirring constantly after a pellicle has begun to form, till the salt granulates. Triturate in a dry, warm mortar, and preserve the powder in stoppered bottles.

EXPLANATION OF PROCESS.—On the addition of carbonate of potash to a solution of citric acid we find three equivalents of the salt acted upon by one of citric acid (this acid being *tribasic*); its carbonic acid escaping, and citrate of potash held in the solution, from which by crystallization it can be recovered; thus, $3KO\,CO_2+\overline{C}=3KO,\overline{C}+3CO_2$.

CHARACTERS.—A white powder, of saline, feebly acid taste, deliquescent, and very soluble in water. 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, readily soluble in acetic acid. Its solution, acidulated with hydrochloric acid, gives a yellow precipitate with bichloride of platinum.

TESTS.—102 grains heated to redness till gases cease to be evolved leave an alkaline residue, which requires for exact saturation 100 measures of the volumetric solution of oxalic acid.

CHEMICAL PROPERTIES.—When heated with sulphuric acid the salt becomes charred, giving off inflammable gas, a result due to the heat employed, and action of the mineral on the vegetable acid (*vide* p. 166). The solution resulting on the addition of chloride of calcium contains acetate of lime, soluble in cold, but not in hot water; and which is redissolved on the addition of acetic acid. The yellow precipitate on the addition of bichloride of platinum ($KClPtCl_2$) proves it to be a salt of potash (*vide* p. 164, 165). The volumetric test admits of no impurity, the quantities directed being in strict proportion to their chemical equivalents.

THERAPEUTICAL EFFECTS.—Citrate of potash is an excellent diaphoretic long in use in practice, not exactly in its present form, but as the salt resulting from the employment either of the carbonate or bicarbonate of potassa in effervescing mixtures. Its use is indicated in cases of febrile excitement, attended with dry skin and irritable condition of the mucous membrane of the stomach.

DOSE AND MODE OF ADMINISTRATION.—Gr. xv. to gr. xxv. in solution in water to which some flavouring syrup has been added. Although in this manner anything but disagreeable to take, and of great service in cases suited for its administration, still it wants the pungent, agreeable flavour and sedative effects over the irritable stomach, conferred on its solutions by the carbonic acid disengaged in its extemporaneous form. We can prepare such a mixture by dissolving one hundred and twenty grains of carbonate, or one hundred and sixty grains of bicarbonate of potash in eight ounces of water, and administering one ounce of this solution with half an ounce of lemon juice, every third hour, whilst effervescing. In this prescription the acid is slightly in excess; but it is better for it to predominate than the alkali, which might occur were the lemon-juice deficient in its proper amount of citric acid.

PULVIS IPECACUANHÆ CUM OPIO. *Powder of Ipecacuan and Opium.* (Syn.: *Pulvis Ipecacuanhæ compositus. Dover's Powder.*)

PREPARATION.—Take of ipecacuanha, in powder, half an ounce; opium, in powder half an ounce; sulphate of potash, four ounces. Rub them well together, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

PHYSICAL PROPERTIES.—A brownish-yellow powder, with an opiate odour, and a bitter, saline, slightly acrid taste.

CHEMICAL PROPERTIES.—It is composed of one part each of powdered ipecacuanha and opium, and eight parts of powdered sulphate of potash. It is insoluble in water or in alcohol. If this powder be kept for any length of time in a bottle without being occasionally shaken, the sulphate of potash sinks to the bottom, and consequently the upper strata will contain more than the proper proportions of the lighter powders—the opium and ipecacuanha: accidents might thus occur in dispensing. The sulphate of potash is introduced simply with the view of, in virtue of its extreme hardness, triturating and intimately mixing together the other two ingredients. Sugar of milk would equally well discharge this duty, be more agreeable to the taste, and not be liable to this objection.

THERAPEUTICAL EFFECTS.—One of the most powerful and most generally employed sudorifics, possessing properties which do not belong to any of its ingredients separately. Its employment is contraindicated in cases attended with irritability of the digestive organs, or where there is cerebral disturbance. It is especially adapted for the milder forms of catarrh, coryza, acute rheumatism, and general dropsy, accompanied by suppressed or diminished perspiration, particularly when the urine is albuminous.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx., in pill or in bolus made with conserve of roses. The surface of the body should be kept warm, and as a precaution against vomiting, the patient should not be permitted to drink for some time after taking the medicine. Every ten grains of Dover's powder contain one grain each of opium and ipecacuanha.

SARSA. *Jamaica Sarsaparilla.* Smilax officinalis, *Humb. and Bonpl.* (The dried root, native of central America, imported from Jamaica.) It has been recently asserted by Dr. Seeman that the so-called various species of the genus sarsaparilla, from which the medicinal root is obtained, are identical with the Smilax officinalis of Humboldt and Bonplandt, which inhabits the warmest regions of South America, especially Peru, Mexico, and the southern parts of Guiana. It belongs to the Natural family *Smilaceæ,* and to the Linnæan class and order *Diœcia Hexandria.*

BOTANICAL CHARACTERS.—A diœcious creeper; stem quadrangular, prickly; perianth, six-parted; male flowers with six stamens; female with a 3-celled ovary, each cell one-seeded; berry the size of a cherry, red, 3-celled, containing one to three roundish seeds.

PREPARATION.—The roots are dug up at all seasons of the year, and dried by the heat of the sun. The difference in the appearance of the varieties as imported is stated by Dr. Seeman to be due to the mode of preparing the root.

PHYSICAL PROPERTIES.—Several varieties of sarsaparilla are met with in English commerce; the most important of these are Jamaica, Honduras, Brazil, and Lima sarsaparilla. They are met with in bundles formed of the folded roots—in the Brazilian variety the roots are unfolded: the bundles are generally from twenty inches to three feet in length; the roots consist of a rhizome, *the chump* of druggists (which, however, is frequently absent), and of numerous rootlets several feet in length, about the thickness of a writing pen, cylindrical, flexible, wrinkled longitudinally, with more or less root-fibres attached to them; of a reddish-yellow or brown colour externally, the inner bark being rose-coloured and more or less mealy, and the centre *(meditullium),* woody, whitish, and shining. Sarsaparilla has scarcely any odour; the taste is mucilaginous, slightly nauseous, leaving an acrid sensation on the back part of the tongue and fauces. *Jamaica sarsaparilla,* which is most probably the produce of *Smilax officinalis,* has a lively red tint, and more attached root-fibres than the other sorts, whence it is sometimes called *red-bearded sarsaparilla:* it is the most esteemed. *Honduras sarsaparilla* is of a greyish-brown colour, and has but few rootlets attached; the inner bark is so amylaceous, that when the root is rubbed or broken, a white mealy powder is driven out of it; this is the sort generally used in the shops for cutting into chips: it is conjectured by Guibourt to be the root of *Smilax sarsaparilla. Brazilian sarsaparilla,* which, according to Martius, is the produce of *Smilax papyracea,* resembles the last in colour and mealiness, but is almost free from rootlets, and the *chump* is not attached. *Lima sarsaparilla* resembles in appearance Jamaica, for which it is often sold; its colour, however, is greyish-brown, and the *chump* is invariably attached, being folded into the centre of the bundle.

CHARACTERS.—Roots not thicker than a goose-quill, generally many feet in length, reddish-brown, covered with rootlets, and folded in bundles about eighteen inches long, scentless; taste mucilaginous, feebly bitterish, faintly acrid.

CHEMICAL PROPERTIES.—Various analyses have been made of sarsaparilla; it appears to consist of volatile oil, nearly all of which is lost during the process of drying, of a peculiar white crystallizable neutral principle, which has been named *smilacin (paraglin, salseparine, parallinic acid,* of various chemists), acrid bitter resin, lignin, starch, and mucilage. According to Petersen the composition of *smilacin* is $C_{15}H_{13}O_5$. Sarsaparilla yields its active properties to boiling water by simple maceration; and the continued boiling to which formerly it was submitted by the directions of the colleges, for preparing the decoctions, the syrup, and the extracts, is not only perfectly useless but highly injurious, and to this fact may be ascribed the great discrepancy of opinion which exists as to the medicinal properties of the drug.

ADULTERATIONS.—The roots of various allied species, which do not possess any medicinal property whatever, are mixed in America with the true sarsaparillas; and in this country the inferior sorts are sold for the finer qualities. The former fraud may be detected by the taste, which is the surest criterion; the latter by attending to the characters of the different species as given above. The characteristics of Jamaica sarsaparilla in the last edition of the London Pharmacopœia were as follows:—"Reddish; thickly beset with radicles; bark not mealy."

THERAPEUTICAL EFFECTS.—Notwithstanding the little esteem which sarsaparilla is held in by many practitioners, a medicine possessing the great activity that it does in the *recent* state, as described by Dr. Hancock, can scarcely be inert; unless, as before observed, we destroy any medicinal properties left in it on drying by the pharmaceutical processes to which it is submitted. Under its use, undoubtedly, diaphoresis is frequently produced; and secondary syphilitic affections, especially nocturnal pains, ulcerations of the throat, and cutaneous eruptions have been speedily cured; these effects, however, have been ascribed by many, and I must say with much reason, to the restricted diet to which patients are submitted while undergoing what is called an alterative course. The question of the powers of sarsaparilla in secondary syphilis is worthy of still further investigation, particularly if we consider the high price of the drug and the great expenditure which its use in hospitals and public charities entails on these institutions; for my own part, I consider that its effects have been very much overrated; and in the treatment of cutaneous eruptions, whether of syphilitic origin or not, I very rarely use it now, as I have found by experience that fresh

Elm-bark (see *Tonics*) acts with much more certainty. Its use in various forms of cachectic complaints, such as chronic rheumatism, abscesses, &c., as an alterative, has been highly praised by numerous practitioners. In the first and second editions of this work I expressed the opinion, that in any future trials of the efficacy of this medicine it would be well to use a simple infusion, prepared with boiling water in the same manner and of the same strength as the compound infusion of the Dublin Pharmacopœia of 1826, substituting boiling distilled water for the lime water ordered in that formula; and it will be found that the Dublin College in its last edition substituted a decoction and compound decoction for those previously contained, in both of which the prolonged boiling was reduced to a period of ten minutes, in which proceeding its example has been followed in the British Pharmacopœia.

DOSE AND MODE OF ADMINISTRATION.—In powder, the dose is from gr. lx. to gr. cxx.; it is very seldom administered in this form; but if the powder is good, as may be ascertained by the taste, it ought to prove the best mode of giving the medicine; it may be made into a bolus with honey.

Decoctum Sarsæ. Decoction of Sarsaparilla. (Take of Jamaica sarsaparilla, not split, two ounces and a half; boiling distilled water, one pint and a half. Digest the sarsaparilla in the water for an hour; boil for ten minutes in a covered vessel, cool and strain. The product should measure a pint.) Dose, f℥iv. to f℥vi. three times a day.

Decoctum Sarsæ Compositum. Compound Decoction of Sarsaparilla. (Take of Jamaica sarsaparilla, not split, two ounces and a half; sassafras, in chips, a quarter of an ounce; guaiac wood turnings, a quarter of an ounce; fresh liquorice root, bruised, a quarter of an ounce; mezereon, sixty grains; boiling distilled water, one pint and a half. Digest all the ingredients in the water for an hour, boil for ten minutes in a covered vessel; cool and strain. The product should measure a pint.) Dose, f℥iij. to f℥vi. three times a-day. The old *Decoction of Sweet Woods.*

Extractum Sarsæ Liquidum. Liquid Extract of Sarsaparilla. (Take of Jamaica sarsaparilla, not split, one pound; distilled water, at 160°, fourteen pints; rectified spirit, one fluid ounce. Macerate the sarsaparilla in one half of the water for six hours, and decant the liquor. Digest the residue in the remainder of the water for the same time, express and filter the mixed liquors, and evaporate them by a water bath to seven fluid ounces, or until the specific gravity of the liquid is 1·13. When cold, add the spirit. The specific gravity should be about 1·095.) Used either as an adjunct to the decoctions to strengthen them, or diluted with water as a substitute for them. Dose, f℥j. to f℥iv.

* *Syrupus Sarsæ.* (Sarsaparilla, ℔iiiss.; distilled water, cong. iij.; sugar, ℥xviij.; rectified spirit, f℥ij.; boil down the sarsaparilla in cong. ij. of the water to cong. j.; pour off the liquor and strain

while hot; boil down the sarsaparilla again in the remainder of the water to one-half, and strain. Evaporate the mixed liquors to Oij. and dissolve the sugar in them. Finally, when cold, add the spirit.) When well prepared its flavour is very agreeable. Dose, f℥iv. to f℥vj., diluted with water or as an adjunct to the decoction.

* *Extractum Sarsaparillæ Fluidum*, U. S. P. (Sarsaparilla, sliced and bruised, ℥xvj.; liquorice root, bruised; bark of sassafras root, bruised, of each, ℥ij.; mezereon, sliced, gr. ccclx.; sugar, ℥xij.; diluted alcohol, Oviij. Macerate all the ingredients together, except the sugar, for fourteen days, then express and filter. Evaporate the liquid by means of a water bath to twelve fluid ounces, add the sugar to it whilst still hot, and remove from the bath when the sugar is dissolved.) An admirable substitute, in a concentrated form, for the compound decoction. Dose, a teaspoonful added to four ounces of water. The profession is indebted to Dr. Butler of this city for the first suggestion of this, as of many other valuable formularies.

INCOMPATIBLES.—Lime-water; and the acetates of lead.

SASSAFRAS. *Sassafras*. Sassafras officinale, *Nees, Laurineæ*. Plate 31, *Woodv. Med. Bot.* (*Laurus Sassafras*). (The dried root; from North America.) This tree, which is a native of North America, belongs to the Natural family *Lauraceæ*, and to the Linnæan class and order *Enneandria Monogynia*.

BOTANICAL CHARACTERS.—A tall straight tree; with alternate, caducous leaves, of a lucid green colour; flowers, diœcious, yellow, appearing before the leaves; berry succulent, of a rich blue colour.

PREPARATION.—The root is dug up at all periods of the year and cut into billets, in which form it is imported into Britain; the volatile oil is obtained from it by distillation.

CHARACTERS.—In branched pieces, sometimes eight inches in diameter at the crown; bark externally greyish-brown, internally rusty-brown, of an agreeable odour, and a peculiar aromatic warm taste; wood light, porous, greyish-yellow, more feeble in odour and taste than the bark. Also in chips.

PHYSICAL PROPERTIES.—Sassafras root is imported in various sized, branched pieces or logs, covered with a reddish-brown bark which is often partially stripped off; the wood is of a reddish-yellow colour, light, and very porous; it has an aromatic agreeable odour, somewhat resembling fennel; and a warm aromatic taste, both of which are dependent on the presence of volatile oil, which was officinal in the Edinburgh Pharmacopœia and was formerly so in that of Dublin. The odour and taste of the bark are stronger than of the wood. The volatile oil, which is of a pale-yellow colour and heavier than water, when exposed to a low temperature, deposits very large and beautiful crystals, measuring 1½ inch on the side; its composition is $C_{10}H_5O_2$; it is scarcely soluble in alcohol.

CHEMICAL PROPERTIES.—Sassafras wood and bark have been recently analysed by Reinsch: the latter is much the more active.

It contains a peculiar principle which he has named *sassafrid*, and which bears much resemblance to tannic acid, a light and heavy volatile oil, camphoraceous matter, tannin, and other unimportant matters. The medicinal virtues are extracted by both water and alcohol.

THERAPEUTICAL EFFECTS.—A stimulating diaphoretic, but its powers as such are so uncertain that it is never prescribed alone. The wood forms a constituent of the *compound decoction of sarsaparilla*, and of the *decoction of guaiacum*.

DOSE AND MODE OF ADMINISTRATION.—It may be given in the form of infusion, prepared by infusing ℥j. of the chips in Oj. of boiling water for an hour, of which f℥ij. may be taken three or four times a day.

* *Oleum Sassafras* (prepared according to the general direction for volatile oils; see note to *Oil of Juniper*). But seldom used; it is an aromatic stimulant in doses of min. ij. to min. x.

PREPARATION.—**Decoctum sarsæ compositum (which see).**

CHAPTER VIII.

DIURETICS.

DIURETICS are medicines which augment the secretion and promote the discharge of urine. These effects are produced in a very different manner by different substances; some acting as direct stimulants to the secreting vessels of the kidney, being taken into the current of the circulation and carried without undergoing any decomposition *in transitu* to the urinary organs; others are partially acted on by the digestive organs, and some of their component parts thus eliminated are carried by the circulation to the kidneys, which are thereby stimulated to increased action; while a third class of substances acts primarily on the stomach, the action they excite being secondarily communicated by sympathy to the urinary organs. In whatever manner the action of diuretics is produced, the general effect is to diminish the watery part of the blood, and by this means to promote indirectly the absorption of fluid effused into any of the cavities or into the meshes of the areolar membrane. Hence, dropsy is the disease in which they are principally employed, and when the discharge of urine can be excited by their administration, the effused fluid is in general removed more speedily from the system, and with less injury to the patient than by any other method. But they are most uncertain in their operation, and it often happens that, although the discharge of urine is much augmented, the dropsical swellings are not removed. The action of diuretics is much modified by the state of the skin, and it therefore frequently occurs that if the surface of the body be excited by external warmth after the administration of a diuretic, its action will be diverted from the kidneys to the vessels of the skin, and diaphoresis be occasioned. A cathartic action seems also to be, to a certain extent, incompatible with diuresis, and consequently some remedies, as cream of tartar, various salts, oil of turpentine, &c., which, if given in small doses, properly regulated, increase remarkably the urinary discharge, when administered in larger doses, so as to act on the bowels, will occasion scarcely any apparent influence on the functions of the kidneys. A rule originally promulgated by the disciples of the Liebig school of chemists has been very generally adopted, that when any of the saline diuretics are administered, they should be given in a state of great dilution, on the principle that if the solution in which they are prescribed be not of a lower specific gravity than that of the serum of the blood, it would fail to produce diuresis. I cannot, however, agree with this proposition, as experience has led me, more particularly in the treatment of dropsies, to place most confidence in diuretic medicines exhibited, so to say, in rather concentrated solution; a practice I was first led to adopt from considering that saline diuretics, when so administered, require for their elimination by the kidneys a greater amount of the fluids of the system than if they were taken in a diluted state; the demand thus created must be supplied at the expense of the serum of the blood, and the therapeutical action of the medicine is thereby manifestly increased. May it not be that, when given in tolerably full doses, they produce eliminative effects, partly by *purgation* partly by *diuresis*? In the process of *endosmosis* and *exosmosis* the interchange of fluid is not in *one* direction,—the thinner fluid goes to dilute the thicker, but the denser fluid goes also to inspissate the thinner; so in strong saline solutions; and as the result we have the watery particles of the blood removed, partly by diuresis resulting on their stimulant action upon the kidneys, dependent on the partial inhibition of the denser by the thinner fluid, partly by purgation, resulting on the passage of the denser to dilute the thinner fluid. The most important rules to be attended to in the exhibition of the remedies of this class, are to keep the surface of the body cool, and as soon as the action of the diuretic has commenced, to promote its operation by the use of diluent drinks. Diuretic medicines, when applied to the surface of the body in the form of liniment, or concentrated tincture or infusion, will in some cases act with much certainty even after they have failed to produce diuresis when given by the mouth. This mode of employing them may be consequently had recourse to in some cases with advantage. The result of mental impressions on the secretion of urine must not be lost sight of; not only increasing its quantity, but altering its colour and density,—fright being an example of the former, hysteria of the latter statement.

ÆTHERIS NITROSI SPIRITUS. *Spirit of Nitrous Ether.* (Syn.: *Spiritus Ætheris Nitrici*, Lond. Ed. Sweet Spirits of Nitre.) Nitrous Ether, C_4H_5O,NO_3 (=75) dissolved in rectified spirit.

PREPARATION.—Take of nitrite of soda, five ounces; sulphuric acid, four fluid ounces; rectified spirits, two pints. Introduce the nitrite of soda into a matrass connected with a condenser; pour upon it the spirit and the sulphuric acid previously mixed; and distil thirty-five fluid ounces, the receiver being kept very cool.

EXPLANATION OF PROCESS.—By the action of sulphuric acid upon rectified spirit we have ether (C_4H_5O) generated, (a reaction that will be understood by reference to *Æther*) which distils over; but the action of the acid is not confined to the spirit, it also reacts upon the nitrite of soda, a complex substance (see *Supplementary Agents*), in virtue of which a portion of nitrous acid (NO_3) is set free, and distils over in combination with the ether. Presuming the nitrite of soda to be pure, this equation explains the action of sulphuric acid upon it, $NaONO_3+SO_3=NaOSO_3+NO_3$. This, combined with ether and a varying amount of rectified spirit, constitutes the preparation in question. I have said, "presuming the nitrite of soda to be pure;" this, as will be seen on reference to it, it never is, generally containing but a small per-centage of nitrite, amounting as the mean of several examinations, according to Professor Apjohn, to about twenty-five per cent. This process, however, though by no means a perfect one, is a decided improvement on the former method of procuring it by distilling over a mixture of rectified spirits and nitric acid, with the object of generating the ether by the direct action of the acid upon the spirit; a process most uncertain in its results, so much so indeed as to produce commercial articles very frequently containing no trace of nitrous ether.

CHARACTERS.—Transparent and nearly colourless, with a very slight tinge of yellow, mobile, inflammable, of a peculiar penetrating apple-like odour, and a sweetish, cooling, sharp taste. When agitated with the solution of sulphate of iron, and a few drops of sulphuric acid, it becomes deep olive-brown or black.

CHEMICAL PROPERTIES.—This preparation is a mixture of nitrous ether and alcohol in variable proportions. It is very volatile, producing much cold during its evaporation; and is very inflammable, burning with a whitish flame. It mixes with alcohol and water in all proportions. By keeping, it gradually becomes acid. The brown colour produced under the conditions stated in the pharmacopœial characters is due to the presence of the nitrous acid, and will be understood on reference to p. 90.

TESTS.—Specific gravity 0·843. It effervesces feebly or not at all when shaken with a little bicarbonate of soda. If it is agitated with twice its volume of a saturated solution of chloride of calcium, one and a-half per cent. by volume of nitrous ether separates and rises to the surface.

ADULTERATIONS.—Spirit of nitric ether often contains free nitrous acid, probably from being too long kept. It is moreover not uncommonly adulterated with water and with alcohol; perhaps no other preparation in the Pharmacopœia is so frequently found in our shops in so sophisticated a state, frequently not presenting a trace of nitrous ether, rarely free from aldehyd, which latter impurity is detected by boiling it with liquor potassæ, when, if it be present, or if *methylated spirit* has been employed in its preparation, a dark-brown color will be produced. The tests of the Pharmacopœia readily detect the other impurities; by the specific gravity we estimate the amount of water present, by the effervescence on the addition of the alkali we recognize any free acid; and by the chloride of calcium we estimate the amount of nitrous ether present in any sample.

THERAPEUTICAL EFFECTS.—This preparation operates as a mildly stimulating diuretic, and with such intention is administered in dropsical affections especially when occurring in children. In the retention of urine, and the dysuria that we occasionally meet with in very young children, I find a mixture of one fluid drachm of sweet spirits of nitre, a dessert spoonful of warm water, and a little white sugar to sweeten it—half a tea-spoonful every half hour or so, for a dose—a very useful remedy. It is most generally employed as an addition to other remedies of this class, as digitalis, squill, &c., the diuretic operation of which it renders more certain. Spirit of nitric ether sometimes fails to act on the kidneys, when it generally promotes the cuticular secretion, and consequently is frequently employed with benefit in combination with the water of acetate of ammonia in the early stages of febrile diseases. Christison states that as a diuretic he has found sweet spirits of nitre "least serviceable in dropsy connected with diseased kidney, and most useful in the form associated with diseased heart."

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥ij. or f℥iij. every second or third hour; it is best given in water or in camphor mixture.

* *Diuretic Potion*, SWEDIAUR. (Spirit of nitric ether; and vinegar of squills, of each, f℥j; infusion of juniper, f℥iij.; compound spirit of horse-radish; and syrup of ginger, of each, f℥ij.; mix.) Dose, f℥ss., two or three times a-day in water.

INCOMPATIBLES.—Sulphate of iron; alkaline and earthy carbonates; and tincture of guaiacum.

BUCCO. *Buchu*. 1. Barosma Betulina, *Bartling and Wendland*. Plate 404, vol. v. *Lodd. Cab.* (*Diosma Crenata*). 2. Barosma Crenulata, *Willd. Enum. Sup.* Plate 3413, vol. lxii. *Bot. Mag.* 3. Barosma Serratifolia, *Willd. Enum.* Plate 456, vol. xiii. *Bot. Mag.* (*Diosma Serratifolia*). The dried leaves imported from the Cape of Good Hope. The various species of the genus Barosma, formerly named Diosma, from which the buchu of commerce is obtained, are natives of the Cape of Good Hope, and are placed in the Natural family *Rutaceæ*, and in the Linnæan class and order *Pentandria Monogynia*.

BOTANICAL CHARACTERS.—Small shrubs with opposite, smooth, dotted leaves, and stalked axillary flowers; all the species have a heavy odour.

CHARACTERS.—Smooth, marked with pellucid dots at the indentations and apex;

having a powerful odour, and a warm camphoraceous taste; 1, about three quarters of an inch long, coriaceous, obovate, with a recurved truncated apex, and sharp cartilaginous spreading teeth; 2, about an inch long, oval-lanceolate, obtuse, minutely crenated, five nerved; 3, from an inch to an inch and a half long, linear, lanceolate, tapering at each end, sharply and finely serrated, three-nerved.

PHYSICAL PROPERTIES.—As it occurs in commerce at present, buchu consists almost entirely of the leaves of *Barosma serratifolia* mixed with a small quantity of the white flowers; but a few years since, as described in the first edition of this book, it was composed of various species, two in particular, *Barosma crenata* and *Barosma crenulata*, intermixed with broken stalks and seed vessels. The leaves are smooth and shining, dotted with glands containing essential oil; they are of a pale yellowish-green colour, have a heavy aromatic odour resembling a mixture of rue and peppermint, and an aromatic taste leaving a sense of coldness on the mouth.

CHEMICAL PROPERTIES.—Buchu leaves consist of volatile oil (upon which their medicinal properties chiefly depend), gum, resin, extractive, &c. They yield their virtues to water and to alcohol. The volatile oil is of a yellowish-brown colour, lighter than water, and of the same odour as the leaves; the extractive has been named *Diosmin*.

THERAPEUTICAL EFFECTS.—Buchu is a stimulating diuretic; the volatile oil is taken into the circulation, and communicates its odour to the urine soon after it has been swallowed. Independently of its stimulating the kidneys to increased action, it seems to act as a direct tonic to the mucous membrane of the urino-genital organs; thus, it is found most useful in chronic mucous discharges from the bladder and urethra, in diseased prostate, in irritability of the bladder, and in some forms of incontinence of urine. In my experience it is one of our most valuable diuretics in cases where no immediate powerful action on the kidneys is requisite; thus it is especially valuable in the many derangements of the digestive organs attended with deficient secretion of urine, and deposit of lithates, and constitutes a useful adjunct to other remedies in obstinate cutaneous affections. At the Cape of Good Hope the powdered leaves are used as a vulnerary, and a spirit distilled from them is employed in dyspeptic affections.

DOSE AND MODE OF ADMINISTRATION.—In powder (a bad form), gr. xx. to gr. xxx.

Infusum Bucco. Infusion of Buchu. (Take of buchu, bruised, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for an hour, and strain.) Dose, f℥j. to f℥ij. three or four times a-day.

Tinctura Bucco. Tincture of Buchu. (Take of buchu, bruised, two ounces and a half; proof spirit, one pint. Macerate the buchu for forty-eight hours, with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij. in any suitable menstruum.

INCOMPATIBLES.—The sesquisalts of iron; and the astringent vegetables.

CAMBOGIA. The diuretic properties of gamboge have been noticed at page 136, and a formula given for its administration; it is not used in this country as a diuretic, although an excellent purgative in dropsical cases, and when given with that intention I have found it promote the operation of medicines of this class.

CANTHARIS. *Cantharides.* (Syn.: *Spanish Flies. Blistering Beetle.*) Cantharis vesicatoria, *De Geer, Hist. des Insectes.* (The beetle, dried; collected in Russia, Sicily, and Hungary.) This, the *Meloë vesicatorius* of Linnæus, *Lytta Vesicatoria* of other authors belongs to the class *Insecta,* and to the order *Coleoptera.* It is a native of the middle and southern parts of Europe, and has been also met with, but rarely, in England. It frequents the ash, the privet, the lilac, and the honeysuckle, and is also found on the elder, the rose, the plum, the elm, and the poplar, upon the leaves of which trees the insects feeds. In the month of June cantharides are collected in the south of Europe. In the morning, before the rising of the sun, while the insects are still torpid from the moisture of the night, men, whose faces and hands are covered with masks and gloves, having spread a cloth upon the ground, shake the tree violently; the insects fall into the cloth, are immediately gathered in sieves, and are killed by exposure to the vapour of vinegar, or preferably by being placed for a short time in an air-tight vessel; they are then dried in stoves. When perfectly dry, cantharides are immediately put into air-tight boxes, containing a little sulphate of lime or camphor, the former to keep them dry, and the latter to preserve them from the attacks of mites and other insects by which they are devoured. Of late years most of the cantharides employed in medicine are collected in Southern Russia, whence they are exported to Germany, France, England, and America.

PHYSICAL PROPERTIES.—Each cantharis is from six to ten lines long, and about a grain and a-half in weight; it has two wing-covers or elytræ, long, flexible, of a golden-green colour; two membranous, transparent wings, inferior, folded; antennæ, black, filiform, longer than the head; and a longitudinal furrow along the head and neck. Cantharides have a faint disagreeable odour, and a resinous, very acrid taste. They are readily reduced to powder, which even in the finest state presents numberless glistening green particles of the elytræ; this is their most distinguishing characteristic, Orfila having recognised them in the human stomach nine months after interment.

CHARACTERS.—From eight to ten lines long, furnished with two wing-covers of a shining metallic green colour, under which are two membranous transparent wings; odour strong and disagreeable; powder greyish-brown, containing shining green particles.

CHEMICAL PROPERTIES.—Cantharides consist of a white crystalline substance named *cantharidine*, of a yellow-fat oil, a concrete green oil, a yellow viscid substance, a black substance, osmazome, uric, acetic, and phosphoric acids, and some salts. Its active properties are due to the cantharidine, which may be obtained by acting on the powder with rectified spirit, distilling off the spirit and crystallizing; it occurs in the form of white micaceous scales, is odourless and tasteless, very volatile even at the ordinary temperature, soluble in alcohol, chloroform, ether, and the fixed and volatile oils, but when pure insoluble in water. The chemical composition of cantharidine is $C_{10}H_6O_4$. It is a very active poison, and produces immediate inflammation of the skin wherever it comes in contact with it, advantage of which fact can be taken in identifying it in toxicological investigations. Cantharidine, according to Farines, exists only in the trunk and soft parts of the body of the fly, whilst the head, antennæ, elytræ, wings and legs are inert, or nearly so.

TEST.—Free from mites.

ADULTERATIONS.—By the characters and properties given above cantharides may be distinguished from other insects which resemble them, and are said to be frequently mixed with them on the Continent. They are best protected from the attacks of mites, which destroy their activity, by keeping them in well-stoppered bottles and adding a few drops of strong acetic acid (Pereira), or a few grains of camphor which I have found very effectual. In powder they are not unfrequently adulterated with euphorbium, a fraud which may be easily detected by boiling the suspected powder in a water-bath with proof-spirit, and filtering while hot; if any euphorbium is present, the decoction on cooling will deposit this gum-resin. The rich glistening colour of the Russian cantharides is said to be due to their being steeped in oil, a process by which their weight is fraudulently increased.

THERAPEUTICAL EFFECTS.—The most important medicinal property of the Spanish fly is its vesicating power, which will be considered hereafter (See *Epispastics*). In large doses it is a powerful irritant poison; in small or medicinal quantities it acts as a stimulant to the urino-genital organs, generally causing diuresis and exciting the venereal appetite; but, according to Christison, the latter effect is not produced unless it be taken in poisonous doses, a statement fully corroborated by my own experience in several instances where they were administered with this object, but produced mania. As a diuretic, cantharides are not much used in consequence of the dangerous symptoms which sometimes arise even from small doses, yet they often prove the most effectual diuretic in dropsy dependent on disease of the heart. Those who have employed them state that they prove beneficial also in incontinence of urine caused by paralysis of the neck of the bladder, and when it occurs in young persons during sleep. They have been highly praised by many as a remedy for gleet, leucorrhœa, and chronic mucous discharges from the urinary organs; and have been used empirically in hooping-cough.

DOSE AND MODE OF ADMINISTRATION.—Cantharides are seldom employed internally in the form of powder; the dose is gr. ss. to gr. ij. made into pill with extract of liquorice, or conserve of roses.

PREPARATIONS.—Emplastrum, emplastrum calefaciens, linimentum, tinctura, unguentum.

Tinctura Cantharidis. Tincture of Cantharides. (Take of cantharides, in coarse powder, a quarter of an ounce; proof spirit, one pint. Macerate the cantharides for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, min. x. gradually increased to min. xl.; it should be given in at least an ounce of some emulsion, or of decoction of linseed or barley.

In cases of poisoning with cantharides, we are not acquainted with any antidote; but emetics, emollient and mucilaginous drinks, blood-letting general and local, opiates by the mouth and rectum, and general antiphlogistic treatment should be resorted to.

DIGITALIS. *Digitalis.* Digitalis purpurea, *Linn.* Purple foxglove. Plate 48, *Flor. Lond.* (The dried leaf, from wild indigenous plants, gathered when about two-thirds of the flowers are expanded.) An indigenous biennial plant, belonging to the Natural family *Scrophulariaceæ,* and to the Linnæan class and order *Didynamia Angiospermia.*

BOTANICAL CHARACTERS.—Stem erect, three to four feet high, with a purplish hue; leaves large, veiny, ovato-lanceolate, crenate, downy, purplish on their under surface; flowers numerous, purple, spotted within, drooping, in very long spikes.

PREPARATION.—The leaves are gathered in the months of June and July, just before the plant comes into flower, and the mid-rib and stalk removed; they are dried with stove heat in a dark place. The seeds, which should be gathered when fully ripe, are very seldom employed now in this country, and consequently have been omitted from the Pharmacopœia.

CHARACTERS.—Ovate-lanceolate, shortly petiolate, rugose, downy, paler on the under surface, crenate.

PHYSICAL PROPERTIES.—The dried leaves of digitalis, when properly preserved, are of a bright-green colour; they have scarcely any odour, but the taste is nauseous and acrid.

CHEMICAL PROPERTIES.—They consist of volatile oil, a concrete flocculent volatile matter, fatty matter, extractive, tannin, &c., and a peculiar principle recently discovered by M. M. Homolle and Quevenne, and named by them *digitaline*: this will be described in the chapter on *Sedatives*. The leaves yield their active properties to water, alcohol, ether, and the weak acids. The sesqui-salts of iron produce a dark, and solution of gelatin a white flaky precipitate with infusion of digitalis, indicating the presence of tannin.

ADULTERATIONS.—The leaves of several species of Verbascum are often offered for sale for those of digitalis; the botanical characters should therefore be attended to. The powder ought to be of a fine green colour, and possess the acrid taste of the fresh plant.

THERAPEUTICAL EFFECTS.—Digitalis, in small doses gradually augmented, operates as a special stimulant to the kidneys, increasing the secretion of urine; in somewhat larger doses, or when its use is continued for a longer period, it acts as a *sedative* to the vascular system (See *Sedatives*). As a diuretic in the various forms of dropsy, digitalis has acquired a high reputation, but later experience has shown that it proves most serviceable in those cases of dropsical effusion which take place into the areolar membrane of the extremities, and of the face, and which depend on diseases of the heart, of the kidneys, or of the liver. It is also better adapted as a diuretic for persons of a weak or enfeebled habit of body, than for the strong or the robust; and should any inflammatory symptoms be present, antiphlogistic treatment should be had recourse to before employing digitalis. My experience is also that children bear its administration better than adults, it being a favorite remedy with me in the dropsy consecutive on scarlatina, occurring amongst patients of this age. In its continued employment at any age we should anxiously watch lest it produce signs of *accumulation*, these will be described when treating of its sedative properties. The diuretic action of foxglove is much promoted by combining it with other remedies of this class, as squill, tincture of horse-radish, juniper, the diuretic salts of potash, &c., or with small doses of calomel; when there is much debility or anæmia present, preparations of iron are advantageously prescribed in conjunction with it.

DOSE AND MODE OF ADMINISTRATION.—Of the powder, gr. ss. every six hours, its operation being aided by the use of diluents, and the surface of the body being kept cool; administered thus, it generally produces a copious flow of urine after the fifth or sixth dose.

Infusum Digitalis. Infusion of Digitalis. (Take of digitalis, dried, thirty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) This is the best preparation of digitalis; the dose is f℥ij. to f℥ss. every six hours. The present preparation is of the same strength as that in the last edition of the London Pharmacopœia, from which it differs in not containing spirit of cinnamon, which, however, seems to possess the property of developing its *diuretic*, rather than its sedative powers. It is but one half the strength of the infusion in the last edition of the Dublin and Edinburgh Pharmacopœias. The infusion prepared with four times the quantity of digitalis, and applied to the surface of the abdomen in ascites, or to the legs in anasarca, by means of spongio-piline or flannel covered with oil-silk, in some cases produces a diuretic action, when the medicine administered by the mouth fails to do so. This external employment of digitalis as a diuretic, however, notwithstanding it has been lately much used and favourably reported of on the Continent, is in my experience very uncertain in its action.

Tinctura Digitalis. Tincture of Digitalis. (Take of digitalis, bruised, two ounces and a half; proof spirit, one pint. Macerate the digitalis for forty-eight hours with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit, as soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) This tincture, if well prepared, has a greenish colour when viewed by transmitted light. Dose, min. xx. three times a day; it may be given in f℥j. of decoction of broom-tops, combined with sweet spirits of nitre, and compound spirit of juniper.

* *Pilulæ Digitalis et Scillæ.* (Digitalis and squill, of each, one part; aromatic electuary, two parts; beat into a proper mass with conserve of red roses, and divide into four-grain pills.) An excellent diuretic pill. The addition of one grain of calomel to each pill constitutes a valuable medicine known as "Baly's Pill." The addition to each pill of one drop of oil of juniper will be found of advantage. Dose, one pill every five or six hours.

INCOMPATIBLES.—Sulphate and tincture of the muriate of iron the preparations of cinchona bark; and the acetates of lead.

OLEUM JUNIPERI. *English Oil of Juniper.* Juniperus communis, *Linn.* Plate 95, *Woodv. Med. Bot.* (The oil distilled in England from the unripe fruit) *Common Juniper.* Indigenous; belonging to the Natural family *Coniferæ* (*Pinaceæ*, Lindley), and to the Linnæan class and order *Diœcia Polyandria.* Formerly the berries *(fructus, baccæ)*, and the tops *(cacumina)* were officinal.

BOTANICAL CHARACTERS.—A bushy shrub from two to eight feet high, evergreen;

leaves linear, mucronate; flowers appearing in May, axillary, small; fruit, a berry (*galbulus*), three seeded, requiring two seasons to arrive at maturity.

PREPARATION.—The tops are cut in spring before the plant flowers, and the berries are gathered when ripe, both are dried with stove heat; the oil is obtained from the berries by simple distillation.

PHYSICAL PROPERTIES.—*Juniper berries* are spherical, somewhat larger than a pea, of a bluish-black colour; they have a strong aromatic terebinthinate odour, and a sweetish, pungent, terebinthinate taste. They are imported from Hamburgh, and from several of the Mediterranean ports. *Juniper tops* have a similar odour and taste, but both much weaker. *Juniper oil* is limpid, transparent, lighter than water, and of a very pale-greenish colour. It has the peculiar odour and taste of the berries in a marked degree.

CHEMICAL PROPERTIES.—The medicinal properties of juniper are due to the volatile oil; its composition is $C_{10}H_8$ being isomeric with oil of turpentine, and its specific gravity 0·855. The berries contain besides, resin, sugar, gum, wax, and some salts of lime. The tops and berries yield their active principles to boiling water, and to alcohol.

THERAPEUTICAL EFFECTS.—Juniper is a stimulating diuretic, promoting the secretion of urine, to which it communicates its peculiar odour. It is chiefly employed as an adjunct to other diuretics in dropsical affections; its use is contraindicated if the kidney is diseased, or if any inflammatory symptoms are present.

DOSE AND MODE OF ADMINISTRATION.—The berries are best prescribed in the form of infusion. The tops are at present scarcely ever employed.

Oleum Juniperi. (Obtained from the berries according to the general process for obtaining volatile oils.*)

* The following general directions for obtaining volatile oils were given in the Dublin and Edinburgh Pharmacopœias; they are introduced here as being as convenient a place as any other, to give a general idea of how volatile oils are prepared.—*Dublin.* "The substance from which the oil is to be extracted is macerated for twenty-four hours with five times its weight of water, in a sheet-tin or copper still, and, a condenser being then attached, half the water is drawn over by distillation, on the surface of which the oil will be found to float unless (which is rarely the case) it should be heavier than water, when it will be found at the bottom of the receiver. The oil having been separated, the aqueous product, which is a saturated solution of the oil in water, is to be returned to the still, and the distillation resumed, and continued till the resulting liquid has the same volume as before. The oil is again separated, the watery product returned to the still, and the distillation resumed; and this process is to be repeated until it ceases to afford any additional oily product. The oil thus obtained is to be separated as completely as possible from water, and preserved in a well stopped bottle. The water distilled over in the preparation of the several oils should be preserved for medical use."—*Edinburgh.* "Volatile oils are obtained chiefly from the flowers, leaves, fruits, bark, and roots of plants, by distilling them with water in which they have been allowed to macerate for some time. In order to obtain these oils profitably and of good quality, a great variety of conditions must be attended to, differing in regard to each, and such as it would be out of place to enumerate here in detail. Certain general principles, however, may be mentioned. Flowers, leaves, and fruit generally yield the finest oils and in greatest quantity when they are used fresh. Many, however, answer equally well, if they have been preserved by beating them into

CHARACTERS.—Colourless or pale greenish-yellow, of a sweetish odour, and warm aromatic taste.

Dose, min. iij. to min. v. as an oleo-saccharum, or dissolved in spirit. It is to the presence of this oil that the spirit called *Geneva* or *Hollands* owes its peculiar flavour, and the diuretic properties it possesses.

Spiritus Juniperi. Spirit of Juniper. (Take of English oil of juniper, one fluid ounce; rectified spirit, nine fluid ounces; dissolve. This spirit contains about ninety-five times as much oil of juniper as spiritus juniperi, *Lond.*) A powerful diuretic, introduced into the pharmacopœias as a substitute for *Geneva.* Dose, min. x. to f℈j. Generally used as an adjunct to stimulating diuretic mixtures.

* *Infusum Juniperi.* (Take of juniper berries, bruised, one ounce; boiling water, half a pint, infuse for an hour in a covered vessel, and strain. The product should measure about eight ounces.) Dose, f℥j. to f℥iij. three or four times a-day.

PAREIRA. *Pareira.* Cissampelos pareira, *Linn.* Plate 82, *Woodv. Med. Bot.* (Syn.: *Pareira Brava, Velvet Leaf.*) (The dried root from Brazil.) This plant is an inhabitant of the West Indian isles, and of the South American Main; it belongs to the Natural family *Menispermaceæ,* and to the Linnæan class and order *Diœcia Monadelphia.* According to Aublet, Pareira brava is the root of *Abuta rufescens,* the *Cocculus platiphylla* of St. Hilaire, which also belongs to this family. It is probable that the roots of several allied plants are sold in commerce as Pareira brava.

BOTANICAL CHARACTERS.—It is described as being a climbing shrub, with a woody

a pulp with about twice their weight of muriate of soda, and keeping the mixture in well-closed vessels. Substances yielding volatile oils must be distilled with water, the proper proportion of which varies for each article, and for the several qualities of each. In all instances, the quantity must be such as to prevent any of the material from being empyreumatized before the whole oil is carried over. In operations where the material is of pulpy consistence, other contrivances must be resorted to for the same purpose. These chiefly consist of particular modes of applying heat, so as to maintain a regulated temperature not much above 212°. On a small scale heat may be thus conveniently applied by means of a bath of a strong solution of muriate of lime, or by means of an oil-bath, kept at a stationary temperature with the aid of a thermometer. On the large scale, heat is often applied by means of steam under regulated pressure. In other operations it is found sufficient to hang the material within the still in a cage or bag of fine net-work; and sometimes the material is not mingled with the water at all, but is subjected to a current of steam passing through it. The best mode of collecting the oil is by means of a refrigerator, from which the water and oil drop together into a tall narrow vessel provided with a lateral tube or lip near the top, and another tube rising from the bottom to about a quarter of an inch below the level of the former. It is evident that, with a receiver of this construction, the water will escape by the lower tube; while the volatile oil, as it accumulates, will be discharged by the upper one, except in the very few instances where the oil is heavier than water."

branching root; leaves smooth, silky beneath; flowers small, yellow; berries scarlet, roundish, hispid.

CHARACTERS.—Cylindrical, oval, or compressed pieces, entire, or split longitudinally, half an inch to four inches in diameter, and four inches to four feet in length. Bark greyish-brown, longitudinally wrinkled, crossed transversely by annular elevations; interior woody, yellowish-grey, porous, with well marked often incomplete concentric rings and medullary rays. Taste at first sweetish and aromatic, afterwards intensely bitter.

PHYSICAL PROPERTIES.—Pareira root is imported in cylindrical pieces, from half an inch to three inches in diameter, and from five or six inches, to three or four feet in length. It is covered externally with a dark-brown cortex, which is thin and firmly adherent; internally the wood is very porous, of a pale reddish-yellow colour; odourless, but with a sweetish, aromatic, intensely bitter taste.

CHEMICAL PROPERTIES.—It consists of a soft resin, a bitter extractive *(Cissampelina)* on which its activity depends, fecula, nitrate of potash and other salts, colouring matter, lignin, &c Cissampelina *(Pelosina)* is an alkaline white powder, soluble in alcohol and ether; it forms salts of which the hydrochlorate crystallizes; its composition is $C_{36}H_{21}NO_6$. The root yields its virtues to both cold and boiling water.

THERAPEUTICAL EFFECTS.—Pareira is a tonic diuretic, acting specifically on the urinary organs, increasing their secretion, and at the same time checking discharges from the mucous membrane of the bladder and urethra. It is with the latter intention only that it is ever employed at present; and according to the observations of Sir Benjamin Brodie and other surgeons, it has a great influence over the ropy mucous discharge of chronic inflammation of the bladder. It can be combined with dilute phosphoric, or nitric acids, or with the alkalies or their carbonates, as the case may seem to require.

DOSE AND MODE OF ADMINISTRATION.—In powder (a bad form), ʒss. to ʒj.

Decoctum Pareiræ. Decoction of Pareira. (Take of pareira, sliced, one ounce and a half; distilled water, one pint and a-half. Boil for fifteen minutes and strain. The product should measure a pint.) Dose, fʒij. to fʒiv. thrice a-day. This is a good form for administering pareira; it may with advantage be fortified by the addition of some of the next preparation.

Extractum Pareiræ Liquidum. Liquid Extract of Pareira. (Take of pareira, in coarse powder, one pound; boiling distilled water, one gallon, or a sufficiency; rectified spirit, three fluid ounces. Macerate the pareira in a pint of the water for twenty-four hours, then pack in a percolator, and add distilled water until the pareira is exhausted. Evaporate the liquor by a water-bath to thirteen fluid ounces, and, when it is cold, add the spirit, and filter through paper) Dose, fʒj. to fʒij. This is a new and valuable preparation. It may be ordered as an addition to the preceding one.

INCOMPATIBLES.—The sesquisalts of iron; the acetates of lead; and tincture of iodine.

POTASSÆ ACETAS. *Acetate of Potash* (described in the division *Cathartics*), dissolved in a large quantity of water, and given in small doses frequently repeated, operates as a mild but certain diuretic. It is employed most generally as an adjunct to other remedies of this class, in ascites and hydrothorax. It has been recently very highly recommended for the treatment of psoriasis, lepra, and eczema, by Dr. Easton of Glasgow, in doses of half a drachm three times a-day, dissolved in an ounce of water; but from its use, thus administered in these diseases, I have not seen the least good result to follow. Dose, as a diuretic, gr. x. to gr. xx.; it is best administered in decoction of broom tops, or of pyrola.

POTASSÆ TARTRAS ACIDA. *Acid Tartrate of Potash* (described in the division *Cathartics*), when administered in small doses dissolved in a large quantity of water, or in combination with other diuretics, increases the secretion of urine remarkably, and consequently is very generally employed in all forms of dropsy. Dose, as a diuretic, gr. xx. to gr. lx. frequently repeated.

* *Imperial*, an excellent diuretic and refrigerant drink in febrile diseases, is prepared by dissolving gr. lx. or cxx. of bitartrate of potash in Oj. of boiling water, and flavouring with lemon-peel and sugar. I have found it of great service in cases with a tendency towards anasarca, given as the ordinary after-dinner drink of the patient, a couple of tumblerfuls of it with half a glass of good *Hollands* in each; this makes a most palatable drink.

* *Cream of Tartar Whey*, used for the same purpose, is prepared by boiling gr. xc. of the bitartrate in Oj. of new milk, and straining to remove the curd. Either of these drinks may be taken *ad libitum*.

POTASSÆ NITRAS. *Nitrate of Potash.* (Syn.: *Nitre, Saltpetre, Sal-prunelle.*) KO,NO_5 (=101.)

PREPARATION.—Nitrate of potash is an article of the Materia Medica; it is imported into Britain chiefly from the East Indies, where it is obtained by lixiviating the surface of the soil of certain districts, dissolving out with water the saline matters contained therein, filtering and crystallizing; after importation, the salt is purified by solution and re-crystallization. Nitre is also a constituent of many plants, being found in tobacco, hemlock, &c. and is procured by artificial means in Germany and France, in the former country in what are termed *artificial nitre beds*, composed of animal and vegetable remains, calcareous earth, ashes, &c. whilst in France it is recovered from old plaster rubbish. In the Pharmacopœia the commercial salt is directed to be further purified by the following process:—"Take of nitrate of potash of commerce, four pounds; distilled water, five pints, or a sufficiency. Having dissolved the commercial nitrate of potash in two pints of the water at a boiling temperature, let the heat be withdrawn, and the solution stirred constantly as it cools, in order that the salt may be obtained in minute granular crystals. Separate as much as possible of the uncrystallized solution by decantation and draining, and wash the crystals in a glass or earthenware percolator with the remainder of the water, until the liquid which passes through ceases to give a precipitate on being dropped into a solution of nitrate of silver. The contents of the percolator are now to be extracted, and dried in an oven." In this process the salt is freed from any chloride or sulphate it may contain at the trifling expense of the loss of a small portion of the nitrate itself, inasmuch, as water though *saturated* with nitrate of potash, is still capable of dissolving these salts. Its thorough freedom from these contaminations is ascertained by its non-precipitation with the solution of nitrate of silver.

PHYSICAL PROPERTIES.—A solid colourless salt, in striated prismatic crystals generally six-sided, with dihedral summits, semitransparent, inodorous, having a cooling, saline, slightly bitter taste. Specific gravity, 1·933.

CHARACTERS.—In white opaque masses or fragments of opaque striated six-sided prisms, colourless, of a peculiar cool saline taste. Thrown on the fire it deflagrates; warmed in a test tube with sulphuric acid and copper filings, it evolves ruddy fumes. Its solution acidulated with hydrochloric acid gives a yellow precipitate with bichloride of platinum.

CHEMICAL PROPERTIES.—It is composed of one equivalent of potash, and one of nitric acid, ($KONO_5$), is anhydrous, permanent in the air, fusible by a heat below redness into a limpid liquid, in which state, when cast in moulds, it forms *sal-prunelle;* by a strong heat it is decomposed into oxygen, and hyponitrite of potash. The *ruddy forms* are those of hyponitric acid, generated by the action of the nitric acid (liberated by the action of the sulphuric acid upon the salt) upon the copper filings, (see page 201). The *yellow precipitate* proves it to be a salt of potash, (see pp. 164, 165). Nitre is soluble in four parts of water at 60°, and in about half its weight of boiling water; during the solution cold is generated; it is insoluble in absolute alcohol.

TESTS.—Its solution is not affected by chloride of barium or nitrate of silver.

ADULTERATIONS.—Nitrate of potash, as met with in commerce, is often contaminated with sulphate of potash or chloride of potassium; the presence of the former is detected by solution of hydrochlorate or nitrate of baryta, that of the latter, by solution of nitrate of silver, causing white precipitates, in a solution of the salt in distilled water.

THERAPEUTICAL EFFECTS.—In large doses, from ʒj. to ʒij., nitre acts as an irritant to the gastro-intestinal mucous membrane, producing generally nausea, vomiting, purging, and even death. In small doses, gr. xxx. to gr. xl., it increases the flow of urine, in which secretion it can be detected soon after it has been swallowed. It is generally employed as an adjunct to the vegetable diuretics in anasarca and ascites, but is inadmissible in cases where there is any tendency to irritation or inflammation of the digestive tube. Nitrate of potash is greatly inferior as a diuretic to the acetate or bitartrate, and in the present day is, consequently, more employed for its refrigerant properties. As a diaphoretic it is also a popular remedy, frequently employed in feverish colds in the form of *nitre whey,* prepared by adding gr. lx. to gr. cxx. to half a pint or a pint of common whey, and taken as a drink before going to bed. (See, also, *Refrigerants.*)

INCOMPATIBLES.—Sulphuric acid; alum; sulphate of magnesia; metallic sulphates; and hydrochloric acid, if heat be applied.

* PYROLA CHIMAPHILA. (*Herb of Chimaphila Umbellata. Umbelled Winter-green. Pyrola, Pipsissewa.*) This plant is a native of North America, but is also found in the woods of Europe and Asia. It belongs to the Natural family *Pyrolaceæ*, and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A beautiful evergreen, six to eight inches high, with cuneato-lanceolate leaves, coriaceous, smooth and shining; flowers in a small corymb, reddish-white, fragrant.

PHYSICAL PROPERTIES.—Although the entire herb, possesses medicinal properties, the leaves only are generally employed. In the fresh state when bruised they have a strong unpleasant smell, but in the dry state they are odourless; they have a bitter-sweet, astringent, slightly aromatic taste. If applied to the skin when recently gathered, they produce irritation, and even slight vesication.

CHEMICAL PROPERTIES.—They contain bitter extractive, resin, tannin, &c.; the medical virtues probably depend on the combination of these three substances; they are communicated to boiling water by infusion, but more completely by decoction.

THERAPEUTICAL EFFECTS.—Pyrola leaves operate as a tonic diuretic, exerting a specific influence on the urinary organs, increasing the discharge of urine, and, according to many observers, diminishing the secretion of lithates. They have been chiefly used in dropsies occurring in the old and debilitated, their use in such cases being strongly advocated by the late Dr. Beatty of this city; and in chronic mucous discharges from the bladder and urethra. In the advanced stages of albuminuria where diuretics are sometimes called for, I have administered the decoction of this herb with excellent effect. In scrofula, also, its use exhibited both internally and externally has obtained some reputation, in America having gained for itself the title of the "King's Cure," a title traceable to the supposed efficacy in olden days of the royal touch in the cure of these affections. I, myself, fancy that I have seen beneficial results ensue on the use of a wash composed of its decoction in ulcers of this class.

DOSE AND MODE OF ADMINISTRATION.—Never given in powder.

* *Decoctum Pyrolæ. Decoctum Chimaphilæ.* ("Take of leaves of winter-green, dried, half an ounce; water, half a pint, boil for ten minutes in a covered vessel, and strain. The product should measure about eight ounces.") Dose, f℥j. to f℥ij. three or four times a-day. An extract may be prepared by evaporating the decoction to a proper consistence; it is not used in this country, but has been employed in America in doses of from gr. v. to gr. xv.

INCOMPATIBLES.—The sesquisalts of iron; and all substances incompatible with tannin.

SCILLA. *Squill.* Urginea Scilla *Steinheil.* Plate 118, *Woodv. Med. Bot.* (The bulb from the Mediterranean coasts, sliced and dried.) *Bulb of Squilla Maritima,* E. A native of the shores of the Mediterranean, of France, and of Portugal; belonging to the Natural family *Liliaceæ,* and to the Linnæan class and order *Hexandria Monogynia.*

BOTANICAL CHARACTERS.—Bulb very large, sending up annually a scape or flowering stem from two to three feet high, terminated by a dense long raceme of white flowers.; the leaves, which appear after the flowers, are broadly lanceolate, 12 to 18 inches long.

PREPARATION.—The bulb, which is the officinal part of the plant, is dug up in autumn, divided into four parts, the centre cut out and rejected as being inert, and the remainder cut into thin slices, which are dried quickly with a gentle heat. Sometimes, however, the bulb is imported entire, in which state it quickly spoils. Squill is brought from Malta and other Mediterranean ports; also from St. Petersburg and Copenhagen.

CHARACTERS.—Bulb pear-shaped, weighing from half a pound to four pounds; outer scales membranous, brownish-red or white; inner scales thick, whitish, fleshy, juicy; taste mucilaginous, intensely and disagreeably bitter, somewhat acrid. The dried slices are white or yellowish-white, slightly translucent, scentless, disagreeably bitter, brittle and easily pulverizable if very dry, but, if exposed, readily recovering moisture and flexibility.

PHYSICAL PROPERTIES.—The entire bulb varies in size from that of the fist to that of a child's head, ovoid, covered externally with layers of thin, reddish *(squilla rubra),* or whitish *(squilla alba),* papery membranes; internally it is composed of thick, fleshy, concentric scales, of a pale rose-colour. Dried squill is in yellowish, somewhat translucent slices, brittle, but readily attracting moisture, when they become flexible; it is odourless, but has an acrid, very nauseous taste.

CHEMICAL PROPERTIES.—According to the analysis of M. Tilloy, squill consists of, 1. a very acrid, poisonous, resinoid substance, soluble in alcohol but not in ether; 2. a very bitter yellow principle *(Scillitine?),* soluble in water and in alcohol; 3. a fatty matter, tasteless, soluble in ether, but not in alcohol when it is entirely deprived of the acrid and bitter principles; 4. citrate of lime; and 5. mucus and sugar. A recent analysis by M. Marais shows that it contains also traces of iodine. *Scillitine,* as obtained by Marais, is an uncrystallizable, semi-transparent substance, hygrometric but not deliquescent, as he found it to be insoluble in water, but soluble in cold alcohol and ether; it has an intensely bitter penetrating taste. Squill yields its virtues to alcohol, vinegar, and the dilute acids. The sesquisalts of iron communicate a deep blue colour to the infusion, but it is not affected by gelatin, or by tincture of iodine.

THERAPEUTICAL EFFECTS.—In large doses squill acts as a narcotico-acrid poison, twenty-four grains of the powder having proved fatal. In medicinal doses it operates as an emetic, expectorant, and diuretic; for the latter purpose it is usually given in combination with digitalis and calomel, when it seldom fails to produce increased flow of urine, and at the same time promote the absorption of the effused fluid in dropsies. Squill is better adapted for local than for general dropsy; it is generally held to be inadmissible when inflammatory symptoms are present. (See, also, *Emetics* and *Expectorants.*)

DOSE AND MODE OF ADMINISTRATION.—To reduce squill to powder the slices should be carefully dried at a temperature not exceeding 100° F., and immediately triturated in a dry, warm mortar. The powder should be kept in closely-fitting glass-stoppered bottles, in a warm place, as it attracts moisture rapidly from the air. Dose, as a *diuretic*, gr. j. to gr. iij., usually given in the form of a pill made with conserve of roses, or some soft extract.

PREPARATIONS.—Pilula composita (see *Expectorants*), syrupus (see *Emetics*), tinctura.

Tinctura Scillæ. Tincture of Squill. (Take of squill, bruised, two ounces and a half; proof spirit; one pint. Macerate the squill for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, min. x. to min. xxx. An excellent addition to infusion of digitalis or decoction of broom-tops.

* *Acetum Scillæ.* (Take of squill, dried and bruised, two ounces; acetic acid of commerce—specific gravity, 1044—four fluid ounces; distilled water, twelve ounces; in the acid, diluted with the water, macerate the squill in a close vessel for seven days; then strain with expression, and filter.) Dose, f℥ss. to f℥iss. in some aromatic or distilled water, or in combination with some of our vegetable diuretic remedies. Although not contained in our national pharmacopœia, this, in my opinion, is the best form for securing the *diuretic* effects of squill.

* *Vinum Scillæ* (squill, 30 parts; white wine, 500 parts; macerate for 14 days, and filter). Dose, f℥j. to f℥ij.

INCOMPATIBLES.—The alkalies; and the sesqui-salts of iron.

SCOPARIUS. *Broom Tops.* Sarothamnus Scoparius, *Wimmer.* Plate 89, *Woodv. Med. Bot.* (*Spartium Scoparium*). (The tops, fresh and dried; from indigenous plants.) *The top branches of Cytisus scoparius.* The common-broom is an indigenous shrub; belonging to the Natural family *Leguminosæ* (*Fabaceæ,* Lindley), and to the Linnæan class and order *Diadelphia Decandria.*

BOTANICAL CHARACTERS.—A bushy shrub from three to six feet high; with long, straight, green branches; and large, bright, yellow, papillionaceous flowers.

CHARACTERS.—Straight, angular, dark-green, smooth, tough twigs, of a bitter nauseous taste, and of a peculiar odour when bruised.

CHEMICAL PROPERTIES.—Broom-tops, according to a recent analysis of Stenhouse, contain a peculiar substance soluble in boiling water and alcohol; it is of a yellow colour, and when purified can be got in stellate crystals. The composition of this principle, which he named *Scoparin*, is $C_{21}H_{11}O_{10}$. Dr. Stenhouse procured it by evaporating the watery decoction down to a tenth part, whereby a gelatinous mass, consisting chiefly of scoparin, was left; on it and a portion of volatile oil it is probable that the medicinal virtues of broom-tops depend. These are extracted by boiling water.

THERAPEUTICAL EFFECTS.—In the form of decoction, broom-tops are an excellent and certain diuretic, seldom failing to produce a copious secretion of urine; in fact I know of no diuretic so much to be depended upon. The officinal preparations are most generally employed as vehicles for the more active remedies of this class in the treatment of dropsical effusions. According to Stenhouse, scoparin is a diuretic of much power and great certainty, almost invariably causing a copious flow of urine in 12 hours after it has been taken.

DOSE AND MODE OF ADMINISTRATION.—The dose of *Scoparin* is five or six grains. Broom-tops are only given in the following forms; but if Stenhouse's experiments are to be depended on, an extract would be much more certain in its action.

Decoctum Scoparii. Decoction of Broom. (Take of broom tops, dried, half an ounce; distilled water, half a pint. Boil for ten minutes in a covered vessel, and strain. The product should measure about eight ounces.) Dose, f℥j. to f℥ij.

Succus Scoparii. Juice of Broom. (Take of fresh broom-tops, seven pounds; rectified spirit, a sufficiency. Bruise the broom-tops in a stone mortar; press out the juice; and to every three measures of juice, add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place.) Dose, fʒj. to fʒij. in water. A *new* but valuable preparation, inasmuch as we have the broom-tops directed in their greatest state of efficiency.

* *Decoctum Scoparii Compositum.* (Broom-tops; juniper, bruised; and dandelion, bruised, of each, ℥ss.; distilled water, Oiss.; boil down to a pint and strain.) All these are excellent diuretics, particularly the two latter, which scarcely ever fail to act on the kidneys. The addition of half an ounce of cream of tartar to eight ounces of either of these decoctions will increase considerably their activity. Dose, f℥j. to f℥iv., three or four times a-day.

SODÆ ACETAS. *Acetate of Soda.* $NaO, C_4H_3O_3+6HO(=136)$.

* PREPARATION.—Take of crystallized carbonate of soda of commerce, one pound, or a sufficient quantity; acetic acid of commerce (specific gravity, 1044), one pint; to

the acid, placed in a porcelain capsule, add by degrees the carbonate of soda, and, taking care that there shall be a slight excess of acid, evaporate the resulting solution till a pellicle begins to form on the surface, and set it by to crystallize. The crystals, when drained off the mother liquor, and dried by a short exposure to air on a porous brick, should be enclosed in a well-stopped bottle.

PHYSICAL PROPERTIES.—In white, striated, prismatic crystals, of the oblique rhombic series. It has a faint acetous odour when moistened, and a sharp, cooling, acetous taste.

TESTS.—Its solution in water, when dilute, is not precipitated by chloride of barium or nitrate of silver.

CHEMICAL PROPERTIES.—It consists of 1 equivalent of soda, 1 of acetic acid, and 6 of water of crystallization ($NAO, C_4H_3O_3+6HO$). It is unalterable in ordinary states of the air, but in dry warm air effloresces slightly; is soluble in 3 parts of water at 60°, and in somewhat less than its own weight of boiling water, and is also soluble in five times its weight of alcohol. Exposed to heat acetate of soda undergoes the watery fusion, loses all its water of crystallization at the heat of 550°, and at a heat of 600° it is decomposed. Its non-precipitation with chloride of barium proves the absence of sulphates; with nitrate of silver, of chlorides.

THERAPEUTICAL EFFECTS.—A mild diuretic, similar in operation to acetate of potash, over which it does not possess any advantage, but for which it may be substituted. It is very rarely used in the present day, and consequently has been omitted from the list in the Materia Medica of the Pharmacopœia, being only mentioned in Appendix A. with a view to its pharmaceutical employment.

DOSE, MODE OF ADMINISTRATION, AND INCOMPATIBLES.—Same as acetate of potash.

SODÆ BIBORAS. *Borax* (described in the division *Astringents*) is an excellent diuretic in cases of uric acid gravel, as a solution of it dissolves that acid freely, and does not produce any injurious constitutional effect, even when its use has been continued for some time. Borax should not be administered to pregnant females, as it stimulates the uterus and has in some instances caused abortion.

TEREBINTHINA CANADENSIS. *Canada Balsam.* Abies Balsamea, *Aiton. Hort. Kew.* Balm of Gilead, Fir. Plate 31, *Lambert, Pinus (Pinus Balsamea.)* (The turpentine obtained from the stem by incision in Canada.) *Liquid Resin of Abies Balsamea.* A native of the coldest regions of North America; belonging to the Natural family *Coniferæ* (*Pinaceæ*, Lindley), and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—An elegant tree; stem about forty-feet high; leaves solitary, flat, sub-erect above; cones erect on the branches, large, nearly cylindrical, of a beautiful deep glossy colour, fragrant as well as the leaves.

PREPARATION.—The resinous exudation improperly termed balsam is obtained either from little vesicles which form on the bark, or by making incisions quite through the bark into the wood, and collecting the juice as it exudes.

PHYSICAL PROPERTIES.—When fresh it is of the consistence of honey, but it gradually concretes into a yellow, translucent, resinous looking mass, of a peculiar agreeable, terebinthinate odour, and an acrid, rather nauseous taste.

CHARACTERS.—A pale-yellow ductile oleo-resin, of the consistence of thin honey, with a peculiar agreeable odour, and a slightly bitter, feebly acrid taste; by exposure drying very slowly into a transparent adhesive varnish, solidifying when mixed with a sixth of its weight of magnesia.

CHEMICAL PROPERTIES.—Canada balsam consists of volatile oil, two resins—one soluble, the other insoluble in alcohol—extractive, and some salts. It is insoluble in water, but forms an emulsion with it by means of mucilage, or yolk of egg.

THERAPEUTICAL EFFECTS.—The action of Canada turpentine on the urinary organs is similar to that of the other turpentines; it is more generally preferred for the treatment of the advanced stages of gonorrhœa, of gleet, of leucorrhœa, and of cystirrhœa, in which diseases it proves highly beneficial.

DOSE AND MODE OF ADMINISTRATION.—Gr. xx. to gr. xxx. three or four times daily; if liquid, it may be made into pills with magnesia or powdered liquorice root, or it may be given in emulsion with yolk of egg or mucilage; if solid, it may be swallowed entire rolled up in a little sugar.

TEREBINTHINÆ OLEUM. *Oil of Turpentine*, (described in the division *Anthelmintics*), given in small doses frequently repeated acts as a stimulant to the renal vessels, causing an increased flow of urine, to which it communicates a violet odour. It also possesses a specific action over the mucous membrane of the bladder and urethra, checking excessive discharges, and giving increased tonicity to the vessels which secrete the mucus. If the use of oil of turpentine be too long continued, and especially when given in small doses, *insufficiently suspended*, whether by mouth or rectum, it is apt to produce strangury, bloody urine, and even sometimes total suppression of the secretion. The dose of this oil as a diuretic is from min. x. to min. xxx. It has occasionally proved serviceable in dropsical effusions, but its stimulating property forbids its employment if there is any tendency to inflammatory action. It is frequently employed with much benefit in gleet, in leucorrhœa, and in chronic cystirrhœa. Under the use of oil of turpentine, the quantity of lithic acid in the urine is much increased, owing to which it frequently proves very beneficial in chronic rheumatism, and in sciatica occuring in the old and debilitated.

* TEREBENTHINA CHIA. *Liquid Resin of Pistacia Terebinthus. Chian Turpentine. Scio Turpentine.* This tree is a native of parts of the South of Europe, of the Grecian Archilepago, and of Syria, it belongs to the Natural family *Anacardiaceæ*, and to the Linnæan class and order *Diœcia Pentandria*.

BOTANICAL CHARACTERS.—Stem 30 to 35 feet high; leaves pinnate; young leaves reddish; flowers in compound racemes; fruit globular, purplish, inclosing an osseous one-seeded nut.

PREPARATION.—The liquid resinous exudation, which constitutes the Chian turpentine of commerce, is obtained chiefly in the island of Scio, by making incisions into the trunk of the tree, and allowing the juice which flows out to harden on large flat stones placed under; each tree yields from 8 to 10 ounces only.

PHYSICAL PROPERTIES.—It is of the consistence of very thick honey, but often nearly solid; of a pale greenish-yellow colour; has a weak terebinthinate, somewhat fragrant odour, and a slightly bitter taste.

CHEMICAL PROPERTIES.—Chian turpentine consists of volatile oil and resin. It resinifies by keeping or by exposure to the air, when it loses its fragrancy. This turpentine is very scarce, Strasburgh or Venice turpentine being usually substituted for it.

THERAPEUTICAL EFFECTS.—It resembles oil of turpentine in its action on the urinary organs; but by many it is supposed to act more effectually in stopping chronic mucous discharges.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. three or four times a day; it may be made into pills with powdered liquorice root or gum arabic, or may be given in emulsion with yolk of egg or mucilage.

* UREA. *A peculiar principle contained in the urine of most animals.* $C_2H_4O_2N_2 = 60$.

PREPARATION.—Urea may be obtained by evaporating fresh human urine to the consistence of a syrup, treating with *pure* nitric acid, washing well with distilled water the nitrate of urea, decomposing with carbonate of potash, dissolving the precipitated urea in alcohol, and crystallizing; or by the following elegant process of Liebig, ℥iv. of perfectly colourless crystallized urea may be procured from ℔j. of ferrocyanide of potassium:—Mix together 28 parts of perfectly dry ferrocyanide of potassium with 14 of binoxide of manganese, both in fine powder; place the mixture upon a smooth iron plate, and expose it to a dull red heat over a charcoal fire. By-and-by it will begin to burn of itself, when it is to be frequently stirred about. After it cools it is to be lixiviated with cold water. The solution is to be treated with 20½ parts of dry sulphate of ammonia, whereupon a copious deposit of sulphate of potash will ensue, whilst cyanate of ammonia will be held in solution. It is then to be allowed to stand for some time in a warm place (under 212° F.), so as to concentrate the supernatant liquor, which is afterwards to be decanted, evaporated to dryness, and then treated with alcohol of a density of ·835 to ·865 which dissolves out the urea formed at the expense of the cyanate of ammonia, and which on evaporation yields it in the form of crystals. The fact being that the hydrated cyanate of ammonia comprises all the elements requisite to form urea, but with the atoms differently arranged; heat recasts them, and as the result urea appears. For this beautiful discovery in organic chemistry we are indebted to Wöhler. This will be understood by reference to this equation, Hydrated cyanate of ammonia=NH_3+C_2NO+HO. These elements differently arranged $=C_2H_4O_2N_2,=$Urea.

PHYSICAL PROPERTIES.—It occurs in long, colourless, transparent crystals, which are flattened four-sided prisms. They are heavier than water, have a cooling, sharp taste, but are inodorous.

CHEMICAL PROPERTIES.—It consists of 2 equivalents of carbon, 4 of hydrogen, 2 of oxygen, and 2 of nitrogen ($C_2H_4O_2N_2$). It is soluble in its own weight of water at 60°, in 4 or 5 parts of cold alcohol, and in 2 parts of boiling alcohol; is unalterable in dry air, but deliquesces in damp air ; fuses at 248°, and is decomposed at a higher temperature. Urea is a feeble base, combining with most acids without neutralizing them.

THERAPEUTICAL EFFECTS.—Urea is at present scarcely ever employed as a diuretic, although from the reports of several French practitioners it appears to promote remarkably the secretion of urine, without producing any general disturbance of the animal economy.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xx. dissolved in sweetened distilled water. It may be also given made into pill or bolus, with any soft extract, or with honey or treacle.

CHAPTER IX.

EMETICS.

(Vomits.)

EMETICS are substances which are used for the purposes of producing vomiting. The number of medicines employed with this intention is but few, and they act either *specifically*, that is, they excite vomiting when injected into the veins as well as when introduced into the stomach, or their operation is *topical*, producing vomiting only when taken into the stomach. Tartar emetic is an example of a *specific*, mustard, of a *topical* emetic. It would be out of place here to enter into any consideration of the phenomena and pathology of vomiting; it must suffice to say that, independently of the mere evacuation of the contents of the stomach, emetics generally influence the entire system sympathetically. The primary effect of most emetics is the production of nausea, during which there is general relaxation of the muscular system, pallor of the face, coldness of the surface, great flow of saliva, with a well-marked diminution in the force of the circulation; by the administration of remedies of this class in doses not quite sufficient to cause vomiting, this effect may be produced with much certainty, and is frequently had recourse to as a therapeutical agent in cases in which it is required to allay spasm or to subdue commencing inflammation. The act of vomiting, on the other hand, excites the circulation, increases the frequency of the pulse, and, determining to the surface of the body, promotes cuticular transpiration; the urinary secretion also is frequently augmented during the operation of an emetic, and the liver stimulated to an increased discharge of bile. Emetics are, therefore, often administered with the view of producing, so to say, a general *perturbation* of the system, in the hope of cutting short fevers and other severe diseases at their very commencement, and frequently with decided results. In prescribing emetics, attention must be paid to the differences which exist in their mode of operation. Some medicines of this class, as sulphate of zinc and sulphate of copper, produce their effects very rapidly, exciting vomiting almost immediately after they are swallowed, without occasioning much nausea or depression. Tartar emetic operates more slowly, and causes great nausea, accompanied by a feeling of feebleness and exhaustion; many of the vegetable emetics, as ipecacuanha, act somewhat similarly, but require a much longer time for their operation; whilst there is yet a third class of emetics whose action is attended with marked stimulant effects, as sesquicarbonate of ammonia, and, in a minor degree, squill. In selecting a particular remedy of this class, therefore, we should be always guided by the nature of the indication which is to be fulfilled. Wherever their employment in cases of *poisoning* is called for, we should carefully eschew administering those whose action is attended with depression, the process of absorption being thereby materially stimulated; the converse, of course, holding true wherever we desire to remove the results of plastic exudation. When there are symptoms of determination of blood to the cerebral organs, emetics must be employed with great caution, in consequence of the obstruction of the circulation which is occasioned during the act of vomiting; for the same reason also they ought not to be administered in diseases of the heart and larger arteries, more especially when aneurism exists. From the violent action of the abdominal muscles which is caused, the act of vomiting is attended with great risk in the advanced stages of pregnancy, in hernia, and in prolapsus uteri. Independent of emetics, strictly so called, the act of vomiting can be excited by mechanical means, such as tickling the throat with the finger or an oiled feather, care being taken not to introduce this latter too far down the throat lest it might be involuntarily swallowed—an accident, the possible occurrence of which physiology accounts for; or, the contents of the stomach may be removed by the stomach pump—an instrument, from the incautious use of which in inexperienced hands, much mischief may ensue; consequently, as a general rule, it is safer, unless familiar with its use, for the practitioner to prefer to it some one or other of the emetics hereafter described.

AMMONIÆ SESQUICARBONAS. *Sesquicarbonate of Ammonia* (described in the division *Antacids*), given in doses of gr. xxx. or upwards, acts as a stimulating emetic, without producing much nausea or depression. It is consequently employed in cases of great debility when the use of an emetic is indicated; as in chronic bronchitis occurring in broken-down constitutions, and in the suffocative catarrh of fever. But in consequence of the uncertainty of its operation mustard is generally preferred in these cases, and is indeed frequently combined with it. The difficulty experienced, however, in getting patients to swallow either of them frequently acts as a barrier to their administration in cases where their emetic action would be attended with unquestionable benefit.

ANTIMONIUM TARTARATUM. *Tartar Emetic* (described in the division *Diaphoretics*), administered in doses of two or three grains dissolved in water, operates as a powerful emetic, producing at the same time general depression, and much nausea. The act of vomiting does not occur for from twenty minutes to half an hour after the emetic has been taken, but it is then usually energetic and frequently repeated. The emetic action is *specific*, as this medicine operates not only when administered by the stomach or rectum, but when injected into the veins, or otherwise introduced into the vascular system. Tartar emetic is employed in all cases in which it is wished to produce a powerful impression on the system, and at the same time lower the circulation; as in the early stages of febrile or inflammatory affections, when if given at the very commencement of the symptoms the disease is frequently cut short; with this view it is employed in common continued fever, in acute ophthalmia, in croup, in hooping cough, in hernia humoralis, in bubo, &c. In cases of threatened suffocation from the lodgment of solid bodies in the œsophagus, tartar emetic has been successfully injected into the veins to produce vomiting, and thereby the expulsion of the substance. In cases of poisoning, it is inferior to other remedies of this class, in consequence of the slowness of its operation and its depressing effects, whereby the further absorption of any of the poison remaining in the stomach is much facilitated. Tartar emetic is also frequently administered with the intention of producing nausea without causing vomiting; thus it is used in cases of strangulated hernia, to cause relaxation of the parts and permit the return of the contents of the sac, a line of practice attended with great risk, and in my opinion seriously to be deprecated, inasmuch as we cannot calculate on the limitation of its action to that of *nausea*, but it may superinduce *emesis*, which might seriously complicate matters; in rigidity of the os uteri obstructing labour; in dislocation, to relax the muscular system, a class of accidents that frequently render the system strangely tolerant of its action; and in spasmodic stricture. In most, if not all, of these cases, however, its use with these objects in view is now-a-days superseded by that of chloroform. To produce similar effects, its use, combined with opium, has been also employed with advantage in the delirium attended with vigilia of fever by Graves, and in delirium tremens by Law. Similarly combined, Pritchard recommends its use in insanity, when a hot and dry skin, with a full, hard pulse, together with maniacal excitement, are present; and Collins and Murphy have found a similar combination of use in puerperal convulsions. It is best administered in distilled water; gr. ij. may be dissolved in f℥viij. of water, and of this f℥ij. should be given every ten minutes until vomiting is produced, or f℥ss. every hour if it is wished to produce nausea merely. When prescribed with this view it should always be combined with tincture of lavender (see p. 236). It is sometimes given in the form of enema; for this purpose gr. vj. are to be dissolved in Oj. of tepid water; in this form, however, its operation is uncertain. For injection into the veins, gr. j. or gr. ij. are dissolved in f℥ij. of tepid distilled water. (See, also, *Epispastics*, *Expectorants*, and *Sedatives.*)

CUPRI SULPHAS. *Sulphate of Copper* (described in the division *Astringents*), in doses of from gr. x. to gr. xv. operates as a speedy and effectual emetic, producing generally a single but complete evacuation of the contents of the stomach, without causing any depression of the system, a fact which renders this salt peculiarly applicable as an emetic in cases of narcotic poisoning; but from its being apt to act as a powerful irritant if vomiting be not speedily produced, sulphate of zinc should be preferred in such a case, especially if we have any reason to suspect that the stomach is paralyzed by the narcotic action of the poison; for the same reason, it ought to be given in the full doses above mentioned.

IPECACUANHA. *Ipecacuan.* (Syn.: *Hippo.*) Cephaëlis Ipecacuanha, *D.C.* Plate 62, *Steph. and Church. Med. Bot.* (The root dried; imported from Brazil.) A native of Brazil; belonging to the Natural family *Cinchonaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Root, perennial, generally simple; stem, shrubby, ascending, 2 to 3 feet long; leaves, opposite, ovato-lanceolate, 4 to 8 placed at the end of the stem and branches; flowers, white, in terminal, pendulous heads; fruit, a fleshy black berry.

PREPARATION.—The roots are gathered at all seasons of the year, cut from the stems, dried in the sun, and packed in bundles of various sizes.

CHARACTERS.—In pieces three or four inches long, about the size of a small quill, contorted, and irregularly annulated. Colour, brown of various shades. It consists of two parts, the cortical or active portion, which is brittle, and a slender, tough, white, woody centre. Powder, pale brown, with a faint, nauseous odour, and a somewhat acrid and bitter taste.

PHYSICAL PROPERTIES.—Ipecacuanha root is in pieces from three to six inches long, about the thickness of a writing pen, irregularly twisted and bent, presenting many circular depressions at short intervals, which give the root an annulated appearance resembling a number of beads placed side by side on a string. It breaks with a short, clean fracture, presenting an outward cortical portion of a grayish or grayish-brown colour, and a white woody centre *(meditullium)*; these exist in the proportion of four of cortex to one of meditullium. Ipecacuan root is readily reduced to powder, which is of a pale brownish-yellow colour, has a faint, nauseous, peculiar odour, and a bitter, somewhat acrid taste.

CHEMICAL PROPERTIES.—The cortical portion of the root is the more active; according to the analysis of Pelletier it consists of 16 per cent. of a peculiar alkaloid named *emetina*, in which the active properties of the drug reside, 2 of a fat oily matter, 6 of wax, 10 of gum, 42 of starch, and 20 of lignin. Further experiments have proved, however, that the emetina procured was a very impure preparation, and that ipecacuanha root did not yield more than 1 per cent. of the *emeta* or *emetina* in a pure state. In addition to the matters above mentioned, Willigk, who, in 1851, analysed carefully some specimens of the root, discovered in it a peculiar acid which he named *ipecacuanha acid;* it is of a reddish-brown colour, has a strong, bitter taste, and is soluble in ether, alcohol, and water; its composition is $C_{14}H_8O_6$. Emetina is prepared by dissolving 1 part of an alcoholic extract of ipecacuanha in 10 parts of water, filtering to remove the fatty matter, and adding 1 part of calcined magnesia; evaporating with a gentle heat to dryness, pulverising, washing with cold water, drying and pulverising again; exhausting the powder with boiling alcohol, distilling off the spirit, treating the dry residue with weak sulphuric acid and animal charcoal; and finally precipitating the *emetina* with ammonia. Emetina, as commonly met with, is a dark, pasty-looking substance, but when pure is white and pulverulent, inodorous, with a faint, bitter taste, alkaline, very soluble in alcohol, sparingly soluble in water, and less so in ether; it is composed of $C_{37}H_{27}NO_{10}$. Ipecacuanha yields its active principles to water and to alcohol.

ADULTERATIONS.—Spurious ipecacuan roots are frequently substituted, especially on the Continent, for the true root, but as none of them present the precise characters of the latter, as given above, the fraud is readily detected. The powder is generally supposed to be very frequently adulterated, but of this we can scarcely judge except by its effect when administered as a medicine.

THERAPEUTICAL EFFECTS.—In full medicinal doses, ipecacuan operates as a certain but mild emetic, at the same time increasing remarkably the secretions. It resembles tartar emetic in the time which elapses after it has been taken before its effects are produced, and also in the act of vomiting being repeated several times; but it differs from that substance in not causing so much nausea or general depression; it has less tendency, also, to act on the bowels, producing, in fact, an *antiperistaltic* action of the bowels, to which, perhaps, its great value in *dysentery* may be attributed; in such cases more benefit follows its employment in nauseating than in emetic doses. I have frequently tested its value under such circumstances, and can speak of it with confidence. In India it is a favourite remedy in dysentery, and many of my former pupils have on their return spoken to me in terms of enthusiasm of its great value. There

Annesley's Formulary is in general repute. ℞.—Pulv. Ipecac, gr. ij.; Pil. Hydrarg., gr. ij.; Pulv. Opii, gr. ss; ft. pil.; 4tis horis, Sumend.; but by some practitioners it has been exhibited in doses far exceeding this. As an emetic, ipecacuanha is adapted for children, for the old or debilitated, and for delicate females, where we wish to produce vomiting without depressing much the vital powers; and also for cases when the indication is to increase the secretions of the pulmonary organs. Thus, it is used with benefit in the gastric febrile disorders of children, to evacuate the contents of the stomach; at the approach of the paroxysm in ague, hysteria, or hooping cough, when it frequently checks the development of the fit; and it is generally given in conjunction with tartar emetic in the febrile and inflammatory disorders in which that substance is employed. As an emetic, ipecacuanha is to be preferred to tartar emetic, when there is any tendency to irritation or inflammation of the digestive organs; it is inferior to the metallic sulphates in cases of narcotic poisoning, on account of the slowness of its operation. Small doses of ipecacuanha, when continued for some time, have produced occasionally symptoms analogous to those of salivation caused by mercury. *Emetina* has been very little used in medicine; the only advantages which it possesses over ipecacuanha are the smallness of the dose required to produce vomiting and its freedom from the unpleasant odour and taste of that substance: these are, however, more than counterbalanced by the dangerous symptoms which would result from an overdose. (See, also, *Epispastics* and *Expectorants*.)

DOSE AND MODE OF ADMINISTRATION.—In powder, as an emetic, the usual dose of ipecacuanha is from gr. xij to gr. xx.; but gr. v. or gr. vj. are frequently sufficient; it is best given mixed with warm water, and its action is promoted by tepid drinks: gr. j. is usually enough to act as an emetic for an infant. When administered in combination with tartar emetic, gr. xij. are mixed with gr. j. of the latter. The dose of impure *emetina* is from gr. ss. to gr. iij.; of the pure alkaloid from gr. $\frac{1}{8}$ to gr. ss.; either may be given dissolved in water with the aid of a few drops of dilute sulphuric acid.

Vinum Ipecacuanhæ. Wine of Ipecacuan. (Take of ipecacuan, bruised, one ounce; sherry, one pint. Macerate for seven days with occasional agitation, strain, express, and filter.) As an emetic, very generally employed for children, in doses of from min. xx. to f℥j.; seldom for adults. Dose, f℥ij. to f℥iv.

* *Syrupus Ipecacuanhæ.* (Ipecacuan, in coarse powder, ℥iv.; rectified spirit, Oj.; proof spirit; and water, of each, f℥xiv.; syrup Ovij.; digest the ipecacuan in f℥xv. of the rectified spirit at a gentle heat for twenty-four hours; strain, squeeze the residue, and filter. Repeat this process with the residue and proof spirit, and again with the water; unite the fluids and distil off the spirit till the residuum amounts to ℥xij. Add to the residuum f℥v. of the rectified spirit, and then the syrup.) This syrup is as effectually and much

more simply prepared by dissolving an alcoholic extract of the root in distilled water, and adding syrup. It is an excellent preparation for children; about min. xl. of the syrup are equal in strength to one grain of ipecacuanha. The dose, as an emetic for adults, is f℥ij.; for children, min. xx. to f℥j.

INCOMPATIBLES.—The salts of lead and of mercury; the vegetable acids; and all astringent vegetable infusions.

SCILLA. *Squill* (described in the division *Diuretics*), in full medicinal doses, generally produces nausea and vomiting; but its action is uncertain, and therefore it is not much used as an emetic. It is sometimes, however, given to children with this intention in hooping-cough, and in the advanced stages of bronchitis or of croup. In consequence of its stimulating effects it is inadmissible where there is any tendency to inflammation. The preparation of squill usually employed as an emetic is the following:—

Syrupus Scillæ. Syrup of Squill. (Take of squill, bruised, two ounces and a half; dilute acetic acid, one pint; refined sugar, two pounds; proof spirit, one fluid ounce and a half. Digest the squill in the dilute acetic acid for three days, with a gentle heat; express, add the spirit, and filter; then mix in the sugar, and dissolve with the aid of heat. The product should weigh three pounds two ounces, and should have the specific gravity 1·330.) Dose, as an emetic, for children, f℥j. every quarter of an hour until vomiting is produced.

SINAPIS. *Mustard.* (Syn.: *Flour of Mustard.*) Sinapis nigra, *Linn.*, and Sinapis alba, *Linn.* Black Mustard, White Mustard. Plates, 969 and 1677, *Eng. Bot.* (The seeds, reduced to powder, mixed; cultivated in England.) These are indigenous plants, belonging to the Natural family *Cruciferæ* (*Brassicaceæ*, Lindley), and to the Linnæan class and order *Tetradynamia Siliquosa.*

BOTANICAL CHARACTERS.—Annual; stem, 3 to 4 feet high; lower leaves, large, lyrate, rough; flowers, yellow; pod, with a very short beak, quadrangular; seeds, dark brown. The white mustard is distinguished by the pod having a long beak, and by the seeds being yellow.

CHARACTERS.—Greenish-yellow, of an acrid bitterish, oily, pungent taste, scentless when dry, but exhaling when moist a pungent, penetrating, peculiar odour, very irritating to the nostrils and eyes.

PHYSICAL PROPERTIES.—Table mustard, as met with in the shops, and which is always used in medical practice, is prepared from both the black and white species of sinapis, mixed in nearly equal proportions and ground. Mustard is a greenish-yellow powder, having a somewhat oily aspect, an acrid burning taste, and in the dry state a faint nauseous smell; when moistened it emits a strong penetrating odour, very irritating to the eyes and nostrils. Black mustard is much more pungent than white.

CHEMICAL PROPERTIES.—Black mustard seeds consist of a bland fixed oil; of a peculiar acid, bitter, odourless, and uncrystallizable, which has been named *myronic acid;* of another peculiar principle, resembling vegetable albumen and emulsin, which has been named *myrosyne;* and of a third peculiar principle, crystallizable and very volatile, named *sinapisin;* with other unimportant matters. When water is added to mustard, by the mutual action of these principles upon each other a pungent volatile oil is formed, which may be obtained by distillation, but which does not pre-exist in the seeds; and it is to its formation that the active properties of mustard are due.

TEST.—A decoction cooled is not made blue by tincture of iodine.

ADULTERATIONS.—Flour of mustard is always more or less adulterated with a variety of substances. Wheaten flour, which is generally (always according to Christison) mixed with it, may be detected by tincture of iodine turning a cooled decoction blue. Other sophistications may be discovered by examination with the microscope, or we may judge of their existence by the physical properties of the specimen.

THERAPEUTICAL EFFECTS.—Mustard is a powerful stimulating emetic, and should be preferred to any other remedy of this class when the sensibility of the stomach is greatly reduced, or the vital power is low. Thus it is employed with much advantage in cases of poisoning, especially with the narcotics or sedatives, in intoxication threatening complete coma, in malignant cholera, in some forms of apoplexy and of paralysis, and in suffocative catarrh occurring in the aged or debilitated. (See also *Epispastics.*)

DOSE AND MODE OF ADMINISTRATION.—As an emetic, mustard is given in doses of one or two tablespoonfuls; it is best administered rubbed up with f℥vj. or f℥viij. of tepid water.

PREPARATION.—Cataplasma.

VIOLA ODORATA. The root of this plant (which has been described in the division *Cathartics*), though not officinal in the British pharmacopœias, possesses well-marked emetic properties, which depend on the presence of an alkaloid named *violina;* this principle operates in a manner precisely similar to *emetina,* and has been found to exist in the roots of all the species of the genus Viola. In their action on the system violet roots resemble ipecacuanha, for which they would form an excellent substitute; and as many of the species are indigenous, the subject is worthy of more attention than has been hitherto bestowed on it. The dose of the powdered root is from gr. xxx. to gr. lx.

ZINCI SULPHAS. *Sulphate of Zinc* (described in the division *Astringents*), in full medicinal doses, from gr. xv. to gr. xxx., operates as a speedy, safe, and efficacious emetic, not producing much nausea or depression, and is therefore preferred to all other medicines of this class in cases of narcotic poisoning. It is also applicable to any case in which it is wished to produce a single but complete evacuation of the contents of the stomach. As an emetic, sulphate of zinc is best administered in the full doses above stated, dissolved in three or four ounces of tepid water.

CHAPTER X.

EMMENAGOGUES.

EMMENAGOGUES are medicines supposed to be capable of promoting the menstrual discharge. That any substances have a direct or specific power over the uterine organs has been doubted by many, in consequence of the uncertainty of operation of the so-called specific emmenagogues, and also as the uterus is not an organ intended for the elimination of foreign matter. Nevertheless there are some medicines employed to promote the menstrual secretion, which appear to act solely as stimulants to the uterus, and these shall be considered in this chapter. Suppression or absence of the menstrual discharge is generally the effect of some morbid state of the system, and therefore the remedies which are to be employed should have reference to this morbid state. Thus, when amenorrhœa is the consequence of general debility, recourse must be had to tonics and stimulants; and when it occurs with a state of plethora, leeching or cupping and other lowering plans of treatment must be employed. In the treatment of suppressed, absent, or deficient menstruation, these general remedies should be always used before what may be termed the *specific* emmenagogues are administered, as healthy menstruation is admittedly incompatible with a deranged or diseased state of the constitution, and therefore when such exists, stimulation of the uterine organs cannot be expected to produce the desired effect. Substances which stimulate powerfully the neighbouring organs act *relatively* on the uterine vessels, and consequently are often effectual in restoring the menstrual discharge. Thus, some of the more *acrid cathartics*, as aloes, gamboge, &c.; and the *stimulating diuretics*, as the turpentines, cantharides, &c., are frequently the most certain emmenagogues. More lately it has been proposed to make use of applications to the mammary glands with the view of restoring the menstrual discharge, and for this purpose a warm decoction of the leaves of the castor-oil plant has been successfully employed. But the result must have been due to the warm fomentation of organs between which and the uterus so close a sympathy exists, and not to any medicinal virtue in the substance employed.

CROCUS. *Saffron.* Crocus sativus, *Linn.* Plate 101, *Steph. and Church. Med. Bot.* (The stigma, and part of the style, dried; imported from Spain, France, and Naples.) A native of Asia Minor, now naturalized in England; belonging to the Natural family *Iridaceæ*, and to the Linnæan class and order *Triandria Monogynia.*

BOTANICAL CHARACTERS.—Root, a round cormus; leaves, linear, with a white central stripe; flowers, appearing in September and October, light purple with red veins; style single, stigma protruded, drooping, with three linear divisions, fragrant.

PREPARATION.—Early in the morning the flowers are gathered, just as they are about to expand, the stigmata with part of the style picked out, and the rest of the flower thrown away; the stigmata are then spread loosely on white paper, and dried on a small kiln of a peculiar construction. Formerly the over-ripe or injured stigmata were dried under pressure between folds of paper, when they constituted what was called *Cake Saffron*, now rarely met with.

CHARACTERS.—Consists of a thread-like style, terminated by three long orange-brown stigmas, which are broadest at their summit; has a powerful aromatic odour. When rubbed on the moistened finger, it tinges it intensely orange-yellow.

PHYSICAL PROPERTIES.—Saffron is met with in commerce under two forms, *Cake Saffron,* produced by tightly packing it together, during the process of drying (the least esteemed form); or, *Hay Saffron,* which consists of the dried stigmata in loosely-aggregated masses; the colour is deep orange, the odour powerful and agreeably aromatic, in large quantities stupifying; the taste is pungent, aromatic, and somewhat bitter. It is imported chiefly from Spain and France, English saffron not being met with in the market at present. According to Pereira, "one grain of good commercial saffron contains the stigmata and styles of nine flowers; hence 4,320 flowers are required to yield one ounce of saffron."

CHEMICAL PROPERTIES.—Saffron consists of albumen, mucilage, a colouring extractive matter named *polychroite,* which constitutes two-thirds of its weight, volatile oil, &c. It yields its properties readily to water and to alcohol; its solution in either being of a deep orange colour; strong sulphuric acid changes its colour to an indigo blue.

TEST.—When pressed between folds of white filtering paper, it leaves no oily stain.

ADULTERATIONS.—In consequence of the high price of saffron, it is very much adulterated; the petals of the *Carthamus tinctorius* or Safflower, and of the *Calendula arvensis* or Marigold, pomegranate blossoms, and fibres of smoked beef are used for this purpose. Oil is also frequently added to improve its colour and to increase its weight; hence the pharmacopœial test. The flowers may be detected by the thickness of their structure, when a specimen is soaked in water: the fibres of beef, by the odour which they emit on being burned. What is at present sometimes sold in England for *cake* saffron, consists of the petals of the *Carthamus tinctorius* made into a paste with gum water. Of the qualities of saffron we judge by its sensible properties.

THERAPEUTICAL EFFECTS.—Saffron is a stimulant of weak power, exerting a specific influence, by no means well-marked, over the uterine organs; so that it is but a doubtful emmenagogue. In the present day it is scarcely ever employed in medicine, except to give an agreeable odour and a pleasing colour to mixtures. On the continent it bears a high character as a remedy for the severe lumbar pains which so frequently precede or accompany menstruation. In the exanthemata it is a favourite domestic remedy, from the idea that it favours the production of the eruption.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. xij. to gr. lx.

PREPARATIONS.—Pulvis aromaticus (see *General Stimulants*), tinctura.

* *Syrupus Croci.* (Take of saffron, chopped fine, ℥ss.; boiling distilled water, Oj.; refined sugar, in powder, as much as is sufficient. Infuse the saffron in the water, in a covered vessel, for twelve hours, then boil for five minutes, and strain through calico with expression; let the decoction stand until the sediment subsides, and having then decanted the clear liquor, add to it twice its weight of sugar, and dissolve with the aid of steam or water heat.) Dose, f℥j. to f℥ij. Chiefly used for flavouring and colouring purposes.

Tinctura Croci. Tincture of Saffron. (Take of saffron, one ounce; proof spirit, one pint. Macerate the saffron for forty-eight hours with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥j. to f℥ij.

ERGOTA. *Ergot.* (Syn.: *Secale Cornutum.*) Secale cereale, *Linn.* Common Rye. (The grain diseased by the presence of an imperfect fungus.) Plate 113, *Steph. and Church. Med. Bot.* Much difference of opinion exists as to what this substance really is; the latest and best authorities agree that it is a peculiar species of fungus (*Spermoëdia clavus* of Fries and Lindley, *Ergotætia abortifaciens* of Quekett and Pereira), which is produced under certain circumstances, as yet not fully ascertained, on plants belonging to the Natural families *Graminaceæ*, *Cyperaceæ*, and *Palmaceæ*, but on none so frequently as on the *Secale cereale* or common rye.

CHARACTERS.—Subtriangular, curved, with a longitudinal furrow on the concave side, obtuse at the ends; from one-third of an inch to an inch and a half in length; of a violet-brown colour on the surface, yellowish within; solid, frangible, fracture short, odour faintly marked.

PHYSICAL PROPERTIES.—Ergot, or spurred rye, consists of angular, sometimes round bodies, from the third of an inch to an inch and a half in length, retaining the longitudinal depression of the sound grain, obtuse at the extremities, curved like the spur of a cock, whence the name. It is of a violet-brown colour externally, sometimes whitish; yellowish internally. In the entire state, the odour is very faint, but when powdered it has a heavy, mawkish, somewhat animal smell; the taste is acrid and disagreeable; it is firm and fragile, breaking with a clear transverse fracture. Ergot of rye attracts moisture if exposed to the air, swells, and becomes mouldy, and is attacked by a small insect, a species of *acarus*, which devours the interior and leaves the grain a mere husk, no longer fit for medical purposes; it should therefore be kept in well-stopped bottles. Van Ryn recommends as the most effectual method of preserving ergot, to dry it with a stove heat, pulverise immediately, mix the powder with an equal quantity of powdered white sugar, and keep it in well-stopped glass bottles; thus prepared, he states that it retains its medicinal powers unimpaired for four years.

CHEMICAL PROPERTIES.—According to the analysis of Wiggers, 100 parts contain 30 of fixed oil, 46 of fungin, and 1·25 of *ergotin*, a peculiar principle, besides several unimportant matters, such as phosphates of lime, potash, and iron, gum, sugar, osmazome, and wax. The *ergotin* of Wiggers, however, cannot be, as he supposes, the active principle of ergot of rye, as it is insoluble in water. Legrip obtained from 100 parts of ergot 34·50 parts of a thick, very fluid, fixed oil, of a fine yellow colour; 2·75 of starch; 1·00 of albumen; 2·25 of inulin; 2·50 of gum; 2·25 of uncrystallizable sugar; 2·75 of a brown resin; 3·50 of fungin; 13·50 of vegeto-animal matter; 0·75 of osmazome; 0·50 of a fatty acid; 24·5 of lignin; 0·50 of colouring principles; an odorous principle not isolated; 2·25 of fungate of potassa; 0·50 of chloride of sodium; 0.50 of sulphate of lime and magnesia; 1·25 of subphosphate of lime; 0·25 of oxide of iron; 0·15 of silica; 2·50 of water; with 2·35 of loss. Dr. Wright, an earlier experimenter on this drug, believed its active properties to depend on the fixed oil, which he describes as of a reddish-brown colour, lighter than water, and soluble in alcohol, ether, the volatile oils, and solutions of the caustic alkalies; it is readily procured by evaporating with a gentle heat an ethereal tincture of the ergot prepared by percolation. M. Bonjean, at a later period, examined with great care the chemical, toxicological, and therapeutical properties of ergot. He found it to contain two very distinct active principles, the one a soft, reddish-brown extract, very soluble in water, which he has named *ergotin*, and on which the obstetrical and anti-hemorrhagic properties of the drug depend; and the other, a colourless fixed oil, very soluble in ether, and *which alone is the poisonous principle.* A discrepancy of opinion exists as to this latter statement, as when the fixed oil is obtained by expression it has been found to be inert; according to Mr. Baker, of Richmond, U.S., closely resembling castor oil. Bonjean obtains the ergotin by percolating powdered ergot with cold water, evaporating the product in a water-bath to the consistence of an extract, treating the watery extract with rectified spirit, and evaporating the alcoholic solution thus obtained; this alcoholic extract is the ergotin. By this process a reddish-brown, homogeneous extract is obtained; it has a pungent, bitter taste, and an odour resembling that of roast meat. It forms with water a beautiful red solution, limpid and transparent. 500 parts of ergot yield from 70 to 80 of ergotin. From his results, it would appear that water must be the best menstruum for extracting the active principles of ergot of rye.

ADULTERATIONS.—Plaster of Paris and common paste, artfully coloured, are substituted for or mixed with ergot of rye; they are difficult of detection. The characteristics of good ergot as given by Wright should, therefore, be attended to:—"Clear and smooth on the surface, not powdery, of a deep purple colour, neither totally black nor light brown, having a full strong odour, breaking clearly, exhibiting a pink blush interiorly, unpunctured by insects, burning with a clear jetting flame, and being of a less specific gravity than water." But Bonjean states that he has found ergot which is white internally fully as active as that which is pink.

THERAPEUTICAL EFFECTS.—Ergot of rye in single large doses, from gr. lx. to ℥j., produces nausea, pain in the head, and vertigo, generally followed in from twelve to twenty-four hours by delirium and stupor, with dilatation of the pupil and great depression of the pulse. In medicinal doses, from gr. xv. to gr. xl., it exerts a specific influence on the uterine organs, chiefly manifested by a stimulant effect on the muscular fibres of the uterus, exciting them to increased contraction. Ergot of rye is principally used in medicine to accelerate delivery in cases where childbirth is delayed in consequence of feeble or languid contractions of the uterus; to produce the expulsion of the placenta retained from a similar cause; to stimulate the uterus to expel sanguinous clots, hydatids, or polypi; to promote the lochial discharge; and to check leuchorrhœa, or hemorrhage from the womb; all of which effects are the results of augmented contractility of the uterus. The power of ergot to produce the catamenial discharge in amenorrhœa is doubted by many, nevertheless in chlorotic amenorrhœa after the administration of ferruginous preparations for some time, I have in many cases employed the infusion with most benefical results. The circumstances which contraindicate the employment of ergot, in parturition, are want of dilatation of the os uteri, great rigidity of the soft parts, deformity of the pelvis, and mal-presentation. Most practitioners also agree in advising that it should not be administered in the earlier stages of labour, or in first pregnancies. It is now very generally admitted that the administration of ergot of rye during labour endangers the life of the fœtus; and that this depends on the poisonous action of the drug, as evidenced by its effects on the action of the heart both of the mother and child, is shown in a valuable report by Dr. Hardy, in the 27th volume of the first series of the *Dublin*

Medical Journal. It is therefore requisite that after the administration of ergot during labour, any change in the action of the fœtal heart should be carefully watched by the employment of the stethoscope, and if the number of the beats be reduced below 110, *with intermissions*, instrumental delivery must be had recourse to, to save the life of the child. Dr. Beatty, who has closely and ably investigated this question, fixes the limit beyond which the child will rarely be born alive after the administration of ergot to the mother, at two hours. To this rule he has met with but three exceptions; although he has seen death result at an earlier period (the children being lost although born alive); in one instance in 20, in a second, in 25 minutes after the administration of the ergot to the mother. In such cases he describes the fœtus as presenting a general lividity of the surface, and universal rigidity of the muscular system, producing stiffened limbs and clenched hands in those born dead, and a curious kind of spasm and palsy in those born alive. The *ergotin* of M. Bonjean is, however, stated by him to be entirely void of this poisonous property, and if such be proved to be the case, this great objection to the employment of ergot will be overcome by the use of it. The effects produced by the continued use of ergot, as an article of food, are very singular, and have been fully described by different writers; any detailed account of them, however, would be quite foreign to the scope of this work, I must, therefore, refer the reader to Dr. Wright's excellent treatise in the 52nd and 53rd vols. of the *Edinburgh Medical and Surgical Journal*, and to a recent admirable report on "Convulsive Epidemic Ergotism," by Dr. Lasègue, in the 9th volume of the *Archives Générales de Médecine*, May, 1857, contenting myself with simply observing that the symptoms produced are arranged in two classes—*Convulsive* and *Gangrenous Ergotism.* In both forms we find these symptoms in common:—formication, voracious appetite, dimness of vision, giddiness, and loss of sensation—in the first variety convulsions ensue, which terminate fatally; in the second, gangrene supervenes.

DOSE AND MODE OF ADMINISTRATION.—In powder, which should be always prepared for use; for a woman in labour, the dose is gr. xx. repeated every half hour until gr. lx. have been taken, unless its effects are sooner produced; for other cases, gr. v. to gr. x. three times a day. It may be administered diffused through peppermint or cinnamon water.

Extractum Ergotæ Liquidum. Liquid Extract of Ergot. (Take of ergot, in coarse powder, one pound; ether, one pint; distilled water, three pints and a half; rectified spirit, eight fluid ounces. Shake the ether in a bottle with half a pint of the water, and after separation decant the ether. Place the ergot in a percolator, and free it from its oil by passing the washed ether through it. Remove the marc, and digest it in three pints of the water at 160° for twelve hours. Press out, strain, and evaporate the liquor to nine fluid ounces; and, when cold, add the spirit. Allow it to stand for an hour to coagulate, then filter. The product should measure sixteen fluid ounces.) The ether is washed to remove any spirit it may contain, which would prematurely remove some of the ergotin, and is then made to percolate the ergot to remove its oil (the poisonous principle, according to Bonjean; inert, according to others). The water now exhausts it of its active principles, together with some vegetable albuminous matter, which is coagulated by the spirit, and removed on filtration. The products measuring 16 fluid ounces, and 16 ounces of ergot having been operated upon, it is evident that each measure used should represent an equal amount of the powder, perhaps somewhat more in virtue of its greater purity. Until clinical experiment clears up the doubt that hangs over the physiological effects of the oil, this undoubtedly is the preparation that should be used, at all events, for obstetrical purposes. Dose, min. x. to min. xl.

Infusum Ergotæ. Infusion of Ergot. (Take of ergot, in coarse powder, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for half an hour, and strain.) Dose, during parturition, ¼th of this repeated at intervals of half an hour, unless its effects be sooner produced; for other cases, the dose is f℥ss. to f℥j.; some aromatic tincture should be added to this preparation and to the next, to conceal their nauseous taste. A decoction may be prepared with the same proportions by boiling for ten minutes and straining.

Tinctura Ergotæ. Tincture of Ergot. (Take of ergot, bruised, five ounces; proof spirit, one pint. Macerate the ergot for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit; as soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, in slow parturition, f℥ss. to f℥j.; in other cases, min. x. to min. xx.

* *Ergotin*, BONJEAN. Dose, from one grain and a half to three grains every quarter of an hour during labour; in other cases this dose may be given three or four times a day. It may be prescribed in pill made with liquorice powder and mucilage, or dissolved in water and sweetened with syrup of orange flowers or syrup of saffron.

RUTA GRAVEOLENS. *Rue* (described in the division *Antispasmodics*) was formerly highly esteemed as an emmenagogue, and even at present is a popular remedy as such; it is sometimes resorted to for the purpose of procuring abortion. Although it undoubtedly possesses a direct stimulating influence on the uterine organs, this herb is scarcely ever employed in regular practice in the present day for any of the purposes for which this class of remedies is administered.

SABINA. *Savin.* Juniperus Sabina, *Linn.* Plate 94, *Woodv. Med. Bot.* (The fresh and dried tops collected in spring from plants cultivated in Britain.) A native of the South of Europe, cultivated in this country, belonging to the Natural family *Coniferæ* (*Pinaceæ*, Lindley), and to the Linnæan class and order *Diœcia Monadelphia.*

BOTANICAL CHARACTERS.—An evergreen, small, bushy shrub; leaves very small, ovate, pointed, densely imbricated; it flowers in April or May, and ripens its fruit, a dark purple *galbulus* or berry about the size of a currant, in autumn.

CHARACTERS.—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; greyish-white, crystalline on the surface and in its texture, translucent, hard, scentless, faintly sweet, gritty when chewed.

PHYSICAL PROPERTIES.—As met with in the shops, savin consists of the young tops and their attached leaves; in the fresh state they are of a bright green colour, have a heavy, peculiar, terebinthinate odour, and a bitter, nauseous taste. When dry their colour is yellowish-green, and their odour much weaker.

CHEMICAL PROPERTIES.—Savin tops consist of resin, volatile oil, gallic acid, extractive, &c. The medicinal properties are due to the volatile oil, ℔ij. of the tops yielding f℥v. of oil; it is limpid and nearly colourless, having the odour of the plant, and a hot, acrid taste; its density is ·915, and its composition is $C_{10}H_8$, being isomeric with oil of turpentine. Savin communicates its odour and taste to water and to alcohol; the alcoholic tincture is of a bright green colour.

THERAPEUTICAL EFFECTS.—Savin is a powerful stimulant to the uterine organs, and is employed as an emmenagogue with much benefit in amenorrhœa and chlorosis depending on torpid or deficient action of the uterine system. In consequence, however, of its poisonous properties, it should be used with caution; its employment is contraindicated where there is the least tendency to irritation or inflammation of the uterus or any of the pelvic viscera. Savin is the drug usually resorted to by the public for the purpose of producing abortion, but this result cannot be effected except at the risk of the life of the mother. (See, also, *Epispastics.*)

DOSE AND MODE OF ADMINISTRATION.—In powder, a bad form, the dose is from gr. v. to gr. xv.

Tinctura Sabinæ. Tincture of Savin. (Take of savin, dried and bruised, two ounces and a half; proof spirit, one pint. Macerate the savin for forty-eight hours with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥j.

Oleum Sabinæ. English Oil of Savin. (The oil distilled in England from fresh savin.) A colourless or pale yellow oil obtained from the tops according to the general process for obtaining volatile oils, as formerly directed in the Dublin and Edinburgh Pharmacopœias; see page 259. Dose, from min. ij. to min. vj.

* *Infusum Sabinæ*, (fresh savin tops, gr. lx.; boiling water, f℥viijss.; macerate for one hour in a covered vessel and strain.) Dose, f℥ss. to f℥j.

In cases of poisoning with savin, emetics should be first employed to remove the poison from the stomach; and afterwards opiates and demulcents, to be followed by general antiphlogistic treatment.

SODÆ BIBORAS. *Borax* (described in the division *Astringents*), though not ordinarily employed in medicine as an emmenagogue, possesses a powerfully stimulant action on the uterine organs. It is sometimes used empirically to cause abortion, an effect which its incautious administration in regular practice has in more than one instance produced.

CHAPTER XI.

EMOLLIENTS.

(Demulcents; Relaxants.)

EMOLLIENTS may be defined, substances which diminish the vital tone or cohesion of the solid tissues, and thereby render them more lax and flexible; or which, by diminishing acrimony, protect the sensible surfaces of the body from the action of acrid matter, and consequently from the injurious effects which might result therefrom. This division of medical agents has been stated by many writers to act merely mechanically, lubricating and softening the parts to which they are applied, or sheathing them from the action of matters which are capable of irritating them. But this explanation cannot possibly apply to those substances which, when introduced into the stomach, operate on remote parts of the body. Emollients, therefore, seem to act either directly on the part with which they are placed in contact, or indirectly through the medium of the circulation. They are principally employed in the treatment of inflammations, either general or local, in painful ulceration, in diseases of the urinary organs, and in poisoning with acrid substances; but in all these cases they are used only to alleviate symptoms. Of the non-medicinal substances employed as emollients, warm water is the most important, and the higher the temperature at which it can be applied without the actual production of pain, the greater will be its emollient power; for this reason, it will be found of most advantage when employed in the form of vapour.

ADEPS PRÆPARATUS. *Prepared Lard.* (Syn.: *Axungia, Axunge, Hog's Lard.*) (Hog's fat, deprived of its membranes, and purified by heat.) *Sus scrofa*, the common hog, belongs to the class *Mammalia*, order *Pachydermata*. The fat is usually taken from about the loins, from the omentum, and from the mesentery, and is melted and strained to separate the membranes.

Adeps Præparatus. Prepared Lard. (Take of the internal fat of the abdomen of the hog, perfectly fresh, fourteen pounds. Remove as much as possible of the membranes, cut the fat into small pieces, and liquefy it over a water bath at a boiling heat; strain through fine linen, again heat it over the water bath, stirring continually until it becomes clear, and entirely free from water. Keep it in a stone jar.) Lard, as sold for general use, usually contains salt, which has been added to prevent it from becoming rancid; consequently, to prepare it for medical purposes, the following formula was given in the *Dublin Pharmacopœia*:—*Adeps suillus præparatus*. "Take of lard of commerce, any convenient quantity, melt it in twice its weight of boiling water, stirring the mixture constantly; then set the mixture aside to cool, and separate the lard when it has solidified." If the pharmacopœial directions, however, are strictly obeyed, and *fresh fat* alone be employed, this proceeding becomes unnecessary.

PHYSICAL PROPERTIES.—Axunge is a white, solid, fatty matter, with a very faint odour, and a mild sweetish taste. Specific gravity, ·881.

TESTS.—Has no rancid odour, dissolves entirely in ether. Distilled water in which it has been boiled, when cooled and filtered, gives no precipitate with nitrate of silver.

CHEMICAL PROPERTIES.—It is composed of 38 per cent. of *stearin* and *margarin*, and 62 of *oleïne* or *elaïne*. It melts at about 100° F. into a clear, transparent liquid, which, if water be present, is whitish or milky; exposed to the air axunge undergoes a process of decay, becoming *rancid*, when it acquires a peculiar unpleasant odour and acrid properties; in this state it is unfit for medical purposes; did it precipitate with nitrate of silver we should infer the presence of salt.

THERAPEUTICAL EFFECTS.—Axunge is not used in medicine internally; its action on the body is nutritive and emollient. As an external agent it is employed as a basis for ointments, cerates, and liniments.

Unguentum Simplex. Simple Ointment. (Take of white wax, two ounces; prepared lard, three ounces; almond oil, three fluid ounces. Melt the wax and lard in the oil on a water bath; then remove the mixture, and stir until it becomes solid.) Used as a very general application to blistered surfaces, &c.

* *Ceratum Galeni*, PARIS CODEX. Oil of sweet almonds, f℥xvj.; white wax, ℥iv.; rose water, f℥xij.; liquefy the wax in the oil in an earthenware vessel with gentle heat; pour the mixture into a marble mortar, warmed, and stir constantly until nearly cold; then incorporate the rose water, adding it in small quantities while beating up the cerate continuously and briskly.) *Cold Cream.* Besides the above, which is the French officinal form, numerous other formulæ for its preparation are contained in druggists' receipt books. Cold cream forms an excellent basis for ointments, especially in the treatment of cutaneous diseases, with many of which more *greasy* applications disagree.

* *Ceratum Lauro-Cerasi*, AUTHOR. (Oil of sweet almonds, f℥xvj.; white wax, ℥iv.; cherry laurel water, f℥viij.; prepare as directed for *cold cream* in the last formula.) This preparation will be found most useful for allaying irritation in many diseases of the skin.

SEVUM PRÆPARATUM. *Prepared Suet.* Ovis Aries, *Linn.* The sheep. (The internal fat of the abdomen purified by melting and straining.) The sheep belongs to the class *Mammalia*, and order *Ruminantia*. The fat, *adeps ovillus*, is selected from the neighbourhood of the kidneys, melted, and strained to separate the membranes. Mutton suet is similar in its properties to axunge, and is employed for the same purposes; it is sometimes preferred to axunge, in consequence of its greater consistence and higher melting-point.

CHARACTERS.—White, soft, smooth, almost scentless; fusible at 103°.

* ALTHÆA OFFICINALIS, FOLIA ET RADIX. *(The Leaves and Root of Althæa Officinalis.) Common Marsh-mallow.* An indigenous plant, belonging to the Natural family *Malvaceæ*, and to the Linnæan class and order *Monadelphia Polyandria.*

BOTANICAL CHARACTERS.—Stem, two to three feet high, downy; leaves, heart-shaped, exquisitely soft and pubescent; flowers, on axillary stalks, large, pale, rose-colour.

PHYSICAL PROPERTIES.—The roots are fusiform, from 12 to 18 inches long, about the thickness of the finger, yellowish externally, white and fibrous within; the odour is faintly nauseous, the taste sweet, and very mucilaginous. The leaves have a weaker odour, and a less mucilaginous taste.

CHEMICAL PROPERTIES.—The roots consist of gum, uncrystallizable sugar, starch, yellow colouring matter, *asparagin*, albumen, &c. They yield their mucilaginous properties to water.

THERAPEUTICAL EFFECTS.—Marsh-mallow root is one of the most commonly employed emollients on the continent; but is not much used in this country, and in consequence is omitted from the Pharmacopœia. As an internal remedy it is given in inflammation of mucous membranes, as in gonorrhœa, cystitis, nephritis, bronchitis, &c., either alone or as a vehicle for other medicines. Externally, the leaves are generally employed in the acute phlegmasiæ in the form of decoction or cataplasm.

DOSE AND MODE OF ADMINISTRATION.—Only used in the following forms:—

* *Mistura Althææ.* (Dried root of althæa officinalis, ℥iv.; raisins freed of the seeds, ℥ij.; boiling water, Ov.; boil down to Oiij.; strain through linen or calico; and when the sediment has subsided, pour off the clear liquid for use.) Dose, f℥j. to f℥ij., frequently repeated.

* *Syrupus Altheææ.* (Althæa, sliced, ℥iss.; sugar, ℔iij. or a sufficiency; distilled water, Oj.; rectified spirit, f℥iiss. or a sufficiency; macerate the althæa in the water for 12 hours; express the liquor and strain through linen. Then add to the strained liquor twice its weight of sugar, and dissolve with a gentle heat. Finally, when the syrup is cold, add the rectified spirit in the proportion of f℥ss. to each f℥j.) This syrup does not keep well. The dose is from f℥ss. to f℥j.

INCOMPATIBLES.—Iodine; and tincture of the sesquichloride of iron.

AMYGDALA. *Jordan Almonds.* Amygdalus communis, *var.* dulcis, *D.C.* The Sweet Almond Tree. Plate 83, *Woodv. Med. Bot.* (The seed; from trees cultivated about Malaga.)

AMYGDALÆ OLEUM. *Almond Oil.* (The oil expressed in England from almonds.)

CHARACTERS.—Pale yellow, nearly inodorous or having a nutty odour, with a bland oleaginous taste.

The almond tree is a native of Syria and Barbary; but grows freely throughout the south of Europe; it belongs to the Natural family *Rosaceæ* (*Drupaceæ,* Lindley), and to the Linnæan class and order *Icosandria Monogynia.*

BOTANICAL CHARACTERS.—A small tree, with acuminate, serrulate leaves, petiolate; gland, on the petioles of the bitter almond variety, on the leaves of the sweet almond; flowers, sessile, appearing before the leaves, white, or rose-coloured; fruit, an ovoid drupe, leathery, with a longitudinal furrow where it opens when ripe, containing a hard rough shell (*putamen*), marked with pits or furrows, within which is the seed or kernel.

CHARACTERS.—Above an inch in length, lanceolate, acute, with a clear cinnamon-brown seed-coat, and a bland, sweetish, nutty-flavoured kernel.

PHYSICAL PROPERTIES.—Sweet almonds vary in size from half an inch to above an inch in length, and are about three-eights of an inch in breadth; they are oblong, compressed, and pointed at one end; the *perisperm* or outer covering is reddish-brown, covered with a yellowish dust; the parenchyma or *episperm* is white, hard, and oleaginous, inodorous, having a sweet, bland taste. Bitter almonds are generally smaller; they are characterized by their bitter taste, and peculiar odour when rubbed with water. Several sorts of sweet almonds are met with in commerce, the principal of these are Jordan and Valentia almonds; the former come from Malaga, and are the most esteemed; they are longer and more pointed than the latter, which are brought from Valentia. Jordan almonds are specially directed to be employed by the Pharmacopœia, as from their shape they are not liable to be confounded with the bitter almond. Bitter almonds are imported from Mogadore.

TESTS.—Not bitter; not evolving the odour of bitter almonds when bruised with water.

CHEMICAL PROPERTIES.—Sweet almonds consist of fixed oil, emulsin, liquid sugar, gum, &c.; on triturating them with water, their oil is suspended by the agency of the emulsin and sugar, and a white emulsion closely resembling milk is the result. Microscopic examination reveals numbers of oil globules diffused through the fluid; acids and alcohol coagulate it into a sort of curd. In addition to these the bitter almond contains a peculiar principle named *amygdalin*, which, when brought in contact with water, from a mutual reaction between it and the emulsin, generates an essential oil, which will be more particularly described hereafter (see *Sedatives*). The fixed oil, *Oleum Amygdalæ*, is an article of the Materia Medica in the Pharmacopœia; in obtaining it the almonds are expressed without heat, and for this purpose either sweet or bitter almonds may be employed; the latter, as being cheaper, are generally used; 1 cwt. of almonds yields from 48 to 52℔ of oil. Why bitter almonds may be thus employed without any danger of producing their highly-poisonous oil will be more fully understood on reference to the remarks on that preparation under the head of *Sedatives*. It is a bland, pale-yellow, inodorous, very liquid oil, lighter than water, its density being about ·920; it consists of 76 per cent. of *oleine*, and 24 of *margarine*; it requires 6 parts of boiling, or 25 of cold alcohol for its solution; but is very soluble in ether. Poppy seed oil is occasionally employed to adulterate it; this sophistication may be readily detected by pouring a few drops of the suspected oil on a plate with an equal number of drops of nitric acid; if pure, the almond oil retains its fluidity; if poppy oil be present, the specimen will assume more or less of consistency, depending on the per-centage of the adulteration.

THERAPEUTICAL EFFECTS.—Sweet almonds are nutritive and emollient; they should be *blanched* before being used, that is, deprived of the husk or pellicle, as from its acridity it has been known to produce nausea and irritation of the stomach and bowels, in some instances followed by an eruption on the skin. In medicine the preparations of the sweet almond are used as emollients, chiefly in inflammation of the genito-urinary mucous membrane, to lessen the acrimony of the urine, and with the same intention in calculous affections. The oil is seldom given internally; according to some it possesses mildly laxative properties; externally it is used for frictions, and as an ingredient in some soaps.

DOSE AND MODE OF ADMINISTRATION.—Employed internally only in the following forms:—

Mistura Amygdalæ. Almond Mixture. (Take of compound powder of almonds, two ounces and a half; distilled water, one pint. Rub the powder with a little of the water into a thin paste, then add the remainder of the water, and strain through muslin.) A bland demulcent, white in colour, closely resembling milk, which, as stated above, it resembles in many particulars; only used as a vehicle for more active remedies. Dose, f℥j. to f℥ij. For reasons stated above, acids and tinctures should not be prescribed with it.

Pulvis Amygdalæ Compositus. Compound Powder of Almonds. (Syn.: *Confectio Amygdalæ*, Lond. *Conserva Amygdalarum*, Ed.) (Take of Jordan almonds, eight ounces; refined sugar, in powder, four ounces; gum arabic, in powder, one ounce. Steep the almonds in cold water until their skins can be easily removed; and, when blanched, dry them thoroughly with a soft cloth, and rub them lightly in a mortar to a smooth consistence. Mix the gum and the sugar; and, adding them to the pulp gradually, rub the whole to a coarse powder. Keep it in a lightly covered jar.) Only used to prepare the former preparation *(Mistura)*.

PREPARATIONS.—*Of the Oil.*—Unguentum Cetacei (which see); Unguentum Simplex (already described, p. 291).

AMYLUM. *Wheat Starch.* Triticum vulgare, *Villars, Plant. Dauph.* Common Wheat. (Starch procured from the seed.) *Starch. Wheaten starch.* The common wheat, *Triticum vulgare*, of which *Triticum æstivum* is a variety, is a native of the country of the Baschkirs, and is cultivated throughout Europe. It belongs to the Natural family *Graminaceæ*, and to the Linnæan class and order *Triandria Digynia.*

BOTANICAL CHARACTERS.—Culms, simple, glaucous, jointed; leaves, alternate, linear, smooth, of a glaucous-green colour; flowers, glumaceous, at the extremity of the culm; seed (grain), ovoid, yellowish, with a longitudinal furrow.

PREPARATION.—The fecula or starch forms nearly 70 per cent. of wheaten flour. It is procured by steeping the flour in water for one or two weeks until it becomes sour, drawing off the supernatant liquor; washing the residuum on sieves with repeated portions of the water, allowing the liquor which passes through to deposit the starch in large vats; and finally draining the deposited starch, and drying it in a stove.

CHARACTERS.—In white columnar masses, which become blue with solution of iodine.

PHYSICAL PROPERTIES.—Starch usually occurs in the form of small, irregular, hexagonal prisms; white, pulverulent, unalterable in the air, crackling under the fingers when lightly pressed, inodorous, and insipid. Viewed on the field of the microscope it is found to consist of various-sized transparent particles, rounded or angular, uneven on the surface.

CHEMICAL PROPERTIES.—The ultimate analysis of starch is $C_{12}H_{10}O_{10}$. Starch is insoluble in cold water, but may be suspended in it by trituration; it is also insoluble in alcohol and ether. In water near the boiling point it dissolves almost completely, and if sufficiently concentrated forms an opaque jelly, which becomes more consistent as it cools. By roasting starch, it is rendered somewhat analogous to gum, and is then soluble in cold water. If a mixture of 20 parts of starch-paste and 1 part of strong infusion of malt be heated together to about 120° F., until iodine no longer turns it blue, and strong alcohol be then added, a perfectly soluble gum is precipitated as a thick syrup. This gum is termed *Dextrine*, from its power of causing the plane of polarization to deviate to the right. If the application of heat to the above mixture be continued longer, the dextrine is converted into *Glucose* or grape sugar. With a cooled decoction of starch, iodine forms a rich blue compound (*iodide of starch*), which varies in the intensity of the colour as the iodine or starch predominates.

ADULTERATIONS.—Starch is often adulterated with sulphate of lime; the fraud may be detected by incineration, the starch being burned away and leaving the fixed sulphate. Its weight is often increased by the presence of superabundant moisture, which may be discovered by drying starch in a vapour bath, and ascertaining the loss of weight, which should not be more than ten or twelve per cent. Potato starch is sometimes sold for wheaten starch; this fraud may be readily detected by the microscope, the particles of the former being much larger than those of the latter; it may be also discovered by triturating for a short time a small quantity of the suspected specimen with water in an *agate* mortar, and adding to the strained solution a few drops of tincture of iodine,—if it be pure wheaten starch, a pale yellow colour only will be produced; but if potato starch be present, the coloration will be deep blue.

THERAPEUTICAL EFFECTS.—Wheaten starch is employed in medicine, chiefly in the form of decoction, as an emollient enema in dysentery, diarrhœa, or other inflammatory affections of the abdominal viscera; it is also used as a vehicle for more active remedies, and for suspending drugs which are administered in a state of powder. Externally, starch in fine powder is applied to excoriated parts, and for preventing the formation of bed sores, also as a basis for dusting powders in the treatment of cutaneous affections.

DOSE AND MODE OF ADMINISTRATION.—***Mucilago Amyli. Mucilage of Starch.*** (Take of starch, one hundred and twenty grains; distilled water, ten fluid ounces. Triturate the starch with the water, gradually added, then boil for a few minutes, constantly stirring.) Used in the form of enema, generally for the purpose of introducing astringent or sedative medicines through this route into the system; in such cases the bulk of the enema should not exceed four ounces.

* AVENA. *The seeds freed from the husks of Avena Sativa. Oatmeal. Avena Sativa,* the common oat, is generally cultivated over the whole of Europe, it belongs to the Natural family *Gramminaceæ*, and to the Linnæan class and order *Triandria Digynia*.

BOTANICAL CHARACTERS.—Root annual; culm from two to three feet high; leaves linear, acute; flowers glumaceous, disposed in loose, terminal, somewhat pendant panicles; seeds more or less elongated, pointed at both extremities, convex at one side, marked with a longitudinal furrow on the other; white, in some varieties black.

PREPARATION.—Oats deprived of their husks are called *groats*, which, when coarsely ground, constitute *oatmeal;* the husks with some adhering starch from the groats are sold under the name of *seeds*. These different preparations are too well known to need description.

PROPERTIES.—Oats contain 66 per cent. of meal, and 34 per cent. of husk or *bran*. The dried meal consists of starch, mucilage, sugar, albumen, and lignin, but no gluten. Oatmeal or groats boiled with water, in the proportion of about ℥iij. to Oiij. of water, down to one-half, constitutes *gruel*, a light article of diet for the sick or convalescent. If a larger proportion of the coarsely ground meal be used it is called *porridge*, a principal article in the dietaries of hospitals and charitable institutions, and forming a staple article of food in Scotland and the North of Ireland.

THERAPEUTICAL EFFECTS.—Oatmeal is nutritive and emollient; it is employed in medicine internally only in the form of *gruel* above referred to. Externally it is sometimes used in the form of poultice, prepared as *porridge*, but with less boiling. It may be used in the form of thin gruel as a vehicle for more active medicines for the administration of the various enemata.

* CANNA EDULIS.—*The fecula of the root. Tous les Mois.* The Dublin College introduced this excellent fecula into the Materia Medica list of their last Pharmacopœia, where it was stated that the above plant is supposed to yield it; most botanical authorities, however, ascribe it to the *Canna coccinea*. Both plants belong to the Natural family *Marantaceæ*.

PROPERTIES.—Tous-les-Mois is in the form of a white powder, presenting a much more glistening aspect than either potato-starch or arrow-root, in consequence of the larger size of the globules of which it is composed, many of them being the 300th part of an inch in length, and some even so much as the 200th (Christison). It possesses the general properties of wheaten starch already described, but forms a much firmer jelly with boiling water, being in this respect equal to arrow-root.

THERAPEUTICAL EFFECTS.—As an article of diet for delicate persons or invalids, it takes the same position as arrow-root, although it at present bears a much lower price in the English market. Christison states that it is more esteemed and dearer than true arrow-root in many of the West India Islands. It is prepared for use in the same way as arrow-root (see p. 313).

CERA FLAVA. *Yellow Wax. Unbleached bees'-wax.* Apis mellifica, *Linn.* The hive bee. (The prepared honeycomb; British and imported.)

CERA ALBA. *White Wax.* (Yellow wax, bleached by exposure to moisture, air, and light; British and imported.) *White wax;*

Bleached bees'-wax. Wax is a product of many vegetables; but the wax employed in medicine is a secretion of certain glands—*wax pockets*, situated on the abdomen of the common bee; it is used by the insect for constructing the cells of the honeycomb.

PREPARATION.—It is obtained from the comb, after the honey has been removed by dripping and expression, by melting it in water and straining it so as to free from impurities; in this state it constitutes yellow wax. White wax is procured from this, by melting and agitating with water, and finally bleaching in thin ribbons in the open air; the process being repeated until it loses all colour and odour.

CHARACTERS.—*Of Yellow Wax.*—Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odour. *Of White Wax.*—Hard, nearly white, translucent.

PHYSICAL PROPERTIES.—*Yellow wax* is in large cakes of the shape of the mould in which it has been allowed to cool; it has a gamboge-yellow colour, a dull lustre, a peculiar sweet odour, and a faint greasy taste; specific gravity, when pure, ·972. *White wax* is in white cakes, with a faint yellow tinge; it is feebly translucent, inodorous, and insipid; specific gravity same as that of yellow wax.

CHEMICAL PROPERTIES.—Recent chemical analysis has shown that wax is a rather compound substance, containing two acids, with other matters interesting to the chemist, as adding to the analogical list of homologous alcoholic compounds. The acids have been named *Cerotic acid* ($C_{54}H_{54}O_4$), Brodie, and *Melisic acid* ($C_{60}H_{60}O_4$). Yellow wax contains a little more carbon and a little less oxygen than white wax (Lewy). Wax is insoluble in water, and in alcohol and ether when cold; but is soluble in boiling alcohol and ether, in the fixed oils and in oil of turpentine. Yellow wax melts at 145°, and white at 158°; both are inflammable, burning without any residuum when pure. Wax combines with fats and resins when heated with them.

TESTS.—*Of Yellow Wax.*—Not unctuous to the touch; does not melt under 140°; yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine. Boiling water in which it has been agitated, when cooled, is not rendered blue by iodine. *Of White Wax.*—Not unctuous to the touch; does not melt under 150°.

ADULTERATIONS.—Wax is adulterated with starch, which may be detected by the action of tincture of iodine on cooled water in which it has been boiled; with resin, which may be dissolved out by alcohol; with fat or grease, which emit a peculiar odour when burned; and with flour of sulphur and other earthy or metallic substances, which are left when wax is dissolved in oil of turpentine.

THERAPEUTICAL EFFECTS.—Wax acts as an emollient, and was formerly employed as such in ulcerations of the intestines, but at present it is not used as an internal remedy. As an external agent it is an important constituent of many ointments and plasters.

PREPARATION.—Unguentum simplex (see p. 291).

CETACEUM. *Spermaceti.* Physeter macrocephalus, *Linn.* The

Sperm Whale, inhabiting the Pacific and Indian Oceans. (Nearly pure Cetine, separated by cooling and purification from the oil contained in the head.) *Physeter macrocephalus*, the great-headed cachalot, is a gregarious whale, inhabiting the Pacific Ocean, and the Indian and Chinese seas; it belongs to the class *Mammalia*, order *Cetacea*.

PREPARATION.—Although spermaceti is found in various parts of the body of the animal mixed with common fat, it is chiefly obtained from a large, triangular-shaped reservoir, existing in the head over the surface of the upper jaws, in which it is contained dissolved in oil, forming a milky-looking, oleaginous fluid. It is separated from the oil by boiling water, from which the spermaceti crystallizes as it cools; it is then purified by being re-melted in a weak solution of potash and the impurities skimmed off, and finally melted a third time by the agency of steam, and cooled slowly in thin moulds.

CHARACTERS.—Crystalline, pearly-white, glistening, translucent, with little taste or odour, reducible to powder by the addition of a little rectified spirit.

PHYSICAL PROPERTIES.—Spermaceti occurs in various-sized crystalline masses, beautifully white, which are formed of an infinite number of small brilliant scales; it is soft and slightly unctuous to the touch, inodorous, and insipid. Specific gravity, ·943.

TESTS.—Scarcely unctuous to the touch; does not melt under 100°.

CHEMICAL PROPERTIES.—It is composed of *cetine* and a small quantity of a liquid oil, from which it may be easily purified. Cetine when melted or dissolved in alcohol forms fine crystals. Spermaceti may be readily pulverised by the addition of a few drops of alcohol or of almond oil; it is fusible at 112°, combustible, insoluble in water, and only slightly soluble in alcohol, even at a boiling temperature; it combines with fixed or volatile oils, and with melted fats.

THERAPEUTICAL EFFECTS.—Spermaceti is an emollient and demulcent, but at present is not used internally. Externally, it is employed as an ingredient in various cerates and ointments.

Unguentum Cetacei. Ointment of Spermaceti. (Take of spermaceti, five ounces; white wax, two ounces; almond oil, one pint, or a sufficiency. Melt together with a gentle heat, remove the mixture, and stir constantly until it solidifies.) An emollient and cooling application to raw and blistered surfaces.

* CUCUMIS SATIVUS. *The Cucumber.* This plant, commonly cultivated throughout Europe as a cooling vegetable, is only used in medicine for the preparation of an emollient and refrigerant ointment. It belongs to the same Natural family and Linnæan class and order as the Colocynth. Several processes for preparing cucumber ointment have been proposed by the French pharmaceutists, the following is that of MM. Henry and Guibourt:—

* *Unguentum Cucumis. Cucumber Pomade.* (Prepared lard, ℔ij.; veal suet, ℔ss.; melt together with a gentle heat, and as soon as the

mixture is nearly cold, add gradually f℥xxiv. of the expressed juice of fresh cucumbers, mixing and bruising well with the hand; set aside for twenty-four hours; then pour off the juice and replace it by a similar quantity of fresh juice, and repeat this process ten times, adding fresh juice each time. As soon as the pomade has acquired a well-marked odour of the cucumber, melt in a water-bath, and add an ounce of finely-powdered starch, which will combine with the water and precipitate it. Allow the entire to settle, and then pour off the pomade into small vessels.) To render it more white and smooth, the French pharmaciens usually prepare it for use by melting again in a warm-bath, and beating for two hours or even longer with a wooden spatula; but when submitted to this treatment it does not keep fresh for a longer period than a month, while in the former case it will keep for a year, or even longer in a cool place.

As the foregoing process has frequently failed in the hands of compounders in this city, I think it well to append the following, published by Mr. Proctor in the *American Journal of Pharmacy*:—"Green cucumbers (suitable for table use), 7 pounds; lard (the purest and whitest), 24 ounces; veal suet (selected), 15 ounces. The unpared cucumbers, after being washed, are reduced to a pulp by grating, and the juice expressed and strained. The suet is cut in small pieces, and heated over a salt water bath until the fat is fused out from the membranes; the lard is then added, and when liquefied is strained through muslin into a wide-mouthed earthen vessel capable of holding a gallon, and stirred until it commences to thicken, when one-third of the cucumber juice is added, and beaten with the ointment by means of a wooden spatula until its odour has been almost wholly extracted. The part that separates by standing is decanted, and the other two-thirds consecutively incorporated and decanted in the same manner. The jar is then closed, covered, and placed in a water-bath until the fatty matter entirely separates from the exhausted juice. The green albuminous coagulum which floats on the surface is then skimmed off, and the jar put aside in a cool place that the ointment may solidify. The crude ointment is then separated from the watery liquid on which it floats, melted, and strained; a part into a jar and closely sealed for keeping; the remainder into a mortar, and triturated with a little rosewater until it is very white and creamy, for present use. It is usual to keep this ointment in glass jars covered with rosewater, to prevent access of the air."

This ointment when well prepared is of a pearl white colour and a tolerably firm consistence, with an agreeable odour of fresh cucumbers. It is an excellent basis for external applications which it is wished to use in the form of ointment, and especially beneficial in the treatment of diseases of the skin. Employed alone, it is also an admirable soothing and healing preparation, very serviceable in intertrigo and other cutaneous irritations.

* CYDONIUM. *Quince Seeds. Seeds of Cydonia Vulgaris.* The Quince tree is a native of the South of Europe, belonging to the Natural family *Rosaceæ* (*Pomaceæ*, Lindley), and to the Linnæan class and order *Icosandria Pentagynia.*

BOTANICAL CHARACTERS.—A small much-branched tree; leaves ovate, obtuse, their under surface tomentose; flowers large, solitary or few, pale rose colour; fruit, a variously-shaped pome, yellow, austere, but very fragrant, containing many seeds.

PHYSICAL PROPERTIES.—Quince-seeds are ovate, pointed, plano-convex, of a reddish-brown colour, inodorous, leaving a bitter impression on the palate when chewed for some time.

CHEMICAL PROPERTIES.—The episperm of the seed contains a large quantity of mucilage named by Pereira *Cydonin.* The substance of the seed contains, besides other matters, emulsin and fixed oil, consequently emitting when moistened the bitter almond odour. The mucilaginous principle is dissolved out by boiling water.

THERAPEUTICAL EFFECTS.—Quince seeds are only employed in medicine for the mucilage which they contain; the decoction has been recommended as an emollient application to erysipelatous surfaces, and to aphthous ulcerations of the mouth.

* *Decoctum Cydonii.* (Quince seeds, ʒij.; distilled water, Oj.; boil for ten minutes over a slow fire, and strain.) Never used internally. It does not keep well.

INCOMPATIBLES.—Alcohol; acids; most metallic solutions; and tincture of galls.

FARINA. *Flour of the seeds of Triticum Æstivum, of Triticum Vulgare. Wheaten Flour* (see *Amylum*).

Flour is employed in medicine for dusting excoriated or burned parts. In the form of bread it is used as a basis for making pills; but as bread always contains salt, it should not be employed for that purpose with substances which are decomposed by chloride of sodium, as the salts of silver, &c.

FICUS. *Fig.* Ficus Carica, *Linn.* Plate 154, *Steph. and Church. Med. Bot.* (The dried fruit imported from Smyrna.) A native of Asia and the south of Europe, belonging to the Natural family *Urticaceæ* (*Moraceæ*, Lindley), and to the Linnæan class and order *Polygamia Diœcia.*

BOTANICAL CHARACTERS.—A small tree, with large, cordate, palmate leaves; flowers numerous, pedicellated, inclosed within a fleshy receptacle, which is umbilicated and nearly closed at the apex, hollow within; drupe or utricle one-seeded, sunk into the pulpy receptacle.

CHARACTERS.—Compressed, soft, but tough, brown, covered with a saccharine efflorescence, containing a viscid sweet pulp, and numerous small hard seeds.

PHYSICAL PROPERTIES.—Figs consist of the fleshy, pyriform receptacle, containing within numerous, small, crustaceous seeds. When fully ripe they are dried in the sun, and packed in drums, boxes, or baskets, in which forms they are imported; those in drums, or boxes from Smyrna *(Turkey figs)*, those in baskets from Spain and Portugal *(Portuguese figs)*. Dried figs are too well known to require description.

CHEMICAL PROPERTIES.—Dried figs consist of 62 per cent. of *sugar of figs*, with gum, fatty matter, extractive, and salts. They yield their sugar and gum to boiling water.

THERAPEUTICAL EFFECTS.—Figs are nutritive and emollient, and in large quantity gently laxative; they are more employed as an article of the table than in medicine. They enter into the composition of the *confection of senna* of the Pharmacopœia. Roasted figs are applied to gum-boils to promote suppuration.

GLYCERINUM. *Glycerine.* (A sweet principle, $C_6H_8O_6$, obtained from fats and fixed oils.)

PREPARATION.—Glycerine is introduced as an article of the Materia Medica into the Pharmacopœia. It is formed in the preparation of the Emplastrum lythargyri by the reaction of the oxide of lead on the olive oil; during the process an insoluble soap of lead is thrown down, and the glycerine is left in the aqueous liquid. The latter should be treated with sulphuretted hydrogen, to remove any lead that may remain in it, digested with animal charcoal, filtered, and evaporated in vacuo, at the temperature of the air to the consistence of a syrup. This is, however, a wasteful and expensive process, and cannot be made to yield a product free from a disagreeable odour. The following excellent method of preparing glycerine originated with Dr. Morfit, an American chemist:—"Take 100 pounds weight of oil, tallow, lard, or "stearin" (pressed lard), place it in a clean iron-bound barrel, and melt it by the direct application of a current of steam. While still fluid and hot, add 15 pounds of lime previously slacked and made into a milk with 2½ gallons of water, then cover the vessel, and continue the steaming for several hours, or until the completion of the saponification. This is known when a sample of the resulting and cooled soap gives a smooth and lustrous surface on being scraped with the finger nail, and breaks with a cracking noise; it is now allowed to cool, and then strained through cloth. The strained liquor, which contains only the glycerine and excess of lime, must be carefully concentrated by steam heat. A portion of the lime is thereby deposited, and the remainder is to be removed by treating the evaporated liquid with a current of carbonic acid gas, boiling by steam heat to convert any soluble bicarbonate of lime that may have been formed into the insoluble neutral carbonate, allowing the whole to settle, decanting or straining off the clear supernatant liquid, and further evaporating as before, if necessary, to drive off any excess of water." Nearly all the glycerine, however, that is at present met with in the English market, is the produce of the great candle works of Price and Co. of London, who, from the extensive nature of their manufactures, are enabled to supply it at a moderate price of great purity. But it is to be feared that should the use of glycerine in making printing paper, to obviate the necessity of damping the paper before being printed on, be successful, the high price it will necessarily attain must interfere with the general use in medicine it is now likely to acquire.

CHARACTERS.—A colourless thick fluid, oily to the touch, without odour, of a sweet taste; freely soluble in water or in alcohol. When decomposed by heat, it evolves intensely irritating vapours.

PHYSICAL PROPERTIES.—Glycerine is a syrupy liquid, with a sweet taste; inodorous when properly prepared; it is usually met with in the shops of a pale yellow colour, but when concentrated by evaporation in vacuo is nearly colourless; then it also acquires somewhat of an acrid taste. Its specific gravity, according to the Pharmacopœia, is 1·26.

CHEMICAL PROPERTIES.—This substance is the *sweet principle of oils;* in each fat it is united with a different acid, and is consequently regarded by chemists, though a neutral substance itself, as the salifiable base of oils; the various oils being *salts of glycerine.* It cannot be made to crystallize, nor can it be obtained in a solid state; it dissolves in water and alcohol, but is insoluble in ether. By heat it is volatilized in part, finally becomes dark and is decomposed, yielding a peculiar volatile compound, *acroleïne,* which affects the eyes most powerfully. Exposed to the air it absorbs water; becomes at first yellowish, and then brownish, but does not undergo the alcoholic fermentation. The composition of glycerine is $C_6H_8O_6$.

ADULTERATIONS.—Glycerine cannot be said to be adulterated, though it is often met with in the shops of not very good quality, sometimes from not being kept in a cool place, or in bottles not completely filled. The following tests for its goodness are therefore necessary to be known:—It should be of the prescribed density, colourless, or of a faint straw colour, free from odour and from any acrid or burning taste, and should dissolve completely in two volumes of an ethereal alcohol, prepared by mixing together five parts of sulphuric ether and one of alcohol, which solution should be free from the least turbidity in twelve hours after the mixture.

THERAPEUTICAL EFFECTS.—Glycerine has not been much used in medicine internally. It has been administered in phthisis as a substitute for cod-liver oil, but without sufficiently successful results to encourage its further employment. From its harmless nature, it may be prescribed with advantage as a vehicle for the administration of some of the more active medicines, many of which, such as iodine and most of its preparations, quina, tannin, strychnia, veratria, atropia, &c., it dissolves very freely. As an external application it has been employed chiefly in the treatment of cutaneous diseases, for which it was first proposed by Mr. Startin of London. He used it principally in the treatment of eruptions of the scalp, lepra, psoriasis, lichen, inveterate impetigo, and prurigo. Its effects seem to depend on its property of keeping the parts to which it is applied continuously moist: it thus allays irritation, and moreover prevents the too rapid drying of the skin, which is apt to attend the use of alkaline washes. My own experience of glycerine as an addition to ointments or lotions in the treatment of skin diseases is most favourable; but it is not adapted for eruptions attended with much discharge, as it keeps the surface too moist. It has been also employed to moisten cotton, when introduced into the ear with the view of acting as an artificial tympanum in cases in which that membrane has been destroyed from any cause—a plan of treatment now adopted by some aurists. In *pharmacy*, glycerine may be used to prevent pill masses from getting hard, which the addition of a small quantity effects, and also to preserve syrups and extracts. Mr. Schacht has recently proposed to substitute a mixture of glycerine and starch, in the proportion of a fluid ounce of the former and twenty grains of the latter, rubbed together in the cold and then heated gradually to about 240° F., constantly stirring, for fats in the preparation of ointments and cerates, but the hygrometric nature of the compound forms, in my opinion, an insuperable objection to its use.

DOSE AND MODE OF ADMINISTRATION —As regards the dose of glycerine for internal employment it does not appear to be more active than simple syrup. Externally, it may be added to lotions, cataplasms, or ointments, in the proportion of from an eighth to a sixteenth part.

GLYCYRRHIZA. *Liquorice Root.* Glycyrrhiza glabra, *Linn.* Plate 134, *Steph. and Church. Med. Bot.* (The root or underground stem, fresh and dried; cultivated in England.) A native of the south of Europe, now cultivated extensively in England; belonging to the Natural family *Leguminosæ (Fabaceæ,* Lindley), and to the Linnæan class and order *Diadelphia Decandria.*

BOTANICAL CHARACTERS.—Root, long, creeping, succulent; stem, erect, smooth, 4 to 5 feet high; leaflets, ovate, retuse, yellowish; flowers, axillary, racemose, papilionaceous, bluish or purplish.

PREPARATION.—The root is dug up in November, when the plant is three years old, washed, and the smaller fibres cut off; it is imported in large quantities from Spain and Portugal, but that grown in England is most esteemed. It may be kept fresh for many months by covering it with sand in a damp cellar. The London College directed it "to be kept fresh for use buried in dry sand."

CHARACTERS.—In long cylindrical branched pieces, an inch or less in diameter, tough and pliable; of a greyish-brown colour externally, yellow internally, without odour, of a sweet, mucilaginous, and slightly acrid taste.

PHYSICAL PROPERTIES.—Liquorice root is in cylindrical pieces, from one to two or three feet long, smooth and plump when fresh, wrinkled in the dry state, about the thickness of the little finger, of an umber-brown colour externally, yellow internally; it has a faint earthy odour, and a sweet, mucilaginous, subacrid taste.

CHEMICAL PROPERTIES.—It consists of a peculiar saccharine principle named *glycirrhizine*, albumen, fecula, *asparigin* or a principle analogous to it, some salts, and a thick, acrid, resinous oil. It yields its active principles to boiling water, but as the acrid oil is dissolved out by the aid of heat, the Pharmacopœia directs cold water to be used for preparing the extract.

ADULTERATIONS.—Liquorice powder is often adulterated on the Continent with a yellow pigment *(French yellow)*, which is readily detected, as it effervesces on the addition of hydrochloric acid. Extract of liquorice is generally much adulterated.

THERAPEUTICAL EFFECTS.—Liquorice root is emollient and demulcent; it is chiefly employed in the form of extract or decoction in catarrhal affections; it is also used to give flavour to other medicines. Liquorice powder is employed in pharmacy as a covering for pills, or to give them consistence.

DOSE AND MODE OF ADMINISTRATION.—The fresh root may be chewed *ad libitum*.

Extractum Glycyrrhizæ. Extract of Liquorice. (Take of liquorice root, in coarse powder, one pound; distilled water, a sufficiency. Macerate the liquorice root in eight fluid ounces of the water, for twelve hours; then pack in a percolator, and add more distilled water, until the root is exhausted. Heat the liquor to 212° and strain through flannel; then evaporate by a water bath to a proper consistence.) Extract of liquorice is imported in large quantities from Italy and Spain, in the form of flattened rolls, about five or six inches long, an inch in breadth, and half an inch in thickness, enveloped in bay leaves; in this state it generally contains a large quantity of copper acquired from the boilers in which it is prepared; it is, therefore, usually purified by dissolving in boiling water and inspissating, it then forms *stick or refined liquorice.* It is used as an emollient in coughs and bronchial affections, being allowed to dissolve slowly in the mouth.

* *Trochisci Glycirrhizæ.* (Extract of liquorice and gum arabic, of each, ℥vj.; pure sugar, ℔j.; dissolve them in a sufficiency of boiling water, and then concentrate the solution over the vapour bath to a proper consistence for making lozenges.) For allaying tickling cough caused by irritation of the fauces.

GOSSYPIUM. *Raw Cotton. Hairs attached to the seeds of Gossypium herbaceum.* A native of Asia, and extensively cultivated in America; belonging to the Natural family *Malvaceæ*, and to the Linnæan class and order *Monadelphia Polyandria.*

BOTANICAL CHARACTERS.—Stem, 3 to 12 feet high; leaves, hoary, palmate, acutely lobed; flowers, yellow, with a large purple spot at the base of each petal; capsules, ovate, pointed, about the size of a walnut; seeds, numerous, imbedded in down, which constitutes the cotton.

PHYSICAL PROPERTIES.—Cotton is in filamentous masses; each filament examined by the microscope is a flattened tube twisted on itself. It is of a pale yellowish-white colour, tasteless and destitute of smell.

CHEMICAL PROPERTIES.—Cotton is a modification of *lignin*; it is highly combustible, and is completely insoluble in water, alcohol, ether, the fixed and volatile oils, and all the vegetable acids.

THERAPEUTICAL EFFECTS.—The only medicinal use made of cotton is in the treatment of blistered surfaces, and of burns; it is applied in all stages of the latter, the earlier the better, but if any vesications exist, they should be first opened. The most convenient form for its application is that which is technically known as ***French wadding***, and which is prepared for milliners; this should be applied in successive layers, the unstarched side next the burn, so as to completely exclude the air; it should not be removed for five or six days if possible, and then the outer layers only. Some surgeons use a spirituous or turpentine wash in extensive burns before applying the cotton. The method of using cotton as a dressing for blistered surfaces will be described in the next chapter under the head of Cantharides.

If one part of clean raw cotton be steeped for two minutes in about ten parts of a mixture of equal volumes of strong nitric acid (D. 1·500) and concentrated sulphuric acid (D. 1·840), squeezed, thoroughly washed, and dried very cautiously at a low temperature, certainly not higher than 200°, it is converted into *Gun-cotton*, a substance highly explosive and of peculiar properties. Chemists recognize at least two varieties of this substance, one insoluble in ether, *true pyroxylin*, the other soluble in ether, *xyloidine;* both, but more especially so the former, possess explosive properties of a very energetic character indeed, weight for weight exceeding that of gunpowder three or fourfold. Pyroxylin burns with such extreme rapidity, that, placed over a small portion of gunpowder, it may be exploded without igniting the gunpowder. They are both prepared in a similar way, save that, to produce pyroxylin, nitric acid of great density (sp. gr. 1·500) is required, whilst, to prepare xyloidine, a more dilute acid (sp. gr. 1·420) should be employed; by the adoption at a stage of the Pharmacopœia subsequent to that at which the officinal formula for collodion was written, of a nitric acid of greater density than that originally contemplated, the very natural oversight has occurred of giving us a formulary for the preparation of pyroxylin instead of xyloidine. This latter gun-cotton dissolved in sulphuric ether constitutes *Collodium*, an adhesive compound that has been proposed for the reunion of recent incised wounds. It is applied in layers by means of a camel's-hair brush, and drying instantaneously, owing to the evaporation of the ether, a thick coating may be given to any part of the body. Its effects depend on its keeping the exposed surfaces in close contact, and preserving them from the air. With the latter view it has been also used in the treatment of some diseases of the skin, of erysipelas, and burns, but it is now rarely employed for any of these purposes, experience having proved that its application does not fulfil the expectations of advantage held out by those who first proposed its adoption.

Pyroxylin. Gun Cotton. (Take of cotton, one ounce; sulphuric acid, five fluid ounces; nitric acid, five fluid ounces. Mix the acids in a porcelain mortar, immerse the cotton in the mixture, and stir it for three minutes with a glass rod, until it is thoroughly wetted by the acids. Transfer the cotton to a vessel containing water, stir it well with a glass rod, decant the liquid, pour more water upon the mass, agitate again, and repeat the affusion, agitation, and decantation, until the washing ceases to give a precipitate with chloride of barium. Drain the product on filtering paper, and dry in a water-bath.) This very remarkable substance was originally discovered by Schoenbein, in 1846. Chemists are not as yet agreed upon the exact reactions that ensue on the mixture of these ingredients; but, assuming the pharmacopœial formulary for pyroxylin to be the correct one, and taking *cellulose* (the basis of cotton) to have this composition, $C_{12}H_{10}O_{10}$, we can account for the production of gun cotton by the removal of some of its hydrogen from the cellulose in the form of water by some of the oxygen of the nitric acid, and the substitution for it of the hyponitric acid thus produced. To reduce this statement to the form of an equation, we will assume that three atoms of cellulose are acted upon by eight of nitric acid, and the reaction will be represented thus, $3(C_{12}H_{10}O_{10}) + 8NO_5 = 8HO + C_{36}H_{22}N_8O_{62}$; an empirical formulary, which comparison will show to be equivalent to the rational formulary assigned to gun cotton in the Pharmacopœia.

TESTS.—Readily soluble in a mixture of ether and rectified spirit; leaves no residue when exploded by heat.

Collodium. Collodion. (Pyroxylin, $C_{36}H_{22}8(NO_4)O_{30}$, dissolved in ether mixed with one-third of its volume of rectified spirit.) (Take of pyroxylin, one ounce; ether, thirty-six fluid ounces; rectified spirit, twelve fluid ounces. Mix the ether and the spirit, and add the pyroxylin. Set aside for a few days, and, should there be any sediment, decant the clear solution. Keep it in a stoppered bottle.) 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 or rectified spirit. Its uses have been mentioned above. The addition of a small quantity of castor oil makes it more plastic.

ACACIA. *Gum Arabic.* One or more undetermined species of Acacia, *Linn.* (A gummy exudation from the stem; collected chiefly in Cordofan, in Eastern Africa, and imported from Alexandria.) The species of the genus acacia which yield gum are inhabitants of Arabia, Egypt, and Senegal; they belong to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Polygamia Monœcia.*

BOTANICAL CHARACTERS.—Small, thorny trees; leaves, pinnated; leaflets, linear, 8 to 20 pairs; flowers, capitate, small, yellow.

PREPARATION.—Gum exudes from the trees either through natural fissures in the bark, or through artificial incisions made into it in the hot season of July and August; it flows in the form of a thick, viscid fluid, which concretes on the tree without losing its transparency; that which flows early in the season is gathered in December, and that which flows later, in March; the first gathering is considered the best.

PHYSICAL PROPERTIES.—Several varieties of gum acacia are met with in commerce; the most commonly known are *Turkey, or true Gum Arabic, Barbary Gum, Senegal Gum, East India Gum, and Cape Gum.* Gum arabic occurs in tears or irregularly-shaped pieces, varying in size from a pea to that of a chestnut; it is transparent and brittle, but not readily reducible to fine powder; has a vitreous fracture; a pale reddish-yellow or pure white colour; is inodorous; and has a weak, mucilaginous taste. Its specific gravity varies from 1·335 to 1·525. The most transparent and whitish tears are picked out and sold as *picked gum* or *gum of first quality.* The other varieties of gum do not differ essentially from gum arabic; they are usually in larger sized pieces, and of a darker colour; they are inferior in quality to gum arabic, and should not be used for medical purposes.

CHARACTERS.—In spheroidal tears, from half an inch to an inch in length, nearly white, and opaque from numerous minute cracks, or in shining fragments; brittle, bland and mucilaginous in taste, soluble in cold water. The solution forms with subacetate of lead an opaque white jelly.

TEST.—The powder does not become blue on the addition of solution of iodine.

CHEMICAL PROPERTIES.—Gum arabic consists of 79·4 per cent. of soluble gum *(arabin)*, and 17·6 per cent. of water. Some of the inferior sorts of gum contain a large quantity of insoluble gum *(bassorin)*. Its ultimate analysis is $C_{12}H_{11}O_{11}$. Gum is soluble in its own weight of cold or boiling water, forming a viscid solution (*mucilage*); it is also soluble in vegetable acids; but is insoluble in alcohol, ether, and the fixed and volatile oils. By exposure to heat the water it contains is driven off; but it cannot be fused. Its solution in water reddens litmus paper faintly.

ADULTERATIONS.—The finer qualities of gum arabic are adulterated with the inferior, and these again with the other varieties of gum; but picked gum ought alone to be used in medicine. The powder is very commonly adulterated with starch or flour, either of which may be detected by the action of tincture of iodine on a cooled decoction.

THERAPEUTICAL EFFECTS.—Gum is nutritive, emollient, and demulcent. It is employed in inflammation of the mucous membranes, in gastric irritation, in acrid poisoning, &c. Its chief uses, however, are as a vehicle for more active medicines, for suspending insoluble substances in water, and as a basis for pills in extemporaneous prescriptions. A strong solution has been proposed by Mr. Rhind of Edinburgh, as an application to burns, and in some cases in which I tried it the pain was much alleviated, and when applied immediately after the accident, the formation of blisters was prevented. Thick mucilage dropped into the eye removes the annoyance occasioned by the presence of fine sand or dust in that organ. Mucilage is extensively used in pharmacy for the extemporaneous preparation of pills, and for compounding mixtures and emulsions. Pills made with mucilage become hard very speedily, and therefore it should not be employed as an excipient in their preparation, unless when they are to be used immediately.

DOSE AND MODE OF ADMINISTRATION.—In substance or powder, gr. xxx. to gr. lx., allowed to dissolve slowly in the mouth; in irritation of the fauces, and in tickling cough.

Mucilago Acaciæ. Mucilage of Gum Arabic. (Take of gum arabic, in small pieces, four ounces; distilled water, six fluid ounces. Suspend the gum in a muslin bag under the surface of the water, in a deep vessel; after thirty-six hours, squeeze out the fluid remaining in the bag, and mix.) Mucilage made with cold water, as directed, keeps best. The pharmacopœial formulary yields an admirable mucilage. The following proportions of mucilage are required to render different substances miscible with aqueous vehicles, according to the observations of Dr. Montgomery in his notes on the Dublin Pharmacopœia of 1826: "*Oils* require about three-fourths of their weight; *balsams* and *spermaceti*, equal parts; *resin*, two parts; and *musk*, five times its weight."

INCOMPATIBLES.—Alcohol; ether; ammonia; acetate of lead; borax; and the mineral acids.

HEMIDESMUS. *Hemidesmus.* Hemidesmus Indicus, *DC.* Plate 1320, vol. iv. *Wight, Icon. Plant. Ind. Orient.* (The root dried; imported from India.) *The root of Hemidesmus Indicus. Indian Sarsaparilla.* The root of this plant has, within the last twenty years, been employed in medicine in the British Isles, under the name of *Smilax aspera.* It is a native of the Indian peninsula; and belongs to the Natural family *Asclepiadaceæ.*

BOTANICAL CHARACTERS.—Roots, long, cylindrical; stems, twining, woody, slender; leaves, opposite, entire, glaucous, on short footstalks; flowers, small, greenish-purple, in axillary racemes.

CHARACTERS.—Yellowish-brown, cylindrical, tortuous, furrowed, and with annular cracks, having a fragrant odour, and a very agreeable flavour.

PHYSICAL AND CHEMICAL PROPERTIES.—As usually met with, the roots are from 10 to 12 inches in length, and vary in thickness from that of a goose-quill to that of the little finger. They consist of a reddish-brown corrugated epidermis, a yellow inner bark from a line to a line and a half thick, and a paler coloured woody centre or meditullium; the bark splits transversely into rings, between which the meditullium is seen. Indian sarsaparilla has a very agreeable odour resembling that of the *Tonquin bean*, and a sweetish mucilaginous taste. It has not been accurately analysed, but Mr. Garden, of London, obtained from it a volatile crystallizable acid, which he has named *smilasperic (hemidesmic? Pereira)* acid, and on which its fragrant odour depends. It imparts both odour and taste to cold and boiling water.

THERAPEUTICAL EFFECTS.—Although this root is highly esteemed in India as a diaphoretic and tonic, and is used there extensively as a substitute for sarsaparilla, it has been only employed in this country for preparing a demulcent syrup, which, chiefly in consequence of its agreeable flavour, is employed as a vehicle for more active medicines.

DOSE AND MODE OF ADMINISTRATION.—An infusion, prepared by infusing ℥ij. of the root in a pint of water, is employed in India. The dose of it is from f℥ij. to f℥iv.

Syrupus Hemidesmi. Syrup of Hemidesmus. (Take of hemidesmus, bruised, four ounces; refined sugar, twenty-eight ounces; boiling distilled water, one pint. Infuse the hemidesmus in the water, in a covered vessel, for four hours, and strain. Set it by till the sediment subsides; then decant the clear liquor, add the sugar, and dissolve by means of a gentle heat. The product should weigh two pounds ten ounces, and should have the specific gravity 1·335.) The syrup prepared with cold water is not only very much more fragrant but keeps better. Mr. Jacob Bell, of London, proposed the following method for preparing this syrup, which, in consequence of the excellence of the product obtained thereby, is inserted here at length:—"Root of hemidesmus indicus, ℥xvj.; refined sugar, ℔j.; distilled water, Oiij.; bruise the root sufficiently to separate the bark by sifting, and reject the wood; add to the bark an equal bulk of washed sand; moisten with water (three or four ounces), so as to insure its intimate mixture, and pack it well in a displacement apparatus; add as much water as it will absorb; macerate for four hours, and displace the liquor by the addition of a further portion of water; reserve the first six ounces: add more water till it passes through tasteless, then evaporate the latter portion to three ounces, in which, with the addition of the first six ounces, dissolve the sugar with as moderate a heat as possible." Dose, f℥ss. to f℥j.

HORDEUM. *Pearl Barley.* Hordeum distichum, *Linn.* Plate 29, *Woodv. Med. Bot.* Cultivated in Britain. (The seeds deprived of their husks.) A native of Tartary, now cultivated extensively in Europe; belonging to the Natural family *Graminaceæ,* and to the Linnæan class and order *Triandria Digynia.*

BOTANICAL CHARACTERS.—Stems, 3 to 4 feet high, glaucous, furrowed; leaves, alternate, lanceolate, acute; flowers, terminal, in close spikes, with long serrated awns.

PREPARATION.—Pearl barley is prepared in a mill of a peculiar construction, by which, after it has been deprived of its husk, it is rounded and polished.

PHYSICAL PROPERTIES.—Small spherical grains, white, smooth, still retaining a trace of the longitudinal furrow of the seed; they are odourless, but have a mild, sweetish, mucilaginous taste.

CHEMICAL PROPERTIES.—Pearl barley is composed of fecula, uncrystallizable sugar, gum, gluten, albumen, lignin, &c. Proust has indicated the presence of a peculiar principle in barley-meal which he has named *hordëin*, but Dr. Thomas Thomson states that it is merely a variety of *amylin*. According to Einhoff's analysis it consists of 63 per cent. of starch, 5·3 per cent. of sugar, 5 of albumen, and 1 of gluten. Pearl barley yields its mucilaginous principles to boiling water; the decoction contains much starch, as shown by the action of iodine on it when cool.

THERAPEUTICAL EFFECTS.—Peal barley is employed in medicine in the form of decoction, as an emollient and demulcent drink in febrile and inflammatory affections, as a vehicle for other remedies, and to give bulk to enemata.

DOSE AND MODE OF ADMINISTRATION.—As follows:—

Decoctum Hordei. Decoction of Barley. (Take of pearl barley, two ounces; distilled water, one pint and a half. Wash the barley in cold water, and reject the washings; boil with the distilled water for twenty minutes in a covered vessel, and strain.)

* *Mistura Hordei.* (Pearl barley; figs, sliced; and raisins, stoned, of each, ℥iiss.; liquorice root, sliced and bruised, ℥ss; water, Ovss.; clean the barley, if necessary, by washing it with cold water; boil it with Oivss. of the water down to Oij.; add the figs, raisins, and liquorice root with the rest of the water; boil down again to Oij.; then strain.)

Either of these preparations may be employed for the purposes above stated; the plain decoction being used for injections, and the mixture for a soothing drink.

LINI SEMEN. *Linseed.* Linum usitatissimum, *Linn.* Plate 22, fasc. 5, *Flor. Lond.* (The seeds; cultivated in Britain.)

LINI FARINA. *Linseed Meal.* (The seeds ground and deprived of their oil by expression.)

LINI OLEUM. *Linseed Oil.* (The oil expressed without heat from linseed.)

The common flax, *Linum usitatissimum*, is an indigenous plant, belonging to the Natural family *Linaceæ*, and to the Linnæan class and order *Pentandria Pentagynia.*

BOTANICAL CHARACTERS.—Stem a foot to a foot and a half high, slender, branched above; leaves, distant; flowers, large, purplish-blue; capsule, globular, ten-seeded.

PREPARATION.—The seeds are threshed out of the plant when fully ripe, and the oil is obtained from them by pressure without heat.

CHARACTERS, *of the Seeds.*—Small, oval, pointed, flat, with acute edges, smooth, shining, brown externally, yellowish-white within, of a mucilaginous oily taste.

CHARACTERS, *of the Oil.*—Viscid, yellow, with a faint odour, and oleaginous taste.

PHYSICAL PROPERTIES.—The seeds are ovate, pointed, about a line in length, smooth and shining; they are reddish-brown externally, whitish within; have an oily, slightly sub-acrid taste, but are inodorous. The oil is thick, of a wine-yellow colour, with a faint disagreeable odour, and a sub-acrid, somewhat nauseous taste. Specific gravity, ·932. As met with in commerce, it is expressed with the aid of heat, when the colour is rather deeper. The seeds yield from 20 to 25 per cent. of oil.

CHEMICAL PROPERTIES.—The seeds consist of vegetable mucus, containing free acetic acid and some salts, extractive, starch, wax, soft resin, gum, albumen, yellow colouring matter, and fixed oil *(Meyer)*. The mucilage exists in the tegument, the fixed oil chiefly in the nucleus. Linseed oil is composed of *oleic* and *margaric* acids, combined in equal equivalents with *acroleine* (SACC); it dissolves in five times its weight of boiling alcohol, in forty times its weight of cold alcohol, and in about one part and a half of ether. At a temperature of —17° it congeals into a solid yellow mass. Exposed to the air, it concretes into a transparent varnish, and consequently is termed in the arts *a drying oil.*

THERAPEUTICAL EFFECTS.—Linseed and its oil are emollient and demulcent. An infusion of the seeds is sometimes employed internally in dysentery and diarrhœa, and in bronchial affections; it is also used as an emollient enema. Externally, the seeds reduced to powder, *linseed-meal,* are employed to prepare poultices and cataplasms; for this purpose the meal should be *boiled* for a short time with the water, and not simply mixed with it, as is usually done and as is directed in the Pharmacopœia; this will prevent the poultice from adhering to the skin, besides rendering it a much more emollient application. A linseed meal cataplasm should be applied directly to the surface without the intervention of a fold of linen or muslin. Linseed-oil mixed with lime-water may be used as an application to recent burns.

DOSE AND MODE OF ADMINISTRATION.—The following are the officinal preparations:—

Cataplasma Lini. Linseed Poultice. (Take of linseed meal, four ounces; olive oil, half a fluid ounce; boiling water, ten fluid ounces. Mix the linseed meal with the oil, then add the water gradually, constantly stirring.

Infusion Lini. Infusion of Linseed. (Take of linseed, one hundred and sixty grains; fresh liquorice root, sliced, sixty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for four hours, and strain through calico.) *Linseed Tea,* the best form for internal use; it may be sweetened with honey, which increases its emollient properties. Dose, f℥ij. to f℥iv.

INCOMPATIBLES.—Preparations of lead and iron, and probably most metallic salts are incompatible with infusion of linseed.

* MALVA. *Herb of Malva sylvestris. Common Mallow.* Indigenous; belonging to the Natural family *Malvaceæ,* and to the Linnæan class and order *Monadelphia Polyandria.*

BOTANICAL CHARACTERS.—Root, perennial, tapering; stem, two to five feet high, branched; leaves, on long petioles, five to seven lobed; flowers, large, three or four together, axillary, of a purplish-rose colour.

PREPARATION.—The herb should be gathered when in full flower.

PROPERTIES.—The entire plant is employed; it is odourless and insipid; every part of it abounds in mucilage, which it yields to boiling water. An infusion of the fresh flowers is an excellent chemical test for acids and alkalies, being changed to red by the former, and to green by the latter.

THERAPEUTICAL EFFECTS.—A simple emollient; it is employed in the same cases as the other remedies of this class, but at present is not much used, and consequently has been omitted (although in some localities a favourite domestic remedy) from the Pharmacopœia.

* MARANTA. *Fecula of the tubers of Maranta Arundinacea, and of Maranta Indica. Arrow-root. Maranta Arundinacea* is a native of the West Indies, it is extensively cultivated in Jamaica. *Maranta Indica* is a native of the East Indies, and is supposed to yield some of the East Indian arrow-root. They belong to the Natural family *Marantaceæ*, and to the Linnæan class and order *Monandria Monogynia.*

BOTANICAL CHARACTERS.—The rhizome is white, tuberous, and jointed, running horizontally in the ground, sending down many tuberous rootlets (*stoles*), about the thickness of a quill covered with scales; stem 2 to 3 feet high; leaves ovate, lanceolate, alternate, with long, leafy, hairy sheaths; flowers small, white.

PREPARATION.—Arrow-root is the fecula of the *stoles*; it is procured from them when they are twelve months old; they are then dug up, cleansed, and reduced to a state of pulp in wooden mortars; the pulp is agitated with water, the fibres removed with the hand, the milky liquor passed through a fine hair sieve, and allowed to settle, when it deposits the arrow-root, which is again washed with cold water, and finally dried in the sun.

PHYSICAL PROPERTIES.—*West Indian Arrow-root*, which is the most prized, is in the form of a very white powder, often aggregated into small irregular masses, crackling between the fingers, inodorous and tasteless. Examined by the microscope it is seen, like the other varieties of fecula, to consist of small elliptical grains, varying in size from a 2000th to a 750th of an inch in their longest diameter.

CHEMICAL PROPERTIES.—Its composition is $C_6H_5O_5$. In all other respects it resembles wheaten starch already described, but the jelly which it forms with boiling water is much more consistent; according to the observations of Hayne, with equal quantities of boiling water, the jelly formed by 9 parts of arrow-root is as firm as that formed by 14 parts of wheaten starch.

ADULTERATIONS.—A great many varieties of fecula, known in commerce as Brazilian arrow-root, East Indian arrow-root, &c., but especially that obtained from the potato, *potato-starch*, are commonly sold for the true West Indian arrow-root. The fraud is best detected by the microscope, the grains of which the true arrow-root is composed being much more minute than those of any of the other varieties.

THERAPEUTICAL EFFECTS.—Arrow-root is rather an article of mild nutritious diet for the invalid than a medicine, being particularly valuable in consequence of its emollient properties in diseases of the digestive organs; it is also an excellent nutriment for infants and young children.

DOSE AND MODE OF ADMINISTRATION.—A table-spoonful is sufficient to form a stiff jelly with a pint of boiling water or milk; to prepare it for use, the arrow-root should be first blended with a small quantity of cold water, the menstruum should then be added, care being taken that it is boiling, and the whole gently heated for a few minutes; it is usually flavoured with lemon-peel, sugar, &c. Arrow-root milk and arrow-root pudding are made like the corresponding preparations of sago. (See page 318.)

OLIVÆ OLEUM. *Olive Oil* (described in the division *Cathartics*) acts also as an emollient; internally it is only employed as such in cases of irritant poisoning; as an external agent it enters into the composition of emollient ointments, liniments, &c.

Linimentum Calcis. Liniment of Lime. (Take of solution of lime, two fluid ounces; olive oil, two fluid ounces; mix together with agitation.) Olive oil has been substituted for linseed oil in the preparation of this liniment in the present Pharmacopœia; it may be looked upon as a species of earthy soap. This, commonly known by the name of *Carron Oil* (a name derived from the celebrated iron works, where it is in constant requisition), is an excellent application to recent scalds and burns. Its efficacy is to be attributed to its mechanically excluding the air from the raw surface; its use in hot weather is objectionable, in consequence of the unpleasant smell to which it gives rise.

OVI ALBUMEN ET VITELLUS. *The white and yolk of the egg of Gallus Bankiva,* var. *domesticus. The egg of Phasianus gallus. Phasianus gallus, the domestic fowl* (Gallus domesticus, *Temminck*), belongs to the class *Aves*, order *Gallinæ*. Eggs are a mild and nutritious article of diet, and as such are frequently used in the sick-room. The white, or *albumen*, is employed as an antidote in poisoning with corrosive sublimate, or with the salts of copper; it is also useful in all cases of irritant poisoning. The yolk is employed in pharmacy for suspending camphor, oils, resins, turpentine, &c. in aqueous vehicles.

SACCHARUM ALBUM. *Refined Sugar.* Saccharum officinarum, *Linn.* Plate 33, 34, 35, *Nees' Plant. Med.* (The crystallized refined juice of the stem; from plants cultivated in the West Indies and other tropical countries.) $C_{12}H_{11}O_{11}$ (=171).

THERIACA. *Treacle.* (The uncrystallized residue of the refining of sugar.) The sugar cane, *Saccharum officinarum,* is extensively cultivated in both the East and West Indies; it belongs to the Natural family *Graminaceæ,* and to the Linnæan class and order *Triandria Digynia.*

BOTANICAL CHARACTERS.—Stem, solid, juicy, from 6 to 12 feet high, coloured; leaves, flat, in two rows, sheathing at the base; flowers, triandrous, in a terminal panicle from 2 to 4 feet long, of a silver-grey colour from the long soft hairs that surround the flower.

PREPARATION.—The canes, when ripe, are cut off close to the ground, and the juice expressed from them by pressure between rollers; milk of lime is immediately added to the liquor, and the mixture gently heated, to saturate any acid present, and to remove the herbaceous matter. The clear liquor is then drawn off, evaporated to a proper consistence in copper boilers, and allowed to cool in large wooden vessels, in which the impure sugar is deposited in coarse, brown grains; this constitutes *raw sugar or muscovado.* The syrupy liquor, which does not crystallize, constitutes *molasses or treacle.* Raw sugar is refined in England: it is first dissolved in a small quantity of water by the aid of steam, heated for a short time with bullocks' blood, or with hydrate of alumina, which clarifies the syrup, then strained to remove the impurities, and filtered through a thick layer of animal charcoal; the clear liquor is next evaporated by steam heat in copper vessels placed in a partial vacuum, to a proper consistence, and poured into conical moulds; as soon as it becomes solid in the moulds, they are put to drain, and a solution of pure syrup, or a mixture of clay and water, poured over the base of each loaf; which, as it gradually percolates through the sugar, removes any impurities. These loaves constitute *loaf-sugar, refined sugar, white or pure sugar.*

CHARACTERS.—*Of Refined Sugar.*—Compact, crystalline, conical leaves, snow-white, dry, scentless, and intensely and purely sweet. *Of Treacle.*—A thick, brown, fermentable syrup, very sweet; not crystallizing by rest or evaporation. Specific gravity about 1·40.

TEST.—Nearly free from empyreumatic odour or flavour.

PHYSICAL PROPERTIES.—The physical properties of the different varieties of sugar are too well known to need description. The specific gravity of crystallized white sugar is 1·6.

CHEMICAL PROPERTIES.—Sugar is permanent in the air, exposed to heat it melts, becomes brown, and emits a peculiar odour; it is inflammable, burning with a white flame; is soluble in two parts of water at 60°, and to any extent in boiling water; is also soluble in 80 parts of absolute alcohol at the boiling temperature, very slightly in the same when cold, and in about five parts of rectified spirit; much more soluble in proof spirit; but wholly insoluble in ether, which precipitates it from its solutions. In the crystalline state, cane sugar is composed of $C_{12}H_9O_9+2HO$. Treacle consists principally of uncrystallizable sugar, gummy extractive, and a small quantity of water, which it retains with so great tenacity, that if left exposed to the air, even for a very long period, it does not become drier, or lose weight.

ADULTERATIONS.—The inferior raw sugars frequently contain sand, which will be detected by dissolving the sugar in water, when the sand remains behind; white sugar is said to be adulterated with lime and gum ; the former is detected by oxalic acid, the latter, by diacetate of lead producing white precipitates in a solution. Raw cane sugar is in the present day commonly adulterated with grape sugar, a fraud of much importance in consequence of the inferior sweetening powers of the latter. That variety of it obtained from potatoes—*potato sügar*—is generally used for this purpose. It may be detected by the following simple and beautiful test of Trommer:— "Dissolve the specimen in water, add sufficient solution of sulphate of copper to colour the liquid blue, then a large excess of solution of caustic potash ; the blue precipitate at first thrown down is redissolved with an intense purplish-blue colour by the excess of alkali. On heating the liquid now to the boiling point, if there is no grape sugar present, it undergoes but little change ; but if it contains any, a precipitate of brilliant red sub-oxide of copper is thrown down, copious in proportion to the quantity of grape sugar present."

THERAPEUTICAL EFFECTS.—Sugar is highly nutritious, but as an article of diet is rather employed for its agreeable sweetness. Its nutritious properties, however, are well marked : the negroes on the sugar plantations becoming rapidly plump as soon as the sugar-making season commences ; and in cases of corpulency abstinence from it producing a marked diminution in weight. As a medicine it is emollient and demulcent, and as such, is used in coughs, and in irritant poisoning. In pharmacy it is in very general use as a flavouring ingredient, and to give bulk and consistence to powders, pills, conserves, electuaries, lozenges, syrups, &c.

DOSE AND MODE OF ADMINISTRATION.—The following is the only officinal preparation of sugar :—

Syrupus. Syrup. (Take of refined sugar, five pounds; distilled water, two pints. Dissolve the sugar in the water with the aid of heat ; and add, after cooling, as much distilled water as may be necessary to make the weight of the product seven pounds and a half. The specific gravity should be 1·330.) As a flavouring adjunct to mixtures, and to suspend insoluble substances in aqueous vehicles.

SACCHARUM LACTIS. *Sugar of Milk.* (*Lactine.*) (Crystallized sugar, obtained from the whey of cow's milk by evaporation.) $C_{24}H_{24}O_{24}=(360.)$

PREPARATION.—An article of the Materia Medica introduced into the last edition of the Dublin Pharmacopœia. It is prepared by evaporating clarified whey to a syrupy state, and setting aside to cool, when the lactine crystallizes slowly. The crystals may be purified by means of animal charcoal.

CHARACTERS.—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes ; greyish-white, crystalline on the surface, and in its texture translucent, hard, scentless, faintly sweet, gritty when chewed.

PHYSICAL PROPERTIES.—It occurs in white, translucent, small square prisms of great hardness. They feel gritty under the teeth, and have a faint sweetish taste, but a strong solution in water tastes much more sweet.

CHEMICAL PROPERTIES.—The composition of crystallized sugar of milk is $C_{24}H_{24}O_{24}$. It dissolves very slowly in cold water, requiring five or six times its weight; but is soluble in twice and a half its weight of boiling water. It is insoluble in alcohol and ether. Heated it loses water, turns black, and is decomposed. Milk sugar may be converted into grape sugar by boiling it with the dilute mineral acids.

THERAPEUTICAL EFFECTS.—Sugar of milk is only used in medicine as an excipient for active substances or for heavy powders, such as calomel, &c., for which purpose it is admirably suited. It is employed by the Homœpathists as an excipient for their globules and powders almost exclusively.

* SAGO. *The farina from the interior of the trunk of Cycas circinalis; also obtained from other species of Cycas and various Palmaceæ*, D. *The fecula of the stem of Sagus lævis, and probably of other species of palms*, L. *Farina from the interior of the trunk of various Palmaceæ and species of Cycas*, E. *Sago.* It has been ascertained that various species of the palm tribe yield the sago of commerce; the finest is procured from *Sagus farinifera*, and *Sagus genuina*, trees which form immense forests on nearly all the Moluccas, and which are so rich in starch that a single tree is reckoned to yield from 600 to 800 pounds weight of sago. Some is also obtained from the *Sagus rumphii*, a native of Malacca and the Malay Islands, and from the *Saguerus rumphii*, which inhabits the islands eastward to the Bay of Bengal; it is also procured from the *Cycas circinalis* and *revoluta*, from the *Areca oleracea*, the *Phœnix farinifera*, the *Arenga saccharifera*, &c. They are all lofty trees, belonging to the Natural family *Palmaceæ*, and to the Linnæan class and order *Monœcia Hexandria*.

PREPARATION.—The tree being cut down, the pith is removed, reduced to powder, and the fecula separated from the woody fibre by repeated washings with water over a hair sieve; when the milky liquor which passes through is allowed to settle, it deposits the sago in the form of a fine powder, which is afterwards granulated by a process with which we are not acquainted.

PHYSICAL PROPERTIES.—Sago occurs in the form of a fine powder *(Sago Meal)*, or in pearly grains *(Pearl Sago)*; both sorts have a pinkish-yellow tint, a faint musty odour, but no taste. The grains of pearl-sago vary in size, from a pin's head to that of a pea; the small variety is most esteemed, the larger sort is known as *common* or *brown sago*.

CHEMICAL PROPERTIES.—In its chemical properties, sago resembles the other varieties of starch; but it does not form so firm a jelly with water as arrow-root: as seen under the microscope, its globules are larger than those of arrow-root, but smaller than those of potato-starch.

THERAPEUTICAL EFFECTS.—For the sick-room, sago is much inferior to arrow-root or tapioca as an article of diet, consequently it is not much used in the present day. The jelly may be prepared with it in the same manner as with arrow-root.

* *Sago Milk.* THOMSON. (Sago, ℥j.; cold water, Oj.; soak the sago in the water for an hour, pour off the water, and add of new milk, Oiss.; and boil slowly until it is well incorporated.) It may be flavoured with sugar, nutmeg, cinnamon, or white wine, according to circumstances.

* *Sago Pudding.* THOMSON. (Beat the yolks of two eggs and half an ounce of sugar together, and stir the mixture into a pint of sago milk.)

* SALEP. *The dried root of Orchis mascula;* an indigenous plant belonging to the Natural family *Orchidaceæ,* and to the Linnæan class and order *Gynandria Monandria.*

By grinding the dried roots of this and of other species of the genera Orchis and Eulophia, a nutritious substance is procured which, although highly esteemed by the ancients, and in modern times in the East, is but little employed in the present day amongst Europeans. It contains a large quantity of gum—insoluble in cold but soluble in boiling water *(bassorin),* and a trace of fecula. A mucilage formed by boiling ℥ss. of it in Oj. of water, forms a nutritious and useful article of diet for the sick. In Turkey, where salep enjoys a high reputation as a corroborant in affections of the bowels and respiratory organs, the dried root is ground by means of handmills to a fine powder, then stirred up with water, and boiled into a stiff jelly which is sweetened with honey.

SAMBUCUS. *Elder Flowers.* Sambucus nigra, *Linn.* Plate 78, *Woodv. Med. Bot.* (The fresh flowers; from indigenous plants.) A small, indigenous tree, belonging to the Natural family *Caprifoliaceæ,* and to the Linnæan class and order *Pentandria Digynia.*

CHARACTERS.—Flowers, small, white, fragrant, crowded in large cymes.

A distilled water, an oil, and an ointment may be prepared from the flowers, all of which possess an agreeable odour and mildly emollient properties, but the first of which only is officinal.

Aqua Sambuci. Elder-Flower Water. (Take of fresh elder flowers, separated from the stalks, ten pounds; water, two gallons. Distil one gallon.) Principally used as a popular cosmetic.

* *Unguentum Sambuci,* L. (Elder flowers; and lard, of each,

℔j.; boil the elder flowers in the lard until they become crisp, and press through a linen cloth.) An agreeable, cooling application for excoriated surfaces.

* TAPIOCA. *Fecula of the root of Janipha manihot* (*Manihot utilissima*, POHL). *Mandioc plant. Tapioca.* A native of Brazil; belonging to the Natural family *Euphorbiaceæ*, and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—Root, large, thick, juicy; stem about six feet high, shrubby; leaves, palmate, 5–7 parted; flowers, axillary, racemose.

PREPARATION.—The root, which consists of woody fibre, a bland fecula, and a highly acrid, poisonous, milky juice, is reduced to a pulpy mass, washed and pressed on mat-sieves; the milky liquor, with the fecula suspended in it, passes through, and on settling deposits the fecula, which is repeatedly washed with water to free it from the poisonous juice, and finally dried on hot plates; the marc is afterwards dried on iron plates over a fire, when it constitutes *Cassava* bread.

PHYSICAL PROPERTIES.—Tapioca occurs in irregularly shaped, rugged fragments about the size of a small nut; white, with a pinkish hue, inodorous and tasteless. Like the other feculas, as seen under the microscope, it consists of small globules, very uniform in size, and nearly as small as the smallest globules of arrow-root.

CHEMICAL PROPERTIES.—It is similar to the other varieties of fecula, and is a very fine form of starch.

THERAPEUTICAL EFFECTS.—Precisely similar to those of arrow-root; a jelly may be prepared in the same manner. Tapioca milk and tapioca pudding are made in the same way as sago milk and sago pudding.

TRAGACANTHA. *Tragacanth.* Astragalus verus, *Olivier, Voy.*, *D.C.* Plate 329, *Nees, Plant. Med.*; and possibly other species. (A gummy exudation from the stem; collected in Asia Minor.) Several species of the genus Astragalus yield gum-tragacanth; they are natives of Asia Minor, of Persia, and of the island of Crete. They are placed in the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and in the Linnæan class and order *Diadelphia Decandria.* The officinal tree (*Astragalus gummifer*) indicated by the Dublin College yields an inferior quality of gum, described by Guibourt as pseudo gum-tragacanth.

BOTANICAL CHARACTERS.—The astragalus verus, which yields the finest gum-tragacanth of English commerce, is a small shrub, from 3 to 4 feet high, with spiny branches, pinnatified leaves, and yellow papilionaceous flowers.

PREPARATION.—Tragacanth flows from natural fissures in the bark, and concretes rapidly when exposed to the air; it flows only during the hot season and in the night time.

CHARACTERS.—White or yellowish, in broad shell-like slightly-curved plates, tough and elastic, but rendered more pulverizable by a heat of 120° Fahr.; very sparingly soluble in cold water; but swelling into a gelatinous mass, which is tinged violet by tincture of iodine.

PHYSICAL PROPERTIES.—Gum-tragacanth occurs in broad, thin plates of a white or citron-yellow colour, semi-transparent, marked with concentric elevations, as if it had been exposed to the waves of the sea. It is inodorous and tasteless, is hard and brittle, but with difficulty reduced to powder, unless heated to 100° or 120° F.

TESTS.—After maceration in cold water, the fluid portion is not precipitated by the addition of rectified spirit, and the gelatinous mass is not turned deep blue by tincture of iodine.

CHEMICAL PROPERTIES.—It is composed of 57 per cent. of soluble gum (*adragantine or arabin*), and 43 per cent. of gum insoluble in cold but soluble in boiling water (*bassorin*), (Bucholz). Gum-tragacanth forms a thicker mucilage with water than gum arabic, "one part giving more viscosity to water than 25 parts of gum arabic" (Bucholz).

THERAPEUTICAL EFFECTS.—Similar to those of gum arabic, but not so generally employed.

DOSE AND MODE OF ADMINISTRATION.—Powder, gr. xxx. to gr. cxx.

Mucilago Tragacanthæ. Mucilage of Tragacanth. (Take of tragacanth, one hundred grains; boiling distilled water, ten fluid ounces; Macerate for twenty-four hours, then triturate, and express through calico.) Used for suspending more active but insoluble medicines. It has also been used for the purpose of excluding the air from burns.

Pulvis Tragacanthæ Compositus. Compound Powder of Tragacanth. (Take of tragacanth, in powder, one ounce; gum arabic, in powder, one ounce; starch, one ounce; refined sugar, in powder, three ounces. Rub them well together.) Generally used for administering calomel and other active and heavy powders to children. The dose as an emollient for adults is from gr. lx. to gr. cxx.

UVÆ. *Raisins.* Vitis vinifera, *Linn.* The grape vine. Plate 195, *Woodv. Med. Bot.* (The ripe fruit, dried in the sun or with artificial heat; imported from Spain.)

* VITIS VINIFERA, FRUCTUS RECENS. *Grapes.* The grape-vine is generally cultivated throughout the greater part of the globe; it belongs to the Natural family *Vitaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A hardy, climbing shrub; leaves, alternate, smooth, lobed; flowers, very small, greenish, in pendant racemes opposite to the leaves; fruit, a succulent, globose berry, usually four-seeded.

PREPARATION.—To prepare raisins, grapes are in general merely dried in the sun, sometimes artificial heat is employed; and in many places the fruit is dipped in an alkaline ley before being dried.

CHARACTERS.—Fruits shrivelled and compressed, smooth, and free from sugary or saline incrustation, agreeably fragrant; pulp soft, very sweet.

PHYSICAL PROPERTIES.—Raisins are too well known to require description; two sorts widely different in appearance and flavour are commonly met with; the common raisin (*Passulæ Majores*) which alone is officinal; and dried currants (*Passulæ Minores*), which are the product of a small variety of vine, an inhabitant of Greece, especially the neighbourhood of Corinth, and of the islands of Zante and Cephalonia. Grapes and raisins are imported into the British islands chiefly from Spain, Portugal, and the Levant; Muscatel raisins are the finest.

CHEMICAL PROPERTIES.—Raisins consist of uncrystallizable sugar (*grape sugar*), mucilage, extractive, bitartrate of potash, malic and citric acids, &c.

THERAPEUTICAL EFFECTS.—Raisins are emollient, nutritive, and demulcent; they are only employed in medicine as flavouring adjuncts, for which purpose they form ingredients in many officinal preparations. Grapes are an agreeable cooling fruit for the sick room; besides which they have recently gained what I can scarcely avoid thinking an ephemeral notoriety in the treatment of various forms of chronic disease, under the name of the "Grape Cure." I am indebted to my friend Dr. Madden, author of the valuable and charming book, *A Change of Climate*, for the following notes on this subject:—

GRAPE CURE.—Dr. Carrière has written on this subject an essay, *Les Cures de Petit-lait et de Resin en Allemagne et en Suisse dans la traitment des Maladies Chroniques*. Paris, 1860. According to him the grape cure consists in making several repasts each day entirely of grapes. Commencing with a pound, and increasing the dose to six and even eight pounds per day, though seldom exceeding three or four pounds. The largest quantity of grapes is taken at the morning meal, after which the patient walks for a couple of hours, and then breakfasts sparingly on bread and water; the second grape meal is taken before dinner, which is at an early hour; the third, three hours after dinner; and the fourth immediately before bed-time. This system is usually persevered in for about six weeks. M. Carrière regards the grape cure as well suited for cases of hepatic and abdominal plethora, enlargement of the spleen, hæmorrhoids, and diarrhœic discharge. In chronic dyspepsia it is frequently employed by Swiss and German physicians. Carrière recommends it in scrofula, tuberculosis, phthisis, gout, and chronic skin affections. This "Grape Cure" is very often practised in the same establishments as the "Whey Cure," which is also very generally used in Germany and Switzerland.

Poisoning from Diseased Grapes.—A case of poisoning from grapes affected with "oidium" is reported in the *Echo Médical Suisse*. A wet nurse, aged twenty-two, was seized with gastralgia, delirium, and difficulty of breathing after eating some grapes affected with oidium. She recovered under the use of opiates internally, laudanum, cataplasms to the stomach, and laxative injections. For some time she remained very weak, and her infant was attacked by severe and obstinate diarrhœa.

CHAPTER XII.

EPISPASTICS.

(Vesicants; Rubefacients; Counter-irritants; Derivatives; Revulsives.)

EPISPASTICS are substances which produce irritation, inflammation, or vesication, when applied to the skin. They are employed in the practice of medicine principally with the intention of relieving or removing the diseased condition of some internal organ, by producing a determination of blood to the surface immediately over the seat of the affection or to some remote part. Independently of this effect, however, blisters, which are the most important therapeutical agents in this division, act also as general stimulants to the system, and, as such, are frequently used with much benefit in the advanced stages of typhoid fevers, and in spasmodic affections arising from debility. This stimulant action of blisters is to be borne in mind, and consequently their application should be avoided in the very acute stages of inflammatory diseases, until the general excitement has been previously subdued by antiphlogistic means. Another effect produced by blisters, and with which intention they are not unfrequently employed, is to cause an immediate discharge of serum from the vascular system; this is often attended with the most beneficial results in cases of sudden effusion into the pericardium, the pleura, or the substance of the lungs. When used with this intention the blister should be of large size, and left in contact with the skin sufficiently long to produce free vesication. Blistering agents are also applied to the surface of the body for the purpose of removing the epidermis, so as to permit the direct application of various medicinal substances to the absorbing layer of the true skin: mercury is thus very frequently introduced into the system; and strychnia, morphia, &c. are sprinkled over the denuded part in certain diseases, with the intention of producing a direct local action. They are also employed to expedite the action of caustics, such as potassa fusa, in effecting the separation of the slough in the insertion of issues, the caustic being applied directly to the raw surface that results on the separation of the cuticle. Epispastics are generally applied as near the seat of the disease as possible, unless when the intention is to produce a determination to some remote part of the body, as in the application of sinapisms to the feet or calves of the legs in affections of the head. In the employment of any of the remedies contained in this class, in the diseases of infancy and childhood, it must be remembered that inflammation of the skin is much more readily produced in the young and very old than in persons in the prime of life, and consequently their effects must be carefully watched; this is more especially the case with reference to blisters (see page 326).

ACIDUM SULPHURICUM (described already, p. 71, and *seq.*) forms one of the important ingredients in the liniment recommended by the late Sir Benjamin Brodie for producing counter-irritation in chronic inflammation of the synovial membrane of the knee joint, and which he also recommended in acute inflammation *after the inflammatory symptoms had subsided.* This is his formulary:—

* *Brodie's Liniment.* (Strong sulphuric acid, f℥jss; olive oil, f℥jss.; oil of turpentine, f℥ss. Mix.) The proportion of acid and of turpentine in the formulary may be varied, so as to suit the character of the integument in each particular case, it being manifestly impossible to give a formulary suited for every variety of structure, some being more delicately organized than others. In compounding this prescription care must be taken not to mix all the ingredients together at once, else an explosive mixture might result from the heat eliminated by the *condensation* of the acid (see p. 73). The acid and oil should first be mixed cautiously, and on the mixture cooling the turpentine may then be added.

AMMONIÆ LIQUOR FORTIOR. *Stronger Solution of Ammonia.* (This preparation has been described in the chapters which treat of *Antacids* and *Caustics.*) Applied to the surface of the body, the stronger solution of ammonia produces redness and irritation, and, if the application be long enough continued, vesicates. Its only advantage as a blistering agent is that it operates speedily, on which account it is employed in inflammation suddenly attacking any of the abdominal viscera, as in retrocedent gout. In diseases of the urinary organs it should be preferred as a blistering agent to cantharides, in consequence of the irritant action of that substance on the kidneys. As a counter-irritant it is frequently used to relieve internal inflammations; and as a rubefacient, it is employed in muscular and neuralgic pains. An immediate blister may be readily produced by saturating a piece of lint of the size of the desired blister with concentrated solution of ammonia, and applying it to the skin with moderate pressure for a few minutes, taking care, in its removal, not to tear away the cuticle with it.

Linimentum Ammoniæ. Liniment of Ammonia. (Take of solution of ammonia, one fluid ounce; olive oil, three fluid ounces.

Mix together with agitation.) This preparation, so generally known as a domestic remedy by the name of *hartshorn and oil*, is an excellent counter-irritant much employed in inflammatory sore throat; it is usually applied on a piece of flannel. By increasing the quantity of ammonia it produces more powerful effects.

Linimentum Camphoræ Compositum. Compound Liniment of Camphor. (Take of camphor, two ounces and a half; English oil of lavender, one fluid drachm; strong solution of ammonia, five fluid ounces; rectified spirit, fifteen fluid ounces. Dissolve the camphor and oil of lavender in the spirit; then add the solution of ammonia gradually with agitation until the whole is dissolved.) Compound camphor liniment is the most useful counter-irritant in the Pharmacopœia, where it is wished to produce an immediate and decided effect, as in inflammation suddenly attacking some internal organ. When poured on a fold of linen and applied immediately to the skin, being kept closely in contact with the surface by pressure, it may be made to vesicate if left on sufficiently long, an effect, however, rarely required from it. It should in nearly every case be preferred to a cantharides blister in affections of infants and young children, or very old people. This preparation is also used for the same purposes as the liniment of ammonia, than which it is cleaner, more agreeable, and more efficacious. As kept in the shops, compound camphor liniment is usually too weak to produce a sufficiently active counter-irritant effect, and therefore, in prescribing it, the addition of f℥j. of the stronger solution of ammonia to each fluid ounce is always advisable where an immediate powerful action is desired.

* *Ammoniacal Blistering Ointment*, GONDRET. (Take of axunge, ℥j.; oil of sweet almonds, f℥ss.; melt together with a gentle heat; pour the mixture while still liquid into a wide-mouthed glass vessel; then add water of caustic ammonia, f℥v., and mix with constant agitation till cold.) In preparing this ointment particular care must be taken that the axunge be merely melted; if it be too fluid or too warm, some of the ammonia will be vaporized and the resulting ointment weak. It may be kept unchanged for many months in stoppered glass bottles in a cool place. It is applied by spreading it over the skin, and covering the part with a compress. It vesicates in about ten minutes.

ANTIMONIUM TARTARATUM. *Tartar Emetic* (described in the division *Diaphoretics*), applied by friction to the skin, produces a crop of pustules which ulcerate and discharge purulent matter, causing thereby a counter-irritant action. With this intention it is very frequently employed in various affections of the thoracic and abdominal viscera; in subacute inflammation of the brain or spinal cord and their membranes; in diseases of the joints; in muscular and neuralgic pains, &c. A charge of *metastatic* action is not unfrequently made against it; that is, that when applied in one place it developes an eruption in another. In all such cases, however, I have been able to account for the apparent metastasis by the fact of its being transferred inadvertently by the patient's hand from the place where it was originally applied to the new seat of the eruption. It is usually applied in the form of ointment or saturated solution; or from gr. v. to gr. x. may be sprinkled over the surface of any simple plaster, and left on until the desired effect is produced. The concentrated solution is applied by means of pledgets of linen soaked in it; its operation is more speedy than that of the ointment. Rollott has proposed a new method for producing counter-irritation with tartar emetic. He places a small quantity in very fine powder on a piece of glass, and makes it into a thick paste with a drop or two of oil or water. This he inserts with a lancet under the skin, in the same manner as vaccine matter, proportioning the number of punctures to the effect it is wished to produce.

Unguentum Antimonii Tartarati. Ointment of Tartarated Antimony. (Take of tartarated antimony, in fine powder, a quarter of an ounce; simple ointment, one ounce. Mix thoroughly.) This ointment contains nearly twice as much tartarated antimony as unguentum antimonii tartarizati, *Dub.* It is applied by rubbing about half a drachm on the skin night and morning; in two or three days pustules begin to appear, when the application of the ointment should be discontinued, as it sometimes gives rise to troublesome ulceration.

AQUA FERVENS. Boiling water has been used to produce rapid and extensive vesication, as a means of rousing the system in narcotic poisoning; the difficulty of confining its action, the great pain caused, and the troublesome ulceration which may be occasioned, forbids its use except in extreme cases. In the absence of other more suitable means, *cold* water may be used as efficiently, and will not present as formidable an appearance to the patient. A piece of bibulous paper should be soaked in cold water, applied to the part to be vesicated, and covered with three or four folds of dry paper. A common smoothing iron heated to 212° F. should now be passed three or four times over all, and on removing the paper the part will be found vesicated.

CANTHARIDES (described in the division *Diuretics*) are employed externally to produce rubefaction, vesication, or suppuration. The first of these effects is caused by the application of cantharides mixed with other substances to blunt their activity, as in the *Emplastrum calefaciens* of the Pharmacopœia, or by applying the active preparations for a short space of time only. To produce rubefaction, cantharides are employed in the treatment of rheumatic and other local pains, in chronic catarrh, and in the habitual cough of the old and debilitated. When cantharides are left for some time closely applied to the surface of the skin, the cuticle is raised, and serous fluid effused between it and the true skin, a blister being thus produced in a period varying with the preparation of the flies which is employed. No other agents are so generally used to produce vesication as cantharides, in consequence of the certainty of their operation, the comparatively little pain which they occasion, and the facility with which they may be applied. Blisters are employed in a great variety of diseases, generally with the intention of relieving pain, inflammation, and congestion of internal organs, which they effect by derivation to the surface of the body, or as it is usually termed by counter-irritation. With this view they are applied in both the acute and chronic forms of inflammation of the brain and spinal cord to the scalp, or along the track of the spinal marrow; in inflammatory affections of the thoracic and abdominal viscera, to the surface of the chest or abdomen, and in the local congestions of fevers, as near the affected part as possible. Blisters are also used to stimulate to increased action, as in indolent buboes, in chronic enlargement of the testicle, over cold abscesses, to indolent ulcers, and in effusion into the joints. To excite the system generally, they are applied in the comatose stages of typhoid fever or pestilential cholera, and in apoplectic affections. To produce suppuration, cantharides are used in the form of ointment, as a dressing to parts from which the cuticle had been previously removed; and as powerful counter-irritants, forming what is termed a perpetual blister, are employed with much advantage in chronic inflammatory diseases. Cantharides should not be applied to produce vesication when any irritation or inflammation of the urinary organs is present, in consequence of their peculiar tendency to cause strangury. In infants and young children, or very old people, blisters should be used with great caution, as they are liable to produce troublesome sloughing, which, in many instances, has caused death; as a general rule they should be left on only until redness of the surface is produced, when the application of a warm poultice to the part will cause vesication.

PHARMACEUTICAL PREPARATIONS :—

Emplastrum Cantharidis. Cantharides Plaster. (Take of 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. Liquefy the wax, suet, and lard together by a steam or water bath, and add the resin previously melted; then remove them from the bath, and, a little before they solidify, sprinkle in the cantharides, and mix by stirring briskly.) This is the preparation most generally employed to produce a blister; it is spread on leather with a cold *(not heated)* spatula (more generally with the ball of the thumb), and the margin covered with adhesive plaster to prevent its moving or falling off; blistering plaster, however, acts much better when spread on soft brown paper in a thin layer, in consequence of its being much more easily and more perfectly kept in close contact with the skin, which is effected by means of a bandage. In ordering blisters in prescriptions, it is usual to draw an outline with the pen of the size and shape which it is wished that they should be; but in some of the continental pharmacopœias, as in that of Hamburgh, prescribed sizes are given for them. In order to prevent the irritant action of cantharides on the urinary organs, in persons liable to such an effect, a piece of tissue paper oiled should be placed between the plaster and the skin. Blisters are usually left on from eight to twelve hours to produce their action; the raised cuticle should be then cut to allow the escape of the serum—except in children or young persons, or those with a very irritable skin, when the vesications should not be broken—and a dressing of spermaceti or some simple ointment applied. Unless when it is wished to produce a copious serous discharge, however, the following method, which I have adopted for years, and which was first proposed by Dr. Douglas Maclagan of Edinburgh, will be found far preferable:—The blister is left on for five or six hours, according to circumstances, a poultice then applied for two hours, and the raised cuticle having been removed with a pair of scissors, the surface is covered with a thick layer of raw cotton; it heals completely in about twenty-four hours, but is so little painful after twelve hours, that percussion and auscultation may be performed on the part—of course without disturbing the cotton—a matter of much importance in pulmonary affections. The painful *itching* which frequently follows the application of a blister is best removed by a simple bread and water poultice, moistened with a dilute solution of *liquor plumbi subacetatis*.

Emplastrum Calefaciens. Warm Plaster. (Take of cantharides, in coarse powder, four ounces; boiling water, one pint; expressed oil of nutmeg, four ounces; yellow wax, four ounces; resin, four ounces; soap plaster, three pounds and a quarter; resin plaster, two pounds. Infuse the cantharides in the boiling water for six hours; squeeze strongly through calico, and evaporate the expressed liquid by a steam or water bath till reduced to one third. Then add the other ingredients, and melt in a steam or water bath, stirring well until the whole is thoroughly mixed.) Rubefacient; its uses have been described above. (See page 325.)

Linimentum Cantharidis. Liniment of Cantharides. (Take of cantharides, in powder, eight ounces; acetic acid, four fluid ounces; ether, one pint. Macerate the cantharides in the acetic acid for twenty-four hours; then place in a percolator, and allow the ether to pass slowly through, till twenty fluid ounces are obtained. Keep it in a stoppered bottle.) A rubefacient liniment not used in consequence of its disagreeable odour. I have applied it occasionally with good effect as an addition to ointments, when it is desired to stimulate the scalp in cases of alopœcia.

Unguentum Cantharidis. Ointment of Cantharides. (Take of cantharides, one ounce; yellow wax, one ounce; olive oil, six fluid ounces. Digest the cantharides in the oil, in a covered vessel for twelve hours, then place the vessel in a water bath at 212° for fifteen minutes, strain through muslin with strong pressure, add the product to the wax previously melted, and stir constantly until the mixture solidifies.) Used to keep issues open, and also to produce counter-irritation.

* *Acetum Cantharidis.* ("Spanish flies, in fine powder, ℥iv.; strong acetic acid, f℥iv.; acetic acid of commerce (specific gravity, 1004), f℥xvj.; mix the acids, and having added the flies, macerate in a close vessel for fourteen days; then strain through flannel with expression, and filter so as to obtain a clear liquor.") Employed as an extemporaneous blister; it may be conveniently applied with a piece of sponge, and produces a blister in from five to ten minutes. Complaints are frequently made of the inefficiency of this preparation, which arises either from its being prepared with weak acid, or from its not being rubbed into the skin with sufficient care, as the application should be continued until it produces intense redness of the part, and much pain.

* *Æther Cantharidalis*, Œttinger. (Cantharides, in coarse powder, 1 part; sulphuric ether, 2 parts; digest for three days and express.) This preparation is an active vesicant; mixed with equal parts of hog's lard it forms an admirable preparation for blistering children, vesicating after two or three applications within two hours.

* *Blistering Cloth*, Paris Codex. (Oil of cantharides obtained by ether, four parts; yellow wax, eight parts; melt with a very gentle heat, and spread on waxed linen or calico.) A more elegant preparation than blistering plaster, and equally, if not more efficacious. *Tela vesicatoria; Charta vesicatoria*, &c. so generally employed in the present day for blistering, are prepared in the same manner, paper being used instead of calico.

* *Collodium Vesicans, seu Cantharidale.* (Most readily prepared by mixing together equal parts of collodium and cantharidal ether.) An elegant preparation, possessing the advantage that its strength can be easily increased or diminished. It is now much used for blistering, owing to its cleanliness, its certainty, and the facility with which it may be applied in the neighbourhood of joints or to other parts of the body which are difficult to blister by the ordinary method. It is applied with a camel's-hair brush: two scruples are sufficient to blister a surface the size of the palm of the hand; it is preferable to apply the quantity to be used twice, instead of at one time, on the place to be blistered. I have found this the very best application at our command for *chilblains;* applied before ulceration, it rarely fails to prevent this stage, and after ulceration it expedites their cicatrization. It should be diluted with ordinary collodion in the proportion of one part of vesicating to five of ordinary collodion, and applied with a camel's-hair pencil.

* *Emplastrum Cantharidis Compositum.* (Venice turpentine, ℥ivss.; Burgundy pitch; and cantharides, of each, ℥iij.; wax, ℥j.; verdigris, ʒss.; white mustard seed; and black pepper, of each, ℥ij.; melt the wax and Burgundy pitch, add the turpentine, and while the mixture is hot, sprinkle into it the remaining articles previously in fine powder and mixed together; stir the whole briskly as it concretes in cooling.) A more certain blister than the simple *emplastrum cantharidis;* according to Duncan it is *infallible.*

* *Papier d'Albespeyres,* now so commonly employed for keeping up a discharge from blistered surfaces, is prepared as follows:—No. 1. which is the weakest; "White wax, 5 parts; olive oil, 3 parts; oil of chocolate, 4 parts; spermaceti, 3 parts; turpentine, 1 part; cantharides, 1 part; water, 8 parts; all melted together." No. 2. "White wax, 3¾; olive oil, 2½; oil of chocolate, 3; spermaceti, 2½; turpentine, ¾; cantharides, 1; water, 8." No. 3, the strongest, contains the same quantities of cantharides and water, and half the proportions of the other ingredients contained in No. 1. The compound is spread on paper, on fine linen, or on calico.

CAPSICUM. *Capsicum.* Capsicum fastigiatum, *Blume, Bidjr.* Plate 1617, vol. iv., *Wight, Icones Plant. Ind. Orient.* (The ripe fruit dried; imported from the coast of Guinea, and from the East and West Indies, and distinguished in commerce as guinea pepper and pod pepper.) Syn.: *Chillies, Red* or *Cayenne Pepper.*) The Capsicum annuum, Capsicum fastigiatum, *Blum,* is a native of the East and West Indies, of the East coast of Africa, and of South America; it belongs to the Natural family *Solanaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A herbaceous annual, 1–2 feet high; leaves ovate, smooth, placed on long footstalks in irregular order; flowers white, axillary, solitary; fruit, a long, conical, juiceless, scarlet, or yellow berry, pendulous.

PREPARATION.—Cayenne pepper is prepared by reducing to a moderately fine powder the dried fruit of this and of other species. It is often imported in powder, in small gourds, chiefly from the West Indies; but the greater part is ground at home, a fourth part of common salt being generally mixed with it.

CHARACTERS.—Pod, membranous, from five to eight lines long, two lines broad, straight, conical, pointed, smooth, shining, but somewhat corrugated, orange-red, intensely hot in taste.

PHYSICAL PROPERTIES.—A moderately fine powder, of a reddish-yellow colour; with a faint aromatic odour, and a bitter, acrid, burning taste.

CHEMICAL PROPERTIES.—The active properties of Cayenne pepper depend on a very acrid solid oil, which has been named *Capsicin,* and which when quite pure may be crystallized. It yields its virtues to water, alcohol, ether, acetic acid, and the fixed and volatile oils.

THERAPEUTICAL EFFECTS.—Cayenne pepper applied to the skin produces redness and inflammation, which are followed by vesication, if the application be continued for some time. As a rubefacient, and even vesicant, it is much employed in the West Indies, but is scarcely ever used with either of these intentions in this country; nevertheless, applied in the form of cataplasm, it is a convenient and effectual counter-irritant. Its use as a stimulant will be considered in the chapter on *General Stimulants*.

CROTONIS TIGLII OLEUM. *Croton Oil* (described in the division *Cathartics*) rubbed on the skin produces redness and inflammation of the part to which it is applied, which are followed by a copious pustular eruption. It is applicable to all cases in which we wish to produce speedy and active counter-irritation, but it should not be applied to the face or scalp, as in more than one instance I have seen it produce erysipelatous inflammation of these parts. To its use also has the same objection been made of its metastatic action as alleged against tartar emetic; however, the same observations are applicable here (see p. 324). Lafargue cures nævi by inoculation with croton oil; five or six punctures are made on and around the tumour with a lancet dipped in the oil, just as in vaccination. Each puncture immediately causes a pimple, which in 36 hours is developed into a little boil; these boils unite and form a hot painful tumour, covered with white crusts. Two days afterwards the scabs separate, and in lieu of the nævus is seen an ulcer which is to be treated on general principles. It would be dangerous to make more than six punctures on a very young infant, as the irritation and fever are considerable. To prepare a liniment of croton oil, one part may be rubbed up with seven of olive oil, a combination sufficiently powerful for general employment, four minims of oil of bitter almonds, or ten of oil of lemons being added to each ounce to give it an agreeable odour; in hospital or dispensary practice, linseed oil may be used instead of olive oil. A plaster, prepared by melting with a gentle heat four parts of diachylon plaster, and incorporating with it one part of croton oil, spread on calico, and applied to the surface of the body, will produce a pustular eruption in about 24 hours. It is a convenient and excellent way of employing this counter-irritant.

Linimentum Crotonis. Liniment of Croton Oil. (Take of croton oil, half a fluid ounce; olive oil, three fluid ounces and a half. Mix.) A convenient form for use.

* EUPHORBIA. *Concrete resinous juice of undetermined species of Euphorbia. Euphorbium.* In Africa euphorbium is procured

from *Euphorbia officinarum* and *Euphorbia antiquorum*; in the Canaries it is obtained from *Euphorbia Canariensis*. The genus belongs to the Natural family *Euphorbiaceæ*, and to the Linnæan class and order *Monœcia Monandria*.

BOTANICAL CHARACTERS.—The pieces of the branches which we find mixed with the gum are 4 to 5 angled, with dark, shining spines, double. The genus is characterized by its monœcious heads of flowers surrounded by an involucrum of one leaf with five divisions, including several barren flowers with one fertile; capsule, 3-seeded.

PREPARATION.—It is obtained in the neighbourhood of Mogadore (from whence it is chiefly brought to this country) by making incisions into the stem and branches, from which a milky juice exudes; this juice concretes on the tree into a yellow gum, and is gathered when quite dry. So intensely acrid is the gum, that those who gather it are obliged to tie a cloth over their mouth and nostrils.

PHYSICAL PROPERTIES.—Euphorbium is in tears or small irregular masses, roundish, and angular, somewhat friable; of a dull yellow colour, and pierced with small holes, formed by the spine of the branch on which they concrete. It has a weak odour, but a very acrid and burning taste; the powder snuffed into the nostrils produces much irritation, with incessant sneezing.

CHEMICAL PROPERTIES.—Euphorbium consists principally of resin, (the active ingredient), with wax, some caoutchouc, and salts of lime and potash. The pure resin is soluble in alcohol, but water has no action on it. Euphorbium melts when exposed to heat, is inflammable, and burns with a bright flame, and rather agreeable odour.

THERAPEUTICAL EFFECTS.—Applied to the surface of the skin it causes much irritation, but does not vesicate or produce any eruption; if the cuticle, however, had been previously removed, its application gives rise to a purulent discharge. It may be employed mixed with lard with much advantage as an issue ointment, or for keeping up a discharge from blistered surfaces, being cheap and certain in its effects. For an issue ointment, 25 to 30 grains should be rubbed up with an ounce of lard, and the strength may be increased or diminished according to circumstances. Euphorbium possesses the advantage over the preparations of cantharides, that it does not irritate the urinary organs; and over savin ointment that it does not spoil by keeping. The facility with which we can increase or reduce its strength is also of great importance. Nevertheless this drug has been omitted from the Pharmacopœia, so rarely is it now used in medicine.

IPECACUANHA (described in the division *Emetics*) is an excellent counter-irritant, though sometimes uncertain in its action; applied in the form of liniment, prepared as directed below, it produces an eruption of minute vesicles on an inflamed base in from 36 to 38 hours, which fade away in three or four days. It possesses the advantage of not causing much pain or constitutional irritation.

* *Linimentum Ipecacuanhæ.* (Ipecacuan, in very fine powder,

℥ss.; axunge, ℥ij.; olive oil, f℥iss. Mix.) A fourth part of this should be rubbed well into the part it is desired to irritate, three or four times a day.

MEZEREUM. *Mezereon* (described in the division *Diaphoretics*). The inner bark of the stem and branches is much employed on the continent as a vesicatory, but as in the dry state its effects are uncertain and slowly produced, it is not used in this country as such. In France, in order to produce a blister with this substance, a piece of the bark is softened in warm water or in vinegar, and applied to the part with a compress and roller; at first the bark is renewed night and morning, but when the blister is produced it is changed only once daily. An issue ointment is also prepared with it, by digesting for twelve hours the sliced bark in axunge and white wax liquefied together, and straining.

* MOXA.—*A term borrowed from the Chinese, by whom it was used to designate a cylinder of a cottony substance, which they obtained from the leaves of Artemisia moxa.* This is a small shrub, a native of China, belonging to the Natural family *Compositæ (Asteraceæ*, Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

PREPARATION.—Moxas are prepared in China and Japan, from whence we have derived the use of them, by pounding the downy covering of the leaves until it resembles fine cotton, and rolling into small, conical masses. In this country they are prepared either from the pith of the stem of the *Helianthus annuus*, the common sunflower, or by soaking cotton-wool in a concentrated solution of nitre, and forming into small masses of the same shape as the Chinese moxas. More recently the late Professor Osborne of this city proposed the use of fresh-burned quick-lime, as a substitute for the common moxa (*Dublin Journal, first series*, vol. xx., p. 409). On the Continent a piece of linen soaked in a concentrated solution of acetate of lead, dried and rolled into the proper shape, is usually preferred in the present day. A conical-shaped piece of camphor also forms an excellent moxa.

EFFECTS AND USES.—The first sensation felt on the application of a moxa is rather agreeable, but it soon causes intolerable pain, which, however, does not last long. Redness and inflammation of the part to which it is applied are produced, and an eschar formed immediately under the spot on which it has been placed, which extends to a considerable depth if the moxa be kept long in contact with the skin. The eschar separates in from eight to ten days, the process of inflammation set up for its discharge being attended with more or less suppuration, according to circumstances; and a discharge of purulent matter may be established after the separation of the eschar by the application of irritating unguents, or by the insertion of issue-peas. Moxas differ from the actual cautery in that their effects are produced more slowly, and that the inflammation caused by them penetrates more deeply. The principal diseases in which the application of moxas has been found beneficial are, in Pott's curvature of the spine, in inveterate sciatica, in neuralgia, in paraplegia, in chronic inflammation of the joints, in amaurosis, &c. The good effects produced by moxas depend on the principle of counter-irritation. Their use is contra-indicated in all acute inflammatory diseases. Of late years they have not been much employed.

MODE OF EMPLOYMENT.—The apex is set on fire, and the base kept firmly applied to the skin by means of a piece of wire or a pair of forceps; the neighbouring parts should be covered with wet pieces of linen to protect them from the sparks; the combustion may be quickened by the blow-pipe or with the breath. Professor Osborne applied the quick-lime moxa as follows:—"Some quick-lime in powder to the depth of about half an inch is placed on the skin inside a *porte-moxa*, or strip of card bent together and tied so as to form a circle; some water is dropped on and mixed with it. The ordinary lime from a lime-kiln answers well if fresh." Moxas should be applied as close to the seat of the disease as possible. Baron Larrey considers that their application to the following parts of the body is improper:—To the head, where the skull is covered with skin and pericranium only; to the eyelids, nose, ears, larynx, trachea, sternum, glandular parts of the breast, linea alba, over the course of superficial tendons, articular prominences, where there is danger of injuring the articular capsules, and projecting points of bone. To these may be added, immediately over the course of large arteries, veins, or nerves.

RUTA GRAVEOLENS.—(Described in the division *Antispasmodics*). The fresh leaves may be employed as a local stimulant and rubefacient. A curious property possessed by this shrub is the immunity it confers on people carrying sprigs of it from the attacks of these most tormenting plagues, *midges;* its volatile oil might, perhaps, be equally efficacious.

SABINA. *Savin* (described in the division *Emmenagogues*) acts as a powerful local irritant. It is very generally employed in the form of ointment or cerate for keeping up the discharge from issues or a blistered surface, producing what is termed a *perpetual blister* Owing, however, to the difficulty in preparing the ointment well, and to its losing its properties by long keeping, an ointment prepared with euphorbium (see page 330) may be preferred for that purpose; one part of powdered savin combined with two parts of finely powdered alum forms an excellent application to venereal vegetations: it is sprinkled over the part, and the application renewed twice daily, simple dressing being applied in the interval

Unguentum Sabinæ. Ointment of Savin. (Take of fresh savin, bruised, eight ounces; white wax, three ounces; prepared lard, sixteen ounces. Melt the lard and the wax together on a water bath, add the savin, and digest for twenty minutes. Then remove the mixture, and express through calico.) When well prepared, this ointment is of a fine green colour, and has the peculiar odour of savin well marked.

SETONS and ISSUES are employed to produce derivation from some internal organ, by causing a discharge of pus from the surface of the body, as in deep-seated local inflammations; and to establish a drain from the system in many diseases. With the former intention they are employed in ophthalmia, in chronic inflammation of the ear, in diseases of the brain and spinal marrow, in caries of the vertebræ, in chronic articular inflammation, in white swelling, in hip-joint disease, &c. With the latter, in apoplexy, epilepsy, chorea, spasmodic asthma, phthisis, hepatitis, &c. When setons or issues are employed in local diseases, they should be applied as near their seat as practicable; but when used in general affections, they may be inserted in whatever part of the body is most convenient; thus, setons may be inserted into the nape of the neck, and issues in the inside of the leg or arm.—The introduction of a seton is easily effected with a seton needle, an instrument shaped like a lancet, about three inches long, 3-8ths of an inch broad, slightly curved, and having an eye in the handle; a fold of the integuments being held up, the needle is forced through, and by its means a skein of silk, or a piece of India-rubber or gutta percha tape, sufficient to fill the aperture, introduced through the wound; a fresh portion of the material inserted is drawn through the aperture daily, and if it do not produce sufficient irritation, it may be smeared with some irritating ointment. Issues are more employed at present than setons; the manner in which they are inserted has been explained before (see page 219).

SINAPIS. *Mustard* (described in the division *Emetics*), applied to the surface of the body acts as a local irritant, producing inflammation attended with much pain; and if the application be long continued, vesication, with even ulceration and gangrene. It is very generally employed in the form of cataplasm, or as it is technically called *sinapism*, to produce counter-irritation: applied to the soles of the feet or calves of the legs, in the low state of typhus fever, especially when stupor or delirium is present, in apoplexy and coma, in narcotic poisoning, and in other cases in which there is determination to the head. It is also often applied to the chest with much benefit in many pulmonary and cardiac diseases, and to the surface of the abdomen in painters' colic and other affections of the abdominal viscera. Sinapisms are prepared by mixing common table-mustard with lukewarm water, and spreading the paste on a piece of linen or brown paper. They produce a counter-irritant effect in from fifteen to twenty minutes after they have been applied; but the length of time which they should left on may be regulated by the feelings of the patient; if he is insensible, however, they should be removed as soon as the skin is reddened. The following form for preparing sinapisms is contained in the Pharmacopœia:—

Cataplasma Sinapis. Mustard Poultice. (Take of mustard, in powder, two ounces and a half; linseed meal, two ounces and a half; boiling water, ten fluid ounces. Mix gradually the linseed meal with the water, and add the mustard, constantly stirring.)

SUCCINI OLEUM. *Oil of Amber* is an active rubefacient, producing irritation and slight inflammation of the skin when applied with friction. It is sometimes employed in chronic rheumatism and paralysis; but its most general use is as a local application in hooping-cough in the following form, commonly known as *Roche's embrocation*:—Oil of amber, f℥iij.; oil of cloves, f℥j.; olive oil, f℥j.; mix.

TEREBINTHINÆ OLEUM. *Oil of Turpentine* (described in the division *Anthelmintics*), is a speedy and effectual rubefacient, producing active inflammation, succeeded by a crop of small pimples, and sometimes minute blisters, when applied to the surface of the body. If it be applied warm, it acts more quickly and more powerfully. As a counter-irritant, it is very generally and very beneficially employed in inflammatory attacks of the thoracic or abdominal viscera, in colic and peritonitis, in sore throat, in chronic rheumatism, in neuralgia, &c. In such cases it is employed in the form of stupe, and frequently proves of very great service indeed; in general, however, it is applied in anything but a correct manner. The best mode of applying it is to have three or four folds of clean flannel wrung out of boiling water; this can be effected by placing the flannel in a basin, pouring the water upon it, and then placing it in an open towel, the ends of which are to be twisted in opposite directions, enveloping in the fold the flannel, in which manner it is effectually deprived of the surplus water; the turpentine is then to be rubbed on the part to be stuped, and the hot cloth spread rapidly upon it, and a dry towel interposed between it and the patient's linen; two or three of such stupes will produce a powerful rubefacient effect.

Linimentum Terebinthinæ. Liniment of Turpentine. (Take of oil of turpentine, five fluid ounces; ointment of resin, eight ounces. Melt the ointment of resin, then add the oil of turpentine gradually, and stir until a uniform liniment is obtained.) This liniment is powerfully stimulating; it was first proposed by Kentish as an immediate dressing for extensive burns, particularly when the vital powers are sinking, and for this purpose it is employed with much advantage; the parts are first smeared with oil of turpentine, and pledgets of lint covered with this liniment are then applied. It is also used as a counter-irritant applied with friction in rheumatic and neuralgic pains.

St. John Long's Liniment, (the yolk of one egg; oil of turpentine, f℥iss.; strong acetic acid, f℥j.; pure water, f℥iij.; first rub the yolk of egg, the water, and the acetic acid together, then add the oil of turpentine, and agitate the whole until they are well mixed:—or oil of turpentine and distilled vinegar, of each equal parts; yolk of egg, sufficient to make a uniform emulsion.) This excellent counter-irritant liniment is applied by means of a sponge; its effects vary with the force which is used in rubbing, and with the length of time the application is continued; the principal objection to its use is its, to some people, very disagreeable smell (I, myself, rather like it). This may be somewhat obviated, and its rubefacient powers at the same time rather increased, by the addition of a drachm of oil of rosemary.

CHAPTER XIII.

EXPECTORANTS.

(Pectorals.)

EXPECTORANTS may be defined, medicines which promote the secretion from the bronchial tubes and air passages, and facilitate its discharge. No peculiar drugs have been as yet discovered which, by a direct or *specific* action on the lungs, produce expectoration; the medicines which are employed with this intention act relatively, that is to say, they operate through the medium of the system generally, for the most part relieving or removing that state of disease which demands the use of expectorants. It has been indeed asserted that certain substances are eliminated through the bronchial mucous membrane, and that in this manner the natural mucous secretion is augmented when they are taken into the circulation, whether by absorption from the digestive canal or otherwise; but such an assertion is only conjectural, for I am not aware that their presence in the bronchial secretion has been ever detected by direct chemical experiment. It is true that the breath emits or retains the smell of many substances, which have a powerful or peculiar odour, for several hours after they have been swallowed, such as garlic, onions, the balsams, and most of the volatile oils, but this is only a proof that their odorous principle is exhaled by the pulmonary mucous membrane, nor should they, therefore, be regarded as expectorants. In fact most agents which are arranged in this division are derived from other classes of medicines, and there are no remedies more uncertain in their action. There are two modes in which remedies employed to promote expectoration appear to act; first, by removing constriction of the pulmonary exhalent vessels, on which principle the nauseating expectorants seem to produce their effects; or, secondly, by stimulating these vessels, they either increase the natural exhalation where it is deficient, or alter its character where it is in an unhealthy state. To these we may add a third, including all emetics which by their mechanical action dislodge accumulated secretions from the respiratory organs, and thus frequently become most valuable agents in the treatment of many diseases which demand the use of expectorants. The following summary of an able paper on this class of medicines, by Dr. Easton, extracted from the *Glasgow Medical Journal*, 1st. October, 1863, contains so much in which I coincide, that I have not hesitated to insert it here:—

"Before finishing this article, I beg to submit a few general conclusions by way of summary:—First, that as in the early stage of acute bronchitis the pulmonary mucous membrane is inflamed and dry, and the bronchi consequently contain nothing to be expectorated, the remedies which are employed in the treatment of that form of the disease cannot with any propriety be called expectorants. Second, that as the principal indication of cure in acute bronchitis is to alter the condition of the mucous membrane, to make it natural and moist from being inflamed and dry, the agents which effect this change might be called relaxing broncho-muco-alterants. They are, principally, inhalation of vapours, tartar emetic in one-twelfth or one-sixth of a grain doses, ipecacuan in one-quarter or one-half grain doses, henbane, hemlock, aconite, green hellebore, hydrocyanic acid, demulcents, alkalies, &c. Third, that as in chronic bronchitis the system generally is often in an atonic state, and the mucous membrane of the lungs is always so, the indication of cure is to invigorate the general system by tonics, stimulants, and general hygienic measures, and particularly to alter the aërian membrane from a state of debility to a state of health by the administration of those medicines which are known to stimulate that surface, and that such agents might be called stimulating broncho-muco-alterants. They are, principally, squill, leek, onion, garlic, benzoin, styrax, preparations of tolu and peru, turpentine, copaiva, the fœtid gums, myrrh, senega, lobelia, sesquicarbonate of ammonia, &c. Fourth, that as coughing is necessary for the removal of excessive muco-purulent secretion and the consequent relief of dyspnœa, and is a muscular act performed by respiratory muscles, it is often necessary to excite these to healthy contractions, and that the means for that purpose, when employed in that special relation, might be called pneumo-musculo-excitants; that these means are, chiefly, stimulants, especially the sesquicarbonate and aromatic spirit of ammonia, alcohol, as also tonics as a class, and more particularly nux vomica, iron, cinchona, along with general hygienic measures, the use of embrocations, sponging and friction, and the inhalation of stimulating vapours, so as to excite the afferent branches of the pneumogastric nerve that are spread out upon the mucous membrane of the larynx."

ACIDUM BEZOICUM. *Benzoic Acid.* (Syn.: *Flowers of Benjamin.*) (An acid, $HO,C_{14}H_5O_3$, (=122), obtained from benzoin by sublimation.)

PREPARATION.—Take of benzoin, four ounces. Place the benzoin in a cylindrical pot of sheet iron, furnished with a flange at its mouth; and, having fitted the pot into a circular hole in a sheet of pasteboard, interpose between the pasteboard and flange a collar of tow, so as to produce a nearly air-tight junction. Let a cylinder of stiff paper open at one end, eighteen inches high, and having a diameter of at least twice that of the pot, be now inverted on the pasteboard, and secured to it by slips of paper and flour paste. Pass two inches of the lower part of the pot through a hole in a plate of sheet tin, which is to be kept from contact with the pasteboard by the interposition of a few corks, and let a heat just sufficient to melt the benzoin (that of a gas lamp answers well), be applied and continued for at least six hours that benzoic acid may be sublimed. Let the product thus obtained, if not quite white, be pressed firmly between folds of filtering paper, and again sublimed.

PHYSICAL PROPERTIES.—In the form of soft, elastic, pearl-white, satiny crystals or scales, having a very aromatic odour resembling that of benzoïn, and an acid penetrating taste. Specific gravity, 0·667.

CHARACTERS.—In light feathery crystalline plates, nearly white, and with a strong odour of benzoin; sparingly soluble in water, but readily dissolved by rectified spirit; soluble also in the caustic alkalies and lime, but separating from these on the addition of hydrochloric acid, unless the solution be very dilute.

CHEMICAL PROPERTIES.—Its composition is $C_{14}H_5O_3$, combined in the crystalline state with one equivalent of water. It is permanent in air; at a temperature of 248° fuses, and at 293° sublimes; heated in the open air it produces an acrid white vapour which irritates the fauces; it is very inflammable, and burns with a fuliginous flame, leaving no residue. Benzoïc acid requires 200 parts of cold water, and 20 of boiling water for its solution; it dissolves in 2 parts of cold alcohol or ether, and in a less quantity of acetic acid, or oil of turpentine. It possesses the usual characteristics of a weak acid.

TEST.—When heated it sublimes without any residue.

ADULTERATIONS.—It is not liable to adulteration, but is often badly prepared; when good it is colourless, entirely sublimed by a gentle heat, and completely soluble in solution of potash, or in lime water.

THERAPEUTICAL EFFECTS.—Although formerly highly esteemed as a stimulating expectorant in chronic bronchitis, benzoïc acid is scarcely ever employed in the present day, except in preparing the *Tinctura Opii Camphorata,* and the *Ammoniæ Benzoas.**

* Dr. Ure, of London, a few years ago called the attention of the profession to the chemical change which takes place in the composition of the urine when benzoic acid is taken into the stomach: namely, the conversion of the insoluble *uric acid* and its salts into the soluble *hippuric acid* and *hippurates.* He, therefore, proposed its employment in all cases accompanied by increased secretion of uric acid, as in gout, rheu-

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xxx; it should be dissolved in a large quantity of water, as otherwise it is apt to irritate the fauces; its solubility is much increased by combining it with phosphate or biborate of soda.

INCOMPATIBLES.—Alkalies and their carbonates, metallic salts, etc.

ANTIMONIUM TARTARATUM. *Tartar Emetic* (described in the division *Diaphoretics*), administered in small doses from 1-16th to 1-10th of a grain frequently repeated, operates as an expectorant, but its effects as such are most certainly manifested if it be given so as to produce nausea. It is best adapted for *acute* attacks of inflammation of the substance of the lungs, or of the bronchial mucous membrane.

BALSAMUM PERUVIANUM. *Balsam of Peru.* Myrospermum Pereiræ, *Royle, Mat. Med.* Plate, *Pharm. Journ.*, vol. x., page 282. (A balsam, obtained from the stem by incision; from Salvador in Guatemala.) The late Dr. Pereira investigated with great pains the history of the tree from which this balsam is procured, and in 1850 he received from a merchant residing on the San Sonate coast of San Salvador, in the republic of Guatemala, specimens of the leaves and fruit of the tree by which the balsam is there yielded; it is a variety of Myrospermum before undescribed, which I quite agree with a happy suggestion of the late Dr. Royle should now be named Myrospermum Pereiræ. It belongs to the Natural family *Leguminosæ (Fabaceæ,* Lindley), and to the Linnæan class and order *Decandria Monogynia.* From Dr. Pereira's investigations it would appear that Peruvian balsam is altogether obtained from the district above referred to, and not at all from Peru.

BOTANICAL CHARACTERS.—A lofty, handsome, branching tree, with a smooth, thick, very resinous bark; leaves, alternate, pinnated, consisting of eleven leaflets, which are ovate, blunt, and downy on their midrib and petiole; flowers, white, in axillary racemes; fruit a legume.

PREPARATION.—It is usually stated to be procured in two ways; the finest, which is not met with in British commerce, by incisions made into the bark of the tree; the

---

matism, and calculous disorders. In a case of uric acid gravel, in which I employed benzoïc acid, the deposit in the urine apparently ceased while the use of the acid was continued; but returned to a greater extent than before when its administration was stopped. From the experiments of Keller, Booth, Boyé, and others, it has been shown that benzoïc acid is converted into hippuric acid in the system, and excreted by the kidneys in this form, independent of the presence of uric acid at all in abnormal quantities; the benzoïc acid in its passage through the system abstracting the elements of gelatine sugar, *glycocoll* ($C_4H_5ON_6$), and becoming thereby converted into hippuric acid ($C_{18}H_9ON_6$) and water, thus, $HOC_{14}H_5O_3+C_4H_5ON_6=C_{18}H_9ON_6+2HO$. The secretion of uric acid, therefore, manifestly is not affected either in regard to its quantity or chemical properties by it; whence it results that benzoïc acid cannot be regarded as a remedy for uric acid diseases.

second quality, by boiling the young branches and the bark of the trunk in water: many pharmacologists, however, doubt that any of it is procured by the latter method. Nouvel, who was for many years engaged in collecting balsam of Peru on the Balsam Coast of San Sonate, states that the Indians procure it by inserting cotton rags into large incisions made through the bark of the tree, and lighting a fire around the stem to liquefy the balsam, which, flowing out, saturates the rags; these are afterwards boiled in water, when the balsam falls to the bottom.

CHARACTERS.—A reddish-brown, or nearly black, liquid, translucent in thin films; having the consistence of treacle, a balsamic odour, and an acrid, slightly bitter taste; soluble in five parts of rectified spirit.

PHYSICAL PROPERTIES.—Balsam of Peru, as it occurs in English commerce, is a thick, semi-transparent, heavy liquid, of a blackish colour, with a golden lustre. It has an agreeable aromatic odour, and a warm, bitterish taste. Specific gravity about 1·60.

CHEMICAL PROPERTIES.—According to the analysis of Fremy, it is composed of an oily matter which he has named *cinnameïne*, of *cinnamonic* acid (*Benzoic* acid of previous chemists), and one or more resins. Exposed to the air it becomes more dense, but does not dry up; is inflammable, burning with a bright flame and much smoke, and diffusing a very agreeable smell; it is insoluble in cold water, but water boiled with it acquires its agreeable odour. The balsam is soluble in alcohol in all proportions, but is only partially dissolved by ether.

TEST.—Undergoes no diminution in volume when mixed with water.

ADULTERATIONS.—It is said to be adulterated with alcohol; this fraud is known by its low density, and by its losing volume when mixed with cold water.

THERAPEUTICAL EFFECTS.—Balsam of Peru is a mildly stimulating expectorant, and as such was at one time much employed in chronic bronchitis, in the advanced stages of phthisis, and in old asthmatic cases; it has, however, completely fallen into disuse as an internal remedy. (See, also, *General Stimulants.*)

DOSE AND MODE OF ADMINISTRATION.—Min. xx. to min. xl., suspended in aqueous vehicles by means of mucilage or yolk of egg.

BALSAMUM TOLUTANUM. *Balsam of Tolu.* Myrospermum toluiferum, *DC.* (A balsam, obtained from the stem by incision; from the mountains of Tolu in New Granada.) This tree is a native of the mountainous district of Tolu, Turbaco, and the neighbourhood of the river Magdalena; it belongs to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—Precisely similar to myrospermum peruiferum, except the leaves, which are oblong, acuminated, and smooth upon the petiole and midrib.

PREPARATION.—It exudes in the liquid state from incisions made into the bark of the tree, but it soon concretes on exposure to the air.

PHYSICAL PROPERTIES.—In solid masses of a resinous appearance, and a reddish or yellowish-brown colour. It has a peculiar fragrant odour, more agreeable than the balsam of Peru, and a sweet aromatic taste.

CHARACTERS.—A soft and tenacious solid, with a fragrant balsamic odour; soluble in rectified spirit.

CHEMICAL PROPERTIES—Its composition is the same as that of the balsam of Peru. Balsam of Tolu becomes more solid by exposure to the air, melts by heat, and is inflammable, burning with a fuliginous flame and a very agreeable odour. It is soluble in alcohol and ether; and boiling water dissolves out its fragrant acid.

THERAPEUTICAL EFFECTS.—Balsam of Tolu is a stimulating expectorant, and in consequence of its agreeable flavour, is very much used as an adjunct, in the form of syrup, to pectoral mixtures; but it should not be employed when there is any inflammatory action present.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx.; it is best administered suspended in aqueous vehicles by means of mucilage or yolk of egg.

Syrupus Tolutanus. Syrup of Tolu. (Take of balsam of tolu, one ounce and a quarter; refined sugar, two pounds; distilled water one pint, or a sufficiency. Boil the balsam in the water for half an hour in a lightly covered vessel, stirring occasionally; then remove from the fire, and add distilled water if necessary, so that the liquid shall measure sixteen ounces. Filter the solution when cold, add the sugar, and dissolve with the aid of a steam or water bath. The product should weigh three pounds, and should have the specific gravity 1·330.) Dose, f℈ij. to f℥ss.; merely used as a flavouring adjunct. Tolu lozenges, prepared with the syrup and sufficient gum, are a popular and useful remedy in chronic coughs.

Tinctura Tolutana. Tincture of Tolu. (Take of balsam of tolu, two ounces and a half; rectified spirit, one pint. Macerate for six hours, or until the balsam is dissolved, then filter, and add sufficient rectified spirit to make one pint.) Dose, f℈j. to f℈ij.; it is precipitated when added to water, but may be suspended in water by means of mucilage or syrup.

BENZOINUM. *Benzoïn.* Styrax Benzoïn, *DC.* Plate 12, vol. lxxvii. *Phil. Trans.* (A resinous exudation from the stem; imported from Siam and Sumatra.) A native of Sumatra, Borneo, and Java, belonging to the natural family *Ebenaceæ* (*Styracaceæ*, Lindley), and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A tall tree with rounded branches and a downy bark; leaves entire, pointed, tomentose beneath; flowers in compound axillary racemes.

PREPARATION.—The balsamic exudation is procured by making incisions into the bark of the tree in its seventh year, and allowing the liquid which exudes to concrete

on the stem ; when quite hard it is removed and fresh incisions made, by which an inferior quality is obtained.

CHARACTERS.—In lumps consisting of agglutinated tears, or of a brownish mottled mass, with or without white tears imbedded in it; has little taste, but an agreeable odour; gives off when heated fumes of benzoïc acid, and is soluble in rectified spirit, and in solution of potash.

PHYSICAL PROPERTIES.—Benzoïn occurs in large masses of a reddish-brown colour externally, with a waxy somewhat shining fracture, presenting many whitish amygdaloid tears cemented together by a reddish substance; the inferior qualities contain but few tears, and are of a more uniform reddish-brown colour all through. The French pharmaceutists describe another variety in tears of a pale yellow colour, but it is not met with in the English market. Benzoïn has an agreeable aromatic odour, and a sweet balsamic taste; the odour and taste of the inferior qualities are much less agreeable. Specific gravity about 1·065.

CHEMICAL PROPERTIES.—It is composed of 28 per cent. of resin soluble in ether, 50 of resin insoluble in ether, and nearly 14 of benzoïc acid, with a trace of volatile oil, aromatic extract, etc. (Kopp.) Benzoïn is permanent in the air; heated it fuses and benzoïc acid is sublimed; is inflammable, and burns with a fuliginous flame, and an agreeable odour. It is partly soluble in alcohol, ether, and acetic acid; boiling water dissolves out the benzoïc acid.

THERAPEUTICAL EFFECTS.—Benzoïn is a stimulating expectorant, formerly much used in chronic cough, in old cases of bronchitis, and in the advanced stages of phthisis; in the present day it is not much employed. Like the other stimulating expectorants, it is inadmissible in inflammatory cases.

DOSE AND MODE OF ADMINISTRATION.—It is not used in the solid state. Lately benzoïn has been judiciously suggested by Mr. Erasmus Wilson of London, as an addition to prepared lard, with the view of preventing the lard from becoming rancid when employed as the basis of ointments in the treatment of diseases of the skin.

Tinctura Benzoïni Composita. Compound Tincture of Benzoïn. (Take of benzoïn, in coarse powder, two ounces; prepared storax, one ounce and a half; balsam of tolu, half an ounce; Socotrine aloes, one hundred and sixty grains; rectified spirit, one pint. Macerate for seven days, filter, and add sufficient rectified spirit to make one pint.) A stimulating expectorant, but very rarely indeed employed now-a-days with that view. Dose, f℥ss. to f℥ij. as an adjunct to pectoral mixtures; it is precipitated by water, but may be mixed with water by means of mucilage, yolk of egg, or syrup. This tincture was formerly much employed, before the principles of union by the *first intention* were as well understood as they now are, as an application to wounds and contusions, under the name of *Friar's Balsam.*

IPECACUANHA (described in the division *Emetics*), administered in small but frequently repeated doses, a fourth of a grain to half a grain, acts as an expectorant; but its effects as such are much more surely manifested if nausea be at the some time produced. In some cases of chronic inflammation of the bronchial mucous membrane, accompanied by profuse secretion, it operates beneficially, not by promoting expectoration, but by diminishing the discharge, and by some specific action restoring the parts to a healthy state. In acute or inflammatory diseases of the lungs or bronchial tubes, ipecacuanha to prove beneficial must be given in doses sufficient to produce nausea or even vomiting; but in chronic affections of the same parts more advantage will be derived from smaller doses. As an expectorant, the doses of ipecacuanha and its preparations are as follows:—In *powder*, gr. ¼th to gr. j. *Vinum Ipecacuanhæ*, min. v. to min. xx. *Syrupus Ipecacuanhæ*, f℥j. to f℥ij.

* *Pilula Ipecacuanhæ cum Scillâ.* (Compound powder of ipecacuanha, ℥iij.; squill, fresh bruised; and ammoniacum, bruised, of each, ℥j.; treacle, a sufficiency; beat together till they are incorporated.) The *compound ipecacuan pill* of the former London Pharmacopœia. A useful stimulating expectorant in habitual cough affecting the old and debilitated. Dose, gr. v. three or four times a day. Every five grains contain about a fourth of a grain each of ipecacuan and opium.

LOBELIA. *Lobelia.* (Syn.: *Indian Tobacco.*) Lobelia inflata, *Linn.* Plate 19, *Bigelow's Med. Bot.* (The herb in flower, dried; imported from North America.) A native of the United States, where it is a very common weed, growing on road sides and in neglected fields; it belongs to the Natural family *Lobeliaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Annual, 1–2 feet high, with a branching stem; leaves, scattered, alternate, oblong; flowers, pale blue, in terminal racemes; capsules, ovoid, inflated.

PREPARATION.—The entire herb is collected in the end of August, as soon as the capsules are formed, and carefully dried. It is imported from America compressed into rectangular masses, being prepared for exportation by the Shaking Quakers of New Lebanon in the State of New York.

CHARACTERS.—Stem, angular; leaves, alternate, ovate, toothed, somewhat hairy beneath; capsule, ovoid, inflated, ten-ribbed; herb, acrid. Usually in compressed rectangular parcels.

PHYSICAL PROPERTIES.—Its odour is faint but disagreeable, and the taste at first insipid, but when chewed, very acrid, and resembling that of tobacco, causing, like it, a flow of saliva and a nauseating effect on the stomach.

CHEMICAL PROPERTIES.—According to the analysis of Mr. Proctor, lobelia contains an acrid volatile oil, a peculiar principle named by him *Lobelina*, lobelic acid, gum, resin, fixed oil, chlorophylle, extractive, and various salts. Reinsch, who has since analysed the plant, named the active principle he obtained *Lobeleïn;* he procured it by the successive action of alcohol, ether, and water; it is a shining-yellow hygroscopic substance, he says, nearly analogous to the active principle of tobacco; from its chemical reaction it would, however, appear to be a compound substance. Mr. W. Bastick has more recently ascertained the existence in Lobelia of an alkaloid, which, like Conia, is an oily, transparent, volatile fluid; this he names *Lobelina;* it has the odour of the herb, and a pungent, tobacco-like taste, and in minute doses produces all the marked and poisonous action of the plant. The active properties of lobelia are soluble in water, alcohol, and ether.

THERAPEUTICAL EFFECTS.—Lobelia was employed by the native Indians of North America as an emetic, but its action as such is highly irritating and attended with much danger, for if it fail to excite vomiting soon after it has been taken, it produces all the symptoms of a powerful narcotico-acrid poison, and so small a quantity as a teaspoonful of the powdered leaves has proved fatal in some instances. In small doses, however, it is a most valuable sedative expectorant, apparently possessing a specific power in allaying spasm of the bronchial tubes. It is therefore employed with most benefit in paroxysmal diseases of the lungs, as in asthma and hooping-cough; it has also proved serviceable in the obstinate cough of chronic bronchitis, and in the latter stages of croup. Of late years lobelia has been used as a specific for all diseases by a sect of quacks in England, appropriately named after their leader *Coffinites,* and as a result of their treatment numerous individuals have been poisoned.

DOSE AND MODE OF ADMINISTRATION.—Lobelia may be given in powder, in which form I have found its action to be certain and uniform, acting as a sedative expectorant in doses of from gr. j. to gr. ij. three or four times in the twenty-four hours. From ten to twenty grains cause vomiting, and a larger dose produces extreme prostration. The dose, as an expectorant, is from gr. j. to gr. v.

Tinctura Lobeliæ. Tincture of Lobelia. (Take of lobelia, dried and bruised, two ounces and a half; proof spirit, one pint. Macerate the lobelia for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, min. x. to min. xl.

Tinctura Lobeliæ Ætherea. Ethereal Tincture of Lobelia. (Take of lobelia, dried and bruised, two ounces and a half; spirit of ether, one pint. Macerate for seven days, then press and strain, and add sufficient spirit of ether to make one pint.) Dose, min. x. to min. xl. This preparation is usually preferred in asthmatic cases, in consequence of the sedative properties of the sulphuric ether; but I think I have derived more benefit from prescribing the alcoholic tincture in combination with Hoffman's anodyne liquor. No matter which of its preparations we employ, their effects should be carefully watched.

In cases of poisoning with lobelia, the most active stimulants, both internal and external, should be employed.

* MARRUBIUM VULGARE. *White Horehound.* This plant is now omitted from the British Pharmacopœia, though still retained in many of the Continental; it is indigenous, growing in waste places and by road sides, belonging to the Natural family *Labiatæ* (*Lamiaceæ*, Lindley), and to the Linnæan class and order *Dydynamia Gymnospermia.*

BOTANICAL CHARACTERS.—About a foot and a-half high, everywhere hoary with white thick pubescence or woolliness; flowers, small, white, in crowded whorls.

PROPERTIES.—The whole plant has a peculiar aromatic odour, and a very bitter balsamic taste. Its properties depend on volatile oil and extractive, it also contains tannic acid; it yields its virtues to boiling water and to alcohol.

THERAPEUTICAL EFFECTS.—White horehound was long held in high estimation as a tonic expectorant. In the present day it is commonly employed as a domestic remedy in chronic coughs; but is scarcely ever used in regular practice. It is generally given in the form of infusion, *Horehound tea,* prepared by infusing ℥j. of the herb in Oj. of boiling water for an hour, of which the dose is f℥iij. or f℥iv., sweetened with sugar; or in the form of confection, *Candied Horehound,* prepared by evaporating a strong syrup of the herb to dryness; a small bit of this may be allowed to dissolve in the mouth frequently.

INCOMPATIBLES.—The sesqui-salts of iron, ipecacuanha, and tartar emetic.

SCILLA. *Squill* (described in the division *Diuretics*), in small doses frequently repeated, promotes the secretion of the bronchial mucous membrane; it is not, however, so stimulating an expectorant as has been very generally stated, and may be therefore prescribed in the subacute stages of pulmonary affections as well as in the chronic. It proves more serviceable in the bronchitis and pneumonia of children than in the same diseases in adults. From the property which squill possesses of promoting the secretion of mucus, it facilitates expectoration in some forms of asthma and chronic bronchitis in which the sputa are viscid; in these cases it is advantageously combined with the more stimulating remedies of this class, such as senega, sesquicarbonate of ammonia, &c ; when prescribed with this latter in mixture, the tincture of squill is to be preferred to the syrup, inasmuch as this latter would decompose the ammoniacal salt, in consequence of the acetic acid it contains. The dose of powdered squill as an expectorant should not exceed gr. j. frequently repeated. The oxymel or syrup is one of the most useful expectorants we possess for the pulmonary affections of children, in doses of min. x. to min. xxx. The tincture is employed as an adjunct to pectoral mixtures in chronic bronchial affections; dose, min. x. to min. xxx.

Pilula Scillæ Composita. Compound Squill Pill. (Take of squill, in fine powder, one ounce and a quarter; ginger, in fine powder, one ounce; ammoniac, in powder, one ounce; hard soap, one ounce; treacle, by weight, two ounces, or a sufficiency. Reduce the soap to powder, and triturate it with the squill, ginger, and ammoniac, then add the treacle, and beat into a uniform mass.) Dose, gr. v. to gr. xv. in chronic catarrh and asthma. It spoils by keeping.

* *Syrupus Scillæ Compositus,* UNITED STATES PHARMACOPŒIA. (Squill, bruised; senega, bruised, of each, ℥iv.; tartar emetic, gr. xlviij.; water, Oiv.; sugar, ℔iiss.; pour the water on the squill and senega, boil to one-half, and strain; add the sugar, evaporate the whole to Oiij., and while hot dissolve in it the tartar emetic.) This is the famous *Hive syrup* of the Americans, an excellent formula, particularly adapted for croup and chronic bronchitis in children; dose for adults, f℥j. to f℥ij.; for children, min. v. to min. xv.

SENEGA. *Senega.* (Syn.: *Snake Root.*) Polygala Senega, *Linn.* Plate 103, *Steph. and Church. Med. Bot.* (The dried root; from North America.) A native of the United States; belonging to the Natural family *Polygalaceæ,* and to the Linnæan class and order *Diadelphia Octandria.*

BOTANICAL CHARACTERS.—Root, perennial; stems, numerous, annual, from nine inches to a foot high; leaves, sessile, ovato-lanceolate; flowers, small, white, in spiked racemes; capsule, small, elliptical, containing two minute black seeds.

CHARACTERS.—A knobby root-stock, with a branched tap-root, of about the thickness of a quill, twisted and keeled; bark, yellowish-brown, sweetish, afterwards pungent, causing salivation; interior, woody, tasteless, inert.

PHYSICAL PROPERTIES.—Senega root varies in size from the thickness of a writing pen to that of the little finger, contorted, knotty, and marked with slight eminences on one side; cortical portion resinous, greyish or yellowish externally, whitish internally; central portion (*meditullium*), whitish, woody, inert. It has a faint, peculiar odour, and a taste at first mucilaginous, afterwards nauseous and acrid.

CHEMICAL PROPERTIES.—It is composed of tannic and pectic acids, wax, fixed oil, gum, albumen, colouring matter, lignin, some salts, and a peculiar acrid principle, which, according to Quevenne, consists of two volatile acids, named by him *Polygalic* and *Virgineic* acids, the former of which appears to be the active principle of the plant; its composition is $C_{22}H_{18}O_{11}$. Senega yields its properties both to water and to alcohol; according to some recent observations, it has been proved that by the continued action of boiling water on the root, part of the active principle is formed into an insoluble compound with the colouring matter and albumen; therefore, in the Pharmacopœia we have an infusion judiciously substituted for the decoction of the former pharmacopœias.

THERAPEUTICAL EFFECTS.—Senega root is a stimulating expectorant of much power, peculiarly fitted for the advanced stages of chronic bronchitis and of pneumonia, especially when occurring in the aged and debilitated. It is also a very valuable remedy in protracted hooping cough, and in the latter stages of croup and of bronchitis in infants and children.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.; this is the best form for the administration of senega in the pulmonary affections of children.

Infusum Senegæ. Infusion of Senega. (Take of senega, bruised, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) An excellent vehicle for other stimulating expectorants in cases of chronic catarrh and bronchitis. Dose, f℥i. to f℥ij.

Tinctura Senegæ. Tincture of Senega. (Take of senega, bruised, two ounces and a half; proof spirit, one pint. Macerate the senega for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥j.; *a new preparation.*

STYRAX PRÆPARATUS. *Prepared Storax.* Liquidambar orientale, *Miller's Dict.* Plate, *Pharm. Journ.*, vol. xvi., page 462. (A balsam, obtained from the bark in Asia Minor, purified by means of rectified spirit and straining.) The plant indicated by the Edinburgh College as the source of storax, the *Styrax officinale*, undoubtedly in former times did yield the original storax; it is a native of the Levant, Palestine, and Arabia, and cultivated in the south of Europe; it belongs to the Natural family *Ebenaceæ* (*Styracaceæ*, Lindley), and to the Linnæan class and order *Decandria Monogynia*; but the storax we now meet with is stated to be, on the authority of Mr. Hanbury, the produce of the *Liquidambar officinale*, Nat. fam. *Styracaceæ*.

BOTANICAL CHARACTERS.—Stem, from 15 to 25 feet high, branching at the top; leaves, alternate, ovate, villous beneath; flowers, white in small racemes; fruit, a coriaceous capsule, downy, one-seeded.

PREPARATION.—The process followed for obtaining storax from the tree is described by Mr. Maltass as one of removal of the outer bark, scraping off the inner, and subsequent pressure, with the use of boiling water; the residuary bark is employed in the East as a fumigating agent. For use in medicine and pharmacy the storax of commerce is directed to be purified "by means of rectified spirit and straining," though no more explicit directions are given; this, however, is a convenient course to pursue. "Take any convenient quantity of storax in fine powder; exhaust it by boiling it in successive quantities of rectified spirit; filter the spirituous solutions, distil off most of the spirit, and evaporate the remainder over the vapour-bath to the consistence of thin extract."

PHYSICAL PROPERTIES.—A great many varieties of storax have been described by pharmacologists; two most generally occur in English commerce:—1, *Liquid storax;* of this I have met with two sorts; one a greyish substance of the consistence of bird-lime, with a strong odour having some resembance to that of naphtha, acquiring a dirty brown colour on exposure to the air; the other a shining, black, very viscid liquid, becoming more fluid when heated, with a very agreeable aromatic odour: both sorts have a pungent balsamic taste. 2. *Common storax;* this is in very friable reddish-brown masses, with an agreeable, aromatic odour, and a warm, somewhat acrid taste; it appears to be saw-dust cemented together by some liquid resin.

CHARACTERS.—A semi-transparent brownish-yellow semifluid resin, of the consistence of thick honey, with a strong, agreeable fragrance and aromatic, bland taste. Heated in a test tube on the vapour bath, it becomes more liquid, but gives off no moisture; boiled with solution of bichromate of potash and sulphuric acid, it evolves the odour of hydride of benzule.

CHEMICAL PROPERTIES.—The medicinal virtues of storax depend, according to *Simon*, on the presence of volatile oil, *styrole* ($C_{16}H_8$), *cinnamic acid* ($C_{18}H_7O_3+HO$) frequently confounded with benzoic acid, from which, however, it can be distinguished as hereafter pointed out, *styracine*, and resinous extractive. It yields its active properties to alcohol, but its fragrance merely to boiling water. The production of the odour of hydride of benzule ($C_{14}H_5O_2+H$) is due to the development of oxygen gas from the bichromate of potash by the action upon it of the sulphuric acid (see p. 62), which reacts upon the cinnamic acid, and removes from it four atoms of carbon in the form of carbonic acid, and two atoms of hydrogen as water, thus, $O_8+(C_{18}H_7O_3+HO)=(C_{14}H_5O_2+H)+4CO_2+2HO$. This reaction does not occur with benzoic acid, and thus we distinguish between it and cinnamic acid.

ADULTERATIONS.—No accurate account could be given of the adulterations of storax, so many different substances are sold under that name. The grey liquid storax is manifestly some compound of impure naphtha.

THERAPEUTICAL EFFECTS.—Formerly employed as an expectorant in the same cases as benzoïn; in the present day it is only used as an ingredient in the *Pilula Styracis*, an unofficinal preparation (see *Opium*), to conceal the odour and taste of the opium, and in the *Tinctura Benzoïni composita* of the Pharmacopœia.

CHAPTER XIV.

NARCOTICS.

(Anodynes; Hypnotics; Soporifics.)

NARCOTICS may be defined, medicines which produce a primary stimulating effect on the brain and heart, rapidly followed by depression of the vital powers and sleep; or, if a large quantity of the narcotic be introduced into the system, by coma. The primary stage, that of excitement, varies much both as to the degree in which it is produced and as to its duration; depending chiefly on the peculiar property of the substance employed, on the manner in which it is administered, on idiosyncracy, and on habit. Some of the medicines contained in this class, for example, belladonna, hyoscyamus, and lactucarium, stimulate the nervous system but very slightly; while others, as opium, and Indian hemp, if administered in small doses repeated at proper intervals, are followed by all the effects peculiar to the action of powerful stimulants. But with reference to the latter, even when given in large doses, the stage of excitement is so short, and the depression of vital power so immediate, that it led many to deny altogether the stimulant property of narcotics, and to regard them as producing direct sedative effects on the system. An attentive consideration, however, of the *modus operandi* of the medicinal agents described in this chapter, and a careful comparison with those which are contained in the chapter on Sedatives, must, I think, prove satisfactorily that their operation is perfectly different. Indeed, some narcotics, as opium, are frequently administered with the intention of producing a stimulant action only. When given with this intention the doses should be small, but frequently repeated, in order to sustain the state of excitement; but when administered with the view of producing sleep the doses should be larger, and repeated at more distant intervals. The close connection which exists between narcotics and stimulants is well exemplified in the effects of alcoholic stimulants on the system; to these which are so well known I need not refer here further than to point out the distinction that exists in their mode of operation: stimulants produce narcotism simply by their *ex-*

hausting action on the nervous system, and to cause it they must be given in an overdose; while narcotics have a direct and specific effect on the functions of the cerebro-spinal system of nerves, allaying pain and irritation even before narcotism is produced. All narcotics, however, do not seem, judging from their manifested effects, to act in a similar manner upon the nervous centres. For instance, opium contracts, belladonna dilates the pupil: these two opposite conditions cannot depend upon an identical nervous impression; besides which, we have reason to believe that that class of narcotics which produces contraction of the pupil is absolutely antagonistic in its action to that which produces dilatation, a statement that will be more fully discussed in the ensuing chapter. In a clinical point of view, also, this is a question fraught with interest, inasmuch as if established by more extended observation in disease, reference to the condition of the pupil should materially guide our selection of a narcotic, a point that did not elude the acute observation of Graves. It is, therefore, evident that this class of medicinal agents closely resembles and partakes of the characters of both sedatives and stimulants; and no other proves so distinctly the difficulty of forming a therapeutical classification of the Materia Medica based on true scientific principles; in fact, not here alone, but in medicine generally, science may often be advantageously sacrificed to practical utility. Idiosyncracy has a remarkable influence on the effects of narcotics: we meet with some individuals almost insensible to their action; while in others small doses produce a dangerous stupifying effect, or in some instances give rise to a degree of excitement amounting to furious delirium. But habit influences the action of narcotics on the system more than any other circumstance, their power being diminished in an extraordinary degree by repetition; when, therefore, their continued administration is required, it will be necessary to augment the dose gradually, in order that the usual effects may be produced. The influence of age on their action must be also borne in mind in their administration, the young being much more susceptible to the influence of narcotics than individuals of mature age.

ATROPIA. *Atropia.* (An alkaloid, $C_{34}H_{23}NO_6$ (=289), obtained from Belladonna Root.)

PREPARATION.—Take of belladonna root, recently dried, and in coarse powder, two pounds; rectified spirit, ten pints; slaked lime, one ounce; water, half a fluid ounce;

dilute sulphuric acid, a sufficiency; carbonate of potash, a sufficiency; chloroform, three fluid ounces; purified animal charcoal, a sufficiency; distilled water, ten fluid ounces. Macerate the root in two quarts of the spirit for twenty-four hours, with frequent stirring. Transfer to a displacement apparatus, and exhaust with the remainder of the spirit by slow percolation; add the lime to the tincture placed in a bottle, and shake occasionally several times. Filter, add the dilute sulphuric acid in very feeble excess, and filter again. Distil off three-fourths of the spirit, add to the residue the distilled water, evaporate at a gentle heat, but as rapidly as possible until the liquid is reduced to one-third of its volume and no longer smells of alcohol, then let it cool. Add very cautiously, with constant stirring, a solution of the carbonate of potash so as nearly to neutralize the acid; care, however, being taken that an excess is not used. Set to rest for six hours, then filter, and add carbonate of potash in such quantity that the liquid shall acquire a decided alkaline reaction. Place it in a bottle with the chloroform; mix well by frequently repeated brisk agitation, and pour the mixed liquids into a funnel furnished with a glass stop-cock. When the chloroform has subsided draw it off by the stop-cock, and distil it on a water-bath from a retort connected with a condenser. Dissolve the residue in warm rectified spirit, digest the solution with a little animal charcoal, filter, evaporate, and cool until colourless crystals are obtained.

EXPLANATION OF PROCESS.—The first step is to exhaust the root with spirit, by which proceeding the atropia is removed in combination with its vegetable acid (*Malic Acid*, Brandes); lime takes up this and on filtration it is removed, any excess of lime being removed by the second filtration, whilst the acid converts the atropia into a sulphate; on the first addition of carbonate of potash a yellowish resinous substance (*Belladonnia?*) is precipitated, which otherwise would interfere with the subsequent crystallization of the alkaloid; this is removed by the third filtration directed. On the second addition of carbonate of potash the sulphate of atropia is decomposed and the atropia set free, which is recovered from the mixture by the agnecy of the chloroform, advantage being taken of its solubility in this menstruum which is now to be distilled off, the impure atropia dissolved in spirit, digested with the charcoal to decolorize it, and the solution is finally filtered, evaporated, and allowed to crystallize.

CHARACTERS.—In colourless, acicular crystals, sparingly soluble in water, more readily in alcohol and in ether. Its solution in water has an alkaline reaction, gives a citron-yellow precipitate with terchloride of gold, has a bitter taste, and powerfully dilates the pupil. It is an active poison.

TESTS.—Dissolves entirely in pure ether; leaves no ash when burned with free access of air.

The alkaloid atropia has not been given internally in medicine in consequence of its highly poisonous action, even in very minute doses. It has been used for some years on the continent, particularly in Germany, and more lately in this country, in the treatment of diseases of the eye; Sir W. R. Wilde was the first surgeon in this country to publish his experience of its effects.* He has found a single drop of solution of atropia, No. 1 (*see below*), dropped on

* *Dublin Quarterly Journal of Medical Science*, New Series, vol. 2, page 553, 1846.

the lower lid to dilate the pupil to double its ordinary size, or rather more, in from 5 to 15 minutes after its application; the dilatation lasting for four or five days. Sir W. R. Wilde uses the solution of atropia in the same cases as he would extract of belladonna, over which it possesses the advantages of being much more efficacious and much more cleanly, and of producing neither pain nor irritation when dropped into the eye; it is also free from the objection to which extract of belladonna is liable, that of producing an unpleasant eruption around the eye-brow on which it has been applied. It should, however, be used with caution for these purposes, as a case has been published by M. Chassaignac of Paris, in which three or four drops of a solution made with one part of atropia to 600 parts of water acidulated with acetic acid, dropped into the eye, gave rise to dangerous symptoms of poisoning.

Liquor Atropiæ. Solution of Atropia. (Take of atropia, in crystals, four grains; rectified spirit, one fluid drachm; distilled water, seven fluid drachms. Mix the spirit and the water, and dissolve the atropia in the mixture.) An officinal substitute for Wilde's solutions.

Unguentum Atropiæ. Ointment of Atropia. (Take of atropia, eight grains; rectified spirit, half a fluid drachm; prepared lard, one ounce. Dissolve the atropia in the spirit, add the lard, and mix thoroughly.) A vast improvement on the dirty extract of belladonna for external application round the eye to dilate the pupil; it may, also, be used externally over the seat of pain in any case suited for the application of the extract of belladonna, care being taken that the surface is unbroken.

* *Solution of Atropia,* WILDE. (Atropia, gr. j.; dilute nitric acid, min. j.; rectified spirit, min. iij.; distilled water, f℥j.; mix.) A solution of this strength is labelled No. 1; Nos. 2 and 3 contain respectively two and three grains of atropia.

BELLADONNA. *Belladonna.* Atropa Belladonna, *Linn.* Deadly Nightshade. (Syn.: *Deadly Dwale.*) Plate 79, *Flor. Lond.* (*The leaves fresh and dried, and the fresh branches; gathered when the fruit has begun to form, from wild or cultivated plants in Britain.*)

BELLADONNÆ RADIX. *Belladonna Root.* Atropa Belladonna, *Linn.* (The root dried; imported from Germany.) An indigenous plant, belonging to the Natural family *Solanaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Root fleshy, creeping; stems 3-4 feet high, herbaceous; leaves ovate, acute, entire, smooth, some very large, but placed in pairs of unequal sizes; flowers axillary, on short peduncles, drooping, lurid purple, about an inch long; berries shining black, about the size of a black cherry, filled with a sweetish pulp, in which are imbedded many kidney-shaped seeds.

CHARACTERS.—*Of the Leaves.*—Leaves alternate, three to six inches long, ovate, acute, entire, smooth, the uppermost in pairs and unequal. The expressed juice, or an infusion dropped into the eye dilates the pupil.

PREPARATIONS.—Emplastrum, Extractum, Tinctura, Unguentum.

CHARACTERS.—*Of the Root.*—From one to two feet long, and from half an inch to two inches thick, branched and wrinkled, brownish white. An infusion dropped into the eye dilates the pupil.

PREPARATION.—Atropia, Linimentum.

PHYSICAL PROPERTIES.—Belladonna root is from one to two inches in diameter, and a foot or more in length; is of a grayish-white colour internally, grayish-yellow externally; and has a faint nauseous odour, and a slightly astringent bitter taste. The leaves when fresh are of a sombre-green colour, which becomes yellowish-green in drying; they have a feeble odour becoming slightly fœtid on being bruised, and a herbaceous, somewhat nauseous taste.

CHEMICAL PROPERTIES.—The medical properties of belladonna leaf or root depend on a peculiar principle which has been named *atropia;* an alkaloid of which the chemical history has been already given; it was first discovered by M. Brandes in the leaves, in which he found it to exist in combination with malic acid, two nitrogenous extractive matters called by him *pseudotoxin* and *phytocolla,* gum, wax, chlorophylle, starch, albumen, lignin, salts, &c. Belladonna leaves and root yield their active principles to both water and alcohol.

ADULTERATIONS.—The leaves of the *Solanum nigrum* are sometimes sold for those of the Atropa belladonna; the former are smaller, obtuse angled, not acuminate, and are bluntly toothed, by which characters they may be readily distinguished.

THERAPEUTICAL EFFECTS.—Belladonna acts on the system as a powerful narcotic. In large doses it is an active poison, causing dryness and constriction of the throat with ineffectual efforts to vomit, delirium usually of a gay or mirthful character excessive dilatation of the pupils, and then coma, which is followed by death, unless active treatment be immediately employed. In medicinal doses it operates as an anodyne and calmative, diminishing pain and over-excitement of the nervous system; with this intention it has been employed in most neuralgic and convulsive diseases, but it is not so much used at present in these affections as it formerly was. Its action over the pneumogastric nerve and the parts supplied by it are unequivocal; thus Valentine found that galvanisation of the pneumogastric nerve produced constriction of the trachea and bronchial tubes, but not so in animals poisoned with belladonna; this accounts for the dryness, &c. of the throat already mentioned. It was at one time generally stated by writers on therapeutics, that belladonna should not be employed in acute inflammations or febrile affections, but more recent observations have shown that a state of inflammation in the system does not contra-indicate its use, Brown Séquard stating, "This most powerful remedy has been employed quite blindly in the various forms of paraplegia by French and Italian physicians. The *rationale* of its mode of action is generally so little known that it is often prescribed in those cases in which, instead of being useful, it increases the paralysis." An eminent author of a very learned work on Therapeutics and Pharmacology declares that "it is quite obvious that it (belladonna) should never be employed in cases dependent on congestion, inflammation, or organic lesion of the nervous centres, until this condition shall have ceased entirely, and nothing be left but inertness." The truth is that it is precisely in cases of congestion or inflammation of the spinal cord or of its membranes that belladonna should be used against paralysis. The mistake made by this most able writer depends in a measure upon the general but erroneous opinion that belladonna is a stimulant of the nervous centres. We will not speak here of its action on the brain; but as regards the spinal cord and the spinal nerves, belladonna, far from being a stimulant, acts in diminishing the vital properties of these organs. As we have already said, belladonna is a powerful excitant of blood-vessels, and especially of those of the spinal cord and its membranes. In consequence of this influence, it diminishes the amount of blood in the vertebral canal, and in so doing produces a relative diminution of the vital properties of the spinal cord and its nerves. It is, therefore, in those cases in which these vital properties are increased that belladonna should be employed. The diseases in the treatment of which belladonna is most beneficial are the varieties of neuralgia, and spasmodic and painful affections: thus it has been found especially useful in tic-douloureux, in all forms of *external* neuralgic pains, in nervous palpitations, in hysteria, in epilepsy, in hooping cough, in spasmodic stricture of the urethra, in painful spasm of the *sphincter ani* when there is no fissure of the part, in habitual constipation, in dysmenorrhœa, in orchitis after the acute stage has subsided, in painful glandular enlargements, in chronic arthritis, in the flying pains of rheumatism, and in incontinence of urine in children, in which I have found it of signal service. Its value in the treatment of paraplegia has been variously stated by different practitioners, a fact for which we have a ready explanation in the passage quoted from Brown Séquard. This gentleman thus sums up the indications for its use or non-use:—"First. Belladonna is one of the most powerful and reliable remedies that we may employ, in cases of paraplegia with symptoms of irritation of the motor, sensitive, and vaso-motor or nutritive nerve fibres of the spinal cord, or of the roots of its nerves; in other words, in cases of congestion, meningitis, or myelitis. Second. Belladonna is a most dangerous agent, able only to increase the paralysis, if employed in cases of paraplegia without symptoms of irritation, such as cases of white softening, or of the reflex paraplegia." In all these cases the external employment of the drug is advantageously combined with its internal administration. Belladonna has been used as a prophylactic of scarlatina when that disease rages as an epidemic, and several instances of its apparent success as such were narrated originally in Germany. Later experience has fully confirmed its powers in preventing the spread of this affection, when it breaks out in schools, or where many young persons are congregated together; amongst the most recent investigations on this subject may be cited those of M. Lecointe of Paris, in which 2,227 children and adults had been preserved from scarlatina by its use; those at Langendorf, in Prussia, where in the Orphan Hospital, out of 160 inmates to whom the drug was administered immediately on the breaking out of an epidemic, but two contracted the disease; and those of Dr. Newbigging, in Watson's Institution in Edinburgh, where out of 69 children exposed to the contagion but 3 took the disease; to all of which statements, however, Dr. Warburton Begbie has entered an ably-written *caveat*. Belladonna applied externally in the neighbourhood of the eye, causes, after the lapse of a few hours, dilatation of the pupil unattended with any disturbance of vision; to produce this effect it is employed in the operation for cataract, in iritis to prevent adhesions from forming, and in other ophthalmic affections to enable the posterior chamber of the eye to be examined with greater facility.

DOSE AND MODE OF ADMINISTRATION.—Dose of the powdered leaves, gr. j., which should be increased very gradually until dryness of the throat is produced. As a prophylactic of scarlatina it is given twice a day, in doses of from one-eighth to one-third of a grain, according to the age of the child.

Emplastrum Belladonnæ. Belladonna Plaster. (Take of extract of belladonna, three ounces; soap plaster, one ounce and a half; resin plaster, one ounce and a half. Melt the plasters by the heat of a steam or water bath; then add the extract of belladonna, and mix intimately.) An excellent local application over the sacrum in dysmenorrhœa, and for the relief of neuralgic and other pains.

Extractum Belladonnæ. Extract of Belladonna. (Take of the fresh leaves and young branches of belladonna, one hundred and twelve pounds. Bruise the belladonna in a stone mortar, press out the juice, heat it gradually to 130°, and separate the green colouring matter by a calico filter. Heat the strained liquor to 200° to coagulate the albumen, and again filter. Evaporate the filtrate by a water bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.) Dose, gr. ss. gradually increased to gr. ij. or. gr. iij. This is the preparation usually employed to dilate the pupil, for which purpose it is applied round the eye. To which use, however, may be objected its unseemly appearance, the consecutive eruptions following upon its use, and the slowness of its action. In spasm of the urethra, preventing the introduction of an instrument, the catheter has been smeared with extract of belladonna, but the benefit derived from its use is doubtful. It has been also applied to the os uteri in protracted labour caused by rigidity.

Linimentum Belladonnæ. Liniment of Belladonna. (Take of belladonna root, in powder, twenty ounces; camphor, one ounce; rectified spirit, thirty fluid ounces, or a sufficiency. Moisten the belladonna root with a portion of the spirit, and macerate for seven days; then percolate into a receiver containing the camphor, until the product amounts to one pint.) A very great improvement on the muddy looking liniments formerly made by rubbing up the extract of belladonna with various menstrua.

Tinctura Belladonnæ. Tincture of Belladonna. (Take of belladonna leaves, in coarse powder, one ounce; proof spirit, one pint. Macerate the leaves for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) This tincture has about half the strength of *Tinctura Belladonnæ*, Lond., Dub. Dose, min. x. to min. xxx; f3j. to f3iv. added to f℥iv. of water, or of any liniment, may be used as a lotion.

Unguentum Belladonnæ. Ointment of Belladonna. (Take of extract of belladonna, eighty grains; prepared lard, one ounce. Rub the extract smooth with a few drops of distilled water, then add the lard, and mix thoroughly.) In painful hemorrhoidal affections, in chordee, in orchitis, and in neuralgia.

* *Succus Belladonnæ.* (Prepared by expressing the fresh leaves collected in the beginning of July, setting aside the expressed juice for 48 hours, and adding to the clear decanted liquor a fifth part of rectified spirit.) A good form for administration. Dose, min. xx. to min. xl. gradually increased.

INCOMPATIBLES.—According to some recent observations of Dr. Garrod of London, it would appear that caustic potash and caustic soda when combined with belladonna, hyoscyamus, or their preparations destroy their medicinal activity, but that such effect is not produced by the carbonates or bicarbonates of the alkalies. As regards the action of belladonna on the iris, however, this statement does not hold good, nor am I satisfied otherwise as to their clinical accuracy.

In poisoning with belladonna or atropia, stimulating emetics followed by the use of liquor potassæ, and then active cathartics should be employed, with cold applications to the head, and, if coma be present, ammonia should be administered, and the usual external stimulants applied; such, at all events, until very recently was our routine treatment, but the plan of treating symptoms of poisoning on physiological principles, the first germ of which is to be traced in Graves' suggestion to employ belladonna in the vigilia of fever attended with a contracted condition of the pupil, and which later was fully developed by my distinguished friend Professor Haughton, in his investigations as to the antagonistic properties of strychnia and nicotina, has been most successfully extended to the employment of opium as an antidote to belladonna, and numerous cases confirmatory of its value have been placed on record by Anderson, Lee, Lopez, Bell, Seaton, Wharton, Macnamara, &c. The dose of opium, of course, must depend upon the age of the patient and the quantity of belladonna ingested—the state of the pupil being in every case our guide, and in each instance its use should be preceded by the employment of an emetic either of sulphate of zinc or copper.

CANNABIS INDICA. *Indian Hemp.* Cannabis Sativa, *Linn.* Hemp. Plate 61, vol. x. *Rheede, Hort. Malab.* (The flowering tops of the female plant from which the resin has not been removed, dried; cultivated in India.) According to the most recent observations, it would appear that the Indian hemp is precisely identical in botanical characters with the common hemp of this country, the *Cannabis sativa;* differing only in the secretion of a resin with which it abounds, and which is almost totally absent in the European variety. It grows in India, Persia, and Africa, and belongs to the Natural family *Urticaceæ* (*Cannabinaceæ,* Lindley), and to the Linnæan class and order *Diœcia Pentandria.*

BOTANICAL CHARACTERS.—Annual, about three feet high; stem branching, pubescent, angular; leaves alternate or opposite, digitate, scabrous, on long weak petioles; leaflets linear, lanceolate, sharply serrated; flowers diœcious, in axillary clusters; achenium, ovate, one-seeded.

PREPARATION.—The dried plant and resin are both used, although the latter only was officinal in the Dublin, neither being contained in the London or Edinburgh Pharmacopœias; the former is cut when the plant is in flower, and allowed to dry in the sun for three days, care being taken not to remove the resin; it is called in India *Gunjah (Hachish* or *Hatschich).* In Nepaul, according to Captain Smith, the resin is "extracted from the shrub when the plant is in flower, and its seeds on the point of maturity, it being material to the purity of the extract that the leaf should not be parched or dry. The manipulations of the plant consist in rubbing the leaves gently between the hands until these become sufficiently charged with the juice, which adheres to the palms in the form of a dark, viscid, and tolerably consistent substance; this being removed with a spatula or knife, is made up into balls or lumps, which, while unrefined, are sold under the name of *Churrus;* the clarified Churrus is called *Momes* from its resemblance to wax, and burns with the brightness of a resinous flame."* The following account of its preparation in Central India, as given by O'Shaughnessy, differs somewhat from the foregoing:—"Men clad in leathern dresses run through the hemp fields, brushing through the plant with all possible violence; the soft resin adheres to the leather, and is subsequently scraped off and kneaded into balls; a finer kind is collected with the hand; in some instances the leathern attire is dispensed with, and the resin is gathered on the skins of naked coolies."

CHARACTERS.—Tops consisting of one or more alternate branches, bearing the remains of the flowers and smaller leaves and a few ripe fruits pressed together in masses which are about two inches long, harsh, of a dusky-green colour, and a characteristic odour.

---

* A Narrative of Five Years residence in Nepaul. By Thomas Smith, Assistant Political Resident at Nepaul, from 1841 to 1845. London: 1852, vol. 1, page 72.

PHYSICAL PROPERTIES.—*Gunjah* is sold in bundles about two feet long, and three inches in diameter; it consists of the stems with the leaves and flowers accreted together by the resinous exudation; is of a dusky-green colour, and has an agreeable narcotic odour (as met with in this country, however, the odour is feeble), and a bitter taste resembling that of tobacco. *Churrus*—the officinal extract of the Dublin College—is a hard resin, of a blackish-grey colour, a fragrant narcotic odour, and a bitterish, acrid, slightly warm taste. The leaves and capsules without the stalks are sold in India under the name *Bang, Subjee*, or *Sidhee*; they have been also imported into Britain, but as their medicinal property is very feeble, they should not be employed in the preparation of the extract or tincture.

CHEMICAL PROPERTIES.—The medical virtues of Indian hemp are due to the resin with which it is covered, and which has been named *cannabin*; this principle appears to be a peculiar resin developed on the plant in warm climates only. The herb contains also a small quantity of volatile oil which has not been as yet sufficiently examined. The dried resinous tops of the plant yield to alcohol about 20 per cent. of resinous extract, which is of a darkish red-brown colour; has a rather fragrant narcotic odour resembling that of *Canaster tobacco*, and a bitter, somewhat acrid taste. This resin is nearly all soluble in rectified spirit and in ether. The *churrus* which has been brought from India has an odour and taste nearly similar to that of the well prepared extract.

ADULTERATIONS.—Several specimens of the extract of Indian hemp which I have met with did not possess the peculiar odour or taste of the extract as prepared under my own direction; whether this arose from faulty preparation, or the substitution of some other substance, I cannot say. The true extract is readily known by its peculiar odour and taste.

THERAPEUTICAL EFFECTS.—Although the Indian hemp has been used in Persia, throughout India, and in Africa for many hundred years under the name of *Hachish*, for producing inebriation, and also as a medicine, it has only been of late years introduced into British medicine, through the exertions of Sir William O'Shaughnessy of Calcutta. In its action on the system it is decidedly narcotic, producing at first the effects of a powerful stimulant, which, if the dose taken be sufficiently large, are soon followed by those of a direct sedative. With the object of obtaining relief in a severe neuralgic attack, I took a full dose of the ethereal tincture a few years ago for two nights in succession with the most decided beneficial results; on each night, although I obtained almost immediate relief from pain, I was the subject of singular hallucinations which proved quite satisfactorily to myself the *duality of the brain*. The preparations of Indian hemp have been chiefly employed in the treatment of neuralgic and painful affections, in most of which they have proved very beneficial. Thus they have been given in tetanus, hydrophobia, infantile convulsions, sciatica, chorea, neuralgic pains, and chronic rheumatism; they have been also used to subdue sleeplessness or disturbed rest, provided it does not arise from inflammation of the brain. My friend, Dr. Maguire of Castleknock, has directed attention to its value in small doses in menorrhagia, a statement confirmed by Dr. Churchill's and my own experience. In three cases of this class in which I employed it, it produced curious symptoms resembling mania, the patient in one instance being fortunately arrested in the very act of precipitating herself from a high window. I have derived excellent effects from the administration of the tincture of Indian hemp in the nervous depression and palpitation of persons addicted to the inordinate use of opium, in which cases other stimulants and narcotics possess little, if any, effect. All who have tried the effects of this remedy in the British Isles, have come to the conclusion that the Indian hemp must be given in much larger doses in this country than in the East, and on his return home this was acknowledged by Sir William O'Shaughnessy himself. The trials made with it in the diseases above enumerated would seem to show that Cannabis Indica may be often used with benefit as a substitute for opium, in cases for which that drug is unsuited from idiosyncrasy or any other cause; and also that it does often succeed in abating, sometimes in completely removing pain, where this agent totally fails us. But the conclusion which an impartial observer must draw from the numerous cases in which Indian hemp was used as a remedy, which have been made public since the first edition of this book was published, is that it is an exceedingly uncertain medicine, producing the most manifest narcotic symptoms in some individuals, and in others the very same preparation appearing to be perfectly inert: and my own experience of its use fully justifies this conclusion; yet this may, to a certain extent, depend on the bad preparations of it that were commonly sold—a defect which, now that it has become an officinal drug in the Pharmacopœia, will not be so likely to occur. In consequence of its stimulating properties, the use of Indian hemp is contra-indicated in acute inflammatory diseases.

DOSE AND MODE OF ADMINISTRATION.—The officinal preparations of the drug are the purified extract, and a tincture.

Extractum Cannabis Indicæ. Extract of Indian Hemp. (Take of Indian hemp, in coarse powder, one pound; rectified spirit, four pints. Macerate the hemp in the spirit for seven days, and press out the tincture. Distil off the spirit and evaporate by a water-bath to a proper consistence.) Were this extract *honestly* prepared in its native country and imported here, as was done by Sir Wm. O'Shaughnessy, its active properties would be far more marked. Dose, gr. ss. gradually increased to gr. iv. or gr. v. until a tendency to coma is produced, its effects being carefully watched; gr. ss. to gr. iss. is the dose usually given in the East, and this quantity frequently produces marked symptoms. It is best given in the form of pill.

Tinctura Cannabis Indicæ. Tincture of Indian Hemp. (Take of extract of Indian hemp, one ounce; rectified spirit, one pint. Dissolve the extract of hemp in the spirit.) Each f℥j. contains nearly two grains and three-fourths of a grain of the extract. Dose, min. xx. to f℥j. frequently repeated until the desired effect is produced. This tincture is decomposed by water, the resin being precipitated in the form of a pale yellow powder. It should be therefore suspended in aqueous vehicles, by means of mucilage, syrup, or yolk of egg.

* *Tinctura Cannabis Indicæ*, NELIGAN. (Purified extract of Indian hemp, gr. clx.; sulphuric ether, Oss.; dissolve.) I have found this preparation much more certain in its effects than the alcoholic tincture. The dose is from min. x. to min. xx. repeated at intervals of an hour until the desired effect is produced. It should be suspended in aqueous vehicles by means of mucilage.

HYOSCYAMUS. *Hyoscyamus.* (Syn.: *Henbane.*) Hyoscyamus Niger, *Linn.* Plate 9, *Steph. and Church Med. Bot.*) (The leaves and branches of the indigenous biennial plant, dried; collected when about two-thirds of the flowers are expanded.) An indigenous plant, belonging to the Natural family *Solanaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Annual or biennial; stem much branched, rounded; leaves sub-ovate, amplexicaul, sinuate; flowers nearly sessile, dingy yellow, with purplish veins; capsules 2-celled, many seeded, when the seeds are ripe the upper part falling off like a lid; the whole plant is covered with unctuous fetid hairs.

PREPARATION.—The leaves of the biennial plant alone should be employed; they are to be gathered when the plant is in full flower, and dried quickly at a temperature not above 120°. The London College directed the herb which grows in deposits of rubbish and wild by the wayside to be preferred to that cultivated in gardens.

CHARACTERS.—Leaves sinuated, clammy, and hairy. The fresh herb has a strong unpleasant odour and a slightly acrid taste which nearly disappear on drying.

PHYSICAL PROPERTIES.—Hyoscyamus leaves, when carefully dried, are of a greenish-yellow colour, have a clammy feel, a fetid narcotic odour, and a bitter nauseous taste; in the fresh state the odour and taste are similar but more powerful, and the colour is dull green. The seeds which have been omitted from the Pharmacopœia are ovoid, compressed, rough, of a brownish-yellow colour; they have a feeble narcotic odour, and a bitter, somewhat acrid taste.

CHEMICAL PROPERTIES.—Hyoscyamus leaves contain a narcotic extractive soluble in water and alcohol, bitter extractive, gummy extractive, and salts of magnesia (Lindbergson). M. Brandes announced the discovery of a vegetable alkaloid which he named *hyoscyamia,* in the leaves and seeds of the Hyoscyamus niger, but his statements have not been confirmed by more recent experiments. Runge has, however, shown that this was owing to the employment of a caustic alkali to separate it; and by using magnesia for this purpose he has obtained vegetable alkalies from belladonna, henbane and stramonium, the three of which resemble each other so closely, that there is reason for believing them to be identical. Geiger and Hesse have obtained the alkaloid from the seeds in tufts of transparent silky needles, rather sparingly soluble in water, but freely soluble in alcohol and ether. According to the analysis of Kirshoff, the seeds consist of 28·3 per cent. of volatile and narcotic matter, 15·6 per cent. of fixed oil with some resin, 2·3 per cent. of extractive, with sugar, gum, lignin, albumen, and some salts. The leaves and seeds of the henbane impart their virtues to water, alcohol, ether, and the fixed and volatile oils.

ADULTERATIONS.—The admixture of any other leaves with those of the Hyoscyamus niger may be readily detected by their physical properties, of which the following characters were given in the last edition of the London Pharmacopœia:—"Sessile, oblong, acutely sinuous, sub-pubescent, with viscid, fetid hairs." The leaves lose much of their activity by keeping; they should, therefore, be gathered every year. When henbane is badly preserved, the odour and taste are very feeble.

THERAPEUTICAL EFFECTS.—When taken in large quantity every part of this plant acts as a powerful narcotico-acrid poison, producing delirium, followed by sopor with marked dilatation of the pupil, which, if active treatment be not immediately employed, is the precursor of death. In medicinal doses its operation is narcotic; but it is distinguished from most other medicines of this class by several peculiarities. Thus, the preliminary or stimulant stage of its operation, even when taken in small doses frequently repeated, is very slight, often not at all discernible; and in the second stage of its operation it causes sleep, rather by lessening excitability and allaying pain than by any direct action on the nervous system; under its continued use the bowels also are gently acted on, and do not become constipated, as occurs when opium is taken. In consequence of these properties hyoscyamus is employed with much advantage in many painful diseases, in which from any circumstance the use of opium is objectionable. It is especially found beneficial in sleeplessness or irritability, when the symptoms of pyrexia, as hot skin, thirst, delirium, &c. are present; in all forms of neuralgia and spasmodic affections, where there is great excitability of the nervous system, and in which the stimulating effects of opium would prove injurious; in irritation of the bronchial mucous membrane causing cough; and in diseases of the urinary organs. There are, however, many persons in whom hyoscyamus produces great excitement, head-ache, and even delirium; and in such its use should be carefully avoided. Given in combination with active cathartics, it corrects their griping qualities without diminishing their activity. Externally, fomentations or cataplasms of hyoscyamus are employed to diminish pain in glandular enlargements, painful ulcerations, hemorrhoidal affections, &c. The best preparation for this purpose is the oil of hyoscyamus of the Parisian Codex, the formula for preparing which will be found below.

DOSE AND MODE OF ADMINISTRATION.—In powder, the leaves may be given in doses of from gr. v. to gr. x; or the seeds in doses of gr. iij. to gr. viij.; the following preparations, however, are generally employed:—

Extractum Hyoscyami. Extract of Hyoscyamus. (Take of the fresh leaves and young branches of hyoscyamus, one hundred and twelve pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to 130° and separate the green colouring matter by a calico filter. Heat the strained liquor to 200° to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and stirring the whole assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.) Dose, gr. ij. to gr. x. in the form of pill. Frequently added to purgative pill masses to correct griping.

Tinctura Hyoscyami. Tincture of Hyoscyamus. (Take of hyoscyamus leaves, dried and bruised, two ounces and a half; proof spirit, one pint. Macerate the hyoscyamus for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

* *Succus Hyoscyami.* (Fresh hyoscyamus leaves, any quantity; express the juice with a powerful press, set aside for forty-eight hours, pour off the clear supernatant liquor, and add to it a fifth part of rectified spirit.) This is the best preparation of henbane. Dose, min. xx. to min. xl.

* *Oleum Hyoscyami,* PARIS CODEX. (Fresh hyoscyamus leaves, 500 parts; olive oil, 1000 parts; bruise the hyoscyamus, mix with it the oil, and heat over a very gentle fire until all the water is evaporated; then digest for two hours, and strain with expression.) Used as an external application only.

INCOMPATIBLES.—The vegetable acids; nitrate of silver; acetate of lead; and, according to the experiments of Dr. Garrod, (see page 356) potash and soda, but not their carbonates or bicarbonates.

In poisoning with hyoscyamus, stimulating emetics and the stomach pump should be immediately employed, to be followed by external and internal stimulants, and afterwards blood-letting. Several cases of poisoning with henbane have been published in the Italian journals, in which lemon-juice in large quantity is stated to have proved a complete antidote.

* LACTUCARIUM. *Lactucarium.* (Syn.: *Lettuce Opium. Garden Opium.*) The inspissated juice of Lactuca Sativa, and Lactuca Virosa. Both these species of Lactuca belong to the Natural family *Compositæ* (*Asteraceæ*, Lindley), and to the Linnæan class and order *Syngenesia Æqualis*. The former, though extensively cultivated in the British Isles, was originally introduced probably from the East; the latter is indigenous. Lactucarium may be also obtained from the *Lactuca scariola* and *Lactuca sylvestris*, and according to Aubergier the best is procured from the *Lactuca altissima.*

BOTANICAL CHARACTERS.—*Lactuca sativa* is an annual; stem erect, smooth, cylindrical, branching above, 1-2 feet high; leaves rounded, or ovate, more or less wrinkled, generally sheathing at the base, of a pale green colour; flowers pale yellow, small, in terminal corymbs. *Lactuca virosa* is a biennial; stem erect, prickly, 3-4 feet high; leaves distant, patent, oblong, toothed, two-eared and amplexicaul at the base, their keel prickly; flowers small, yellow, in panicles.

PREPARATION.—As soon as the flowering stem of either of these plants shoots up, it abounds in a white milky juice, which did not before exist; this juice, when dried spontaneously, constitutes *lactucarium* or *lettuce-opium.* It is obtained by slicing off the flowering head before the flowers expand, collecting the milky juice which exudes, and removing a fresh slice of the stem as long as it yields any white juice. It has been omitted from the Pharmacopœia. The recent investigations of Mr. Duncan, of Edinburgh, have shown that the Lactuca virosa yields three times as much lactucarium as the garden lettuce, and that its quality also is superior. The milky juice exists in the leaves as well as in the flowering stem of the wild, but not of the garden lettuce.

PHYSICAL PROPERTIES.—Lactucarium is met with in large, roundish, rough masses, of an umber-brown colour; it has a narcotic odour, which though much fainter, closely resembles that of opium, and a disagreeable, bitter taste.

CHEMICAL PROPERTIES.—Lactucarium consists of a peculiar neutral bitter crystalline principle *(Lactucin)*, mannite, asparagine, a crystallizable matter which colours the persalts of iron green, an electro-negative resin combined with potash, a simple resin, wax, myricine, ulmic acid, pectin, albumen, numerous salts (Aubergier). Of these the *Lactucin* is the active principle; it appears to be to lactucarium what morphia is to opium; is slightly soluble in cold but more so in boiling water, is also soluble in alcohol, but is insoluble in ether; it is a crystallizable, resinoid, bitter substance. By heat lactucarium softens, and is partially fused; it is inflammable, and burns with a white flame. It yields its virtues partially to cold or boiling water, but more completely to alcohol.

THERAPEUTICAL EFFECTS.—Lactucarium, in its operation on the system, resembles opium in many respects, but it produces scarcely any excitement, consequently it may be employed as a substitute for that drug in cases in which a stimulant action is objectionable. It is, however, very uncertain in its operation, and in many persons, even when given in very large doses, does not produce any effect. Lactucarium has been principally employed as an anodyne in phthisis, but when its use has been continued for even a comparatively short period, I have found it to lose its powers of producing rest, although the quantity given was much increased. Lactucarium has been also employed as a narcotic in febrile and inflammatory affections, in rheumatism, in arthritis, and in nervous disorders, where opium is contra-indicated from any cause.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx. in the form of pill.

LUPULUS. *Hop.* Humulus Lupulus, *Linn.* Plate 41, *Steph. and Church. Med. Bot.* (The dried catkins of the female plant, cultivated in England.) Scarcely indigenous, probably introduced from Holland; it belongs to the Natural family *Urticaceæ* (*Cannabinaceæ,* Lindley), and to the Linnæan class and order *Diœcia Pentandria.*

BOTANICAL CHARACTERS.—Stems, long, weak, and climbing, scabrous; leaves, petiolate, 3-5 lobed, serrated, veiny, rough; flowers, greenish-yellow.

PREPARATION.—The aggregated fruits, *catkins* or *strobiles*, when preserved, constitute the hops of commerce; they are gathered in September, picked, and dried in kilns.

CHARACTERS.—Scales of a greenish-yellow colour, with an adherent golden-yellow powder (Lupuline) at their base; odour aromatic, taste bitter.

PHYSICAL PROPERTIES.—Hops occur in the form of thin, papery, greenish-yellow scales, variously veined, and sprinkled with a golden-yellow powder; they have a peculiar aromatic odour, and an aromatic, very bitter taste, which are altogether due to this powder, which has been termed *Lupulin*, *Lupuline*, and *Lupulite;* if it be carefully removed, the scales have no longer either odour or taste.

CHEMICAL PROPERTIES.—The medical efficacy of hops is due to the *lupulin;* it constitutes about a sixth part of good hops, and may be readily obtained in a separate state by rubbing and sifting, as formerly directed by the Dublin College. The scales are composed of astringent matter, inert colouring matter, chlorophylle, gum, lignin, and salts of potash and lime, with some adhering *lupulin* (Payen and Chevallier). Lupulin is in the form of a coarse greenish-yellow powder, of a cellular texture; it consists of 2 per cent. of volatile oil, 10·3 of bitter principle (*lupulite*), 50 to 55 of resin, 32 of lignin, &c. According to the recent chemical investigations of M. Personne, it appears that the volatile oil of Lupulin is homologous with oil of valerian, from which he argues an analogy between the therapeutical action of valerian and of hops. Hops and lupulin yield their active properties to both water and alcohol.

THERAPEUTICAL EFFECTS.—Much difference of opinion exists as to the therapeutical properties of hops; they are generally stated to be narcotic, but from the experiments made with them on animals, by Magendie and others, it would appear that this effect is not manifested when they are given internally, no matter how large the dose. Nevertheless, the inhalation of the aroma of hops acts decidedly narcotic, frequently producing sleep in the restlessness and watchfulness of mania and other nervous affections, when opium and other narcotics have completely failed: to produce this effect a pillow stuffed with hops is generally employed. Lupulin has been more employed in the United States than in this country; and amongst the American physicians it bears the character of being a useful narcotic. Dr. Page, of Philadelphia, states that he has found it of especial value in chordee, and his statement has been corroborated by some recent French writers, who also speak very highly of its powers in checking nocturnal seminal emissions. The solution of the bitter principle of the hop in malt liquors serves to make them keep better, and also confers on them aromatic and tonic properties.

DOSE AND MODE OF ADMINISTRATION.—*Lupulin*, gr. vj. to gr. xij. in powder or pill; if the hop possesses any narcotic property, it must be concentrated in this substance. I have frequently administered, with decided advantage, ten grains of it mixed with a tumblerful of sound ale, as a sedative, a short time before the patient's retiring to rest.

Extractum Lupuli. Extract of Hop. (Take of hop, one pound; rectified spirit, one pint and a half; distilled water, one gallon. Macerate the hop in the spirit for seven days, press out the tincture, filter, and distil off the spirit, leaving a soft extract. Boil the residual hop with the water for one hour, then express the liquor, strain, and evaporate by a water bath to the consistence of a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140° to a proper consistence.) Dose, gr. v. to gr. xx.

Infusum Lupuli. Infusion of Hop. (Take of hops, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for two hours, and strain.) A mild sedative bitter, fit only for being a menstruum for more active medicines. Dose, f℥j. to f℥iv.

Tinctura Lupuli. Tincture of Hop. (Take of hop, two ounces and a half; proof spirit, one pint. Macerate the hop for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥j. to f℥iij.

INCOMPATIBLES.—Mineral acids; and the salts of iron, lead, mercury, and silver.

*MORPHIA. *Morphia. An alkaloid* ($C_{34}H_{19}NO_6+2HO=303$) *on which the medicinal activity of opium chiefly depends.* Morphia was contained in the last edition of the Dublin Pharmacopœia, and a process given for its preparation; but, inasmuch as it is no longer officinal, and still more so as the reader will get a sufficient insight into the method by which it can be procured in the Pharmacopœial process for making *Morphiæ Hydrochloras*—in fact, as will be seen on reference to it, morphia being actually the alkaloid primarily produced in that process—I have not thought proper to reproduce here any process for its manufacture; as, by doing so, I would only unnecessarily be repeating myself.

PHYSICAL PROPERTIES.—Morphia is in the form of a white crystalline powder, the crystals being very minute, hard, and brilliant; but by solution in boiling alcohol and slow evaporation they may be obtained much larger; their primary form being right rhombic prisms. They are inodorous, but have a sensibly bitter taste.

CHEMICAL PROPERTIES.—Morphia, in the crystalline state, consists of $C_{34}H_{19}NO_6+2HO=303$; but the proportions of carbon and hydrogen have been variously stated by different chemists. It is permanent in the air, fusible by heat, but by a high temperature is decomposed; is inflammable, burning with a bright flame and a peculiar odour, and leaving a carbonaceous residuum. Morphia requires 100 parts of water to dissolve it, the solution possessing an alkaline reaction; is insoluble in ether, but dissolves in forty times its weight of cold, and in thirty times its weight of boiling alcohol; is very soluble in solution of caustic potash, soda, or lime water, and but feebly so in ammonia. The best characteristic of morphia and its salts is the property which they possess of striking a deep greenish-blue colour with the solution of a persalt of iron made as nearly neutral as possible; it also gives an orange-red colour with nitric acid, and a brownish-red with iodic acid. This last, according to Serullas, is the most delicate test for morphia, as the smallest quantity of it deoxidizes the iodic acid, setting its iodine free; if a small quantity of starch be added at the same time, the blue colour produced by the iodine with it will make the test more sensitive.

THERAPEUTICAL EFFECTS.—On account of its insolubility morphia is not used in medicine; its therapeutical effects, therefore, will be more conveniently considered when treating of the muriate of morphia, the most frequently employed of its salts. The dose of the pure alkaloid would be from one-fourth to one-half of a grain in the form of pill.

* MORPHIÆ ACETAS. *Acetate of Morphia. A crystalline salt prepared from opium.*

PREPARATION.—Take of morphia, in fine powder, ℥j.; rectified spirit, f℥viij.; acetic acid of commerce (specific gravity, 1044), f℥ivss. or as much as is sufficient. Pour the spirit on the morphia, and, applying heat, gradually add the acetic acid until a neutral or slightly acid solution is obtained. Let this be evaporated to the consistence of syrup by a steam or water bath, and then set by for a few days until it solidifies. In operations on the great scale it will be worth while to remove the spirit by distillation.

PHYSICAL PROPERTIES.—As usually met with, acetate of morphia is a grayish-white powder, sometimes obscurely crystalline; when pure, however, it is snow-white and in distinct crystals. It is inodorous, but when moistened emits a feeble odour of acetic acid; its taste is intensely bitter.

CHEMICAL PROPERTIES.—It is composed of one equivalent of acetic acid and one of morphia. Exposed to the air it loses a portion of its acid, and is then partially insoluble in water; it is decomposed by heat, and dissipated without any residuum. Acetate of morphia is very soluble in water and in alcohol. When the base is not completely saturated with acid, its solution in water may be readily accomplished by adding a few drops of acetic acid.

ADULTERATIONS.—When the salt is properly prepared it is of a snow-white colour, and readily soluble in water. The following test of the Edinburgh Pharmacopœia, which indicates the exact quantity of morphia that ought to be present, guards against the adulteration with any other white powder:—"One hundred measures of a solution of gr. x. in f℥ss. of water, and min. v. of acetic acid heated near to 212°, and decomposed by a faint excess of ammonia, yield by agitation a precipitate which in twenty-four hours occupies 15·5 measures of the liquid." The characteristics and tests for acetate of morphia given in the last edition of the London Pharmacopœia are as follows:—"Soluble in water and rectified spirit; by distilling off the spirit it will be obtained in crystals which are dissipated by heat; on the addition of nitric acid it first becomes red, then yellow; tincture of sesquichloride of iron imparts to it a blue colour: on the addition to it first of recently prepared chlorine and then of ammonia, a brown colour is produced which disappears on more chlorine being added: morphia is precipitated by solution of potash, which, if added in excess, redissolves the precipitate."

THERAPEUTICAL EFFECTS.—The uses of this preparation are precisely similar to those of the muriate to be next described; the latter salt should be in general preferred, as it is more easily prepared, keeps better, and is usually more pure.

DOSE AND MODE OF ADMINISTRATION.—Gr. ¼th to gr. ss. in pill, or in solution as follows:—

* *Morphiæ Acetatis Liquor*, D. L. ("Take of acetate of morphia, gr. lxxxij.; rectified spirit, f℥v.; distilled water, f℥xv. Having added the spirit to the water, dissolve the acetate of morphia in the mixture, and, if the solution be not quite clear, pass it through a paper filter, D." "Acetate of morphia, ℥iv.; acetic acid, min. xv.; distilled water, Oj.; proof spirit, Oss.; mix and dissolve," L.) The acetic acid is added to the London Pharmacopœia to render the solution more complete. The strength of the Dublin preparation is intended to be equivalent to tincture of opium; f℥j. contains $4\frac{1}{10}$ths grains of acetate of morphia; f℥j. containing a little more than gr. ss. Dose, min. xx. to min. xl. That of London is double this

strength, each f℥j. containing gr. j. of acetate of morphia: its dose, therefore, is from min. x. to min. xx. (See *Morphiæ Murias*.)

* *Syrupus Morphiæ Acetatis*, D. (Take of solution of acetate of morphia, one fluid ounce; simple syrup, fifteen fluid ounces; mix with agitation.) f℥j. contains a little more than a fourth of a grain of the acetate intended as a substitute for syrup of white poppies (which see).

INCOMPATIBLES.—The stronger acids; the alkalies and alkaline earths; most earthy and metallic salts; and astringent vegetable infusions and decoctions.

MORPHIÆ HYDROCHLORAS. *Hydrochlorate of Morphia.* Syn.: *Morphiæ Murias*, Ed., Dub. (The hydrochlorate of an alkaloid, $C_{34}H_{19}NO_6$, $HCl+6HO$ ($=375{\cdot}5$), prepared from opium.)

PREPARATION.—Take of opium, sliced, one pound; distilled water, a sufficiency: chloride of calcium, three-quarters of an ounce; solution of ammonia, a sufficiency; purified animal charcoal, a quarter of an ounce; dilute hydrochloric acid, two fluid ounces, or a sufficiency. Macerate the opium for twenty-four hours with two pints of the water, and decant. Macerate the residue for twelve hours with two pints of the water, decant, and repeat the process with the same quantity of the water, subjecting the insoluble residue to strong pressure. Unite the liquors, evaporate on a water bath to the bulk of one pint, and strain through calico. Pour in now the chloride of calcium previously dissolved in four fluid ounces of distilled water, and evaporate until the solution is so far concentrated that upon cooling it becomes solid. Envelope the mass in a double fold of strong calico, and subject it to powerful pressure, preserving the dark fluid which exudes. Triturate the squeezed cake with about half a pint of boiling distilled water, and, the whole being thrown upon a paper filter, wash the residue well with boiling distilled water. The filtered fluids having been evaporated as before, cooled, and solidified, again subject the mass to pressure; and if it be still much coloured, repeat this process a third time, the expressed liquids being always preserved. Dissolve the pressed cake in six fluid ounces of boiling distilled water; add the animal charcoal, and digest for twenty minutes; filter, wash the filter and charcoal with boiling distilled water, and to the solution thus obtained add the solution of ammonia in slight excess. Let the pure crystalline morphia which separates as the liquid cools be collected on a paper filter, and washed with cold distilled water until the washings cease to give a precipitate with solution of nitrate of silver acidulated by nitric acid. From the dark liquids expressed in the above process an additional product may be obtained by diluting them with distilled water, precipitating with solution of potash added in considerable excess, filtering, and supersaturating the filtrate with hydrochloric acid. This acid liquid digested with a little animal charcoal, and again filtered, gives upon the addition of ammonia a small quantity of pure morphia. Diffuse the pure morphia, obtained as above, through two fluid ounces of boiling distilled water placed in a porcelain capsule kept hot, and add, constantly stirring, the dilute hydrochloric acid, proceeding with caution, so that the morphia may be entirely dissolved, and a neutral solution obtained. Set aside to cool and crystallize. Drain the crystals, and dry them on filtering paper. By further evaporating the mother liquor, and again cooling, additional crystals are obtained.

EXPLANATION OF PROCESS.—On referring a few pages further on to the observations on opium, the reader will perceive that it is indeed a very complex substance, containing, amongst other principles, the following, which only at present interest us:—morphia, narcotina, and codeia, in combination with meconic and sulphuric acids, in the form of meconates and sulphates. In the present process (a combination of several processes suggested by different authorities) advantage is taken of the solubility of the morphia salts and of the insolubility of narcotine in water, and by digesting opium in this menstruum we get meconate and sulphate of morphia in solution, associated with some codeia. On the addition of chloride of calcium double decomposition ensues, meconate and sulphate of lime are precipitated, and hydrochlorate of morphia held in solution. On evaporation we get a solid mixed mass of all these ingredients; and on treating it with water, the hydrochlorate of morphia is dissolved out. This process is repeated two or three times, the mass each time being subjected to powerful pressure, to expel the colouring principle, and then treated with animal charcoal still further to decolourize it; ammonia is now added, which, uniting with the hydrochloric acid, precipitates the morphia, care being taken not to add it in excess, else it would redissolve the morphia, which at this stage is separated also from the codeia, which is not precipitated by ammonia. The morphia being now treated with hydrochloric acid, the solution yields, on cooling, crystals of hydrochlorate of morphia.

PHYSICAL PROPERTIES.—Muriate of morphia is usually met with in the form of a fine, soft, snow-white powder; but it may be readily obtained in feathery, acicular crystals. It is without odour, but has an intensely bitter, peculiar taste.

CHARACTERS.—In white, flexible, acicular prisms, of a silky lustre, not changed by exposure to the air, and soluble in water and spirit. The aqueous solution gives a white curdy precipitate with nitrate of silver, and a white one with potash, which is redissolved when an excess of the alkali is added. Moistened with strong nitric acid it becomes orange-red, and, with solution of perchloride of iron, greenish-blue.

CHEMICAL PROPERTIES.—It is composed of one equivalent of morphia, one of hydrochloric acid, and (in the crystalline state) six of water of crystallization. It is permanent in the air, is fusible by heat, and by a red heat is decomposed and totally dissipated. Muriate of morphia requires for its solution from 14 to 20 parts of cold water, but is soluble in less than its own weight of boiling water; it is also readily dissolved by alcohol. The white precipitate produced by nitrate of silver is chloride of silver, and that with potash is morphia; the other characters require no explanation.

TESTS.—Entirely destructible by heat, leaving no residue. 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 the air, weighs 15·18 grains.

ADULTERATIONS.—The chief impurities which are at present commonly met with in this salt are colouring matter and moisture, both of which arise from faulty preparation; recently, however, muriate of morphia has been adulterated with so much as 25 per cent. of white sugar, a serious fraud in so active and so important a medicine. The tests of the Pharmacopœia guard against these as well as any other contaminations; the crystalline precipitate being morphia, and the quantities indicate in accordance with the chemical equivalents.

THERAPEUTICAL EFFECTS.—Notwithstanding the observations of many, that morphia is free from the stimulating effects of opium, and that it acts purely as an anodyne sedative, it would appear that it possesses essentially, though perhaps not quite identically, the actions of the drug itself (see *Opium*). Thus, given in small doses, its first effect is to cause a feeling of excitement of the circulation, and, in some persons, of the nervous system also; the stage of excitement, however, is never so distinctly marked as when opium has been taken, and sedative effects are more immediately consequent on it. Morphia and its salts will, in some persons, but not in so many individuals, produce the disagreeable subsequent feelings of nausea and head-ache caused by opium; but constipation, sweating, or dryness of the tongue very rarely follows their employment. There are two effects occasionally produced by morphia and its salts, when taken in medicinal doses, evidently dependent on idiosyncracy, which are not caused by opium, namely, a peculiar sensation of itchiness over the whole surface of the body, in some cases attended even with a cutaneous eruption, and irritability of the bladder, accompanied by a difficulty in voiding urine; the latter symptom is most distinctly marked when any of the salts of morphia have been taken in full doses. The salts of morphia may be employed in most instances to fulfil the same intentions as opium and its preparations, which will be fully considered when treating of that drug. We prefer their use to that of opium, where the drug itself is apt to disagree; when from any cause we wish to employ it without the knowledge of our patient; or where our intentions will be best answered by applying the remedy to the denuded dermis, as in certain local affections, especially those of a nervous character. The insertion of a few drops of a concentrated solution of muriate of morphia in creasote or in water, into the areolar tissue over the seat of the pain, has been practised with much success in the treatment of sciatica, tic douloureux, and various neuralgic pains; an instrument for the purpose was invented many years ago by the late Mr. Rynd, of this city, and is manufactured by Messrs. Weiss, of London, but it may be performed nearly as effectually by means of a common lancet. Like opium, the salts of morphia lose their effect by repetition, and consequently the dose must be gradually increased.

DOSE AND MODE OF ADMINISTRATION.—The dose of the muriate of morphia is from gr. ¼th to gr. ss.; after it or the acetate has been employed for any length of time, so large a dose as gr. viij. to gr. x. will be required to act as a narcotic. When applied endermically, the cuticle is to be removed by means of a blister, and gr. j. to gr. ij. sprinkled over the denuded dermis. The salts of morphia can be also introduced into the system by inoculation with a lancet dipped in their aqueous solution; the punctures may be made on the anterior part of the fore-arm, and half a grain inserted will generally produce sleep.

Liquor Morphiæ Hydrochloratis. Solution of Hydrochlorate of Morphia. (Take of hydrochlorate of morphia, four grains; dilute hydrochloric acid, eight minims; rectified spirit, two fluid drachms; distilled water, six fluid drachms. Mix the hydrochloric acid, the spirit, and the water, and dissolve the hydrochlorate of morphia in the mixture.) This solution contains half as much morphia as liquor morphiæ hydrochloratis, *Lond.* Each drachm contains half a grain of hydrochlorate of morphia; it is the same strength as that in the last edition of the Dublin Pharmacopœia. Dose, min. x. to f3j.

Suppositoria Morphiæ Morphia Suppositories. (Take of hydrochlorate of morphia, three grains; refined sugar, thirty grains; prepared lard, a sufficiency; white wax, a sufficiency. Melt thirty grains of the lard and the same quantity of the wax in a water bath, and, having removed the vessel, mix them thoroughly with the hydrochlorate of morphia and the sugar previously rubbed together. When the mixture has solidified, divide the mass into twelve equal portions, to be formed into cones, which are to be allowed to stand till they acquire sufficient firmness. Dip each cone into a mixture of three parts of wax and eight of lard, melted together in the water bath, and set aside in a cool place that the coating may become hard.) Each of these contains gr. ¼ of morphia.

Trochisci Morphiæ. Morphia Lozenges. (Take of hydrochlorate of morphia, twenty grains; tincture of tolu, half a fluid ounce; refined sugar, in powder, twenty-four ounces; gum arabic, in powder, one ounce; mucilage of gum arabic, two fluid ounces, or a sufficiency; boiling distilled water, half a fluid ounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and, with the gum and the sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains 1-36th of a grain of hydrochlorate of morphia. They are principally used to allay tickling cough; one at a time may be taken occasionally during the day until fifteen or twenty of them are consumed.

Trochisci Morphiæ et Ipecacuanhæ. Morphia and Ipecacuan Lozenges. (Take of hydrochlorate of morphia, twenty grains; ipecacuan, in fine powder, sixty grains; tincture of tolu, half a fluid ounce; refined sugar, in powder, twenty-four ounces; gum arabic, in powder, one ounce; mucilage of gum arabic, two fluid ounces or a sufficiency; boiling distilled water, half a fluid ounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and with the ipecacuan, the gum and the sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains 1-36th of a grain of hydrochlorate of morphia, and 1-12th of a gr. of ipecacuan. Dose and uses same as last.

* *Syrupus Morphiæ Muriatis*, D. (Take of solution of muriate of morphia, one fluid ounce; simple syrup, seventeen fluid ounces. Mix with agitation.) There seems to have been some mistake in these proportions, for while the officinal solution of acetate of morphia was supposed to be of the same strength as that of the muriate, the syrup of the latter was more diluted. Each fluid ounce and a drachm contains gr. ¼ of muriate of morphia; it was meant for and may be used as a substitute for the syrup of white poppy (which see).

* MORPHIÆ SULPHAS. *Sulphate of Morphia.* ($C_{34}H_{19}NO_6,SO_3,6HO = 379$.) This salt, not often used in this country, bears a high character in America, where it is officinal. It is prepared by mixing morphia with distilled water, and adding diluted sulphuric acid till it is saturated and dissolved. It occurs in snow-white feathery crystals soluble in water. The dose is the same as that of the muriate, over which it does not possess any advantage.

INCOMPATIBLES.—Alkalies and alkaline earths; most earthy and metallic salts; and astringent vegetable infusions and decoctions.

OPIUM. *Opium.* Papaver somniferum, *Linn.* (The inspissated juice; obtained by incision from the unripe capsules grown in Asia Minor.) Probably originally a native of Asia, Egypt, and the south of Europe, but now growing wild, and extensively cultivated in most parts of the world; it belongs to the Natural family *Papaveraceæ*, and to the Linnæan class and order *Polyandria Monogynia.*

BOTANICAL CHARACTERS.—Annual; stem, erect, cylindrical, branched, glaucous-green, 2–6 feet high; leaves, amplexicaul, alternate, undulated, incised, ovato-oblong, glaucous beneath; flowers, large, terminal, pendulous before expansion, with two deciduous sepals, and four petals, generally white, with a purple eye, some varieties red or dark-purple; capsules, obovate or globose, smooth, many-seeded; seeds, small, roundish or reniform, oily.

PREPARATION.—Opium is obtained from the capsules of the poppy by a nearly similar process in all parts of the world in which it is prepared:—A few days after the petals fall off, incisions are made horizontally and obliquely with some sharp instrument, through the epicarp and sarcocarp of the capsule, taking care not to penetrate the cavity. In India the incisions are made *perpendicularly*, in the form of a series of parallel wounds, on the exterior surface of the capsule, with an instrument called a *nushtur*, which consists of four or five heart-shaped lancets or blades, tied together with cotton thread. A white milky juice exudes from the incisions in drops; and this is allowed to remain on the poppy head for twenty-four hours, each poppy head yielding on an average two grains of opium. The thickened exudation is then scraped off, and deposited in earthen or wooden vessels, in which it is assiduously stirred until the different collections made are thoroughly inspissated, water or saliva being sometimes added to keep up the moisture, the latter of which is supposed by the natives to prevent fermentation. The opium is finally dried without heat, usually by exposure to the sun, first in small cakes, afterwards in large masses, and in most places wrapped in poppy leaves to prevent them from adhering.

CHARACTERS.—Irregular lumps, weighing from four ounces to two pounds; enveloped in a poppy leaf, and generally covered with rumex seeds; when fresh, plastic, tearing with an irregular, slightly moist, chestnut-brown surface, shining when rubbed smooth with the finger, having a most peculiar odour and nauseous bitter taste.

PHYSICAL PROPERTIES.—The opium met with most commonly, at present almost entirely, in British commerce, is called TURKEY OPIUM, and is brought principally from Smyrna, a small quantity occasionally coming direct from Constantinople. SMYRNA OPIUM occurs in irregularly rounded lumps, varying in weight from a few ounces to two or even three pounds, the most general size being from a pound and a half to two pounds. When first imported it is usually so soft as to be readily imprinted with the fingers, but it quickly becomes hard by keeping. Each lump is covered externally with the reddish winged seeds of some species of *Rumex*, and the inferior sorts usually with poppy leaves also ; it is of a brownish colour, and has a waxy lustre when cut ; its odour is strong and narcotic, and its taste bitter, acrid, and nauseous. CONSTANTINOPLE OPIUM—rarely met with—occurs in small flattened cakes covered with a poppy leaf, but without any *Rumex* seeds. It is hard, and of a hair-brown colour ; its odour and taste are more feeble than the preceding sort. EGYPTIAN OPIUM also sometimes occurs in the British market, but for some years it has been very scarce, in consequence of the demand being slight, owing to its inferior quality. It is in flattened round cakes, from 3 to 8 ounces in weight, each cake being wrapped up in a poppy leaf, with the midrib of which it is indented ; it varies much in consistency, some pieces being very soft and others tolerably hard; but most of them attract moisture from the air so as to become soft by keeping. It has a reddish-brown colour ; its odour and taste are comparatively feeble. EAST INDIAN OPIUM is not an article of British commerce, being manufactured chiefly for the Chinese market. For specimens of the different sorts usually prepared, I am indebted to the kindness of Professor Christison, of Edinburgh, and to Mr. Johnson, formerly assistant opium inspector at the great factory of Behar. Three kinds are commonly met with; BENGAL OPIUM, which includes that prepared at the factories of Behar and Benares, GARDEN PATNA and MALWAH OPIUM. *Bengal Opium* occurs in large round balls from three to four pounds weight, surrounded with a thick envelope of poppy petals firmly agglutinated together. The contained opium is quite soft and of a blackish colour; the odour and taste are purely opiate; it is prepared in large quantity for the Chinese market, and is usually of very fine quality. *Garden Patna Opium* is in flat square cakes, from three to four inches square, and about half an inch thick; while still soft, it is closely enveloped in thin plates of mica, which firmly adhere to it. It has a reddish-brown colour, homogeneous throughout, and a rather agreeable strongly opiate odour. *Malwah Opium* is in flattened, round cakes, five or six inches in diameter; it is hard and brittle, covered externally with a coarse, greyish dust; internally it is of a light-brown colour, and has a shining fracture; its odour is much more feeble than that of Garden Patna Opium. Opium was also formerly prepared in England of very fine quality, but owing to the losses which were sustained from the uncertainty of our climate, the cultivation of the poppy with that intention is now quite abandoned. It is at present prepared in some parts of France and of Germany, for the purpose of procuring morphia from it. A variety of opium under the name of *Persian Opium* is described as having been imported some years since from Trebizond on the Black Sea; it was in cylindrical sticks about six inches long, and half an inch in diameter, wrapped separately in paper; it was of a pale brown colour, had an opiate, somewhat musty odour, and an intensely bitter taste; it appeared to be a very inferior article. Opium has also been recently imported into France from the neighbourhood of Algiers; it is described as resembling closely the best specimens of Smyrna opium; and the cultivation of the poppy there for the purpose of supplying France with opium is being gradually brought into full operation. Of the different varieties of opium above described, the finer qualities of Turkey opium are to be preferred for medical purposes.

CHEMICAL PROPERTIES.—According to the most recent, as well as the most complete analyses that have been made of opium, the substances of which it is composed appear to be the following:—*Morphia, codeia, narcotina, thebaina or paramorphia, narcein, meconin, porphyroxin or opine, meconic acid, sulphuric acid, gum, albumen, resin, fixed oil, a trace of volatile oil (its odorous principle), lignin, caoutchouc, extractive matter, and numerous salts of inorganic bases.* The first eight are peculiar principles found only in opium; they may be conveniently classed as follows, with respect both to their chemical and physiological properties; but I should state that a great difference of opinion exists amongst chemists as to the nature, composition, and number of the peculiar principles which exist in opium:—

SUBSTANCES.	MEDICAL PROPERTIES.
1.—ALKALOIDS.	
Morphia ($C_{34}H_{19}NO_6$)	Narcotic.
Codeia ($C_{36}H_{21}O_6N$)	Narcotic.
Narcotina ($C_{46}H_{25}O_{14}N$	Bitter; resembling Quina.
Thebaina ($C_{38}H_2O_6N$)	Stimulant; resembling Strychnia.
2.—NEUTRALS.	
Narcein $C_{46}H_{29}O_{18}N$)	Inert.
Meconin ($C_{10}H_5O_4$)	Inert.
Porphyroxin ($C_{66}H_{36}O_{23}N$)	Inert.
3.—ACID.	
Meconic Acid ($C_{14}HO_{11}$)	Inert.

The constituents of opium are partially soluble in water, either warm or cold, about a third being left undissolved, which consists chiefly of a dark viscid substance resembling caoutchouc and narcotin; they are more soluble in alcohol and ether, but a small portion is still left undissolved. The watery infusion is of a dark-brown colour, and has an acid reaction. It is precipitated by the alkalies and alkaline earths when not added in excess; by the soluble salts of iron and of lead, by the salts of lime and magnesia, by tincture of galls, and by all astringent vegetable matters. Of the different substances above enumerated as existing in opium, the only one of importance in relation to medicine is *morphia*, which has been already described; it exists in opium combined with meconic and sulphuric acids, in the proportion of from 2 to 8 per cent. according to the quality of the drug. *Codeia* has been used in France, where it is much preferred by Magendie and others as a narcotic; it is stated to be about half the strength of morphia. *Narcotina* was at one time generally believed to be the stimulating principle of opium; but more recent investigations, especially those of Sir W. O'Shaughnessy of Calcutta, have shown that it is completely devoid of any stimulant or narcotic properties, and that, like quina, it is capable of arresting the paroxysms of remittent and intermittent fevers: more than 160 cases of ague, successfully treated with narcotina by himself and others, have been published by this physician. *Thebaina*, from Magendie's experiments, appears to be a powerful poison, one grain injected into the jugular vein, or placed in the pleura, acts like strychnia, causing tetanus and death in a very short time. *Meconic acid* produces a deep cherry-red colour with the persalts of iron; and this forms one of the most important characteristics of opium in medico-legal researches.

TESTS.—Take of opium one hundred grains, slaked lime, one hundred grains, distilled water, four ounces. Break down the opium, and steep it in an ounce of the water for twenty-four 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 twenty-four 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 six to eight grains.

ADULTERATIONS.—Opium is very extensively adulterated, and also varies exceedingly in quality, in consequence of the mode in which it is prepared. Many of the impurities which exist in opium may be detected by a careful physical examination: such as moisture, sand, stones, leaves, woody fibre, pieces of metal, seeds, &c. But by external characters it is very difficult to judge accurately of the quality of opium, and the only sure criterion is to ascertain the quantity of morphia contained in a given specimen of the drug; this may be effected by the process of the Pharmacopœia, which is a modification of one originally proposed by M. Payen, which is very simple in execution, accurate in its results, and the principles of which will be understood by reference to the remarks on the mode of preparation of the hydrochlorate of morphia.

THERAPEUTICAL EFFECTS.—In excessive doses, opium is a powerful narcotic poison, producing soon after it is taken giddiness and stupor, with scarcely any previous excitement; the stupor increases rapidly, accompanied by complete torpor, slowness of breathing, depressed circulation, general relaxation of the muscles, and contracted pupils; and, unless active treatment be speedily employed, death quickly ensues. The countenance in the early stages is florid and congested; in the later, pale and ghastly. In medicinal doses, opium generally produces at first excitement of the vascular system, which is accompanied by exhilaration of the nervous functions; these effects are marked by an augmented force and frequency of the pulse, with increased heat of the body, and by pleasurable sensations which are experienced throughout the whole system. Soon after, unless the dose be repeated, the sedative influence of the drug becomes obvious; the general excitement is calmed, pain is diminished, a disinclination to muscular exertion produced, and the force of external impressions on the senses diminished; this state is succeeded by sleep more or less profound, which lasts usually from six to eight hours. On awaking from the sleep produced by opium, nausea, head-ache, loss of appetite, and indisposition to any active exertion are very generally experienced.

The effects of opium are modified by a variety of circumstances, but most remarkably of all by habit. This is well exemplified by a reference to the customs of some eastern countries, as Turkey, Persia, and China, where the drug is commonly employed to produce a species of intoxication or excitement. In the two former countries the opium is eaten, in the latter it is smoked; but in either way the quantity used must be increased daily, or it ceases to produce the desired effect. Instances of opium-eating occur also constantly in the British Islands; and a graphic account of the effects produced by this pernicious habit, as experienced by himself, is given by Mr. De Quincy in his *Confessions of an English Opium-eater*. Amongst the Turks, the *Theriaci* (opium-eaters) generally begin with doses of from one to two or three grains, and increase the quantity gradually till it amounts to two, three, or in many instances to six drachms. In this country, too, it is taken in immense quantities by opium-eaters, f℥iij. of laudanum being a common daily allowance; and in some instances, where the vice has been long indulged in, from half a pint to a pint is the quantity taken. These facts should be borne in mind by the medical practitioner, as opium-eaters when labouring under disease require of course very large doses of the drug; and in all persons, where the use of opium has been continued for any length of time, the dose must be gradually increased.

Individuals are also occasionally met with on whom, although unaccustomed to its use, opium produces but little effect. Christison mentions an instance of "a gentleman of his acquaintance, who, though not accustomed to its use, has taken 450 drops of the best laudanum without any other effect than some head-ache and constipation; and singularly enough, his son, at the age of six, took 60 minims of solution of muriate of morphia without any apparent effect." In others, we see a very opposite state of sensibility to the operation of this drug, the sixth or eighth of a grain being a sufficient dose; this extreme sensibility to the action of opium is almost invariably met with in infants and young children; opiates must therefore be employed with great caution in the treatment of their diseases, one drop of laudanum frequently proving a dangerous dose for a child a few weeks old.

The effects of opium are moreover much influenced by disease, as will be evident when I come to speak of the special uses of the drug.

Lastly, by combination with other remedies, the operation of opium is greatly modified. Thus, with antimonials or ipecacuanha its narcotic influence is much diminished, and the diaphoretic powers of these substances remarkably increased; with astringents, as catechu, kino, or chalk, their properties are augmented, while narcotism is not readily produced; and with aromatics or camphor the stimulant effect of the drug is in general only manifested.

The special uses of opium in the treatment of disease are so very numerous, that I can only subjoin a concise account of the most important of them; mentioning the peculiar circumstances by which its employment is demanded or contra-indicated. In *fevers*, opium is principally used to procure sleep when there is great watchfulness or delirium present, without excitement of the vascular system, or when they persist after that excitement has been subdued by antiphlogistic treatment. Its effects, however, must be carefully watched, and its use should not be persisted in if the tongue and skin become dry, or if the pupil of the eye be contracted. The combination of tartar emetic with opium, as first proposed by the late Dr. Graves, will often be found particularly useful in fevers attended with much cerebral disturbance. In the *eruptive fevers*, opium when given with due attention to the concomitant symptoms is productive of much benefit, nay, is sometimes imperatively demanded for the safety of the patient; about the eighth or ninth day of the eruption in smallpox great cerebral disturbance frequently comes on, at first marked by throbbing of the carotids; if opium be not administered immediately on the appearance of this symptom, it is in most instances quickly followed by delirium, coma, and death. In *intermittent fever*, opium given in a large dose at the commencement of the cold stage frequently arrests the paroxysm; if there is any local inflammation or congestion present, its use, however, is contraindicated.

In *inflammatory diseases*, given in conjunction with calomel, it acts as a powerful antiphlogistic; one grain of opium, with two or three of calomel, administered every four or five hours, will be often found a remedy of much power in the inflammations of *membranous* parts: it does not, however, in general prove so useful in the inflammation of the *parenchymatous structure* of organs. In *diffuse inflammation*, particularly that fatal form of it which is accompanied by *periostitis*, opium is the most successful remedy which can be employed: it is best given alone in doses of from a quarter of a grain to half a grain every hour or every second hour. Its beneficial influence in this affection depends upon its power of lessening "irritability," and thereby enabling the system to bear up against the disease. After bleeding, either general or local, according to circumstances, at the very commencement of an acute attack of *gastritis, enteritis, peritonitis, cystitis*, &c., a full opiate, 60 to 80 drops of the tincture, or from 2 to 3 grains of solid opium, will often arrest the further progress of the disease. In *peritonitis*, caused by rupture of the stomach or intestinal canal, life can be prolonged for even a short period only by the use of very large doses of opium; and in the same disease, when it attacks debilitated constitutions, or the old and feeble, thus given it is the remedy most to be depended on. In the early stages of *acute dysentery*, opium in full and frequently repeated doses will be found in general to check the disease; the same may be also stated of *diarrhœa* and *common cholera*.

In *acute rheumatism*, when administered as proposed by Dr. Corrigan, it is in some cases productive of the happiest results; to prove useful in this disease, it must be given freely, one grain every second hour, and after a few doses every hour, and this treatment continued for five or six days, or until the disease is subdued; thus employed, it does not cause either dryness of the tongue, headache, or constipation; the duration of the attack is shortened; and the dangerous complications of endocarditis and pericarditis to a great extent prevented. To allay the pain of *gout* and *chronic rheumatism*, it is given in full doses with much advantage.

In *delirium tremens*, opium is the remedy on which most reliance is to be placed; to prove beneficial, it should be employed in very large doses frequently repeated; thus, two or three grains of solid opium must be administered every third or fourth hour. The addition of tartar-emetic to the opium, as originally proposed by Professor Law, will generally be found productive of benefit in cases of delirium tremens, where opium alone fails to do good. It is more beneficial in *hydrophobia* and in some cases of *tetanus* than any other agent which has been yet employed; in these affections there is a remarkable insensibility to the action of the drug, so that it must be given in very large doses to procure any good result.

In *rupture of the uterus*, given immediately and freely, opium has in some instances saved the life of the patient, and in the treatment of uterine hemorrhage it also proves very beneficial, even when the bleeding proceeds from organic disease.

In *spasmodic* and *convulsive diseases*, opium is also a highly important remedy; as in spasm of the ureter or gall duct from the passage of calculi, in spasmodic stricture, in colic, &c. In all the varieties of neuralgia or other painful affections; in the nervous irritability which follows large losses of blood; in senile gangrene; in cancer; in painful ulcerations; in poisoning with acrid or corrosive substances, &c., opium is very generally employed as a palliative and anodyne. In the treatment of ulcers of every class, I have found its use, as originally suggested by Mr. Skey, singularly beneficial in predisposing them to heal; in phagedenic ulcerations we have no drug on which equal dependence can be placed. It has been also found a most useful adjunct to animal diet in the treatment of *diabetes*. And lastly, in *venereal diseases* it is combined with mercurials to prevent them from running off by the bowels.

Externally, opium is used in the form of infusion, liniment, or plaster; the uses of the two latter will be described amongst the pharmaceutical preparations of the drug. The infusion is applied to recent burns, or inflammation of the skin from other causes; a solution of gr. xij. each of powdered opium and of acetate of lead, infused separately in f℥iv. of tepid water, mixed and strained, forms an excellent lotion in these cases. In *chronic ophthalmia*, or where the inflammation is of a subacute character from the commencement, wine of opium dropped into the eye is found an excellent remedy. Suppositories of opium are placed in the rectum in tenesmus and in painful or spasmodic affections of the neighbouring viscera. Opium has been, in fine, introduced into the urethra to alleviate or overcome certain painful or obstinate affections, such as strangulated hernia, violent colics, especially the nephritic form—ischuria, and spasmodic stricture. Riberi speaks in the strongest terms of this practice of employing the drug,—from two to six grains being the quantity used; he states that it is quite immaterial whether the opium is merely introduced into the urethra or reaches the bladder.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. ss. to gr. iij. or gr. iv., usually given in the form of pill, which may be made with simple mucilage, or, if the pills are to be kept for any time, conserve of roses.

PREPARATIONS.—Morphiæ Hydrochloras (p. 368), Emplastrum, Enema, Extractum, Extractum liquidum, Linimentum, Pilula, Pilula Plumbi cum Opio (p. 109), Pulvis Cretæ aromaticus cum Opio (p. 85), Pulvis Ipecacuanhæ cum Opio (p. 243), Pulvis Kino cum Opio (p. 103), Tinctura, Tinctura Camphoræ cum Opio, Trochisci, Vinum, Unguentum Gallæ cum Opio (p. 96).

Emplastrum Opii. Opium Plaster. (Take of opium, in very fine powder, one ounce; resin plaster, nine ounces. Melt the resin plaster by means of a steam or water bath; then add the opium by degrees, and mix thoroughly.) Applied as a local remedy in painful affections.

Enema Opii. Enema of Opium. (Take of tincture of opium, half a fluid drachm; mucilage of starch, two fluid ounces. Mix.) Used as an anodyne in irritable states of the bowels and painful affections of the bladder, rectum, &c. On the Continent it is generally stated that opium acts much more energetically when administered in the form of an enema than when given by the mouth—an opinion based rather upon theoretical grounds than clinical observation, and traceable to the idea that, inasmuch as absorption is a venous process, and that large veins are situated here, therefore absorption should go on with greater energy in the rectum than in the stomach. The contrary to this opinion is held by many British practitioners, some of whom, in my opinion injudiciously, employ three or four times the quantity when administered by the rectum; of course very different results will ensue if the enema be introduced into an empty rectum, or one loaded with fæces; but, *cæteris paribus*, the action of opium appears to me to be as energetic, or very nearly so, in one situation as in the other.

Extractum Opii. Extract of Opium. (Take of opium, in thin slices, one pound; distilled water, six pints. Macerate the opium in two pints of the water for twenty-four hours, and express the liquor. Reduce the opium to a uniform pulp, macerate it again in two pints of the water for twenty-four hours, and express. Repeat the operation a third time. Mix the liquors, strain through flannel, and evaporate by a water bath to a proper consistence.) Dose, same as *Pulvis Opii.*

Extractum Opii Liquidum. Liquid Extract of Opium. (Take of extract of opium, one ounce; distilled water, seventeen fluid ounces; rectified spirit, three fluid ounces. Digest the extract of opium in the water for an hour, stirring frequently; filter, and add the spirit. The product should measure one pint.) Dose, same as *Tinctura Opii.*

Linimentum Opii. Liniment of Opium. (Take of tincture of opium, two fluid ounces; liniment of soap, two fluid ounces. Mix.) *Anodyne liniment*, used as an embrocation for local pains, but far inferior to *Linimentum Belladonnæ.*

Pilula Opii. Opium Pill. (Take of opium, in fine powder, half an ounce; hard soap, two ounces; distilled water, a sufficiency. Reduce the soap to a fine powder, add the opium with the water, and beat into a uniform mass.) Each five grains contain one of opium. Dose, gr. ij. to gr. x.

Tinctura Opii. Tincture of Opium. (Take of opium, in coarse powder, one ounce and a-half; proof spirit, one pint. Macerate the opium for seven days, strain, express, and filter; then add sufficient proof spirit to make one pint.) Dose, min. v. to f℥j.

Tincturæ Camphoræ cum Opio. Camphorated Tincture of Opium. (Syn.: *Paregoric Elixir.*) (Take of opium, in coarse powder, forty grains; Benzoic acid, forty grains; camphor, thirty grains; oil of anise, half a fluid drachm; proof spirit, one pint. Macerate for seven days, strain, express, and filter, then add sufficient proof spirit to make one pint.) A favourite remedy in chronic catarrh and bronchitis; the oil of aniseed is an important ingredient, experiment having demonstrated that, without it, it is not so effectual. Dose, min. xx. to f℥ij.

Trochisci Opii. Opium Lozenges. (Take of extract of opium, seventy-two grains; tincture of tolu, half a fluid ounce; refined sugar, in powder, sixteen ounces; gum arabic, in powder, two ounces; extract of liquorice, six ounces; boiling distilled water, a sufficiency. Add the extract of opium, first softened by means of a little water, and the tincture of tolu, to the extract of liquorice heated in a water bath. When the mixture is reduced to a proper consistence remove it to a slab, add the sugar and gum, previously rubbed together, and mix thoroughly. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains one-tenth of a grain of extract of opium. They may be used in any case requiring the use of opium, the dose being regulated by attention to the quantity of opium contained in each lozenge, and the exigency of the case.

Vinum Opii. Wine of Opium. (Take of opium, in powder, one ounce and a half; sherry, one pint. Macerate for seven days, strain, express, and filter; then add sufficient sherry to make one pint.) This preparation is more agreeable both in smell and taste than laudanum; it is, however, seldom employed internally, being chiefly used as an application to the eye in chronic ophthalmia, for which it was originally suggested by Ware. This formulary differs from his in not containing *aromatics*, an important omission in the opinion of many ophthalmic surgeons, consequently I introduce one containing them:—"Opium, ℥iij.; cinnamon, in moderately fine powder, and cloves bruised, of each, ʒiiss.; sherry, Oij.; digest for seven days, and filter," E.

* *Acetum Opii*, D.E. ("Take of opium, in coarse powder, ℥iss.; dilute acetic acid, Oj.; macerate for seven days in a close vessel, with occasional agitation; then strain with expression and filter," D. "Opium, ℥iv.; distilled vinegar, f℥xvj.: triturate the opium, cut into small fragments, into a pulp with a little of the vinegar, add the rest of the vinegar, macerate in a closed vessel for seven days, and agitate occasionally, then strain, express strongly, and filter the liquors," E.) This preparation of opium is preferred by many to laudanum, in consequence of its primary stimulating action being less marked, and therefore being less apt to occasion the subsequent disagreeable effects of the drug. The preparation of the Dublin Pharmacopœia is the same strength as laudanum; of that of Edinburgh about twenty drops are equivalent to thirty of the tincture of opium. Dose (D.), min. x. to min. xxx.; E.) min. viij. to min. xxv.

* *Pilula Styracis Composita*, L. *Pilulæ Styracis*, E. "Prepared storax, ʒvj.; opium, powdered; saffron, of each, ʒij.; pound together to form a mass," L. "Extract of storax, two parts; opium; and saffron, of each, one part; beat them into a uniform mass which

is to be divided into four grain pills," E.) Every five (four, E.) grains contain one grain of opium. The storax and saffron completely conceal the odour and taste of the opium, and the name enables us to prescribe the drug without the knowledge of our patients, a matter often of very great importance; consequently I have retained the formulary.

* *Tinctura Opii Ammoniata*, E. (Benzoïc acid; and saffron, chopped, of each, ʒiij.; opium, sliced, ʒij.; anise-oil, ʒss.; spirit of ammonia, Oj.; digest for seven days, and filter.) This preparation is called in Scotland *Scotch Paregoric;* it is used as an anodyne and antispasmodic. The active matter of one grain of opium is contained in eighty minims, or about 150 drops (Christison). Dose, fʒj. to fʒij.

* *Unguentum Opii*, L. (Opium, powdered, ℈j.; lard, ℥j.; rub together.) Used to allay pain in inflamed parts and irritable sores; it should be applied with caution, as opium is rapidly absorbed from the surface of the body when denuded of the cuticle.

* *Black Drop.* (Opium, sliced, ℔ss.; expressed juice of the wild crab, Oiij.; nutmegs, bruised, ℥iss.; saffron, ℥ss.; boil to a proper consistence, then add of pure sugar, ℥iv.; yeast, two spoonfuls; set the whole in a warm place near the fire for six or eight weeks, then place it in the open air until it becomes a syrup; and lastly, decant, filter, and bottle it, adding a little sugar to each bottle.) This preparation resembles the old *Acetum Opii;* it is highly prized by many practitioners, and is said not to produce the disagreeable subsequent effects of most of the other preparations of the drug. It is more than twice the strength of laudanum, but of late years it has been very irregularly prepared, is found to vary much in its strength, and is consequently uncertain in its operation. Moreover, it is not now to be met with in the shops, prepared according to the original secret formula.

* *Liquor Opii Sedativus*, COOLEY. (Dry opium, in powder, one part; clear washed sand, two parts; mix and moisten with water; put the mass into a percolator, and pass distilled water heated to 70° F. through the ingredients till it passes both tasteless and colourless. Evaporate the liquor over the water-bath to the consistence of a hard pill extract. Take of this extract, ℥iij.; distilled water, f℥xxx.; boil for two minutes, let it cool and filter; then add of rectified spirit, f℥vj.; and distilled water, a sufficiency, to make up Oij.) This preparation, similar to Battley's sedative solution—a favourite with many practitioners—is about the same strength as laudanum, than which it is said to be less stimulating.

INCOMPATIBLES.—The alkalies and lime water, unless they are added in excess; the carbonates of the alkalies; acetate and diacetate of lead; sulphates of iron, copper, and zinc; arsenite of potash; corrosive sublimate; and all astringent vegetable preparations.

In cases of poisoning with opium, the use of the stomach pump and of emetics, such as sulphate of zinc or of copper, should immediately be had recourse to; external stimulants, such as cold affusion, loud talking, compelled exertion, as forcing the patient to walk between two assistants, the application of ammonia or strong acetic acid to the nostrils, etc. should be employed; internal stimulants, the best of which are brandy, ammonia, and its carbonate, strong coffee, camphor, and musk, administered; and if all other remedies fail, artificial respiration and galvanic shocks made use of, the assiduous application of which has in some almost hopeless cases restored life; in one instance on record, artificial respiration was kept up for nearly three hours, and no matter how successful our treatment may for the time appear, on no account should the patient be allowed to go asleep for some hours afterwards, inasmuch as the poison is absorbed, and present in the blood, and may eventually prove fatal. I know of one case where a valuable life was lost from inattention to this point.

PAPAVER. *Poppy Capsules.* Papaver somniferum, *Linn.* White Poppy. Plate 185, *Woodv. Med. Bot.* (The nearly ripe capsules, dried and deprived of the seeds; cultivated in Britain.) This plant has been described in the last article; the heads are most active when gathered before they are quite ripe, as was directed by the Edinburgh College; they should be dried in the sun.

PHYSICAL PROPERTIES.—They are globular, about the size of an apple, crowned with a persistent, sessile, many-rayed stigma; their structure is thin and fragile; they have a feeble narcotic odour, and a weak somewhat bitter taste. They contain many bland seeds, which yield by expression a yellowish fixed oil.

CHEMICAL PROPERTIES.—Poppy heads contain a very minute proportion of the different substances found in opium, with a large quantity of woody fibre. They yield their virtues to cold and boiling water, and to spirit.

THERAPEUTICAL EFFECTS.—Any medical virtues which poppy-heads possess depend on the presence of a small quantity of opium, they are consequently apt to vary much in strength. They are chiefly used in the form of decoction as a fomentation to inflamed or painful parts. The following preparations are officinal :—

Decoctum Papaveris. Decoction of Poppies. (Take of poppy capsules, bruised, and freed from the seeds, four ounces; distilled water, three pints. Boil for ten minutes and strain. The product should measure thirty-two ounces.) This is one of our most favourite anodyne stupes. I do not approve of the directions to reject the *seeds*, inasmuch as, though destitute of anodyne properties, they possess a bland, mucilaginous principle, very soothing to an inflamed surface. The addition to each half-pint of this decoction of half an ounce of laudanum and one hundred and twenty grains of *carbonate of potash*, much increases its efficacy; the carbonate of potash evidently acting as a detergent, removing the oleaginous secretions of the skin in the form of a soap, and thus bringing the anodyne into more immediate proximity with the cuticle. For this most practical suggestion I am indebted to Professor Hargrave.

Syrupus Papaveris. Syrup of Poppies. (Take of poppy capsules, bruised and freed from seed, thirty-six ounces; boiling distilled water, twenty pints; rectified spirit, sixteen fluid ounces; refined sugar, four pounds. Macerate the poppy capsules in the water, in a water bath, kept hot, for twelve hours. Then evaporate all the water except that absorbed by the capsules, press strongly, 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 specific gravity 1·320.) This preparation is exceedingly apt to ferment and spoil on keeping; hence the direction to add spirit. It is also frequently prepared by adding tincture of opium to simple syrup, a proceeding that gives rise to great variety in its strength; hence I prefer the syrups of morphia formerly officinal in the Dublin Pharmacopœia. Dose, f℥ss. to f℥iv.

RHŒAS. *Red-poppy Petals.* Papaver rhœas, *Linn.* Plate 186, *Woodv. Med. Bot.* (The petals, dried; from indigenous plants.) *The Red or Corn Poppy.* Indigenous; belonging to the Natural family *Papaveraceæ*, and to the Linnæan class and order *Polyandria Monogynia.*

BOTANICAL CHARACTERS.—A slender annual, 2–3 feet high; stem, bristly, many flowered, its bristles and those of the flower stalks spreading; leaves, pinnatifid; flowers, with broad, deep scarlet petals; capsules, glabrous, nearly globose.

CHARACTERS.—When fresh, scarlet, and of a heavy poppy odour; when dry, scentless, and more dingy red.

PROPERTIES.—The petals should be collected immediately after their expansion, as they drop off easily; they should be dried quickly, so as to preserve their colour. In the recent state, red poppy petals are of a rich scarlet colour, which becomes darker by drying; they have a feeble odour of opium, and a slightly bitter taste. They consist of a vegetable albumen, red colouring matter, astringent matter, soft resin, wax, gum, and some salts (Beetz and Ludurg). It is probable that they also contain a trace of morphia. They yield their colouring matter and other principles to boiling water.

THERAPEUTICAL EFFECTS.—The petals of the red poppy probably possess some feeble narcotic properties, but they are used in medicine in the form of syrup, only as colouring ingredients, in consequence of their fine rich colour.

Syrupus Rhœados. Syrup of Red Poppy. (Take of red poppy petals, thirteen ounces; refined sugar, two pounds and a-quarter;

distilled water, one pint, or a sufficiency; rectified spirit, two fluid ounces and a half. Add the petals gradually to the water heated in a water bath, frequently stirring, and afterwards, the vessel being removed, macerate for twelve hours. Then press out the liquor, 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 loss in the process, so that the product shall weigh three pounds ten ounces, and should have the specific gravity 1·330.) In consequence of its great tendency to ferment when prepared without it, spirit is introduced into this syrup. It is only used as a colouring agent.

STRAMONII FOLIA. *Stramonium Leaves.* Datura Stramonium, *Linn.* Plate 124, *Woodv. Med. Bot.* (Syn.: *Apple of Peru, Devil's Apple, Jamestown Weed, Thorn Apple.*) (The leaves dried; collected from plants cultivated in Britain when they are in flower.)

STRAMONII SEMINA. *Stramonium Seeds.* Datura Stramonium, *Linn.* The ripe seeds, indigenous, belonging to the Natural family *Solanaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A herbaceous annual; stem much branched, forked, spreading, leafy; leaves ovate, angulato-sinuate, glabrous; flowers, axillary, large, erect, white; fruit, an ovate capsule, erect, clothed with numerous nearly equal spines, four celled at the base, two celled at the summit, many seeded.

PREPARATION.—The whole herb should be collected when the plant is in flower, and carefully dried as quickly as possible with a gentle heat. The leaves should be removed from the stem and branches, which are to be rejected. The seeds when fully ripe are black, and should be then gathered.

CHARACTERS.—*Of the Leaves.*—Large, ovate, sinuous, deeply cut, of a heavy odour, strongest while they are drying, and of a mawkish, faintly bitter, nauseous taste. *Of the Seeds.*—Brownish-black, reniform, flat, rough, in taste feebly bitter and mawkish; inodorous unless bruised, when they emit a peculiar heavy odour.

PHYSICAL PROPERTIES.—As usually met with, the dried herb is chopped into small pieces; it is of a greenish-white colour; and has a feeble narcotic odour—which in the fresh state is strong and heavy—and a bitter nauseous taste. The seeds are small, kidney-shaped, and rough; when bruised they have the same odour as the herb; their taste is nauseous and bitter.

CHEMICAL PROPERTIES.—The seeds contain fixed oil, wax, resin, extractive, gummy matter, malic acid, some salts, and a peculiar alkaloid which has been named *Daturia.* Geiger and Hesse first obtained it in a pure state; it is in colourless prismatic crystals, slightly volatile, soluble in 280 parts of cold, and in 72 parts of boiling water; also soluble in alcohol, but slightly so in ether; it forms crystalline salts with acids, but its exact chemical composition has not been yet ascertained. Daturia has not been employed in medicine; but it is on it that the therapeutical properties of stramonium appear to depend. It exists also in the leaves. Both herb and seeds yield their virtues to water and to alcohol; but their activity is much impaired by long boiling, as formerly in preparing the watery extract.

THERAPEUTICAL EFFECTS.—Stramonium leaves and seeds act as powerful narcotics, in large doses proving fatal with all the symptoms of narcotic poisoning. In medicinal doses, as might be expected from the supposed identity of their active principles, they produce effects nearly similar to those of belladonna and henbane, and have been consequently used with the same intention in the treatment of disease. In neuralgic affections, as tic douloureux, in which I have found it of signal service, and sciatica, in chronic rheumatism, and in all forms of chronic disease attended with acute pain, administered in *small* doses frequently repeated until its narcotic influence is manifested, stramonium is a remedy of great power, and deserves to be more generally employed than it is. We should never forget, however, that it is a remedy potent for evil as for good, and that its administration requires extreme caution and watchfulness. The inhalation of the vapour of the cut herb when burned is frequently found of much service in the treatment of spasmodic asthma; it is used with a common pipe in the same way as tobacco, or in the form of cigar, prepared by rolling the leaf. The smoking of stramonium, however, should be employed with great caution, and used only in very small quantities at a time, as in many instances it has produced dangerous symptoms; and it should never be prescribed for very old persons, or in cases where there is a tendency to apoplexy, or to paralysis. Besides the Datura Stramonium, other varieties of Datura have been employed as remedial agents, especially in eastern countries, in cases similar to that in which stramonium has been used; for instance, the Datura Ferox, Datura Fastuosa, Datura Alba, and Datura Tatula; the latter two of which have been employed in the East to produce intoxication, especially for lascivious and criminal purposes. The *datura tatula* has lately become rather a favourite in this city as a remedial agent, in the form of smoking, as a substitute for stramonium, in asthma and other allied diseases. My own experience is, however, that it possesses no advantage over stramonium in these cases. If, however, its employment should be preferred, it is to be used in precisely the same manner and with the same precautions as stramonium.

DOSE AND MODE OF ADMINISTRATION.—Of the powder of the herb or leaves, gr. j. to gr. iv.; of the seeds, gr. ¼ to gr. j. gradually increased until some obvious effect is produced. For smoking, gr. x. to gr. xx. of the chopped herb may be used, but the patient should be directed to allow an interval of at least three minutes to intervene between each inhalation of the smoke, whether a common pipe or a stramonium cigar be employed; and the effects caused by it must be carefully watched.

Extractum Stramonii. Extract of Stramonium. (Take of stramonium seeds, in coarse powder, one pound; proof spirit, a sufficiency. Pack the powder in a percolator, and add the spirit until the powder is exhausted. Distil off the spirit, and evaporate the residue by a water-bath to a proper consistence.) Dose, gr. $\frac{1}{8}$ to gr. $\frac{1}{2}$.

Tinctura Stramonii. Tincture of Stramonium. (Take of stramonium seeds, bruised, two ounces and a half; proof spirit, one pint. Macerate the stramonium for forty-eight hours with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, min. x. to min. xxx.

INCOMPATIBLES.—The mineral acids; caustic alkalies; the salts of iron, lead, mercury, and silver; and, according to the observations of Dr. Garrod, potash and soda. (See p. 356.)

In poisoning with stramonium, the same treatment should be employed as in poisoning with belladonna.

CHAPTER XV.

REFRIGERANTS.

(Temperants.)

REFRIGERANTS are prescribed in the treatment of disease with the view of diminishing the heat of the body when it is morbidly increased, and of causing a sensation of coolness throughout the system. Actual experiment has proved that although when taken into the stomach they cause a refreshing or cold feel over the whole body, they do not really diminish the temperature; consequently it has been hitherto found impossible to explain satisfactorily the phenomena which follow their internal use. In their external application as cooling or evaporating lotions to inflamed parts, the mode of operation is readily understood, the temperature of the part to which they are applied being actually lowered. The principal use of refrigerants in the practice of medicine is in the treatment of febrile and inflammatory affections, in which the benefit they produce appears to depend on the fact that their direct action on the stomach occasions sympathetically a transient reduction in the force of the circulation. During their administration irritability is also allayed, and the morbid sensations of heat, thirst, and nausea are diminished.

ACETUM. *Vinegar* (described in the division *Astringents*) is a useful refrigerant in febrile or inflammatory affections. It is not much employed as such internally, nevertheless f℥ss. to f℥j. diluted with f℥xx. of water forms a cooling drink, and may be taken *ad libitum* in cases where its astringent property is not objectionable. As an external refrigerant, its action is attended with much benefit in the treatment of most febrile and inflammatory diseases; it should be applied by means of a sponge to the surface of the body, especially to the face, round the neck, and over the arms and legs; thus employed it rarely fails to give relief, tranquillizing the patient, and, in many instances, predisposing to sleep: to form a solution for this purpose, f℥j. is mixed with f℥iij. of cold or tepid water, according to circumstances. For internal use the simple oxymel of the Pharmacopœia is well adapted, or the following preparation may be used :—

* *Syrupus Aceti.* (Vinegar, French in preference, f℥xj.; pure sugar, ℥xiv.; boil them together.) Dose, f℈ij. to f℥j. as an adjunct to other medicines.

ACIDUM CITRICUM. *Citric Acid.* (An acid obtained from lemon juice, or from the juice of the fruit of Citrus Limetta, *Risso*, the lime.) $3HO,C_{12}H_5O_{11}+HO$ (=201).

PREPARATION.—Take of lemon juice, four pints; beer yeast, two fluid ounces; prepared chalk, four ounces and a half; sulphuric acid, two fluid ounces and three fluid drachms; distilled water, a sufficiency. Mix the lemon juice with the yeast, and let it stand for two days, at a temperature between 60° and 70°. When fermentation has ceased, separate the clear liquid from the lees, boil it, and while hot add the chalk by degrees till there is no more effervescence. Collect the deposit on a calico filter, and wash it with hot water till the filtered liquor passes from its colourless. Mix the deposit with two pints of distilled water, and gradually add the sulphuric acid previously diluted with a pint and a half of distilled water, applying for half an hour sufficient heat to produce ebullition, and constantly stirring. Separate the acid solution by filtration, wash the insoluble matter with cold distilled water, and add the washings to the solution. Concentrate to the density of 1·21, cool, and after twenty-four hours decant the liquor from the crystals of sulphate of lime which have formed; concentrate further till a film forms on its surface, and set it aside to cool and crystallize. Purify the crystals, if necessary, by a second crystallization.

EXPLANATION OF PROCESS.—The lemon juice is first mixed with yeast and exposed to the temperature directed, with the object of setting up a fermenting process, in virtue of which the saccharine matter present in the lemon juice is gotten rid of in the form of alcohol and of carbonic acid. On the addition of the chalk it is decomposed, its carbonic acid escapes, whilst the lime unites with the citric acid to form citrate of lime, which is precipitated. To explain this reaction in symbols, inasmuch as citric acid is tribasic, (i.e. requiring three equivalents of base to saturate one of acid), we must make use of three atoms of chalk for one of citric acid, thus, $3CaO,CO_2+\bar{C}=3CaO,\bar{C}+3CO_2$. The chalk is directed to be added to the solution whilst hot, in consequence of the greater insolubility of the resulting citrate of lime in hot than in cold water, by which loss is avoided. On the addition of sulphuric acid we have sulphate of lime formed, the greater portion of which is precipitated, but a trace of which dissolves, and the citric acid set free is held in solution. On concentrating the solution the sulphate of lime first crystallizes out, and by decantation is gotten rid of, and on continuing the evaporation until the *film* appears on the surface, and then setting aside to crystallize, we obtain the citric acid. It is important to watch for the appearance of this film, as if the evaporation be persevered with after that point, the resulting crystals will be darkened in colour.

CHARACTERS.—In colourless right rhombic prisms with a strongly acid taste, readily soluble in water, sparingly in rectified spirit.

PHYSICAL PROPERTIES.—Citric acid crystallizes in transparent, colourless, regular rhomboidal prisms, terminated by four trapezoidal faces. They are inodorous, but have an agreeable, purely acid taste. Specific gravity, 1·617.

CHEMICAL PROPERTIES.—Crystallized commercial citric acid consists of $C_{12}H_5O_{11},3HO+HO$, but on cooling a saturated solution at 212°, it crystallizes with two equivalents less of water. The crystals are permanent in the air; heated at 212° they part with their water of crystallization, and at a higher temperature are decomposed; 100 parts of citric acid are soluble in seventy-five parts of cold, or fifty of boiling water; the solution undergoes decomposition when kept even in close vessels, and becomes covered with mould. Citric acid is readily distinguished by the following characteristic:—When a few drops of a solution of the acid are added to lime water, a clear liquid results, which, on being heated, becomes turbid, from the deposition of a white precipitate—citrate of lime.

TESTS.—Sixty-seven grains of the crystals dissolved in water are neutralized by 100 measures of the volumetric solution of soda. It leaves no ash when burned with free access of air. Its aqueous solution is not darkened by sulphuretted hydrogen, and gives no precipitate when dropped into solution of lime, or when added in excess to a solution of acetate of potash, or of chloride of barium.

ADULTERATIONS.—Citric acid may be contaminated with sulphuric acid or metallic impregnations, derivable from the materials employed in its manufacture, or may be sophisticated with oxalic or tartaric acids; with sulphates and tartrates, and with lime. These latter will be recognized by an ash being left on incineration, as also by the neutralizing powers of solution of soda, one hundred measures of the solution requiring but sixty-seven grains of citric acid (the third of its chemical equivalent), in consequence of its being a tribasic acid. If its solution be not darkened by sulphuretted hydrogen, the absence of metallic impurities is to be inferred; whilst the presence of oxalic, tartaric, or sulphuric acids would be respectively signalized by the solution of lime, acetate of potash, and chloride of barium. The presence of tartaric acid may also be predicated by the action of sulphuric acid upon a given sample; if it be very much darkened, tartaric acid is present, as the action of sulphuric acid upon citric acid is but to change it to a yellowish colour.

THERAPEUTICAL EFFECTS.—Citric acid produces the refrigerant effects of lemon-juice, as a substitute for which it may be employed to form cooling drinks in febrile affections, but fresh lemon-juice should be preferred whenever it can be obtained.

DOSE AND MODE OF ADMINISTRATION.—It is generally employed as a substitute for lemon-juice (which, however, when procurable, should always be preferred to it). About gr. xvii. of it are equivalent to half a fluid ounce of fresh lemon-juice, and will saturate gr. xxv. of bicarbonate, and gr. xx. of carbonate of potash, gr. xx. of bicarbonate, and gr. xxxv. of carbonate of soda, gr. xv. of sesquicarbonate of ammonia, and gr. xiij. of carbonate of magnesia.

* *Syrupus Acidi Citrici*, D. (Take of citric acid, in powder; distilled water, of each, ℥iiss.; tincture of lemon peel, f℥v.; simple syrup, Oiij. Dissolve the acid in the water with the aid of heat; then add the solution and tincture of lemon-peel to the syrup, and mix with agitation.) This was intended as a substitute for the syrup of lemons of former pharmacopœias; it will keep better, but the presence of spirit renders it unsuited for many purposes, and it also has not the agreeable fresh flavour of the syrup prepared from lemon-juice. Dose, f℥ij. to f℥j.; one ounce contains nearly a scruple of citric acid.

* *Pulveres Effervescentes Citrati.* (Take of crystals of citric acid, ℥j. and 54 grains; bicarbonate of soda, ℥j. and 162 grains; or, bicarbonate of potash, ℥j. and 270 grains. Reduce the acid and alkaline bicarbonates, separately, to a fine powder, and divide each into eighteen parts. The acid and alkaline powders should be kept in papers of different colours.) These powders should only be prepared when required for use, and not kept in boxes for months, as is commonly done.

INCOMPATIBLES.—The alkalies; carbonates; acetates; the alkaline and earthy sulphurets; and tartrate of potash.

ACIDUM OXALICUM. *Oxalic Acid.* HO,C_2O_3+2HO (=63).

PREPARATION.—It is prepared on a large scale as an article of commerce for use in the arts, by the action of nitric acid on treacle or potato-starch. For use in medicine it is further purified by dissolving in water, and re-crystallizing. Independent of its artificial sources, it is found present under various forms in many vegetable productions, such as rhubarb, wood sorrel, &c. It is only introduced into the supplement to the Pharmacopœia as a chemical re-agent.

PHYSICAL PROPERTIES.—Oxalic acid crystallizes in four-sided oblique prisms with dihedral summits; it is odourless, but has a very acid taste. Specific gravity, 1·50.

CHEMICAL PROPERTIES.—It is composed of two equivalents of carbon and three of oxygen, combined in the crystalline state with three of water, HO,C_2O_3+2HO. Recent chemical investigations almost prove that this acid is an oxide of *oxalyle* (C_2O_2=two equivalents of carbonic oxide). The crystals effloresce in the air, and lose two equivalents of their water of crystallization; exposed to a temperature of 35° F. they melt and are decomposed, subliming, being converted into carbonic oxide, carbonic acid, and formic acid. Oxalic acid is very soluble in water and in alcohol, requiring but from eight to ten parts of water at 60° F., its own weight of boiling water, and four parts of cold alcohol; it also dissolves unchanged in dilute nitric and sulphuric acids. The watery solution reddens litmus paper, and decomposes the carbonates with effervescence. The best characteristic of oxalic acid is the action of nitrate of silver on its solution: it produces a white precipitate, soluble in *cold* nitric acid, which, when heated over the flame of a spirit lamp, detonates feebly.

With a solution of sulphate of lime it also precipitates, and finally its solution has an acid reaction, in which it differs from that of epsom salts, with which it is most generally confounded, and on evaporation yields crystals, as described above, which serve to distinguish it from the two acids, with which its other chemical characters render it most likely to be confounded, viz., hydrochloric and hydrocyanic acids.

THERAPEUTICAL EFFECTS.—Oxalic acid is a powerful poison, when taken in large doses or in concentrated solution acting as a corrosive, while a weak solution produces death with marked symptoms of depression of the circulation, and of the nervous system. It is but rarely used as a medicine in this country, but on the Continent it is employed as a refrigerant in the form of lemonade. From the result of the observations of M. Nardo, who has used this acid very extensively, it is to be preferred to the other vegetable acids as a refrigerant and antiphlogistic in all acute inflammations of mucous membranes, more especially when the stomach is the seat of the disease; and from my own experience of several such cases in which I have employed it, I can fully confirm this statement. Many intelligent practitioners, however, object to its use under any circumstances as likely to predispose to that most distressing affection, *oxyluria*.

DOSE AND MODE OF ADMINISTRATION.—From gr. j. to gr. ij. dissolved in f℥j. or f℥ij. of water. Gr. x. give an agreeable acidity to Oj. of water, and half this quantity may be taken in the twenty-four hours. The solution may be sweetened with sugar if preferred.

In poisoning with this acid, chalk, whiting, or magnesia, suspended in water, or better still, milk, should be *at once* administered, and vomiting *afterwards* excited by emetics, or by the use of the stomach pump. Poisoning with oxalic acid most frequently occurs in consequence of its being mistaken for sulphate of magnesia, to which it bears much resemblance. It may be readily distinguished from the latter by pouring a few drops of common writing ink on the crystals, which are changed to a reddish-brown colour by oxalic acid, but no effect is produced by sulphate of magnesia. Moreover, the solution of epsom salts tastes nauseous and bitter, while that of oxalic acid is purely and intensely acid, not at all bitter. From sulphate of zinc, to which it also bears some resemblance, it may be distinguished; first, by the chemical characteristics of the former (which see); secondly, by the taste, that of the zinc salt being distinctly styptic, astringent, and metallic.

ACIDUM TARTARICUM. *Tartaric Acid.* (An acid obtained from the acid tartrate of potash, $2HO, C_8H_4O_{10}$ ($=150$).)

PREPARATION.—Take of acid tartrate of potash, forty-five ounces; distilled water, a sufficiency; prepared chalk, twelve ounces and a half; chloride of calcium, thirteen ounces and a half; sulphuric acid, thirteen fluid ounces. Boil the tartrate of potash with two gallons of the water, and add gradually the chalk, constantly stirring. When the effervescence has ceased, add the chloride of calcium dissolved in two pints of the water. When the tartrate of lime has subsided pour off the liquid, and wash the tartrate with distilled water until it is rendered tasteless. Pour the sulphuric acid first diluted with three pints of the water on the tartrate of lime, mix thoroughly, boil for half an hour with repeated stirring, and filter through calico. Evaporate the filtrate at a gentle heat until it acquires the specific gravity of 1·21, allow it to cool, and then separate and reject the crystals of sulphate of lime which have formed. Again evaporate the clear liquor till a film forms on its surface, and allow it to cool and crystallize. Lastly, purify the crystals by solution, filtration (if necessary), and recrystallization.

EXPLANATION OF PROCESS.—Thoroughly to understand this process it is essential for the reader to bear in mind that tartaric is a bibasic acid, that is, requires two atoms of base to saturate one of acid; but that one of these two atoms of base may be water. The acid tartrate of potash is composed of one atom of water, one of potash, and one of tartaric acid ($HO,KO,\overline{T}$). This, on the addition of the carbonate of lime, is converted into the tartrate of potash ($2KO,\overline{T}$), and tartrate of lime ($2CaO,\overline{T}$), with the escape of carbonic acid and the loss of two atoms of water; thus, $2(HO,KO,\overline{T}) + 2CaO\,CO_2 = 2KO,\overline{T} + 2CaO,\overline{T} + 2CO_2 + 2HO$. Of these two salts the tartrate of lime precipitates, and the tartrate of potash is held in solution; this latter, on the addition of the chloride of calcium, is converted also into tartrate of lime, which precipitates, and chloride of potassium, which is held in solution; thus, $2KO,\overline{T} + 2Ca\,Cl = 2CaO,\overline{T} + 2KCl$. The tartrate of lime thus produced is acted upon with sulphuric acid, in virtue of which the tartaric acid is set free and sulphate of lime formed; thus, $2CaO,\overline{T} + 2SO_3 + 2CaO\,SO_3 + \overline{T}$. The subsequent steps of the process require no explanation.

CHARACTERS.—In colourless, oblique, rhombic prisms, of a strongly acid taste, readily soluble in water, and in rectified spirit. When to either solution a little acetate of potash is added, a white crystalline precipitate forms.

PHYSICAL PROPERTIES.—Tartaric acid occurs in white, semitransparent crystals of considerable size, the primary form of which is the right rhombic prism; more generally, however, it is found in our shops in the form of minute crystallized prisms; it is inodorous, but has a purely acid taste. Specific gravity, 1·75.

CHEMICAL PROPERTIES.—In the crystalline state it consists of $C_8H_4O_{10}$, with two equivalents of water. The crystals are permanent in the air; exposed to heat, they fuse in their water of crystallization, which is all driven off if the temperature be raised; and at a temperature considerably below redness the acid is decomposed, and a series of new compounds formed. Tartaric acid is soluble in twice its weight of cold, and in half its weight of boiling water; it is also soluble in alcohol. The aqueous solution becomes mouldy by keeping. The most distinguishing characteristic of this acid is the crystalline precipitate (Acid Tartrate of Potash, *Cream of Tartar*), which is produced when it is added in excess to a concentrated solution of a salt of potash. This precipitate may not immediately develop itself on the mixture of the solutions, but will be quickly produced if the mixture be briskly agitated.

TESTS.—Seventy-five grains dissolved in water require for saturation 100 measures of the volumetric solution of soda. Its aqueous solution is not affected by sulphuretted hydrogen, and gives no precipitate with the solution of sulphate of lime, or of oxalate of ammonia. It leaves no residue, or only a mere trace, when burned with free access of air.

ADULTERATIONS.—It may be contaminated with metallic impurities, derivable from the vessels employed in its manufacture, and recognizable by the action of sulphuretted hydrogen ; or it may be sophisticated with the acid tartrate of potash, recognizable by its sparing solubility in water ; with oxalic acid, detected by the solution of sulphate of lime; and with lime, recognizable by the oxalate of ammonia, and also by the ash left, if it be present, on incineration. One hundred measures of the volumetric solution of soda require but seventy-five grains of this acid (half the amount of its chemical equivalent), in consequence of its being *bibasic*.

THERAPEUTICAL EFFECTS.—To prepare refrigerant drinks in febrile and inflammatory diseases, tartaric acid, as being cheaper than citric acid, is much employed. Its principal use, however, is for the preparation of effervescing draughts, when added to the alkaline carbonates; and in the manufacture of *seidlitz powders*, already described (see p. 188).

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx.; its refrigerant effects are best manifested when it is dissolved in a large quantity of cold water. For the preparation of effervescing powders, the following are the proportions required:—gr. xx. of crystallized tartaric acid are saturated by gr. xxvij. of crystallized bicarbonate of potash, or gr. xxxiiiss. of crystallized carbonate of soda, or gr. xxij. of bicarbonate of soda, or gr. xvss. of hydrated sesquicarbonate of ammonia.

* *Pulveres Effervescentes Tartarizati*, D. (Take of crystals of tartaric acid, ℥j. and 108 grains; bicarbonate of soda, ℥j. and 162 grains, *or*, bicarbonate of potash, ℥j. and 270 grains. Reduce the acid and alkaline bicarbonates, separately, to a fine powder, and divide each into eighteen parts. The acid and alkaline powders should be kept in papers of different colours.) For preparing ordinary effervescing draughts.

* *Trochisci Acidi Tartarici*, E. (Tartaric acid, gr. cxx.; pure sugar, ℥viij.; volatile oil of lemons, min. x.; pulverize the sugar and acid, add the oil, mix them thoroughly, and beat them with mucilage into a proper mass for making lozenges.) Commonly employed under the name of *acidulated drops* in mild sore throats and colds.

INCOMPATIBLES.—The alkalies ; salts of potash, of lime, of mercury, and of lead ; and the vegetable astringents.

* CITRUS AURANTIUM, FRUCTUS. *The Fruit of Citrus Aurantium. The common sweet orange tree.* This tree is indigenous in many parts of Africa and Asia; and is cultivated extensively in the south of Europe, the Azores, and the West India Islands. It belongs to the Natural family *Aurantiaceæ*, and to the Linnæan class and order *Polyadelphia Polyandria.*

BOTANICAL CHARACTERS.—Stems, smooth, cylindrical, from 12 to 15 feet high; leaves, oval, pointed, entire, shining, coriaceous, on elongated winged petioles; flowers, large, white, axillary, 2-6 on a common peduncle, fragrant; fruit, the well-known sweet orange.

The fruit of the orange is too well known to require description; the juice consists of citric and malic acids, citrate of lime, mucilage, albumen, sugar, and water.

THERAPEUTICAL EFFECTS.—The juice of the sweet orange is an agreeable refrigerant, calculated to allay thirst in febrile and inflammatory affections; it is particularly beneficial in diseases attended with much thirst, and in which it is important not to introduce a large quantity of fluid into the stomach or intestines, as in strangulated hernia, &c.

LIMONIS CORTEX. *Lemon Peel.* Citrus limonum, *DC.* Plate 92, *Steph. and Church. Med. Bot. (Citrus Medica).* (The fresh outer part of the rind of the ripe fruit, imported from southern Europe.)

LIMONIS OLEUM. *Oil of Lemon.* (The oil expressed or distilled from fresh lemon peel; imported chiefly from Sicily.)

LIMONIS SUCCUS. *Lemon Juice.* (The expressed juice of the ripe fruit.) Natives of the same countries, and belonging to the same botanical classification as *Citrus aurantium.*

BOTANICAL CHARACTERS.—The lemon-tree attains a height of 10-15 feet; leaves, oval, or oblong, usually toothed, petiolate; the petioles simply margined, not winged; flowers, white, tinged with red; fruit, ovoid, terminated with an elongated knob; containing an acid pulp.

CHARACTERS.—*Of the Peel.*—In thin slices of a yellow colour, dotted with numerous vesicles of oil, with a fragrant odour, and aromatic, slightly bitter taste. *Of the Oil.*—Colour, pale yellow; odour, agreeable; taste, warm and bitter. *Of the Juice.*—A slightly turbid, yellowish liquor, possessing a sharp acid taste, and grateful odour.

PROPERTIES.—Lemons are too well known to need description. *Lemon Peel* is of a yellow colour, has an agreeable aromatic odour, and a warm, somewhat bitter taste, both of which are much injured by drying. Care must be taken in peeling lemons to remove the outer yellow rind only, as in it alone exists the oil upon which its flavouring properties depend. It should be dried without artificial heat, and is best preserved laid in alternate layers with sugar, and kept in well-closed bottles. Lemon peel yields its properties to both alcohol and water. *Oil of Lemons* is obtained from the rind either by distillation or expression; the latter is the method usually followed; it is imported from Portugal and from France. It has a pale greenish-yellow colour, the fragrant odour of lemons, and a pungent aromatic taste; density, ·850. Oil of lemons has the probable composition C_5H_4, being, like oil of turpentine, composed of two isomeric oils, *citrene* and *citrylene*. The juice consists of 1·77 per cent. of citric acid, 0·72 of gum, malic acid, and bitter extractive, and 97·51 of water. Lemons decay by keeping. Christison states that they are best preserved by packing them with newly-slaked lime in bottles or earthenware jars, the mouths of which are secured with corks and wax. The juice may be kept unchanged for years, by adding to it when expressed and strained a tenth part of spirit of wine, filtering, and preserving in well-stopped bottles.

THERAPEUTICAL EFFECTS.—Lemon juice forms a useful and agreeable refrigerant, allaying thirst and diminishing preternatural heat in febrile and inflammatory diseases; it is also found particularly useful in hemorrhages of an acute character. The employment of lemon juice as a remedy in the treatment of acute rheumatism was proposed some years since by Dr. G. O. Rees, of London, and most of those who have tried it on his authority corroborate his statements of its efficacy. Under its influence the agonizing pain is stated to be very rapidly relieved, and the frequency of the pulse diminished in a marked degree. The form of rheumatism in which lemon juice seems to produce the greatest benefit is the acute disease, when the small, as well as the large joints are engaged, or the acute form of that variety which is ordinarily termed rheumatic gout. In my own experience, although I have seen excellent and speedy effects follow its administration in some cases, it has, on the whole, disappointed my expectations, chiefly from the uncertainty of its beneficial action; being as little to be depended on as most other specifics which have been proposed for this obstinate and tedious disease; and this opinion, propounded in a former edition of this work, further and more extended experience has fully ratified. Various theories have been proposed to explain the *modus operandi* of lemon juice in rheumatic diseases, but none of them are at all satisfactory. Oil of lemons is an aromatic stimulant, only used internally, in doses of from one to three minims, to give an agreeable flavour to other medicines. It enters into the composition of the *spiritus ammoniæ aromaticus*. As a topical remedy it is highly praised by the Germans as a stimulant in rheumatic and scrofulous ophthalmia, for which purpose it is dropped into the eye. Lemon peel is employed as a flavouring ingredient in infusions.

DOSE AND MODE OF ADMINISTRATION.—Lemon juice is usually administered in the form of *lemonade*, which is prepared by adding the juice to about ten or twelve parts of boiling water, and sweetening with sugar to the taste; in acute rheumatism Dr. Rees gives from one to four fluid ounces in the twenty-four hours, but it has been administered in five or even six times this quantity. Lemon juice is also much employed for the preparation of effervescing draughts with the alkaline carbonates: gr. xx. of the bicarbonate of potash require for saturation f℥iiiss. of lemon juice; gr. xx. of the sesquicarbonate of soda, f℥ivss.; and gr. xx. of the sesquicarbonate of ammonia, f℥vj.

Syrupus Limonis. Syrup of Lemons. (Take of fresh lemon peel, two ounces; lemon juice, strained, one pint; refined sugar, two pounds and a quarter. Add the sugar and the lemon peel to the lemon juice in a covered vessel, and dissolve the sugar with the aid of a steam or water bath, then strain. The product should weigh three pounds and a half, and should have the specific gravity 1·340.) An excellent addition to refrigerant drinks; in febrile affections it may be given with barley water. This syrup must be kept in well-stopped bottles in a very cool place. Dose, f℥j. to f℥ij.

Tinctura Limonis. Tincture of Lemon Peel. (Take of fresh lemon peel, sliced thin, two ounces and a half; proof spirit, one pint. Macerate the lemon peel for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.; an agreeable adjunct to other medicines.

* *Artificial Lemon Juice.*—MACNAMARA. (Citric acid, gr. cxl.; syrup, f℥ij.; mucilage, f℥ij.; oil of lemons, min. iv.; water, f℥iijss. Mix.) This will constitute a solution that will require a fastidious palate to distinguish from strained lemon juice. The mucilage and syrup in it fulfil an important indication in effervescing draughts, mechanically entangling and *delaying* the extrication of carbonic acid, until the fluid reaches the stomach, as upon the action of this acid upon an irritable stomach much of the efficacy of the remedy depends.

INCOMPATIBLES.—The mineral and vegetable acids; and lime water.

MORI SUCCUS. *Mulberry Juice.* Morus nigra, *Linn.* Plate 39, *Steph. and Church. Med. Bot.* (The juice of the ripe fruit cultivated in Britain.) The mulberry tree is a native of Persia, now cultivated in this country; it belongs to the Natural family *Urticaceæ* (*Moraceæ*, Lindley), and to the Linnæan class and order *Monœcia Tetrandria.*

BOTANICAL CHARACTERS.—A small tree with rugged bark; leaves, cordate, lobed; flowers, greenish, in small roundish catkins; fruit, dark purple, "consisting of the female flowers, become fleshy and grown together, inclosing a dry membraneous pericarp" (Lindley).

PROPERTIES.—The fruit, commonly called mulberry, has a faint, agreeable odour, and an acidulous, sweetish taste. The juice contains tartaric acid, sugar, colouring matter, and water.

CHARACTERS.—*Of the Juice.*—Of a dark violet colour, with a faint odour, and an acidulous sweet taste.

THERAPEUTICAL EFFECTS.—Mulberry juice is an agreeable refrigerant, but taken in quantity it is apt to produce diarrhœa. In the present day it is very seldom used, except as a colouring agent. The following is the only officinal preparation of mulberries:—

Syrupus Mori. Syrup of Mulberries. (Take of mulberry juice, one pint; refined sugar, two pounds; rectified spirit, two fluid ounces and a half. Dissolve the sugar in the juice by a gentle heat and set aside for twenty-four hours. Then remove the scum, and pour off the clear liquid from the dregs, if any appear. Lastly, add the spirit. The product should weigh three pounds six ounces, and should have the specific gravity 1·330.) Used for the same purposes as the syrup of lemons; it has a fine purple colour, which is changed by acids and alkalies. Dose, f℥j. to f℥ij.

POTASSÆ CHLORAS. *Chlorate of Potash.* $KO,ClO_5 (=122·5)$.

PREPARATION.—(Take of carbonate of potash, twenty ounces; slaked lime, fifty-three ounces; distilled water, a sufficiency; black oxide of manganese, eighty ounces; hydrochloric acid of commerce, twenty-four pints. Mix the lime with the carbonate of potash and triturate them with a few ounces of the water so as to make the mixture slightly moist. Place the oxide of manganese in a large retort or flask, and having poured upon it the hydrochloric acid, diluted with six pints of water, apply a gentle sand heat, and conduct the chlorine as it comes over, first through a bottle containing six ounces of water, and then into a large carboy containing the mixture of carbonate of potash and slaked lime. When the whole of the chlorine has come over, remove the contents of the carboy, and boil them for twenty minutes with seven pints of the water; filter and evaporate till a film forms on the surface, and set aside to cool and crystallize. The crystals thus obtained are to be purified by dissolving them in three times their weight of boiling distilled water, and again allowing the solution to crystallize.)

EXPLANATION OF PROCESS.—On mixing the carbonate of potash with the lime, it is deprived by it of its carbonic acid, caustic potash is held in solution, and carbonate of lime precipitated. By the action of the hydrochloric acid on the black oxide of manganese, chlorine is evolved with the formation at the same time of two atoms of water and one of chloride of manganese; thus, $MnO_2+2HCl=MnCl+2HO+Cl$. Six atoms of chlorine react upon six atoms of potash; one chlorine abstracting the oxygen from five equivalents of the potash to form chloric acid, which unites with the remaining potash to form chlorate of potash, whilst the remaining five chlorines unite with the five potassiums to form five atoms of chloride of potassium, thus, $6KO+6Cl=KOClO_5+5KCl$. It thus appears that in virtue of this process we have formed carbonate of lime, chloride of potassium, and chlorate of potash. The two latter of these are separated from the former in virtue of their solubility in boiling water, and they are themselves separated by the process of crystallization; the chlorate of potash crystallizing first, and the chloride of potassium being left in the mother liquor.

CHARACTERS.—In colourless rhomboidal crystalline plates, with a cool saline taste, sparingly soluble in cold water. It explodes when triturated with sulphur. By heat it fuses, gives off oxygen gas, and leaves a white residue, readily forming with water a neutral solution, which is precipitated white by nitrate of silver, and yellow by bichloride of platinum.

CHEMICAL PROPERTIES.—Chlorate of potash is composed of one equivalent of potash, and one of chloric acid, $KOClO_5$, specific gravity 1·989. It is permanent in the air; inodorous; exposed to heat, it fuses and gives out oxygen below a red heat; if the heat be increased, all the oxygen is driven off, and chloride of potassium left. It is soluble in about 17 parts of cold water, and in once and a half its weight of boiling water. This salt is readily known: by dropping a little sulphuric acid on the crystals they first become yellow, afterwards red, and give out the greenish-yellow gas,—peroxide of chlorine. The white precipitate produced under the conditions stated in the *characters* is chloride of silver, the yellow, potassio-bichloride of platinum (see pp. 164, 165).

TESTS.—Its solution is not affected by nitrate of silver, or oxalate of ammonia.

ADULTERATIONS.—The only impurities met with in chlorate of potash are chloride of potassium and lime, and these arise from faulty preparation; they are readily detected by adding nitrate of silver to a solution of the salt in distilled water; if any chloride be present, a white precipitate is thrown down; or by adding a solution of oxalate of ammonia, which will precipitate the lime in the form of oxalate, should any be present.

THERAPEUTICAL EFFECTS.—Chlorate of potash in its action on the system resembles nitre; by some it has been held to be diuretic, but its most manifest action is refrigerant. It was formerly employed in diseases which were supposed to depend on a deficiency of oxygen, as in phthisis and scurvy, in consequence of the large proportion of oxygen which enters into its composition being deemed capable of supplying that important element directly to the system; and at the present day this idea is being revived in the minds of many practitioners: why, however, it should discharge this duty in any greater degree than nitrate of potash, a salt possessing a precisely identical amount of oxygen, I cannot see, nor am I aware of any clinical facts that can in any way support this theory. More recently it has been proposed as a remedy in diseases attended with a deficiency of the saline constituents of the blood, as in malignant cholera, typhus fevers, &c. Almost the only diseases, however, in which I have seen any great amount of value following its use are malignant scarlatina and *cancrum oris*, or phagedenic ulceration of the cheek in children, and in this affection it occasionally proves singularly beneficial; on the Continent, however, especially in France, it is prescribed in a number of diseases, particularly in those attended with unhealthy or gangrenous ulcerations.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xx. dissolved in water, and sweetened with syrup. The dose for children is from gr. iiss. to gr. v. according to the age, and in the diseases above mentioned this quantity should be given every hour, or at least every second hour.

POTASSÆ NITRAS.—*Nitrate of Potash* (described in the division *Diuretics*) operates as a refrigerant, sensibly diminishing preternatural heat in febrile and inflammatory affections; during its operation the force and frequency of the pulse are diminished also, and it has consequently been named a sedative-refrigerant. Towards the close of the last century nitre was given in large doses in the treatment of acute rheumatism, and this practice has been revived of late years first in Paris, and subsequently in England. So far as my own experience would lead me to judge, it is productive of the most beneficial results in many cases, but in some it fails to afford the least relief; and in all after the second or third day it causes great nausea and loathing. The manifest effects I have seen to follow its use are a great increase in the urinary secretion, and a diminution in the force and frequency of the pulse; according to others, it causes copious sweating and purging. The employment of nitre in hemorrhages, particularly hemoptysis, is attended with much benefit, which depends undoubtedly on the combined action above referred to. It proves very beneficial in the treatment of asthma, especially when dependent on disease of the heart. In such cases a popular mode of employing it is in the form of touch-paper—bibulous paper impregnated with a saturated solution of it, and dried, being burnt in the vicinity of the patient. My old friend, Dr. Jerome Morgan, of this city, has long been in the habit of using such paper, additionally medicated by immersion in saturated decoctions of stramonium, of datura tatula, or of belladonna, with signal benefit in the treatment of such cases. Nitrate of potash is contra-indicated in inflammatory affections of the stomach, the intestinal canal, the kidneys or bladder, in consequence of its irritant properties which have been alluded to in a previous chapter. As an external application, nitre is employed to produce cold during its solution in water; for this purpose it should be applied during the process of solution. According to Mr. Walker, five ounces of nitrate of potash, mixed with five ounces of sal ammoniac, and dissolved in fifteen ounces of water, during the solution of the salts will produce an amount of cold capable of reducing the thermometer forty degrees.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xx., mixed with sugar or dissolved in water. In the treatment of acute rheumatism it must, however, be given in *very large* doses, from half an ounce to three quarters of an ounce, in the course of the twenty-four hours, rapidly increased to an ounce, an ounce and a quarter, or even an ounce and a half. When thus prescribed, it should be given dissolved in a large quantity of fluid; gr. lx. in f℥viij. of gruel, barley-water, or lemonade. *Nitre-whey*, prepared by boiling gr. cxx. of nitre in Oj. of new milk, and straining, is an excellent refrigerant drink in mild and febrile diseases. Dose, f℥ij. to f℥iv. Where nitre is to be administered as a refrigerant dissolved in water, the effect is much increased if the solution be not made until just before being swallowed.

ROSA CANINA.—*Hips*. Rosa canina, *Linn.* The Dog Rose. Plate 139, *Woodv. Med. Bot.;* and other allied species. (The ripe fruit of indigenous plants, deprived of the hairy seeds (achenes).) The dog-rose is a common indigenous shrub, belonging to the Natural family *Rosaceæ*, and to the Linnæan class and order *Icosandria Polygynia*.

BOTANICAL CHARACTERS.—Stem, with scattered, hooked prickles, which are dilated at the base; leaves, naked or slightly hairy; leaflets, with irregular serratures; flowers, rose-red; fruit, scarlet.

CHARACTERS.—An inch or more in length, ovate, scarlet, smooth, shining; taste, sweet, subacid, pleasant.

PROPERTIES.—The fruit *(hip)* of the dog-rose consists of the fleshy calyx, inclosing numerous small carpels enveloped with hairs; it is of a bright scarlet colour, smooth and shining. The external coat alone is used in medicine; it should be carefully freed from the carpels and hairs. It has a sweetish acidulous taste, and is composed chiefly of uncrystallizable sugar, gum, citric, and malic acids.

THERAPEUTICAL EFFECTS.—The hip of the dog-rose is an agreeable refrigerant; it is only employed in medicine in the following preparation:—

Confectio Rosæ Caninæ. Confection of Hips. (Take of hips, carefully deprived of their seeds, one pound; refined sugar, two pounds. Beat the hips to a pulp in a stone mortar, add the sugar, and rub them well together.) Used only as a basis for forming more active remedies into pills or electuaries, and as it contains no tannin, it may be employed for this purpose with the salts of iron.

CHAPTER XVI.

SEDATIVES OR CONTRA-STIMULANTS.

(Calmatives.)

SEDATIVES are medicines which directly or primarily depress the vital powers, without inducing any subsequent excitement; from their action being the reverse of Stimulants, they have also been very generally termed CONTRA-STIMULANTS. This class of medical agents is usually confounded with *Narcotics;* and were we merely to theorize on their mode of action, it would be perhaps difficult to draw an exact line of distinction, but when we come to consider the remedial powers of the medicines classed under each head, it will, I think, be at once evident how *practically* essential it is that we should recognise this as a special class of remedial agents. The diseases in which sedatives are employed are those of over excitement of the nervous and vascular systems: some of the substances contained in the class, for example Hemlock, act directly on the nervous system; while others, as Digitalis, influence more immediately the circulation. It will be therefore necessary before prescribing for individual cases, to consider attentively the peculiar operation of the different sedatives. An important and practical rule to be borne in mind, with reference to the operation of contra-stimulants, is that the dose must be in general proportioned to the degree of excitement present; this *tolerance* of medicines is remarkably illustrated by the very large doses of tartar emetic which are administered not only with impunity, but with advantage, when inflammatory action runs high. To the remedies which have been ordinarily described as sedatives, the modern discoveries in medicine have made an important addition, namely, *Anæsthetics:* under this appellation are included certain vapours or gases, by the inhalation of which sensation and the power of the will are temporarily suspended. The vapour of sulphuric ether was at first employed to produce this effect, but its use has, in this country at least, been altogether superseded by chloroform since the discovery of Professor Simpson, of Edinburgh; and that of *Amylene,* now described in this book for the first time, though only employed very recently, is falling rapidly into disuse.

* ACIDUM CARBONICUM. *Carbonic Acid* (CO_2=22). This gaseous acid, not officinal in the British Pharmacopœia, requires a short notice, in consequence of its use having been lately again revived as a sedative in the practice of medicine. During the last century it had been employed with that intention, and amongst others by Dr. Macbride, who practised in this city, and contributed much at that time to medical literature.

The mode of preparation of carbonic acid gas and its chemical history are too generally described in the most elementary works on chemistry to need any notice here; and there can be no difficulty in devising an apparatus for its therapeutical application according to the special part of the body to which it is to be applied; besides which, the manner of developing it has been already described and explained under the head of bicarbonate of potash, in the manufacture of which salt its use is directed (see p. 22). It has been employed chiefly if not altogether in the treatment of those painful diseases of females which affect the bladder and uterine organs, and it is said with much success. Dr. Churchill, in a memoir published in the *Dublin Quarterly Journal of Medical Science* (vol. xxiv., page 227), narrates some cases in which he derived very decided benefit from the application of carbonic acid gas to the vagina in the irritable bladder attendant on or accompanying uterine diseases, as also in the obstinate vomiting of hysteria and of pregnancy. In the treatment of irritability of the stomach by effervescing mixtures, the carbonic acid eliminated is the important remedial agent. The efficacy of the yeast poultice (hereafter to be described) in a great measure depends upon the production of this gas.

Poisoning by carbonic acid requires a few words of observation. This gas, the product, amongst other sources, of the respiratory process, is met with in the atmospheric air, equally diffused, and constituting of it about one volume in two thousand. Occasionally, however, it is found present in a more concentrated form, and then becomes one of the most deadly as it is the most insidious of poisonous gases. Its specific gravity is greater than that of atmospheric air (1·5245), a circumstance which favours its accumulation in grottoes, wells, brewers' vats, cellars, &c.; places which if not exposed to currents of air should never be entered without the precaution of ascertaining whether a candle will continue to burn *brightly* in the apartment to be visited; should the light *dim*, on no account should it be entered. We have also natural reservoirs of this gas; the *Valley of Poisons* in Java, the *Grotto del Cane* at Naples; and it is a constant ingredient of the atmosphere in the neighbourhood of lime kilns (being given off from the limestone during the process of calcination), and, being given off by plants during night time, it is also found in greenhouses, &c., a fact which explains how prejudicial the presence of plants is in the bedroom, especially of the invalid. The symptoms produced by it are drowsiness, gradually increasing to stupor and coma; congestion and lividity of countenance; venous congestion generally, consequent on the conversion of the arterial into venous blood, &c. The treatment is free access of pure atmospheric air, moderate venesection, general stimuli, the cold douche, and, as a last resource, artificial respiration and the electro-magnetic current. Occasionally it becomes our duty to superintend the removal of parties so asphixiated from vats, &c.; this may be done by covering the mouth of those who descend for the purpose with cloths steeped in lime water, or with masks made for the purpose provided with long tubes of India rubber, which enable the wearer to breathe the air outside the vat. In all such cases a stout rope ought to be fastened to the parties descending, lest they also should succumb to the deleterious influences of the gas, and which in that case will facilitate their extrication.

ACIDUM HYDROCYANICUM DILUTUM. *Dilute Hydrocyanic Acid.* (Syn.: *Prussic Acid, Zootic Acid.*) (Hydrocyanic acid, HC_2N, (=27) dissolved in water, and constituting 2 per cent. of the solution.)

PREPARATION.—Take of ferrocyanide of potassium, two ounces and a quarter; sulphuric acid, seven fluid drachms; distilled water, thirty fluid ounces, or a sufficiency. Dissolve the ferrocyanide of potassium in ten ounces of the water, then add the sulphuric acid previously diluted with four ounces of the water and cooled. 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 by the aid of a sand bath until the fluid in the receiver measures seventeen ounces. Add to this three ounces of the water, or as much as may be sufficient to bring the acid to the required strength of two per cent.

EXPLANATION OF PROCESS.—Upon the addition of sulphuric acid to ferrocyanide of potassium (K_2FeCy_3), we find that two equivalents of the ferrocyanide are reacted upon by six of sulphuric acid, resulting in the production of three equivalents of bisulphate of potash, one of biferrocyanide of potassium (KFe_2Cy_3, *Everitt's salt*), three of hydrocyanic acid, and three of water; thus, $2(K_2FeCy_3) + 6SO_3HO = 3KO2SO_3 + KFe_2Cy_3 + 3HCy + 3HO$; of these the hydrocyanic acid distils over, and by the addition of water is reduced to the proper density. By using an excess of sulphuric acid, and thereby producing a bisulphate instead of the neutral sulphate of potash, the process goes on with greater regularity, and is exempt from the intermissions and subsequent violent action that would otherwise arise.

PHYSICAL PROPERTIES.—Medicinal hydrocyanic acid is a colourless liquid, with a peculiar penetrating odour, somewhat resembling that of peach blossoms, and a bitter taste, leaving a warm sensation on the tongue and palate. The odour is generally stated to resemble that of the volatile oil or distilled water of bitter almonds, but it is decidedly different, and should not be confounded with it. The specific gravity varies with the quantity of real or anhydrous acid contained in the medicinal preparation, a very slight difference in density indicating a very serious difference in strength.

CHARACTERS.—A colourless liquid with a peculiar odour, only slightly and transiently reddening litmus. 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.

CHEMICAL PROPERTIES.—*Absolute hydrocyanic acid* is a colourless liquid, possessing a peculiar odour resembling that of peach blossoms, and stated to have a bitter taste. It is composed of one atom of hydrogen and one of cyanogen; cyanogen itself consisting of two atoms of carbon and one of nitrogen (NC_2); its specific gravity at 64° is 0·697; its boiling point is 80° F., and its freezing point 5° F. When kept for some time in a bottle it is spontaneously decomposed, a black precipitate forming, the exact composition of which has not been as yet accurately determined, although it is known to contain ammoniacal salts and paracyanogen. Diluted with distilled water it constitutes the medicinal acid, the strength of which formerly varied in all our pharmacopœias, that of Dublin and London being 2 per cent., Edinburgh 3·3 per cent., and that which is commonly found in the shops under the name of Scheele's acid, being most uncertain in its strength, ranging from one to four, or even more per cent. of anhydrous acid. Had we no other reason to feel grateful for a national Pharmacopœia, on this score alone we should congratulate ourselves that now the strength of this dangerous medicine is uniform so far as the United Kingdom is concerned. The methods of estimating its strength will be described in the next paragraph. The presence of the acid can be determined by the following characters:—On the addition to it of a solution of nitrate of silver we have a white precipitate, soluble in caustic water of ammonia and in boiling nitric acid, thrown down; the hydrogen of the acid uniting with the oxygen of the salt to form water, the cyanogen uniting with the silver to produce cyanide of silver, and the nitric acid being set free; thus, $AgONO_5 + HCy = HO + AgCy + NO_5$. This test may be varied by adding a few drops of sulphuric acid to the liquid containing it, and covering the vessel with a glass plate, having its lower surface moistened with a solution of nitrate of silver; owing to the volatility of the acid the surface of the plate will be covered with the white cyanide of silver. Treated, as directed in the *characters*, with a mixed solution of proto and per-sulphate of iron, liquor potassæ, and hydrochloric acid, we have prussian blue ($Fe_4 3FeCy_3$) produced. The explanation of this reaction is, that on the addition of the liquor potassæ to the salts of iron we have a mixed precipitate composed of proto and sesquioxide of iron; these are presented to the prussic acid in the nascent condition; their oxygen is removed by the hydrogen of the acid in the form of water, and we have proto and sesquicyanide of iron (or prussian blue) precipitated; thus, $3FeO + 2Fe_2O_3$

$+ 9HCy = 9HO + 3FeCy + 2Fe_2Cy_3$; but $3FeCy + 2Fe_2Cy_3$ are equivalent to $Fe_4 3FeCy_3$, the at present recognized formulary for prussian blue. In addition to these tests, which, however, may be deemed conclusive as determining its existence, Liebig has suggested another, which bears his name; it is as follows:—To the acid must be added a few drops of the solution of bisulphide of ammonium (NH_4S_2) (the ordinary solution found in our laboratories under the name of hydrosulphuret of ammonia will answer), and the mixture is to be evaporated to dryness. During this process any excess of bisulphide is driven off in virtue of its volatility; the hydrogen of the prussic acid is separated from it, and is also expelled, whilst the cyanogen unites with the sulphur and the ammonium to form sulphocyanide of ammonium; thus, $NH_4S_2 + HCy = H + NH_4CyS_2$. This dissolved in distilled water, on the addition of a drop of a solution of sesquichloride of iron, strikes a blood-red colour, forming with it the sulphocyanide of iron ($Fe_2,3CyS_2$); thus, $Fe_2Cl_3 + 3(NH_4,CyS_2) = 3NH_4Cl + Fe_2,3CyS_2$.

TESTS.—Specific gravity 0·997. Half a fluid ounce of the acid, when treated with an excess of solution of soda, requires the addition of 80·66 measures of the volumetric solution of nitrate of silver before a permanent precipitate begins to form, which corresponds to two per cent. of anhydrous acid. It gives no precipitate with chloride of barium, but with nitrate of silver it gives a white precipitate entirely soluble in boiling nitric acid.

ADULTERATIONS.—Medicinal prussic acid, as met with in the shops, varies much in strength, is often much contaminated with impurities, and is frequently unfit for use from having been too long kept. The strength may be estimated by the specific gravity of any given sample; but this method requires great accuracy and considerable nicety of manipulation, as well as balances of great delicacy, inasmuch, as already stated, a very slight difference in density will indicate an important difference in strength. "The excess of the specific gravity, 0·9979 over 0·9970, is less than one in the third place of decimals; while the acid corresponding to the latter is stronger than that corresponding to the former, in the ratio of 4 to 3." (Apjohn, *Manual of the Metalloids*, page 559.) For ordinary purposes it can be readily ascertained by precipitating a known weight of prussic acid with a solution of nitrate of silver, collecting the precipitated cyanide of silver on a well-dried and carefully-weighed filter, drying it, weighing the filter and precipitate together, subtracting from the gross weight that of the filter, when each five grains of the resulting weight will be, *quam proxime*, equivalent to one grain of anhydrous acid. The reason why this should be so will be understood by reference to the atomic weight of cyanide of silver (=134), made up of one atom of silver (=108), and one of cyanogen (=26); so that cyanogen constitutes, as nearly as possible, one-fifth of the entire weight of the salt. The *per-centage* of acid will, of course, be arrived at by the rule of proportion. The pharmacopœial authorities have adopted for this purpose the volumetric test originally suggested by Liebig, the *rationale* of which is, that oxide of silver is precipitated from a solution of nitrate of silver by a solution of soda, the soda abstracting the nitric acid to form nitrate of soda, and the oxide of silver being precipitated; thus, $AgONO_5+NaO=NaONO_5+AgO$. This latter forms with cyanide of sodium a soluble double salt, cyanide of sodium and silver (NaCy,AgCy); thus, $2NaCy+AgO=NaCy,AgCy+NaO$. The cyanide of sodium being produced in virtue of the action of the hydrocyanic acid upon the liquor sodæ; thus, $NaO+HCy=HO+NaCy$; so that no permanent precipitate can form so long as any cyanide of sodium is present in the solution. The moment it disappears the oxide of silver remains a permanent precipitate; and from this fact we judge of the entire disappearance of the cyanide of sodium, and the estimation of the per-centage of acid becomes but a simple matter of calculation, the *data* of which are furnished in the description in the Appendix to the Pharmacopœia, of the volumetric solution of nitrate of silver. The pharmacopœial acid contains two per cent. of anhydrous acid, and consequently "contains rather more than half as much anhydrous acid as acidum hydro-cyanicum, *Ed.*" The presence of any fixed impurity is indicated by the solution not being entirely vapourizable by heat. The most common impurity met with is sulphuric or hydrochloric acid; the presence of either may be suspected if the medicinal preparation acts strongly on litmus paper; they may be easily detected by the test first proposed by Professor Geoghegan, of this city: "Drop one or two crystals of the *hydrargyro-iodocyanide of potassium* into the suspected acid; should any foreign acid be present, a red precipitate will immediately be formed on them." This salt may be readily prepared by adding a concentrated solution of bicyanide of mercury to a solution of iodide of potassium, when it is precipitated in the form of white or pearly crystalline plates. Concentrated distilled water of bitter almonds is sometimes substituted for prussic acid; the sophistication may be detected by placing a small quantity of the suspected liquid in an open phial in a sand bath and holding a piece of litmus paper over the mouth of the bottle; if it be bitter almond water, no effect will be produced on the paper, but it will be reddened by the vapour of prussic acid. When unfit for use from being kept too long, prussic acid is generally, though not always, discoloured.

THERAPEUTICAL EFFECTS.—Hydrocyanic acid is perhaps the most powerful poison which has been as yet discovered, "death having been occasioned in man by a mixture containing scarcely one grain of the anhydrous acid" (Christison). The usual symptoms produced by a poisonous dose are convulsions, difficult and spasmodic breathing, and insensibility, followed by death in a few minutes; in some instances, however, life has been prolonged for half an hour or more; but if the quantity taken be very large, death occurs so rapidly that the only symptoms which can be observed are two or three deep hurried inspirations; in some instances, preceded it is stated, by a loud shriek; this, however, is very doubtful. In medicinal doses hydrocyanic acid acts as a direct sedative, producing, immediately after it has been taken, a sensation of quiet and calmness throughout the whole system, diminishing the force and frequency of the pulse, lowering the sensibility of the nervous system, and allaying irritation when it exists; in addition to the above, which may be said to be its more immediate effects, it promotes the digestive powers, and in many instances acts gently on the bowels.

As a remedial agent, this acid has been principally used to allay irritability, to diminish pain, and to lessen spasm. Thus it has been employed with much benefit in the excited action of the heart in pericarditis, in spasmodic and painful affections of the stomach and bowels, as in gastrodynia and enterodynia, in pyrosis, particularly when accompanied by much pain, in chronic vomiting, and in colica pictonum. In the irritable stomach of pregnancy, combined with bismuth and infusion of calumba, it frequently proves of signal service, as also in that most distressing affection, *sea sickness*. It has been also found very serviceable in allaying irritable or spasmodic cough in various pulmonary affections, as in simple hooping cough, unattended with inflammation, in pure spasmodic asthma, in the advanced stages of phthisis, and in the spasmodic cough of nervous and hysterical females. Hydrocyanic acid has been successfully employed to allay vomiting and purging in severe cases of common cholera, and to check the colliquative diarrhœa and sweating of hectic. Lastly, it has been administered as a calmative and anodyne in neuralgia, tic douloureux, chronic rheumatism, cancerous diseases, and nervous palpitations, but its success in these affections has been very equivocal.

Externally, applied in the form of lotion, it is found very serviceable in allaying the violent itching which attends many forms of skin diseases, but for this purpose is far inferior to chloroform. The vapour of prussic acid has been applied to the eye in amaurosis by Dr. Turnbull, but its efficacy is very doubtful; in a case which I saw with Sir William Wilde, of this city, its employment for this purpose produced giddiness, temporary insensibility, and other symptoms of poisoning, followed by erysipelatous inflammation of the face and forehead.

DOSE AND MODE OF ADMINISTRATION.—The medicinal acid is administered in doses of one or two minims, which should be repeated every second or third hour, according to circumstances, the effects being very transitory. This dose has, however, been very much exceeded, in Professor Geoghegan's celebrated case the patient having taken one hundred and twenty minims before dangerous symptoms appeared. It is best given in distilled water to which simple syrup may be added; it should be always prescribed in the form of draught, as when given in mixture it is generally stated to be apt to float on the top of the liquid, and that thus a single dose may produce dangerous effects; however, from a series of experiments that I have made I have satisfied myself that this is a popular fallacy, although from other motives I concur in the desirability of prescribing it in the form of draught, as thus obviating any chance of a mistake in the dose. The quantity given should be increased very gradually, and its effects carefully watched. For external use, a lotion may be prepared with fʒij. of the acid, and f℥viij. of distilled water, the application of which, however, to raw surfaces should be carefully avoided.

INCOMPATIBLES.—Nitrate of silver; red oxide of mercury; sulphate of copper; sulphate and muriate of iron, if an alkali be present; all sulphurets; and strychnia.

In cases of poisoning with prussic acid, if the person be seen immediately, he should be made to inhale ammonia diluted with atmospheric air, or the liquor ammoniæ should be administered in small but frequently-repeated doses; the administration of chlorine gas has been also recommended, or when it cannot be obtained readily, a solution of the hypochlorite of lime or hypochlorite of soda; but if some time have elapsed, and insensibility be present, the most powerful external stimulants, with the cold affusion, and artificial respiration, should be employed. More recently the Messrs. Smith of Edinburgh have proposed a mixture of a proto- and a per-salt of iron combined with an alkaline carbonate, as an antidote for prussic acid; and from the experiments performed with it, its use appears to be attended with complete success. The method recommended by these gentlemen is as follows:—Dissolve gr. x. of sulphate of protoxide of iron in f℥j. of water, and add to it fʒj. of tincture of muriate of iron; and dissolve in another vessel gr. xx. of carbonate of potash in f℥j. or f℥ij. of water; the latter solution is to be administered first, and immediately afterwards the solution of iron. Of all the remedies, however, which have been proposed for the treatment of poisoning with hydrocyanic acid, none have been attended with the good results which have followed from the sedulous use of artificial respiration and of the cold affusion, or preferably the cold *douche* on the head only; and in several recorded cases, recovery has taken place even where this remedy had not been had recourse to for some time after the symptoms of poisoning had appeared. In all such cases the practitioner will become keenly alive to the nature of the case by the strong smell of prussic acid he will perceive, immediately upon entering the patient's room.

ACONITUM. *Aconite.* Aconitum Napellus, *Linn.* Monkshood. Plate 6, *Woodv. Med. Bot.* (The fresh leaves and flowering tops; gathered, when about one-third of the flowers are expanded, from plants cultivated in Britain.)

ACONITI RADIX. *Aconite Root.* Aconitum Napellus, *Linn.*

Plate, p. 449, vol. xv. *Pharm. Journ.* (The root, dried; imported from Germany, or cultivated in Britain, and collected in the winter or early spring, before the leaves have appeared.) It has not been yet accurately ascertained which species of the genus *Aconitum* was employed by Störck, who was the first to use it as a medicine. The reference of the Pharmacopœia is not only correct, but, according to the accurate and trustworthy experiments of Professor Fleming, now of Birmingham, whose treatise on this plant is a model of the manner in which such an inquiry should be conducted, the aconite here indicated is the only European species possessed of any medicinal activity. It is said to grow wild in some parts of England, but it was probably introduced from the Continent of Europe, where it grows abundantly in woods. It belongs to the Natural family *Ranunculaceæ*, and to the Linnæan class and order *Polyandria Trigynia*.

BOTANICAL CHARACTERS.—Root, tapering, with one or more pyriform tubers attached; stems simple, 2–6 feet high; leaves, palmate, cuneate, pinnatisect; flowers on a cylindrical simple raceme, deeply hairy, with an irregular petaloid calyx, the upper leaflet of which is helmet shaped.

MODE OF PREPARATION.—The root should be dug up immediately after the plant flowers, and the tubers alone employed; they must be cut into thin slices, and dried slowly at a low temperature; the leaves should be gathered just before the flowers expand, and dried carefully with a stove heat.

CHARACTERS.—*Of the Plant.* Leaves smooth, palmate, divided into five deeply cut wedge-shaped segments; exciting, when chewed, a sensation of tingling. Flowers numerous, irregular, deep blue, in spikes. *Of the Root.* From one to three inches long, not thicker than the finger at the crown, tapering, wrinkled, blackish-brown, internally whitish. A minute portion, cautiously chewed, causes prolonged tingling and numbness.

PHYSICAL PROPERTIES.—Aconite root has a faint earthy odour and bitter acrid taste, leaving a benumbing impression on the lips and tongue; it is the most active part of the plant. The leaves have a very feeble narcotic odour; their taste is similar to that of the root. When carefully dried, they retain their virtues for many years, if kept in close vessels in a dry place excluded from the light.

CHEMICAL PROPERTIES.—No very accurate chemical analysis has been made of this plant. It contains an acrid volatile principle, green colouring matter, vegetable albumen, some salts, and a peculiar alkaloid, first discovered by Brandes, and named by him *aconitina* (aconitia), in combination with a peculiar acid *aconitic acid* (C_4HO_3), indicated by Peschier, and said to be identical with Equisetic acid, together with a second (inert ?) alkaloid named *aconella*. Aconitina was officinal in the London Pharmacopœia of 1836, but as it could with difficulty, if at all, be procured by the process there given, it was omitted from the last edition; and is now (although we have a formulary given in the Pharmacopœia for its manufacture) either prepared by a few celebrated pharmaceutical chemists in these countries, or imported from France or Germany. Its properties, &c., will be described among the preparations of the drug. Aconite leaves and root yield their active principles completely to alcohol, but very imperfectly to water.

ADULTERATIONS.—The leaves of other species are occasionally substituted for those of the Aconitum napellus; these can be detected by attention to the characters given above.

THERAPEUTICAL EFFECTS.—In large doses the leaves or root of aconite are highly poisonous, appearing to produce death by a direct depression of the vital powers, thus the most manifest symptoms are slight wandering delirium, the consciousness being partially retained, general muscular tremors, or very slight convulsions, and failure of the circulation; moreover, a feeling of numbness and tingling is experienced over the entire of the body, a diminution of the temperature of the surface takes place, and there is frequently loss of sight —the pupil of the eye, which was at first contracted, becoming dilated, and death by *syncope* taking place. In addition to these, in some carefully conducted experiments on the lower animals, Von Praag discovered a retarding influence on the respiration, and a paralysing operation on the voluntary muscles, which quite agree with its effects on man in poisonous doses. As a medicine it has been used with the most marked benefit in all forms of painful diseases, even when accompanied by inflammation; this is well illustrated by its employment in the treatment of acute rheumatism, and of neuralgia. In the former of these diseases it has proved in the hands of Dr. Lombard, of Geneva, a complete specific, and his statements have been fully borne out by the experience of Dr. Fleming in his carefully conducted investigations; the alcoholic extract, given in doses of from half a grain to eight grains frequently repeated, curing the severest attacks of febrile rheumatism in from two to six days, and affording marked relief within an hour or two after the first dose is taken. It has not, however, proved so successful in the practice of other British physicians, which is probably owing to the inertness of the former officinal preparations, for, in some cases in which I employed the powdered leaves, the beneficial results were most marked. I have administered the tincture with decided benefit in painful affections of the stomach, whether dependent on organic disease or not; and in some obstinate cases of violent gastrodynia, which had resisted all other remedies for years, its effects were most decided, perfect recovery resulting in a short time from its use. In neuralgic pains, particularly tic douloureux, applied externally in the form of extract or tincture, it seldom fails to ameliorate the suffering, producing a remarkable sensation of numbness, and in many instances will cure the disease; but it is not so useful in sciatica or lumbago. It has been also administered in the treatment of many other diseases, but in none of them has its efficacy been well established. Aconitia has been used in the same cases as the preparations of the leaves or root of aconite, but owing to its high price and its intensely poisonous properties, it has hitherto been but little employed.

DOSE AND MODE OF ADMINISTRATION.—The powder of the root or leaves may be given in doses of from gr. iij. to gr. xij. gradually increased, until symptoms indicating its action are produced. The officinal preparations are, *of the root*, aconitia, linimentum, tinctura; *of the leaves*, extractum.

Aconitia. Aconitia. $C_{60}H_{47}NO_{14}$. (An alkaloid, obtained from aconite root.)

PREPARATION.—Take of aconite root, in coarse powder, fourteen pounds; rectified spirit, a sufficiency; distilled water, a sufficiency; solution of ammonia, a sufficiency; pure ether, a sufficiency; dilute sulphuric acid, a sufficiency. Pour upon the aconite root three gallons of the spirit, mix them well, and heat until ebullition commences; then cool and macerate for four days. Transfer the whole to a displacement apparatus, and percolate, adding more spirit, when requisite, until the root is exhausted. Distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water bath until the whole of the alcohol has been dissipated. Mix the residual extract thoroughly with twice its weight of boiling distilled water, and, when it has cooled to the temperature of the atmosphere, filter through paper. To the filtered liquid add solution of ammonia in slight excess, and heat them gently over a water bath. Separate the precipitate on a filter, and dry it. Reduce this to coarse powder, and macerate it in successive portions of the ether with frequent agitation. Decant the several products, mix, and distil off the ether until the extract is dry. Dissolve the dry extract in warm distilled water acidulated with the sulphuric acid; and, when the solution is cold, precipitate it by the cautious addition of solution of ammonia diluted with four times its bulk of distilled water. Wash the precipitate on a filter with a small quantity of cold distilled water, and dry it by slight pressure between folds of filtering paper.

EXPLANATION OF PROCESS.—Aconitia, as already stated, exists in combination with aconitic acid; by digestion with rectified spirit the root is exhausted of this salt, which is decomposed by the first addition of ammonia, the aconitia, together with some colouring matter, precipitating, and the aconitate of ammonia remaining in solution. By digesting the precipitate with ether the aconitia is dissolved out, and the ether is now recovered by distillation; on the addition of the sulphuric acid we have sulphate of aconitia formed, which salt is subsequently decomposed by the second addition of caustic water of ammonia, sulphate of ammonia being held in solution, and the aconitia precipitating: the subsequent steps of the process require no comment.

CHARACTERS.—A white usually amorphous solid, soluble in 150 parts of cold, and 50 of hot water, and much more soluble in alcohol and in ether; strongly alkaline to reddened litmus, neutralizing acids, and precipitated from them by the caustic alkalies, but not by carbonate of ammonia or the bicarbonates of soda or potash. It melts with heat, and burns with a smoky flame. When rubbed on the skin it causes tingling, followed by prolonged numbness. It is a very active poison.

TESTS.—Dissolves entirely in pure ether; leaves no residue when burned with free access of air.

Aconitia is in the form of a white semi-crystalline powder, odourless, with a bitter benumbing taste, producing a sense of dryness and constriction of the fauces. It is very soluble in sulphuric ether, less so in alcohol, and very slightly soluble in water. When perfectly pure, this alkaloid is so powerful a poison "that the fiftieth of a grain has endangered the life of an individual" (Pereira). As usually met with it is of a grayish-yellow colour, in which state it is very impure. The usual impurity being aconella, the second alkaloid found in monkshood; its inferior solubility in ether distinguishes it from aconitia. Aconitina possesses, but of course much more powerfully, the same medicinal virtues as monkshood; it has been principally used in the form of ointment in tic douloureux and other neuralgic pains; but it does not appear to possess sufficient advantages over the extract (considering its enormous price) to warrant its employment as a medicinal agent. It cannot be administered internally with safety.

Unguentum Aconitiæ. Ointment of Aconitia. (Take of aconitia, eight grains; rectified spirit, half a fluid drachm; prepared lard, one ounce. Dissolve the aconitia in the spirit, add the lard, and mix thoroughly.) Employed by friction with the finger during several minutes. If there be any abrasion of the cuticle, the external application of aconitia cannot be unattended with danger.

* *Solutio Aconitinæ,* TURNBULL. (Aconitia, gr. viij.; rectified spirit, f℥ij.; dissolve.) Applied externally by means of a small sponge.

Extractum Aconiti. Extract of Aconite. (Take of the fresh leaves and flowering tops of aconite, one hundred and twelve pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to 130°, and separate the green colouring matter by a calico filter. Heat the strained liquor to 200° to coagulate the albumen, and again filter. Evaporate the filtrate by a water bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.) Dose, gr. ss. to gr. ij.

Linimentum Aconiti. Liniment of Aconite. (Take of aconite root, in powder, twenty ounces; camphor, one ounce; rectified spirit, thirty fluid ounces, or a sufficiency. Moisten the aconite root with a portion of the spirit, and macerate for seven days; then percolate into a receiver containing the camphor, until the product amounts to one pint.) Used as an external application for neuralgic pains, &c. Care must be taken not to apply it to raw surfaces.

Tinctura Aconiti. Tincture of Aconite. (Take of aconite root, in fine powder, two ounces and a half; rectified spirit, one pint. Macerate the aconite root for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) This tincture has half the strength of tinctura aconiti, *Dub.*, and one-third of the strength of tinctura aconiti, *Lond.* Dose, min. v., cautiously increased to min. x.

In cases of poisoning with monkshood, emetics should be immediately administered, and the most active stimulants, both external and internal, employed. Tannin has been recommended as an antidote, in consequence of its forming insoluble compounds with the vegetable alkaloids; but most of the insoluble tannates are digestible in the human stomach. Poisoning with monkshood not unfrequently has occurred as the result of accident, the root having been mistaken for that of horse-radish. When both roots are whole this can only occur through gross ignorance, so dissimilar are they; but when *shred*, as horse-radish is, to be served up as a condiment, they might readily, and *have been*, confounded: the pungent peculiar smell of horse-radish will always, however, suffice to identify it.

* AMYGDALÆ AMARÆ OLEUM. *Volatile Oil of Bitter Almonds.* The bitter-almond tree has been described in the division *Emollients.*

PREPARATION.—Oil of bitter almonds is obtained by submitting bitter-almond cake, left after the separation of the fixed oil by expression, to distillation with water. The chemical history of this product is so interesting, and the account given of it in his valuable manual of the *Metalloids*, by Professor Apjohn, is so clear, that I have not hesitated to reproduce the passage here:—"The celebrated researches of Wöhler and Liebig have disclosed the curious fact, that the prussic acid and essential oil of almonds which are obtained from certain vegetables by distillation do not exist in them ready formed, but are products of the reaction upon each other of two vegetable principles, known under the name of amygdalin and emulsin. In the vegetable tissues these principles are contained in separate cells, but are brought by the crushing of the plants into contact. Besides the volatile oil of almonds, and hydrocyanic acid, there are other products formed, such as grape sugar, formic acid, and water. The emulsin, which is of an albuminous nature, merely acts the part of a ferment, and is hence called *synaptase*, and the different products just enumerated proceed from the amygdalin alone. The following is the equation which has been given to explain this remarkable change:—
$2(C_{40}H_{27}NO_{22})$ *amygdalin*, $=4C_{14}H_6O_2$ *essential oil*, $+2(H,NC_2)$ *hydrocyanic acid*, $+(C_{12}H_{14}O_{14})$ *grape sugar*, $+4(HO, C_2HO_3)$ *formic acid*, $+6HO$.

"This theory is corroborated generally by two remarkable facts, viz., that if the plants be not crushed, or if boiling water has been used, the metamorphosis does not take place. The breaking up of the structure of the vegetable is necessary for bringing the amygdalin and emulsin into contact; and if water at the temperature of 212° be used, the latter principle coagulates, and loses its peculiar power of acting as a ferment.

"In illustration of these views a very simple but striking experiment admits of being made, viz., to add a few drops of an aqueous solution of amygdalin to a sweet almond rubbed in a mortar to a pulp. These two are destitute of odour; but the moment they touch, the smell of hydrocyanic acid is distinctly perceived. This reaction is so definite, that Liebig and Wöhler suggest it as a means of extemporaneously producing hydrocyanic acid for medical use; and state that 17 grains of the amygdalin, when dissolved in an ounce of the emulsion of sweet almonds, develop exactly 1 grain of absolute acid. The sweet almond, it should be observed, though destitute of amygdalin, includes a considerable amount of the synaptase."

PHYSICAL PROPERTIES.—As usually met with, it is of a golden-yellow colour, but when obtained from almonds which have been blanched, is colourless when first drawn. It is a transparent liquid, with a high refractive power, having an agreeable *ratafia* odour, and an acrid, warm, bitter taste. Bitter almond oil is heavier than water, its specific gravity varying from 1·053 to 1·083.

CHEMICAL PROPERTIES.—Oil of bitter almonds, as prepared by distillation, consists of from 8·5 to 14·33 per cent. of pure hydrocyanic acid, mixed with *benzoïc acid*, *benzoïn*, *benzimide*, and *hyduret of benzoyle*. Its poisonous and medical properties depend chiefly on the hydrocyanic acid, which may be completely removed from it by repeated distillation from a solution of caustic potash, but hyduret of benzoyle which is left is still a poison, though not so active a one, and moreover does not keep well, as it rapidly undergoes oxidation. The oil is very soluble in alcohol and ether; by agitation with water, a portion of the hydrocyanic acid is dissolved out, and the water acquires the peculiar odour and taste of the acid.

ADULTERATIONS.—Oil of bitter almonds has been recently much adulterated, but chiefly on the Continent. According to Zeller, the best tests for its purity are its high specific gravity, and its *clear* solubility in sulphuric acid, with a reddish-brown colouration, and without any visible decomposition.

THERAPEUTICAL EFFECTS.—The medical properties of this oil depending on the hydrocyanic acid it contains, its effects and uses are of course similar to those of that acid, for which it has been proposed as a substitute; but its strength being very variable, it is scarcely adapted for internal use. It should be borne in mind that the oil of bitter almonds is at least four times as active as officinal prussic acid.

DOSE AND MODE OF ADMINISTRATION.—Min. ij. may be dissolved in f℥ss. of rectified spirit, and of this solution min. iij. to min. vj. may be given occasionally.

* *Vegetable Hydrocyanic Acid*, SCHREDER. (Oil of bitter almonds, min. iv.; rectified spirit; and distilled water, of each, min. xxx.; dissolve.) Dose, min. ij. to min. iij. every second or third hour.

* AMYLENA. *Amylene.* Among the many substitutes possessing anæsthetic properties proposed for use in medicine instead of ether or chloroform, this alone deserves notice, as having been used for some time pretty extensively, and being still employed in practice by some surgeons. It was originally discovered in 1844 by M. Balard of Paris, but was not used in medicine until within the last few years, when it was first employed as an anæsthetic in surgical operations by Dr. Snow of London. Amylene is procured by distilling Fusel oil (see page 61, *and also the supplement*) with chloride of zinc. The following process is at present generally followed for its preparation:—

PREPARATION.—A certain quantity of pure fusel oil—not more than sufficient to half fill the vessel—is put into the body of a copper still, and about a sixth of its weight of solid chloride of zinc, in small fragments, added; the chloride of zinc should have been moistened with fusel oil previously by being submerged in it for three days. The head of the still being carefully adapted, a large glass tube is closely luted to the orifice, and heat applied by means of a sand-bath. At a temperature of 226° F. it begins to distil, and the product thus obtained is re-distilled, the heat being continued until the temperature of the boiling liquid reaches 570° F. The most volatile parts of the fluid procured by this re-distillation are agitated with concentrated sulphuric acid, when a colourless and very mobile liquid rises to the surface, and this constitutes the amylene of commerce.

PHYSICAL PROPERTIES.—Amylene is a transparent, colourless, volatile liquid, much lighter than water; its specific gravity at 60° F. being 0·660. It has, to most persons, a disagreeable nauseous odour, resembling a mixture of ether and decaying cabbage; its taste is somewhat spirituous, and faintly acrid.

CHEMICAL PROPERTIES.—It is a carburet of hydrogen, its composition being $C_{10}H_{10}$. It is very sparingly soluble in water, but dissolves freely in alcohol and ether; its boiling point is 102° F. and it is inflammable, burning with a brilliant white flame.

ADULTERATIONS.—Amylene, as met with in the shops, varies extremely in odour and properties, which is chiefly due to errors or carelessness in its preparation; other hydro-carbons, more particulary *paramylene*—the amylene of M. Cahours discovered five years previously—which distil over with it, not being separated. The following, according to M. Duroy, are the best tests for its purity:—"The boiling point at 102° F.; to produce no action on potassium plunged into it; not to be coloured by caustic potash; and not to emit the odour of valerianic acid when heated in contact with hydrated potash."

THERAPEUTICAL USES.—For some time after the introduction of amylene as an anæsthetic agent by Dr. Snow, it was believed that it would prove a useful substitute for chloroform, being supposed to be capable of producing insensibility to pain with much less coma or stupor that occurs from the use of either it or ether. This is certainly true, but subsequent experience has shown that its operation is uncertain, and moreover that its employment is not, as was at first stated, free from danger, as some deaths have taken place from its inhalation. Other objections to the employment of amylene also exist, namely, its disagreeable odour, the anæsthetic state caused by it being of short duration, and the greater quantity required to be used of it than of chloroform. On the other hand, again, it is said not to irritate the air-passages—a statement which my own personal experience compels me to deny—nor to induce nausea or vomiting, as chloroform inhalation so usually does. On the whole, however, I am of opinion that as an anæsthetic agent, amylene does not possess sufficient advantages over either chloroform or ether, to entitle it to be generally employed for the purpose of producing insensibility to pain.

MODE OF EMPLOYMENT.—Amylene should not be administered without an inhaler. To produce anæsthesia it should be inhaled at the rate of rather more than a fluid drachm a minute, when, according to Dr. Snow, it will usually cause insensibility in three minutes.

*ANILINA. *Anilene.* ($C_{12}H_7N=93$.) This remarkable substance, although a stranger to our pharmacopœia, requires a few words of comment, as being with some practitioners a favourite remedy. Originally it was derived as one of the many products of the distillation of coal, and in consequence of its being supposed to be a compound of an hypothetical base *Phenyle* ($C_{12}H_5$), it has been known as *phenylamine*; but the quantity of it procurable from that source being very minute indeed, other means of procuring it were sought for, and it has been ascertained that it can be obtained from *nitrobenzole,* by what is termed a *substitution process;* and also from indigo, by distilling it with a strong solution of caustic potash. In the arts it is a very important substance indeed, being the source from whence the present fashionable colours *mauve, magenta, bleu de Paris,* &c. are procured. When pure it is an oily looking colourless liquid, of disagreeable smell, and warm aromatic taste—alkaline in reaction, which, however, is not readily recognized by test papers, in consequence of the greasy stain which it communicates to them, but which, in consequence of its volatility, after a time disappears. It is soluble in alcohol, ether, and in the fixed and volatile oils, and sparingly soluble in water. Exposed to the air it absorbs oxygen, becoming darker coloured and resinous in appearance. Its most characteristic property is the beautiful violet blue colour developed on treating it with a solution of chloride of lime, which colour is changed to red on the addition of an acid. According to Dr. Duckworth, a cat to which thirty minims of aniline had been administered, died within an hour, the pupils being dilated, and respiration hurried; death was preceded by convulsions; post mortem examination revealed extensive venous engorgement, and the fact of its having been absorbed was unequivocally proved by the strong smell of aniline furnished by the blood in all directions, and by the brain. Aniline exhibits its basic properties by uniting with acids to form salts, which can be obtained in crystals, and of which the sulphate has been most generally employed. It is of a light gray colour, which on exposure to light deepens, is soluble in water, the smell of its solution recalling faintly that of tar. The dose of this salt is from one to three grains. It has been exhibited in cases of chorea, and when sufficiently long persevered in, is stated to have been productive of benefit. It is one of those medicines which call for more extended clinical experience, as, if it prove of benefit in this class of affections, it will be a valuable addition to our Materia Medica. The sulphate may be administered either in the form of pill or dissolved in water, with the addition of a few drops of dilute sulphuric acid and of some flavouring syrup.

ANTIMONIUM TARTARATUM. *Tartar emetic* (described in the division *Diaphoretics*), when administered in full doses frequently repeated, acts as a direct *sedative* or *contra-stimulant*, this effect being most manifest in inflammatory diseases. Under the influence of doses of one, two, or three grains, repeated every hour, or every second hour, the nausea, vomiting, or purging produced by the first or second dose ceases entirely, the force and frequency of the heart's action are lowered, and local inflammation is arrested. In Lepelletier's essay, two cases of pneumonia are mentioned, in one of which the pulse was reduced from 120 to 34 beats per minute in nine days, and in the other from 72 to 44 beats per minute in three days, under the use of continued doses of tartar emetic. This contra-stimulant power of tartar emetic is employed with benefit in the treatment of acute inflammations, in which it is administered either alone or as an adjunct to bleeding or other antiphlogistic means. The diseases in which this plan of treatment has been found most beneficial are acute pneumonia and pleuritis. British practitioners usually employ local bleeding in these diseases, in conjunction with tartar emetic; but, although in pleuritis the combined local abstraction of blood will in some instances be absolutely requisite, it is stated by those who adopt this plan of treatment, that many cases of pneumonia are cured as speedily and as effectually by the use of tartar emetic alone; indeed, by many physicians, bleeding is considered singularly injurious to the development of the sedative influence of this medicine. This mode of administering tartar emetic has been also employed in the treatment of bronchitis, of arachnitis, and of many other acute inflammations, in all of which its beneficial effects are more or less decidedly manifest. As a contra-stimulant, tartar emetic is given in doses of from half a grain to two grains every hour or every second hour, dissolved in a small quantity of water— one or two ounces at most; the best vehicle for its administration is perhaps orange flower water. The first dose or two should not exceed half a grain, and the patient should not be permitted to drink, so as if possible to avoid the production of vomiting: when once a tolerance of the medicine is produced in the system, the quantity taken may be rapidly increased.

*CERIUM. *Cerium.* Ce=47·26. This metal, which exists in combination with lanthanium and didybium in some minerals, the most important of which is *cerite*, and which is its parent source, was originally discovered in 1809 by Berzelius; since which time, until very recently, its employment in medicine was not thought of. Within the past few years, however, Professor Simpson has introduced its salts to the notice of the profession, and especially the *oxalate* and *nitrate*, as valuable remedial agents. He conceives these salts to possess a compound action, *sedative* and *tonic*, resembling somewhat in their action that of subnitrate of bismuth and nitrate of silver. The cases in which he recommends their use are those of irritable dyspepsia, complicated with pyrosis and gastrodynia, chronic vomiting, and pre-eminently in the vomiting and morning sickness of pregnancy; he states that he has found the oxalate more successful in curing vomiting in a larger number of cases than any other single remedy which he has yet tried. The oxalate may be administered either in the form of powder or pill; its dose is from one to three grains. The high reputation of the distinguished physician who has acted sponsor for them entitles these preparations to an extended clinical trial; in some cases in which I prescribed the oxalate, it certainly appeared to give relief.

CHLOROFORMUM. *Chloroform.* $C_2HCl_3(=119{\cdot}5)$. (*Syn.: Terchloride of Formyl.*) Chloroform was originally obtained in 1831 by M. Soubeiran, and shortly afterwards discovered also by Liebig, but its composition and chemical characteristics were for the first time carefully investigated by Dumas in 1835. Many processes have been proposed for its preparation; the following is that which is now officinal:—

PREPARATION.—Take of chlorinated lime, ten pounds; rectified spirit, thirty fluid ounces; slaked lime, a sufficiency; water, three gallons; sulphuric acid, a sufficiency; chloride of calcium, in small fragments, two ounces; distilled water, nine fluid ounces. Place the water and the spirit in a capacious still, and raise the mixture to the temperature of 100°. Add the chlorinated lime and five pounds of the slaked lime, mixing thoroughly. Connect the still with a condensing worm encompassed by cold water, and terminating in a narrow-necked receiver, and apply heat so as to cause distillation, taking care to withdraw the fire the moment that the process is well established. When the distilled product measures fifty ounces, the receiver is to be withdrawn. Pour its contents into a gallon bottle half filled with water, mix well by shaking, and set at rest for a few minutes, when the mixture will separate into two strata of different densities. Let the lower stratum, which constitutes crude chloroform, be washed by agitating it in a bottle with three ounces of the distilled water. Allow the chloroform to subside, withdraw the water, and repeat the washing with the rest of the distilled water, in successive quantities of three ounces at a time. Agitate the washed chloroform for five minutes in a bottle with an equal volume of sulphuric acid, allow the mixture to settle, and transfer the upper stratum of liquid to a flask containing the chloride of calcium mixed with half an ounce of slaked lime, which should be perfectly dry; mix well by agitation. After the lapse of an hour, connect the flask with a Liebig's condenser, and distil over the pure chloroform by means of a water-bath. Preserve the product in a cool place, in a bottle furnished with an accurately ground stopper. The lighter liquid which floats on the crude chloroform after its agitation with water, and the washings with distilled water, should be preserved, and employed in a subsequent operation.

EXPLANATION OF PROCESS.—The reactions in virtue of which chloroform is developed are strictly confined to the alcohol, chlorinated lime, and slaked lime employed in the process; the remaining ingredients fulfilling other important but subordinate duties. By the destructive distillation of the *ant (Formica Rufa)* an acid is developed, deriving from its original source its name *formic acid*. Its composition is C_2HO_3, being looked upon by chemists as the teroxide of an hypothetical base, *formyle* (C_2H). The oxygen in formic acid can be replaced with chlorine, constituting chloroform, whence one of its synonyms, *chloroformyle*, is derived. The generally-received explanation of the reactions that ensue between the materials involves the supposition that chloral ($C_4HO_2Cl_3$) a peculiar oily-looking fluid, is formed as an intermediate product by the action of the chlorinated lime upon the alcohol, and with the development, at the same time, of lime, water, chloride of calcium, and formiate of lime. To account for these several products, two equivalents of alcohol are acted upon by eight of chlorinated lime ($CaO\ ClO+CaCl$); but inasmuch as the chloride of calcium of this latter compound takes no part in these changes, I have omitted all mention of it in this equation, which accounts for these reactions, $2(C_4H_6O_2) + 8CaO\ ClO = C_4HO_2Cl_3 + CaO + 9HO + 5CaCl + 2(CaO,C_2HO_3)$. Immediately on the production of the chloral, by the action of lime upon it, it is resolved into chloroform and a second portion of formiate of lime; thus, $C_4HO_2Cl_3+CaO+HO=C_2HCl_3+CaO,C_2HO_3$. But to account for the production of chloroform as the result of the reaction of these materials, it is by no means essential that we should have recourse to the supposition that chloral is developed as an intermediate product; for we can account for the production of the chloroform directly by the action of chlorinated lime upon the alcohol, resulting in the formation of chloroform, chloride of calcium, water, and formiate of lime; thus, $2(C_4H_6O_2)+8CaO\ ClO= C_2HCl_3+5CaCl+8HO+3(CaO,C_2HO_3)$; and the formiate of lime so produced by the action of another portion of chlorinated lime and of lime will be resolved into carbonate of lime (invariably found as a residual salt), chloride of calcium, and water; thus, $CaO,C_2HO_3+CaO\ ClO + CaO = 2(CaO\ CO_2)+CaCl+HO$. The further steps of the process are directed towards its purification, notably from a pyrogenous oil generated during the process, and from alcohol. This latter is removed by the elutriation directed; the former is charred by the sulphuric acid, and is so gotten rid of, at the expense, however, of the deoxidation of the sulphuric acid and the consequent development of sulphurous acid. The slaked lime removes now the acids, the chloride of calcium, the water, and, on distillation, the chloroform is delivered perfectly pure.

CHARACTERS.—A limpid, colourless liquid, of an agreeable, ethereal odour, and sweet taste. Mixes with alcohol and ether in all proportions; and dissolves slightly in water, communicating to it a sweetish taste. Burns, though not readily, with a green and smoky flame.

PHYSICAL PROPERTIES.—Chloroform is a transparent, colourless, very mobile liquid, heavier than water, extremely volatile, with a sweetish, cooling taste, and an ethereal, *fruity* odour, which is agreeably fragrant when the preparation is quite pure, resembling that of ripe apples. The specific gravity of it, when prepared according to the pharmacopœial process, is 1·496; but the late Professor Gregory, of Edinburgh, stated that he obtained it so high as 1·500.

CHEMICAL PROPERTIES.—It is a compound of two equivalents of carbon, one of hydrogen, and three of chlorine, its formula being $C_2H\,Cl_3$. It is nearly insoluble in water, requiring 2000 parts for its solution, to which, however, it imparts its agreeable odour; but is soluble in alcohol and ether. Chloroform boils at 141°, is scarcely inflammable, kindling with difficulty, when it burns with a greenish flame. It is a very powerful and general solvent, dissolving caoutchouc freely, and also gutta percha, making with this latter a solution (gr. lx. of gutta percha to f℥j. of chloroform) admirably adapted for the protection of abraded surfaces. It is the best solvent we possess for camphor; it also dissolves resins (with sealing-wax, making an admirable varnish), iodine, bromine, and, sparingly, sulphur and phosphorus. It dissolves most of the alkaloids—"100 parts of chloroform dissolve of veratria, 58·49 parts; quina, 57·47; brucia, 56·70; atropia, 51·19; narcotina, 31·17; strichnia, 20·19; cinchona, 4·31; and of morphia, 0·57."—*Brande and Taylor, Chemistry*, p. 698. Concentrated sulphuric acid when agitated with chloroform has no action on it, and is therefore made use of for its purification in the process of the Pharmacopœia, as originally proposed by Gregory; but as pointed out by Christison, chloroform when thus treated, although at first unaltered, does not keep for any time, undergoing decomposition, and evolving chlorine and sulphurous acid, when its employment in medicine would be attended with danger. Indeed, according to many authorities, perfectly pure chloroform is anything but a *desideratum*, being always liable to spontaneous decomposition, from which it is preserved by the presence of a trace of spirit; nevertheless I have had in my possession, for more than two years, specimens of chloroform prepared by an Edinburgh house (Duncan and Flockhart), which I have reason to believe perfectly pure, and which during that period remained perfectly unaltered.

TESTS.—Specific gravity, 1·496. Is not coloured by agitation with sulphuric acid, leaves no residue, and no unpleasant odour after evaporation, and evolves no gas when potassium is dropped into it.

ADULTERATIONS.—A great deal of spurious and badly prepared chloroform has been and still is met with in the shops; as a consequence perhaps of which, some of the fatal results which have followed its use have occurred, and its general employment as an anæsthetic agent has been retarded. When pure it is *perfectly* transparent; it should be of the prescribed density, should have no effect on litmus or turmeric paper, and should leave no *after odour* when a small quantity is allowed to evaporate on the palm of the hand, which is one of the best tests, as it is the simplest and readiest. When dropped into water it should remain at the bottom of the vessel *pellucid*; but if it contain even a small proportion of alcohol, the globules will present a milky appearance. Did it evolve gas when potassium is dropped into it, it would be an evidence of the presence of some compound of oxygen. The following is Professor Gregory's test for ascertaining the purity of chloroform:—"Perfectly *colourless* sulphuric acid, of the density of 1·840 at least, when agitated with pure chloroform remains colourless, but if the chloroform be impure it becomes yellow or brown." For the detection of ether, a very frequent adulteration, M. Rabourdin of Orleans has proposed the following simple test:—"Pure chloroform dissolves a small quantity of iodine, acquiring a very beautiful violet colour, precisely resembling in tint the vapour of iodine; but if the chloroform is mixed with sulphuric ether, even in small quantity, the colour is wine red, or even dark brown, if the ether is in any quantity."

THERAPEUTICAL EFFECTS.—From the time of its original discovery, chloroform had been more or less used on the Continent and in America in the fluid form as a sedative, but was very little employed in this country. The chief diseases in which it has been administered with benefit were asthma, spasmodic cough, and cancerous and other painful affections; in cancer it is most highly praised by Mr. Tuson of London, but general experience has not confirmed his extravagant statements. More lately it has been given with excellent effect in obstinate vomiting, in painful affections of the digestive organs, especially the various forms of colic, and in nervous and spasmodic diseases, such as hysteria, tetanus, hydrophobia, delirium tremens, in most of which affections I have prescribed it with decided benefit. A remarkable property it possesses of reducing the frequency of the pulse in delirium tremens has been alluded to by my friend Mr. Butcher; in some cases bringing it down to fifty, or even forty in the minute: this is a statement which I have myself frequently verified. In sea sickness it has been found very efficacious in some cases, whilst in others it has totally failed; it should be given in five or ten minim doses, with or without a little brandy; it has been also employed in the treatment of spasmodic cholera. In many of these cases pure chloroform is preferred, in others the spiritus chloroformi (chloric ether), is a favourite formulary. Externally applied it allays pain and local irritation, and therefore constitutes a useful addition to liniments or ointments in neuralgia, muscular rheumatism, and cutaneous diseases attended with itching, especially prurigo, chronic eczema, urticaria, and lichen.*

But it is from its effects when inhaled in the form of vapour that chloroform has become so important a therapeutical agent. Towards

---

* See *Neligan on Diseases of the Skin.*

the close of the year 1846 the discovery was made in the United States of America, that a state of partial coma with insensibility to pain could be produced by the inhalation of the vapour of sulphuric ether, and this discovery was rapidly taken advantage of, for the purpose of preventing any suffering to the patient during surgical operations. It was almost immediately found, however, that ether inhalation was very uncertain in its effects, producing in many persons violent excitement, spasmodic action of the muscles, delirium, and in some instances death even following its employment; the attention of the members of the profession in all parts of the world was therefore at once actively engaged, with the view of discovering a safe and effectual substitute for it; the honor of this, one of the most important discoveries of modern times, fell to the lot of Professor Simpson of Edinburgh, who, in November, 1847, ascertained that chloroform possessed the desired properties.

The vapour of chloroform, when inhaled in quantity not exceeding that evolved by half a drachm, produces a feeling of fulness in the head, dizziness, and partial loss of consciousness, with usually pleasurable sensations: the effects vary according to individual temperament, but in all they more or less resemble semi-intoxication. If the quantity inhaled be augmented, total insensibility is quickly produced, usually in from thirty seconds to two minutes, the insensibility being marked by slight stertorous breathing, muscular relaxation, and fixing of the eyes. If the inhalation be now stopped, perfect consciousness will be restored, usually in from five to six minutes, the individual recovering without any remembrance of what had taken place. The circulation is somewhat affected during the state of anæsthesia, the strength of the pulse being generally diminished, while its frequency is increased. The anæsthetic condition may be kept up for hours with impunity, as is often done in child-birth, by a cautious continued use of the inhalation.

The therapeutical applications of the inhalation of chloroform are sufficiently manifest, its effects being so fully explained above; but the two purposes for which it is specially used require to be shortly noticed, namely, the prevention of pain during surgical operations, and in child-birth. At first much opposition was given to the employment of anæsthetic agents for the induction of insensibility during operations, and the occurrence of an occasional fatal case, even where chloroform has been inhaled with all due precautions, still affords its opponents an argument against its use; but the magnitude of the boon conferred is so great, and the proportionate risk of ill effect so small, that it is now used almost universally by surgeons, and by some even in the most trivial operations, in which, however, I conceive its employment is as unjustifiable as it is uncalled for. There is one class of operations, the reduction of dislocations, in which it not only prevents pain, but by its relaxing effect on the muscular system removes all difficulty in the reduction, so that the complicated apparatus of compound pulleys, &c., is very rarely indeed required. In the reduction of strangulated hernia, and in the introduction of a catheter in spasmodic stricture, its relaxing effects are also especially advantageous. In operations about the mouth and nose only is the production of anæsthesia contraindicated, and this depends on the danger that might result from the flow of blood into the air-passages during the insensible state of the patient.

The circumstances generally taken into consideration as modifying the action of chloroform are age, strength, and disease. Of these it may be stated that the younger and the older the patient is, the more likely is he to prove amenable to the influence of chloroform. In this instance, as in many others, extremes meet; at these ages we rarely read of fatal cases, and this statement also holds good as to strength. The debilitated and weak, either in consequence of age or disease, bear its administration better than the robust, whilst so far as disease is concerned, my experience agrees with that of Snow, that no matter whether it be disease of brain, lung, or heart, if its administration be required by the emergency of an operation, a fatal result is less likely to follow its administration, than from the shock under such circumstances of a capital operation when the patient is not under its influence. In cases of suspected weak heart, its anæsthetic employment should always be preceded by the administration of some alcoholic stimulus.

It is, however, to the use of chloroform during child-bearing that most opposition has been given, and a fierce controversy has raged between obstetrical practitioners on the subject, since it was first employed by Professor Simpson: scripture authority even being brought to bear on both sides of the question. But as I am not myself a practitioner in midwifery, and consequently cannot speak from personal experience, I wish merely to deal with facts. In Edinburgh anæsthesia is induced—to speak in general terms—in *every case* of labour, natural or preternatural, and with safety to both mother and child; while the opinion of the majority of accoucheurs in this and most other large cities, as far as I can judge from what has been written on the subject, is well expressed in the following extract from the third edition of Dr. Churchill's Midwifery* :—"As to its exhibition in *natural labour*, as I do not believe that in the large majority of cases convalescence is at all impeded by the suffering, I cannot see the necessity, or even the propriety, of urging the employment of anæsthesia in every case; and I do feel that even greater caution ought to be used than in operative midwifery. We may be justified in running some risk when an important point is to be gained, such as perfect quietness during an operation, which we should be not justified in incurring merely to relieve pain; thus, in hysterical or nervous patients, in those labouring under nervous affections, or organic diseases of the

---

* Page 220.

lungs or heart, &c. I do not think we ought to employ it." The most recent authority on the subject, Professor Sinclair, in an able paper in the seventy-fifth number of the *Dublin Quarterly Journal*, thus records his opinion :—"In fact there exist three opinions on the subject, namely :—Firstly, that it should be given in all labour cases; secondly, that it should be administered only in certain selected cases; and thirdly, that it should never be given at all. Prejudice may, of course, influence each section of opinion; to me the middle course appears to be the one most consonant with reason. To assert that because the indiscriminate administration of chloroform in obstetric medicine has sometimes proved dangerous, or even fatal, it should be therefore excluded from obstetric practice altogether, is simply to argue against its use from its abuse."

"Now although amongst the facts here recorded not one fatal accident from chloroform can be found; though it cannot be said that mortality was increased in any way by its means; or that disease, on account of its exhibition, was rendered more rife, or convalescence prolonged; though evidence sufficient cannot be obtained, from the perusal of these observations, to cause its utter condemnation and expulsion from obstetric practice; still, in my opinion, sufficient *can* be gleaned to enable us to come to the conclusion, that the indiscriminate exhibition of chloroform vapour in labour cases should be abandoned, and that it should never be given in labour purely natural, or nearly so. It is true that out of all the cases Dr. Johnston and I have recorded, derived from our hospital experience, but on two or three occasions did symptoms sufficiently alarming occur to cause us to desist in its administration; and it is equally true that from out of my own private practice I can adduce but two cases strongly contra-indicating it; still these two, taken alone, are quite sufficient, in my opinion, to sever chloroform from its much too intimate connexion with natural labour." It is right, however, to add, that in no instance has a fatal result followed the inhalation of chloroform in midwifery practice.

In conclusion, anæsthesia has been employed with most favourable results in the treatment of tetanus, delirium tremens, hysteria, chorea, neuralgic affections, &c.; it has also been had recourse to in hydrophobia, but although the spasms and suffering are thereby alleviated, no decided impression is made on the fatal progress of the disease. In a case of hay asthma I have seen the access of the attack kept off by constantly smelling chloroform, which the patient carried about with him for the purpose; and in hooping-cough I have very frequently indeed seen good results follow its inhalation; a few drops are to be placed in the palm of the nurse's hand, and the patient allowed to breathe it; in a few moments its beneficial action will be evidenced. In laryngismus stridulus a similar proceeding is attended with the happiest results.

DOSE AND MODE OF ADMINISTRATION.—Internally in the fluid form, min. v. to min. xxx. suspended in water by means of mucilage of gum acacia or gum tragacanth, or of Irish moss as proposed by Professor Osborne, but which does not answer as well as either of the gums; in consequence, however, of the volatility of chloroform, it should be always prescribed in draughts: for external use fʒj. to fʒiv. may be mixed by means of yolk of egg with half a pint of any linimint, or from min. v. to fʒss. added to ℥j. of an ointment.

Anæsthesia is usually produced by the inhalation of the vapour emanating from fʒj. to fʒij. It is effectually and safely administered in the manner first proposed by Professor Simpson, namely, by pouring the chloroform into the hollow of a handkerchief folded in the form of an inverted cone; at first fʒss. only should be used, and if the desired effect be not produced in about two minutes, the same quantity may be renewed. Various forms of *inhalers* have been proposed for the administration of the vapour of chloroform, but I must confess that I prefer the simple handkerchief, or the form of inhaler recommended by Dr. Skinner, of Liverpool, which after all is but a convenient modification of the handkerchief, and which allows the thorough admixture of atmospheric air with the vapour; his plan of dropping the chloroform from a bottle by means of a pipette is in my opinion a vast improvement; this is the way in which I have latterly invariably administered chloroform for anæsthetic purposes. The chief points to be attended to are—1st, that the patient should be lying on his back with the head slighly raised; 2nd, that he should be permitted at first to breathe atmospheric air mixed with the chloroform, which is effected by not bringing the chloroform too close to the mouth and nose at once; 3rd, that the vapour should be altogether withdrawn as soon as insensibility is produced, which is usually evidenced by the occurrence of slight stertorous breathing; for this condition can be kept up for any length of time that may be requisite, by the occasional reapplication of fresh chloroform on the handkerchief or inhaler: 4th, that the patient's stomach should be empty when the inhalation is commenced, as otherwise vomiting is apt to be produced. There is but one other remark which I have to make to those inexperienced in the use of chloroform, namely, that during the process of inhalation, just before insensibility is produced, there is usually a struggle on the part of the patient; *this must be resisted, and the chloroform kept just at that time closely applied to the mouth and nostrils.* In surgical operations, as a ready means of ascertaining when the patient is sufficiently insensible to permit an operation to be commenced, Dr. Snow employs as a test, touching the ciliary edge of the eyelids, and when this does not occasion winking, then the insensibility is sufficient.

In the United States of America, a mixture of three parts of ether, and one part of chloroform, is ordinarily employed to produce anæsthesia, which it is said to do effectually and without risk; to this mixture, however, Snow objects, that in consequence of the greater volatility of the ether over the chloroform, we have a most objectionable compound, the ether first producing its effects, and subsequently, at the most dangerous period of the anæsthesia, the chloroform coming into play. M. Bourguignon has recently proposed to substitute the vapour of ether for that of chloroform, to keep up the state of insensibility as soon as anæsthesia is produced by the latter.

Dr. Hardy, of this city, has proposed the direct application of the vapour of chloroform in painful affections, especially those of the uterine organs, from its use in which he has seen much benefit result; for this purpose he has invented an ingenious but simple instrument. (See *Dublin Quarterly Medical Journal*, vol. xvi., page 306.)

Linimentum Chloroformi. Liniment of Chloroform. (Take of chloroform, two fluid ounces; liniment of camphor, two fluid ounces. Mix.) Used as an anodyne for external application.

Spiritus Chloroformi. Spirit of Chloroform. (Take of chloroform, one fluid ounce; rectified spirit, nineteen fluid ounces. Dissolve.) Specific gravity, 0·871. This is an officinal substitute for *chloric ether*. This formerly was much stronger, containing seven parts of spirit to one of chloroform. Dose, min. x. to f℥i. In prescribing it in combination, its remarkably sweet taste should be borne in mind, rendering the addition of syrup almost unnecessary.

* *Gelatinized Chloroform.* (Chloroform and white of egg, equal parts. Set aside for four hours to permit it to assume the gelatinous form. *Or*, chloroform, four parts; white of egg, one part. Heat the mixture in a vessel set in water at a temperature of 140° F. In four minutes it will have been gelatinized.) A useful formulary for the local application of chloroform; it can be used spread on linen, gauze, &c., or may be applied by friction.

If poisonous symptoms ensue on the *internal* use of chloroform, they should be at once met with the administration of emetics and stimulants; this, however, is a rare occurrence. They generally supervene on its exhibition as an anæsthetic agent, and may be suspected on the supervention during its administration of heavy, stertorous, interrupted breathing, dusky livid hue of countenance, and intermitting faltering pulse. On the moment the chloroform should be removed, a free current of air admitted, the tongue drawn forward, and, if necessary, artificial respiration and the electro-magnetic current should be had recourse to. The following remarks of Dr. Snow are so pertinent that I introduce them here:—"Such measures as dashing cold water on the patient, and applying ammonia to the nostrils, can hardly be expected to have any effect on a patient who is suffering from an overdose of chloroform; for they would have no effect whatever on one who has inhaled it in the usual manner, and is merely ready for a surgical operation, but in no danger. I have applied the strongest ammonia to the nostrils of animals that were narcotized by chloroform to the third or fourth degree, and it did not affect the breathing in the least. They recovered just as if nothing had been done. It is difficult to suppose a case in which the breathing should be arrested by the effects of chloroform whilst the skin remained sensible, yet it is only in such a case that the dashing of cold water on the patient could be of use. There is, however, no harm in the application of this and such like means, provided they do not usurp the time which ought to be occupied in artificial respiration; for this measure should be resorted to the moment the natural breathing has entirely ceased."

CONIUM. *Hemlock.* Conium Maculatum, *Linn.* Spotted Hemlock. Plate 88, *Flor. Lond.* (The fresh leaves and branches of wild British plants, gathered when the fruit begins to form, and the leaves dried in the sun, or at a temperature not exceeding 120°.)

CONII FRUCTUS. *Hemlock Fruit.* (The ripe fruit dried.) Indigenous, belonging to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—Biennial; root, fusiform, whitish, 6-12 inches long; stem, 2–6 feet high, striated and spotted with purple, smooth, glaucous, hollow, much branched upwards; leaves, large, tripinnate; leaflets, lanceolate, pinnatifid with acute and often cut segments; flowers, white, in umbels of many general as well as partial rays; *general involucre* usually 3–7 leaflets; *partial involucre* of 3 leaflets on one side; fruit, ovate, compressed laterally, with five primary undulato-crenate ridges. The whole plant, when bruised, emits a peculiar fetid odour resembling the smell of mice.

PREPARATION.—The leaves and fruit are officinal in the British Pharmacopœia. The leaves should be gathered when the plant is in full flower, the stalks carefully picked out, and the leafy part dried with a stove heat excluded from the light. For medicinal purposes they should be kept in well-stopped opaque bottle or jars, but as they lose much of their virtues by keeping, the druggist's stock should be renewed every year. The fruit may be collected when fully ripe; it is more active than the leaves, and preserves its medicinal powers for a much longer period.

CHARACTERS.—*Of the Leaves.*—Fresh leaves tripinnate, smooth, arising from a smooth stem with dark purple spots; dried leaves of a full green colour, and characteristic odour. The leaf rubbed with caustic potash gives out strongly the odour of conia.—*Of the Fruit.* Broadly ovate, compressed laterally; half fruit with five waved or crenated ridges.

PHYSICAL PROPERTIES.—Hemlock leaves in the fresh state are of a glaucous-green colour, and possess remarkably the characteristic odour of the plant; by drying they acquire a dull greyish-green colour, and lose much of their odour. They have a nauseous bitter taste. The fruit has a weaker odour, its taste is bitter, and somewhat acrid.

CHEMICAL PROPERTIES.—Hemlock, leaves, and fruit, contain a peculiar alkaloid which has been named *conia* (*coneïn* or *conicin*), a volatile odorous principle, albumen, resin, colouring matter, and some salts. The active principle of the plant is the alkaloid *conia*; this is a colourless oily liquid, lighter than water, its density being 0·89, with a peculiar, penetrating, very disagreeable odour, and an intensely acrid taste; it boils at 338° F.; is very inflammable; is soluble in 100 parts of water, and in 6 of ether, and mixes with alcohol in all proportions. Pure concentrated sulphuric acid has no effect upon it until heated, when it changes to blood red first, and finally to black. Nitric acid produces with it a topaz colour; it is precipitated yellow by chloride of platinum, and white by corrosive sublimate; it is not precipitated either by acetate or subacetate of lead. *Conia* is nearly as active a poison as pure prussic acid. The alkaloid and its salts in solution are changed to a brown colour on exposure to the air. It is obtained by the distillation of the leaves or fruit with a caustic alkali, existing in the greatest quantity in the full-grown green fruit, eight pounds yielding half an ounce of *hydrated conia* (Christison). The following is the process of the Hanoverian Pharmacopœia for its preparation:—"Hemlock seeds, bruised, ℔iv. ℥vij. gr. xxxviij.; water, Oxxviss.; slaked lime, ℔ij.½; carbonate of potash, ℔j. ℥ij.; mix well and distil as long as the water which passes over has an odour of conia; saturate then with sulphuric acid, and evaporate to the consistence of a syrup. Treat the residue with a mixture of one part of ether and two of alcohol, decant and add water to the residue in small quantity: apply the gentle heat of a water-bath until all the spirit is removed; then treat the liquor with about half its weight of a ley of caustic potash, and distil to dryness. Add to the residue an additional quantity of the ley and distil anew, repeating the process until the fluid which distils over has no longer an odour of conia. The conia now separates from the water, and is sufficiently pure for use in medicine." The composition of this alkaloid is $C_{16}H_1N_{15}$. It combines with acids to form salts which are crystalline and soluble in water. On triturating the leaves or fruit of hemlock with caustic potash, the peculiar odour of *conia*, which should not be confounded with that of the plant, is emitted; and as the medicinal virtues depend on the presence of this alkaloid, a ready test is thus afforded for ascertaining the goodness of any of the preparations of hemlock. The leaves and fruit yield their active properties to water, alcohol, oils, and fats.

ADULTERATIONS.—Other umbelliferous plants which bear a general resemblance to hemlock are frequently confounded with it, and their leaves often sold for those of the true plant. The distinguishing botanical characteristics of the plant are its smooth, purple-spotted stem, and its unilateral partial involucre; the fruit is readily known by its undulato-crenate primary ridges. Chemically all parts of the plant are recognised by the peculiar odour of conia evolved on trituration with caustic potash; and this test, as before remarked, is also applicable for ascertaining the quality of the officinal preparations of hemlock.

THERAPEUTICAL EFFECTS.—From the investigations which have been made of late years as to the action of hemlock, particularly those of Professor Christison and Mr. Judd, it would appear that its influence is chiefly exerted on the nerves of motion, and that its medicinal powers are those of a direct sedative. When taken in poisonous doses, the symptoms preceding death are very similar to those produced by asphyxia from any cause; thus "it does not excite convulsive spasms, or bring on insensibility, but it exhausts the nervous energy of the spinal cord and voluntary muscles, occasioning merely convulsive tremors and slight twitches, and eventually general paralysis of the muscles, and consequent stoppage of the breathing" (Christison). Much difference of opinion exists as to the action of hemlock when employed as a medicine, and consequently as to the diseases in which it proves beneficial; this arises from the fact, that the preparations of hemlock which were in general use until very lately were perfectly inert; for since the discovery of the active principle of the plant, it has been satisfactorily shown that the application of even a moderate degree of heat, when continued for any time, causes it to be volatilized, and therefore that the extract (the preparation most generally employed), as ordinarily prepared, is deprived almost completely of its medicinal powers. In the present day but little faith is placed in the virtues of this plant, or its preparations, as a deobstruent and alterative in the treatment of glandular or visceral enlargements, of scrofulous affections, or of chronic skin diseases, for which it was at one time highly esteemed. In my own experience I have seen very beneficial results follow the use of hemlock in many painful affections, some of which were attended with inflammation; the preparation which I employed was the expressed juice carefully prepared from the fresh leaves gathered when the plant was in full flower. The diseases in which I have principally administered it are, rheumatic affections, both acute and chronic, and especially those complicated with a syphilitic taint, although I do not admit it to be by any means a specific, as at one time supposed, for secondary syphilis; neuralgia, senile gangrene, and cancer, affecting various parts of the body; in all of which I have found it alleviate pain and diminish nervous excitement. On the whole, from the experience which I have had, I am inclined to regard hemlock as an anodyne and sedative of much power, an opinion which from numerous communications that I have from time to time received, is confirmed by the experience of others, who have employed it in consequence of my essay on its medicinal properties in the 26th and 28th volumes of the first series of the *Dublin Journal of Medical Science*. Conia has been used on the Continent as a substitute for the preparations of hemlock, and its effects are more certain and decided; but in consequence of its extreme activity as a poison, it is not likely to come into general use. Hemlock has been employed externally in the form of cataplasm or ointment to cancerous and painful ulcerations, and to tender glandular enlargements. In several cases in my own practice in which the use of the expressed juice of hemlock had been persevered in for some time, and the dose much increased, the patients complained of great dryness, with a painful feeling of constriction of the pharynx, which, however, soon disappeared on the suspension of its use and the administration of an active cathartic. In a few instances, also, headache with delirium occurred. These are the only physiological effects which I have seen produced by hemlock, although I have employed it very extensively for many years; and in no instance have I seen any injurious consequences result from its administration.

DOSE AND MODE OF ADMINISTRATION.—The dose of the powder of the leaves, a bad form, is from gr. v. to gr. x. three or four times a day; of the powder of the seeds, gr. iij. to gr. vj. may be given; the quantity should be gradually increased.

PREPARATIONS.—*Of the Leaves.*—Cataplasma, Extractum, Succus.—*Of the Seeds.* Tinctura.

Cataplasma Conii. Hemlock Poultice. (Take of hemlock leaf, in powder, one ounce; linseed meal, three ounces; boiling water, ten fluid ounces. Mix the hemlock and linseed meal, and add them to the water gradually, constantly stirring.) A soothing poultice to painful ulcers, or glandular enlargements. The fresh leaves, bruised, would form a much better application.

Extractum Conii. Extract of Hemlock. (Take of the fresh leaves and young branches of hemlock, one hundred and twelve pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to 130°, and separate the green colouring matter by a calico filter. Heat the strained liquor to 200° to coagulate the albumen, and again filter. Evaporate the filtrate by a water bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.) Dose, gr. j. to gr. v. gradually increased. The extract is always an uncertain preparation, and does not keep well.

Succus Conii. Juice of Hemlock. (Take of fresh leaves of hemlock, seven pounds; rectified spirit, a sufficiency. Bruise the hemlock in a stone mortar; press out the juice; and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place.) This is the most certain of the preparations of hemlock, as it is of a uniform strength, and keeps well for more than twelve months. I have some in my possession, prepared many years since, which is perfectly good; this is the preparation which I almost invariably use. Dose, min. xx. gradually increased to f℥j. every third or fourth hour, its effects being carefully watched. It is best administered in camphor mixture, or in distilled water sweetened with simple syrup, or syrup of red poppies.

Tinctura Conii Fructus. Tincture of Hemlock Fruit. (Take of hemlock fruit, bruised, two ounces and a half; proof spirit, one pint. Macerate the hemlock fruit for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) From what has been already stated, it will be evident that it is an improvement to prepare this tincture from the seeds in preference to the leaves. Dose, min. xx. to min. xl.

* *Emplastrum Conii.* (Yellow wax, two parts; resin, and olive oil, of each, one part; soap plaster, a sixth part; melt together; and add to the mass when it begins to cool, powdered hemlock, two parts; mix thoroughly.) For neuralgic and rheumatic pains; in cancer of the stomach, liver, or uterus, over the site of these organs; and in glandular enlargements in the abdomen.

* *Conia* has been but little employed in medicine as yet. The dose of the alkaloid, or any of its salts, is from a fiftieth to a thirtieth of a grain. Nega, who has published some observations on it, states that it is a most powerful sedative; he directs one grain to be dissolved in f℥ij. of orange-flower water, and of this he gives four minims five times a day.

INCOMPATIBLES.—The caustic alkalies; the vegetable acids; and vegetable astringents.

In cases of poisoning with hemlock, the same treatment should be followed as in poisoning with monkshood (see page 414).

CREASOTUM. *Creasote* (described in the division *Astringents*) when given in poisonous doses, appears, from the observations of Dr. Rose Cormack, to resemble prussic acid in its sudden depressing action on the heart, as well as in the temporary nature of its toxicological operation. In one case in which it was used to allay the pain of tooth-ache in too liberal a manner, it produced well-marked anæsthetic effects. In medicinal doses, independently of its astringent property already described (see page 66), it operates as a sedative and calmative; and has been chiefly used as such in nausea and vomiting, in checking which it proves highly beneficial. It is particularly serviceable in the morning sickness of pregnancy, and in cases of hysteric vomiting. Creasote will be also found very efficacious in allaying vomiting when it arises from nervous irritability, or functional disorder of the stomach; but it generally fails when organic disease is present, or where the vomiting is symptomatic of diseases of other organs. In the obstinate vomiting of sea-sickness this remedy has been found by some to prove useful, and in all the nostrums of the present day for preventing sea-sickness creasote is a principal ingredient. To allay the inordinate thirst and excessive craving for food in diabetes, creasote is usually one of the most certain medicines which can be employed. In neuralgia and in phthisis it has been highly praised by many as being almost a complete specific, but its efficacy in these diseases has been anything but well established

Carbolic Acid ($HO,C_{12}H_5O=94$) of late years has come into fashion as a remedial agent in all that class of cases in which the use of creasote has been signalized ; it is obtained by treating these portions of the acid of coal tar which distil over between the temperatures 300° and 400° with a strong boiling solution of caustic potash, and decomposing the resulting salt with hydrochloric acid, and subsequent rectification of the impure acid by distillation off chloride of calcium. So obtained, the acid ought to be colourless ; has a smell resembling that of creasote, an acrid taste, and in fact resembles creasote so closely in all its properties, that in the opinion of many chemists carbolic acid is nothing but creasote in a purer state. It may be used internally in all cases suited for the employment of creasote, and is to be prescribed in the same form and doses ; it is, however, principally as a deodorizing agent that it is employed, applied to foul ulcers, &c., in the form of a wash, f℥ij. of the acid to f℥viii. of distilled water. Its use in such cases is highly spoken of by many practitioners ; in some cases, however, in which I recently employed it in the wards of the Meath Hospital, it disappointed my expectations, not acting nearly as satisfactorily as many of our older remedies.

DOSE AND MODE OF ADMINISTRATION.—Min. j. to min. ij., gradually increased to min. v. or min. vj., dissolved in at least an ounce or an ounce and a half of some aromatic water ; or made into an emulsion with distilled water by means of sugar or yolk of egg. In the administration of creasote, it should be borne in mind that its action is temporary, and consequently that the dose should be repeated at short intervals.

DIGITALIS has been described in the division *Diuretics*, but as its active principle, *digitaline*, acts only as a sedative, I have preferred noticing the mode of preparation and properties of that substance here.

Digitalinum. Digitalin. (The active principle obtained from digitalis.) "Take of digitalis, in powder, forty ounces ; rectified spirit, two gallons and five fluid ounces ; distilled water, one pint ; acetic acid, half a fluid ounce ; purified animal charcoal, half an ounce ; solution of ammonia, a sufficiency ; tannic acid, one hundred and sixty grains ; litharge, in fine powder, a quarter of an ounce ; pure ether, a sufficiency. Pour on the digitalis two gallons of the spirit ; digest at a heat of 120° for six hours ; and separate the tincture by filtration and subsequent expression. Distil off the spirit, and treat the extract with five ounces of the water, acidulated with the acetic acid. Digest with a quarter of an ounce of the animal charcoal, filter, and dilute the filtrate with the water, so that it shall have the bulk of a pint. Now add the ammonia nearly to neutralization, and afterwards the tannic acid dissolved in three ounces of the water. Wash the precipitate thus obtained with a little of the water; mix it with a small quantity of the spirit, and carefully rub it in a mortar with the litharge. Place the mixture in a flask, and add to it four ounces of the spirit; raise the temperature to 160°, and maintain for about an hour. Then add the rest of the animal charcoal, filter, and remove the spirit by distillation. Lastly, wash the residue repeatedly with the ether."

EXPLANATION OF PROCESS.—By the action of rectified spirit on the digitalis, it is exhausted of its colouring matter, extractive, and its active principle, *digitalinum;* the spirit is now recovered by distillation, and the extract treated with water and acetic acid, which latter dissolves out the digitalinum, which to some extent is decolourized by the animal charcoal. On the addition of the ammonia the acetic acid is removed, and the digitalinum set free, which forms with the tannic acid an insoluble compound which precipitates, which in its turn is decomposed by the litharge, tannate of lead being formed, and the digitalinum again set free, and dissolved out by the spirit. More animal charcoal is employed for the purpose of further decolourization; on filtration, it and the tannate of lead are removed, the spirit is again recovered by distillation, and the residue is washed with ether to remove impurities, which must now be referred to.

The analysis of digitalis has been conducted of late years most carefully by MM. Momolle and Quevenne, and they have described in it four neutral principles—digital*ine*, digital*in*, digital*ose*, and digital*ide*. The former of these is the substance now officinal; digital*in*, according to their nomenclature, being a tasteless and probably inert substance. It is much to be regretted that these gentlemen should have thought proper to name two substances, so importantly different, so very much alike; and it is still more to be regretted that the pharmacopœial authorities should have intensified the difficulty by applying to the poisonous ingredient the name, according to them, of the inert material. By digestion with ether the inert principle is removed, and the digitalinum, comparatively pure, left behind. In prescriptions, should it be considered desirable to order this principle, its Latin name should always be employed as being sufficiently precise; but from what has been already stated, there will be always room for misconception in the English synonyms.

CHARACTERS.—In porous mammillated masses or small scales, white, inodorous, and intensely bitter; readily soluble in spirit, but almost insoluble in water and ether; dissolves in acids, but does not form with them neutral compounds; its solution in hydrochloric acid is of a faint yellow colour, but rapidly becomes green. It powerfully irritates the nostrils, and is an active poison.

TESTS.—Leaves no residue when burned with free access of air.

Digitalis, administered in large doses, acts as a narcotico-acrid poison, producing giddiness; great debility; stupor; slow, feeble, and intermittent pulse; an abundant flow of saliva; cold sweats; and death, immediately preceded by coma and convulsions. In medicinal doses, when its use has been continued for some time, it operates as a direct sedative, its influence being chiefly manifested on the heart and arterial system; this is indicated by the diminished force and frequency of the pulse, which also sometimes becomes irregular, and by the enfeebled action of the heart itself. If the use of digitalis be continued under these circumstances, although the dose be not increased, all the symptoms of poisoning come on, indeed, in many cases will appear some days after its administration has been stopped; hence it is evident that this medicine accumulates in the system, and therefore in cases where its use has been continued for any period, the administration of the remedy should be occasionally suspended, particularly as soon as its constitutional effects become obvious. From the sedative influence which digitalis exerts on the heart, it may be employed in all cases attended with over excitement of the vascular system; but where much inflammation is present, it is not sufficiently powerful as an antiphlogistic to be relied on, to the exclusion of more active treatment. It is in diseases of the heart and large arteries that this medicine is found most beneficial, and whenever the curative indication will be best fulfilled by diminishing the impulse of the heart, and by lowering the circulation generally, no remedy will produce these results so completely and so certainly as digitalis. It thus proves useful in simple hypertrophy of the heart, in some forms of nervous palpitation, in increased action of that organ arising from functional derangement, not from organic disease, in aneurism of the aorta, and in active hemorrhages where the pulse is quick, hard, and throbbing; its employment is contra-indicated in hypertrophy of the heart with or without dilatation, when that state is produced by obstruction from any cause to the circulation of the blood, or by regurgitation from insufficiency, or other disease of the valves. Digitalis has been also used in cases of insanity and of epilepsy; in the latter affection, when not dependent on organic disease, it often proves singularly beneficial if given in very large doses, so as to bring the system rapidly under its influence; in some cases which I saw with Dr. Corrigan, recovery took place very rapidly under the following mode of employing this remedy:—f℥ij. of the infusion of digitalis were given every night at bed-time until its constitutional effect was produced, which was usually after the fourth or fifth dose; its use was then suspended for two or three nights, according to circumstances, and again the same quantity given as before; as soon as the system became affected the number of fits was diminished, and under the continuance of this plan of treatment for a short time their occurrence ceased altogether, or the return of the fits was postponed for a lengthened period. Some practitioners have administered digitalis as a sedative with excellent results in obstinate cases of tic douloureux. In the employment of digitalis as a medicine, its effects require to be carefully watched, and whenever it is continued for any length of time, the patient should not be allowed to use active exertion, and should be seen at least once daily by the medical attendant.

Digitaline is about a hundred times more active than digitalis, the sedative properties of which it appears to possess in a concentrated degree; a tenth of a grain having frequently reduced the pulse to forty beats in the minute in from eight to ten hours after it had been taken. It has been used in France, and it is stated with much success in the treatment of intermittent fevers, and of spermatorrhœa. It has been proposed to apply it externally over a blistered surface in painful affections of the heart attended with excited action of the organ: but, when pure, even so small a quantity as the sixty-fifth part of a grain produces violent inflammation of the surface. The smallest over-dose of digitaline causes nausea and obstinate vomiting, which last for many hours.

DOSE AND MODE OF ADMINISTRATION.—As a sedative, the dose of the preparations of digitalis is as follows:—Of the powder, gr. ss. to gr. ij.; of the infusion, f℥ij. to f℥ij.; of the tincture, min. x. to f℥iss. This dose has been much increased, but in my opinion at great hazard. The dose of *digitaline* is from one-fiftieth to one-twentieth of a grain repeated every sixth hour, its effects being most carefully watched. As already stated, I have found children bear the administration of the preparations of digitalis better than adults.

* *Unguentum Digitalis.* HAMBURGH PHARMACOPŒIA. (Dried leaves of digitalis, in small fragments, ℥j.; rectified spirit, f℥ij.; digest with a gentle heat for four days in a well-closed vessel; mix intimately with ℔ss. of melted lard, and boil with a gentle heat until all the spirit is driven off; strain with expression, and stir gently while cooling.) A useful sedative ointment in neuralgic and painful affections.

* *Succus Digitalis.* (Prepared in the same manner as *Succus Conii*, see page 431). Dose, min. x. to f℥j.

* *Granules of Digitaline.* (Digitaline, gr. xx.; powdered white sugar, ℥j.; mucilage, sufficient to make 1000 granules.) Each granule contains a fiftieth of a grain of digitaline. Dose, one, gradually increased to five.

In cases of poisoning with foxglove the treatment must vary according as to whether the symptoms arise from one large overdose, in which case the stomach pump should be used, or powerful stimulating emetics immediately administered, and, subsequently, active stimulants, both external and internal, such as coffee, brandy, the cold douche, &c. be assiduously employed. Should the symptoms, however, arise during its administration as a remedial agent, as the result of *accumulation*, perfect rest in the recumbent posture should be enforced, as the slightest exertion might terminate in fatal syncope. I am aware of one such case, arising from inattention to this point. Diffusible stimuli, especially wine, should be freely administered, a fresh current of air allowed to play on the patient's person, and after some hours, an aperient may be exhibited; of course the digitalis must, under such circumstances, be stopped.

LAUROCERASUS. *Cherry Laurel Leaves.* Prunus Laurocerasus, *Linn.* The Common or Cherry Laurel. Plate 117, *Steph. and Church Med. Bot.* (The fresh leaves, from plants cultivated in Britain.) A native of the shores of the Black Sea, whence it was introduced into Europe and the British Isles, where it now grows freely; it belongs to the Natural family *Rosaceæ* (*Drupaceæ*, Lindley), and to the Linnæan class and order *Icosandria Monogynia.*

BOTANICAL CHARACTERS.—An evergreen small tree; stem, smooth, much branched, 12–18 feet high; leaves, large, bright glaucous green, coriaceous; flowers, numerous, white, small, in axillary racemes: fruit, an ovoid blackish drupe, about the size of a small cherry.

CHARACTERS.—Ovate lanceolate, or elliptical, distantly toothed, furnished with glands at the base, smooth and shining, deep green, on strong short footstalks, emitting a ratifia odour when bruised.

PHYSICAL PROPERTIES.—Cherry-laurel leaves are employed in the recent state for use in medicine; they emit an agreeable bitter-almond odour when bruised, and have a bitter, rather astringent taste.

CHEMICAL PROPERTIES.—These leaves have not been accurately analysed; their properties depend on a volatile oil which they yield by distillation with water; it resembles in odour and other properties the volatile oil of bitter almonds, and like it contains free prussic acid. The leaves differ much in the quantity of this oil which they yield at different periods of their growth, and consequently in their activity; according to Christison, the greatest quantity is obtained from the buds and unexpanded young leaves in the months of May and June, at which time they yield 6·33 grains of oil in one thousand; in July the proportion sinks to 3·1 grains, and in the following May to 0·6. Zeller states that they yield more oil when collected in cold wet weather than when gathered in a dry hot season. The water which comes over with the oil in the process of distillation acquires both its odour and taste, and is the only preparation of the plant which is employed in medicine.

ADULTERATIONS.—Cherry-laurel water varies much in activity, according to the time of the year in which it is prepared, and the care with which it is distilled. Its strength is most easily ascertained by the nitrate of silver test, as described for prussic acid (page 406). As it loses its activity by keeping, it should be distilled fresh every year.

THERAPEUTICAL EFFECTS.—Cherry-laurel leaves and the distilled water owe their virtues to the prussic acid which they contain, and consequently produce the same effects. The pharmacopœial preparation contains from one-sixth to one-seventh per cent. of prussic acid. An ounce of the distilled water has caused death in an adult. Cherry-laurel water is much employed in this country as a sedative in spasmodic cough, in phthisis, and in painful or spasmodic diseases of children; for the latter purpose its agreeable flavour renders it peculiarly eligible; it is, however, very liable to vary in strength, and should be therefore prescribed with caution.

DOSE AND MODE OF ADMINISTRATION.—Only in the following form:—

Aqua Laurocerasi. Laurel Water. (Take of fresh leaves of common laurel one pound; water, two pints and a half. Chop the leaves, crush them in a mortar, macerate them in the water for twenty-four hours. Distil one pint of liquid, using a chloride of zinc bath and a Liebig's condenser. Shake the product, filter through paper, and preserve in a stoppered bottle.) Compound spirit of lavender used to be added as a colouring ingredient to prevent mistakes from the preparation being taken for common water; the odour, however, is quite sufficient for this purpose, and consequently the spirit of lavender has been omitted in the formula of the Pharmacopœia. The dose for adults is from min. x. to f℥j.; for infants or children, min. ij. to min. x.

INCOMPATIBLES.—Same as for hydrocyanic acid; as is also the treatment in cases of poisoning.

* POTASSII CYANIDUM. *Cyanide of Potassium.* (KCy=65.) (Syn.: *Cyanuret of Potassium. Hydrocyanate of Potassa.*)

PREPARATION.—*Parisian Codex*, 1837. "Reduce proto-cyanuret of potassium and iron to coarse powder, half fill a retort with it, place the retort in a good reverberatory furnace, adapt a tube to collect the gas; heat moderately to expel the water of crystallization, then raise the temperature so as to fuse the mass, which will be announced by a disengagement of gas; keep up the temperature so that the disengagement will be regular and moderate; increase the heat progressively, and maintain it at a very high degree for a quarter of an hour, close the extremity of the tube, close also the apertures of the furnace, and leave the whole to cool; then break the retort and carefully detach the upper stratum which forms a kind of well-fused enamel. This is the pure cyanide of potassium; include in a well-ground stoppered bottle, remove afterwards the spongy black mass which is found in the lower part; it is a mixture of cyanide of potassium, iron, and charcoal, include it also in bottles." Mr. Donovan of this city has added the following directions to the above process:—The retort should be of forged iron, a quicksilver bottle will answer perfectly, provided it be sound; in its screw plug must be fitted an iron tube so bent that its other extremity may be plunged half an inch below the surface of a little water in a cup. By this means the different steps may be more easily regulated, as the issue of gas is more conveniently observed. The iron bottle should be only half filled with recrystallized ferrocyanide of potassium; and as soon as the process is completed, when cold it may be cut in two by a chisel and heavy hammer. The black, impure cyanide at the bottom of the retort is totally unfit for medicinal use. It may also be obtained very readily and of great purity by passing a stream of hydrocyanic acid through an alcoholic solution of pure potash; a plan first proposed by Wiggers.

PHYSICAL PROPERTIES.—Cyanide of potassium, thus procured, is a whitish, semi-transparent, crystalline mass, having an enamelled appearance. It is inodorous when quite dry, but if moistened emits the odour of hydrocyanic acid. It has an acrid, alkaline, somewhat bitter taste.

CHEMICAL PROPERTIES.—It is composed of one equivalent of potassium and one of cyanogen. Exposed to the air it absorbs moisture and deliquesces, being converted into carbonate of potash by the absorption of carbonic acid from the atmosphere and the evolution of hydrocyanic acid. Cyanide of potassium has an alkaline reaction on vegetable colours; is fusible by heat without change, and unalterable even by a white heat provided air be excluded. It is very soluble in water, but is insoluble in strong alcohol. By solution in water it is converted into the hydrocyanate of potassa.

ADULTERATIONS.—As commonly met with in the shops, this preparation is seldom fit for use in medicine. When pure it should be perfectly white and afford a completely colourless solution with distilled water; if it be at all yellow, it contains iron, which diminishes its activity much. It should be also perfectly free from odour, as if it have any smell of prussic acid, it contains water, is of uncertain strength, and is perhaps undergoing slow decomposition.

THERAPEUTICAL EFFECTS.—Cyanide of potassium possesses precisely similar properties to hydrocyanic acid, as a substitute for which it is used in medicine. Its advantages over that acid are its unvarying strength, and its permanence of constitution, when properly prepared and carefully preserved; but its great liability to deliquesce has prevented its general introduction into the practice of medicine. To remedy this defect, Mr. Donovan has suggested "that consumers should keep the cyanide of potassium in small wide-mouthed, well-stoppered bottles, not quite filled with the salt, but completely filled with alcohol of 0·800; which when of this strength exerts scarcely any solvent power on the cyanide, but will effectually preserve it from the deteriorating influence of the air. When a few grains are required for use, they may be drawn up by an iron wire, like potassium out of naphtha, and heated in a spoon for a moment to drive off the adhering alcohol."

DOSE AND MODE OF ADMINISTRATION.—The dose of the pure cyanide of potassium is from one-eighth to one-fourth of a grain. If it be desirable to administer the prussic acid contained in the salt in a free state, this may be done by prescribing it in combination with any weak acid, as with citric acid, recent lemon juice, or syrup of lemons. One-sixth of a grain of pure cyanide of potassium is equal to about one minim of the medicinal prussic acid of the Pharmacopœia.

* *Syrup of Cyanide of Potassium*, MAGENDIE. (Cyanide of potassium, gr. viij.; simple syrup, f℥xvj.; mix.) Dose, f℥ss. to f℥iv. It is always better to prescribe this preparation in the form of draughts, in consequence of its liability to become decomposed.

* *Calmative Lotion*, TROUSSEAU. (Cyanide of potassium, gr. viij.; distilled water, alcohol, and sulphuric ether, of each, f℥j.; mix.) For external use only.

INCOMPATIBLES.—All acids, and acidulous salts.

In poisoning with this salt, which is as deadly a poison as prussic acid, the treatment to be pursued is identical with that described for this acid (see p. 409).

SPIRITUS PYROXYLICUS RECTIFICATUS. *Rectified Pyroxylic Spirit.* (Hydrated oxide of Methyle, C_2H_3O, HO (=32), with about 10 per cent. of water; a product of the destructive distillation of wood.) (Syn.: *Medicinal Naphtha.*)

PREPARATION.—An article of the Materia Medica in the Pharmacopœia. According to Dr. Ure, of London, it is prepared by mixing crude pyroligneous acid with lime, and then distilling the pyrolignite of lime which yields about 1 per cent. of crude spirit. The spirit is purified by repeated distillation from quick-lime (Christison). But the mode of preparation of the liquid sold under the name of *medicinal naphtha*, and used in medicine in the present day, is kept secret by the chemists who prepare it; there is no doubt, however, but that it is a product of the destructive distillation of wood.

CHARACTERS.—Colourless, mobile, and inflammable, burning with a pale blue flame, having a spirituous odour, and a warm, ethereal taste, with a peculiar after-taste.

PHYSICAL PROPERTIES.—A colourless, transparent, limpid fluid, with an agreeable, ethereal alcoholic odour, bearing some resemblance to that of acetic ether, and an aromatic not unpleasant taste.

CHEMICAL PROPERTIES.—The chemical characters of medicinal naphtha are those of pyroxylic spirit, under which name it was introduced into the last edition of the Dublin Pharmacopœia. It is miscible with water and alcohol in all proportions, an increased temperature being produced on its addition to the former. It is very volatile, and boils at about 150° F., is inflammable, burning with a pale blue flame, and is perfectly neutral to test paper. A mixture of pyroxylic spirit and alcohol, in the proportion of at least a ninth part of pyroxylic spirit, constitutes *methylated spirit;* a mixture which is duty free, and extensively used in the arts.

TESTS.—Specific gravity, 0·841 to 0·846. Without action on litmus paper, free from smoky taste. Is not rendered turbid by mixture with water.

ADULTERATIONS.—Ordinary naphtha is sometimes substituted for medicinal naphtha (pyroxylic spirit), but may be readily distinguished by the chemical characteristics given above.

THERAPEUTICAL EFFECTS.—This remedial agent was first introduced into the practice of medicine by Dr. Hastings, who along with the late Dr. Hocken vaunted it as a perfect cure for pulmonary consumption. They both agreed in describing its effects on the system generally as those of a stimulant, and considered its curative action to depend on its possessing a solvent power over tubercle. Although few, if any, believe now that phthisis can be cured by this agent, it must be confessed that the results of the experience of nearly all who have tried its effects in this disease are strongly confirmatory of its being a most useful remedy, and in this opinion I fully agree. It appears to me, however, to act as a direct sedative: the harassing cough and troublesome vomiting, so frequent attendants on the advanced stages of consumption, being relieved by it more than by any other remedy I have employed; and it is consequently in cases in which these symptoms are very prominent that it proves most beneficial.

DOSE AND MODE OF ADMINISTRATION.—Min v. to min. xx. three or four times a day. It may be given in some aromatic water, and sweetened with syrup if necessary. The following is the mixture which I ordinarily employ:—

* *Mistura Naphthæ Medicinalis*, (Medicinal naphtha, f℥ij.; compound tincture of cardamoms, f℥vj.; water, f℥vij.; mix.) Dose, f℥ss. every fourth hour.

TABACUM. *Leaf Tobacco.* Nicotiana Tabacum, *Linn.* Virginian Tobacco. Plate 37, *Steph. and Church. Med. Bot.* (The dried leaves; cultivated in America.) A native of America, belonging to the Natural family *Solanaceæ*, and to the Linnæan class and order, *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A viscid, herbaceous annual; stem, 3-6 feet high, erect, branching at the top; leaves, sessile, ovato-acuminate, very large, pale green; flowers, in panicles, rose-coloured; capsules, two-celled, loculicidal, containing many small, somewhat reniform, brown seeds.

PREPARATION.—In the month of August the plants are cut above their roots, and dried under sheds; when perfectly dry the leaves are stripped off, twisted, tied in bundles, and packed with great compression into hogsheads for exportation. Virginian tobacco in leaf should be the kind employed for medical purposes.

PHYSICAL PROPERTIES.—Virginian tobacco leaves are of a dark brown colour with yellowish spots, and have an unctuous feel. Their odour is peculiarly heavy and narcotic; their taste bitter and nauseous.

CHARACTERS.—Large mottled-brown ovate or lanceolate acuminate leaves, bearing numerous short glandular hairs, having a peculiar heavy odour and nauseous-bitter acrid taste; yielding, when distilled with solution of potash, an alkaline fluid, which has the peculiar odour of nicotine, and precipitates with bichloride of platinum and tincture of galls.

TEST.—Not manufactured.

CHEMICAL PROPERTIES.—Tobacco is composed of a peculiar, liquid, colourless, volatile alkaloid, which has been named *nicotina;* of a concrete volatile oil, *nicotianin;* of bitter extractive, gum, chlorophyll, vegetable albumen, gluten, starch, malic acid, and some salts. Its properties depend on the alkaloid and on the volatile oil. The former is heavier than water, is odourless when cold, but when heated has the odour of tobacco, and an acrid burning taste, so intense as to communicate it perceptibly to 10,000 parts of water; its composition is $C_{20}H_{14}N_2$, and its specific gravity 1·048. The latter has also the odour of tobacco, its taste is bitter and aromatic, leaving an unpleasant sensation in the throat; it does not exist in recent tobacco leaves, and therefore must be developed during the process of drying. By burning tobacco an *empyreumatic oil* is produced from the decomposition of some of its constituents; this is usually found in pipes which have been used for some time in smoking; it is a very active poison. Tobacco leaves yield their properties readily to boiling water, alcohol, and spirituous liquors.

The adulterations of tobacco are unimportant in relation to its medicinal employment.

THERAPEUTICAL EFFECTS.—Tobacco taken internally in large doses acts as a powerful narcotico-acrid poison; the most marked symptoms are nausea, fainting, great exhaustion, general relaxation both of the voluntary and involuntary muscles, extreme depression of the circulatory powers (marked by the feeble fluttering pulse, cold extremities, paleness of the face, &c.), convulsions, paralysis, and death. In very small doses it is said to act as a diuretic, and sometimes as a laxative. In full medicinal doses it operates as a direct sedative of the vascular system, and also of the cerebral functions. It is principally used in medicine to relax the muscular fibres:—thus it is employed in the form of enema in strangulated hernia, in stricture or obstruction of the bowels from other causes, in retention of urine from spasmodic stricture of the urethra, or from spasm of the neck of the bladder, in obstinate constipation, in severe colic, and in tetanus; in all of which diseases its beneficial effects depend on its relaxing influence over the muscular system. Tobacco was formerly employed as a diuretic in dropsy, and also as an anthelmintic, but in the present day it is rarely used for either purpose. As an external agent the infusion or decoction may be applied by means of compresses in any of the cases above enumerated in which its sedative action is indicated; and in America an ointment is used in chronic cutaneous diseases, especially those of the scalp, but its use requires very great caution, as it has in some instances produced fatal results; for the same reason, although a certain application for the destruction of vermin, the infusion of tobacco is but seldom employed for that purpose.

DOSE AND MODE OF ADMINISTRATION.—The use of tobacco requires great caution, as, in order to produce a sedative influence, its poisonous effects must be partially induced. For the preparation of an enema of tobacco a formula is given in the British Pharmacopœia, but in no instance should a larger quantity be used at first than from gr. xv. to gr. xx. infused in Oss. of boiling water, for cases are on record where so small a quantity as gr. lx. and even gr. xxx. have proved fatal. Tobacco smoke, which was formerly a favourite way of administering this powerful medicine, is infinitely more dangerous than the infusion, and should never, under any circumstances, be employed.

Enema Tabaci. Enema of Tobacco. (Take of leaf tobacco, twenty grains; boiling water, eight fluid ounces. Infuse in a covered vessel for half an hour, and strain.) Dose, half of this enema only should be used; its effects are to be watched, and if necessary the other half may be thrown up in half an hour or an hour's time.

In cases of poisoning with tobacco, if the poison had been swallowed, emetics should be immediately administered; and in all cases the most powerful stimulants, both external and internal, should be employed. The vegetable astringents have been proposed as antidotes for tobacco, tannin forming an insoluble precipitate with *nicotina*; but the physiological researches of the Rev. Professor Haughton leave no room for doubt that the true antidote is strychnine, carefully administered. (See *Strychnia.*)

* VERATRUM VIRIDE. *Green Hellebore.* (Syn.: *American Hellebore, Indian Poke, Poke Root, Swamp Hellebore.*) The root dried, Willd. *Sp. Plant.* iv. 896. Bigelow, *Am. Med. Bot.* ii., 121. An inhabitant of America, from Canada to the Carolinas, belonging to the Natural family *Melanthaceæ*, class and order *Hexandria Trigynia.*

BOTANICAL CHARACTERS.—A perennial, thick, fleshy root or rhizoma, the upper portion of which is tunicated, the lower solid, and beset with numerous whitish fibres or radicles. The stem is annual, round, striated, pubescent, and solid, from three to six feet in height, furnished with green bright leaves, and terminating in a panicle of greenish-yellow flowers. The leaves gradually decrease in size as they ascend. The lower are from six inches to a foot long, oval, acuminate, plaited, nerved, and pubescent, and embrace the stem at their base, thus affording it a sheath for a considerable portion of its length. Those on the upper part of the stem, at the origin of the flowering branches, are oblong-lanceolate. The panicle consists of numerous flowers, distributed in racemes, with downy peduncles. Each flower is accompanied with a downy pointed bracte, much longer than its pedicel. There is no calyx, and the corolla is divided into six oval acute segments, thickened on the inside at their base, with the three alternate segments longer than the others. The six stamens have recurved filaments, and roundish two-lobed anthers. The germs are three, with recurved styles as long as the stamens. Some of the flowers have only the rudiments of pistils. Those on the upper end of the branchlets are barren; those on the lower portion fruitful. The fruit consists of three cohering capsules, separating at top, opening on the inner side, and containing flat imbricated seeds.

PHYSICAL PROPERTIES.—The root of the American hellebore has a bitter acrid taste, leaving a permanent impression in the mouth and fauces. In sensible properties it bears a close resemblance to white hellebore; and has been shown by the experiments of Mr. J. G. Richardson, of Philadelphia, to contain veratria. (*American Journal of Pharmacy*, xxix. 204.)

THERAPEUTICAL EFFECTS.—I have thought proper to introduce the description of this remedy, now so popular in America, under the head of *Sedatives*, inasmuch as, so far as I can ascertain, its remedial effects depend principally on the development of this property in preference to the other physiological effects it is capable of producing. According to many American physicians of repute, in full doses it is capable of reducing the frequency of the pulse as low as thirty-five beats in the minute, accompanied at the same time with faintness, giddiness, head-ache, inclination to sleep, dilated pupils, and dimness of vision ; it also produces nausea, and frequently severe vomiting, but according to Dr. Osgood is destitute of purgative action. To reduce the frequency of the pulse, however, it is by no means essential to produce all these effects ; as by properly adjusted doses, the pulse can be acted upon without their being superinduced. Its value in the treatment of disease may be deduced from this account of its physiological effects. It has been used in most cases of inflammation, but principally in inflammation of the lung.

The following comparison instituted between it and other remedies is extracted from a pamphlet on the subject by Dr. E. Cutter, of Massachussets, U. S. :—

Compared with Venesection.

Venesection diminishes—(*a*) the fulness, force, and frequency of the pulse ; (*b*) has a sedative influence upon the nervous system ; (*c*) directly withdraws a portion of the solid constituents of the life-current, which, at least, it takes time to make up.	*Veratrum Viride* diminishes—(*a*) the fulness, force, and frequency of the pulse ; (*b*) has a sedative influence upon the nervous system ; (*c*) and does not reduce the nervous quantity of the vital fluid, which is the objectionable, if not injurious, feature of depletion.
Venesection cannot be persisted in without great hazard of prolonging the convalescence of the patient, if not weakening him for life.	Veratrum Viride can be employed an indefinite period with safety, and, stopped, its effects speedily subside.

Of course in *every* case the Veratrum Viride cannot entirely supersede the lancet. But in the vast majority of cases, as met with in the Middlesex East Hospital, Massachusetts, it will. Even then it is an excellent thing to maintain the impression gained by the primary depletion.

Compared with Digitalis.

Digitalis is slow, uncertain, cumulative : eminently a diuretic.	Veratrum Viride is prompt, sure, and *not* cumulative, as far as it has been possible to ascertain by the societies referred to above. Less of a diuretic.

Compared with the Tartar Emetic.

Antimony directly changes the character of the blood, alters the secretions, purges in full doses, and its effects are permanent, so to speak.	Veratrum Viride does not seem to change the character of the blood, alters to a less extent the secretions, rarely purges, and, suspended, its effects soon subside.

Compared with Colchicum.

Colchicum is not so certain, is more of a diuretic, purges in full doses, rarely vomits, and has been observed (Dr. Hammond) to increase the urine in quantity and specific gravity.	Veratrum Viride is more sure, less of a diuretic, vomits, and has been observed to increase the urine, lowering the specific gravity.—(Abbott.)

Compared with Aconite.

Aconite is narcotic.	Veratrum Viride is not. In the full physiological effects the mind is clear.

Compared with Veratrum Album.

Veratrum Album is a drastic purgative, judging from our experience with the alkaloid which purports to come from the V. Album.	The Veratrum Viride rarely purges. This statement is made from the writer's experience of about six years, and that of his associates. It acts first on the par-vagum.

DOSE AND MODE OF ADMINISTRATION.—It may be used in substance, tincture, or extract. Dr. Osgood states the dose in which it will generally prove emetic at from four to six grains of the powder, one or two fluid drachms of a tincture made of six ounces of the fresh root, and a pint of alcohol, and one or two grains of an extract made by inspissating the juice of the root. The medicine, however, should in most cases be given in doses insufficient to vomit.

ZINCI CYANIDUM. *Cyanide of Zinc.* (Syn.: *Cyanuret of Zinc. Hydro-cyanate of protoxide of Zinc.*)

PREPARATION.—Pass the vapour of prussic acid into distilled water, in which is suspended recently prepared hydrated oxide of zinc, which is obtained by adding in excess water of caustic potash to a solution of chloride of zinc.

PROPERTIES.—It is a solid white salt, inodorous and insipid; is composed of one equivalent of cyanogen, and one of zinc; and is insoluble in both water and alcohol.

THERAPEUTICAL EFFECTS.—This salt has been proposed on the Continent as a substitute for hydrocyanic acid, or the cyanide of potassium. The dose is from gr. ⅛ to gr. ss., but its insolubility renders it an objectionable preparation. In Germany it has been employed as an *anthelmintic* for children.

CHAPTER XVII.

SIALOGOGUES.

(Masticatories.)

SIALOGOGUES are substances which by *local* stimulant action augment the secretion of saliva. By this definition are excluded the so-called *remote* or *specific* sialogogues, as the preparations of mercury, gold, &c., which generally produce an increased flow of saliva when their internal use has been continued for some time; but as their remediate powers do not depend merely on the increase of this secretion, it is, I think, more practical to confine the term *sialogogue* to those agents which are employed as direct stimulants to the salivary glands. There are but few substances used in the present day in the practice of medicine for this purpose, and their application to the treatment of disease is very limited.

ARMORACIA. *Horse-radish Root.* Cochlearia Armoracia, *Linn.* Plate 150, *Woodv. Med. Bot.* (The fresh root cultivated in Britain.) Indigenous, belonging to the Natural family *Cruciferæ* (*Brassicaceæ*, Lindley), and to the Linnæan class and order *Tetradynamia Siliculosa.*

BOTANICAL CHARACTERS.—Roots, perennial, fleshy, white, running deep into the ground; stems, about two feet high; leaves, large, much veined; flowers, white.

CHARACTERS.—Long, cylindrical, white, sweetish, hot, and acrid, giving off when scraped a highly pungent odour.

PHYSICAL PROPERTIES.—When bruised or cut, the fresh root emits a very acrid penetrating odour; it has a strong pungent taste. The acrimony of the roots is lost by drying, but they may be preserved fresh for a long time by keeping them packed in sand in a damp cellar.

CHEMICAL PROPERTIES.—The active principle of horse-radish is a very acrid volatile oil, which may be obtained by distillation. The root yields its acrimony to both boiling water and alcohol; but it is dissipated by boiling.

THERAPEUTICAL EFFECTS.—Horse-radish root is an excellent sialogogue, producing a copious secretion of saliva. It has been sometimes employed in paralysis of the tongue, but like the other remedies of this class it has nearly fallen into disuse.

PREPARATION.—Spiritus compositus. (See *General Stimulants.*)

MEZEREON, (described in the division *Diaphoretics*), has been occasionally used as a masticatory in tooth-ache, and in difficulty of deglutition from paralysis. A small piece of the bark should be frequently chewed, and the saliva assiduously rejected.

* PYRETHRUM. *Pellitory of Spain. Root of Anacyclus pyrethrum.* A native of Asia Minor, and of the central parts of Europe, belonging to the Natural family *Compositæ* (*Asteraceæ*, Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

BOTANICAL CHARACTERS.—Root, fusiform; stems, several, procumbent, somewhat branched, pubescent; branches, one headed; florets of the ray, white above, purplish beneath; of the disc, yellow.

PHYSICAL PROPERTIES.—It is in short tapering pieces, from three to four inches in length, and about the thickness of the little finger. The bark is thick and of a dark brown colour, with black shining spots; the internal structure is dirty yellow, with a radiated appearance. It is inodorous, but when chewed produces a peculiar prickling sensation on the tongue and lips.

CHEMICAL PROPERTIES.—According to Parisel's analysis, the acrimony of this root depends on an acrid resin, *Pyrethrin*, of which it contains three per cent.; the other constituents are inulin, gum, tannin, colouring matter, lignin, a trace of iron and silica, and some salts. It yields its virtues to alcohol and ether, but not to water.

THERAPEUTICAL EFFECTS.—Pellitory root is the most useful of this class of remedies, acting as a powerful local stimulant to the salivary glands, and causing a copious secretion of saliva. It is used for this purpose in tooth-ache, neuralgia of the face, rheumatism of the jaws, and paralysis of the tongue; in the latter of which affections I have employed it with benefit. It has been also employed in relaxation of the uvula. From gr. xxx. to gr. lx. of the root may be chewed frequently. A tincture prepared by macerating for seven days one part of the powdered root in five parts of rectified spirit and one of water is used by some dentists to relieve tooth-ache.

CHAPTER XVIII.

GENERAL STIMULANTS.

(Excitants; Incitants; Hypersthenics.)

It is difficult to define what is understood in the practice of medicine by the term Stimulant, excitement of the vital energies is produced by such different means under different circumstances; with no class of remedies, therefore, is it more necessary to bear in mind the truth of the axiom, that medicines act merely *relatively*. In general terms Stimulants may be defined to be, agents which produce a sudden but not permanent augmentation in the activity of the vital functions. This effect is evidently due to their operation on the circulatory and cerebro-spinal systems—both of which are excited to increased energy; and many of them act topically on the parts of the body to which they may be applied, giving rise to local hyperemia. Most therapeutists, however, agree in thinking that their primary effect is produced on the nervous system, the circulation being affected only secondarily; but with this view of their mode of action I cannot agree, nor is it at all consonant with the many therapeutical indications, to fulfil which this class of medicines is being constantly employed in the practice of medicine. In their mode of action when administered internally, General Stimulants resemble in some respects Tonics; thus, immediately after their administration, a feeling of tone or increased power is produced, which, however, is not permanent, being almost invariably followed by a corresponding depression of vital power; their effects also are more immediate and more manifestly perceived by the senses than those of Tonics. Many of the remedies contained in this division are closely related to Narcotics, for example, alcohol and the ethers; the secondary effect of both of which, particularly if given in large doses, is to produce sleep and coma: this does not, however, appear to be as with Narcotics, from any direct action on the nervous system, but either to result from exhaustion of the previously over-excited vital energy, or to be produced by the inhalation of their vapour by the lungs as it passes off from the stomach—a state resembling the anæsthesia caused by the vapour of chloroform or the ethers thence resulting. The great number of medicines contained in this class, and the material difference of their action in relation to the particular effects which they produce on the animal economy, prevent any general rules from being laid down as to their administration in disease. The peculiarities in their mode of operation will be more conveniently considered when treating of the therapeutical effects of each.

* ACIDUM ACETICUM CAMPHORATUM. *Camphorated Acetic Acid.* (Syn.: *Aromatic Vinegar, Marseilles Vinegar, Vinegar of the Four Thieves.*)

PREPARATION.—Take of camphor, ℥j.; rectified spirit, fʒj.; strong acetic acid, f℥x.; oil of cloves, min. xx.; oils of lavender, of rosemary, and of lemons, of each, fʒss. Reduce the camphor to powder, by trituration with the spirit; add the acid, and dissolve it, then add in the oil, and keep in a well-stoppered bottle.

This preparation is only employed now-a-days as an external stimulant, the vapour being applied to the nostrils in syncope, or to rouse the vital energies when depressed by any cause. It was formerly supposed to be prophylactic of fever, plague, and other infectious diseases, but modern experience has long since dissipated this error. It is exceedingly pungent and very volatile, and should be therefore kept in well-stopped bottles.

* ÆTHER ACETICUS. *Acetic Ether.* Not employed in this country, but officinal in most of the continental pharmacopœias.

PREPARATION.—*Parisian Codex.*—"Rectified spirit, 100 parts; concentrated acetic acid, 63 parts; strong sulphuric acid, 17 parts; mix, and distil over a sand-bath 125 parts; deprive this of any free acetic acid it may contain by means of carbonate of potash, set aside until it settles, pour off the clear liquor and distil 100 parts."

PHYSICAL PROPERTIES.—It is a colourless, transparent, very volatile liquid, with an agreeable, refreshing odour, and a warm ethereal taste, leaving a cooling impression on the palate. Specific gravity, ·860.

CHEMICAL PROPERTIES.—According to the recent chemical theories as to the constitution of the ethers, acetic ether is an *acetate of oxide of ethyl,* its composition is $C_8H_8O_4$; or, $C_4H_5O+C_4H_3O_3$; it boils at 165°. It is soluble in 7 parts of water, and in alcohol and ether in all proportions. Acetic ether, when free from water, may be kept unchanged in stoppered bottles, but if it contains water, is rapidly converted into acetic acid and alcohol; the alkalies decompose it with great facility.

THERAPEUTICAL EFFECTS.—Acetic ether is an agreeable but mild general stimulant, at one time much used on the Continent in hysteria and nervous affections; at present it is chiefly employed externally as an ingredient in stimulating liniments.

* *Camphorated Acetic Liniment*, PELLETIER. (Soap; and camphor, of each, gr. cxx.; acetic ether, f℥ij.; dissolve in a water-bath, and add oil of origanum, min. xx.) An excellent stimulating liniment in rheumatic and arthritic pains, and in sciatica.

ÆTHER. *Ether*. Syn. *Æther Sulphuricus*, Ed. Dub. (Oxide of ethyl, C_4H_5O (=37), with about eight per cent. by volume of alcohol.)

PREPARATION.—Take of rectified spirit, fifty fluid ounces; sulphuric acid, ten fluid ounces; chloride of calcium, ten ounces; slaked lime, half an ounce; distilled water, thirteen fluid ounces. Mix the sulphuric acid and twelve ounces of the spirit in a glass matrass capable of containing at least two pints, and, without allowing the mixture to cool, connect the matrass by means of a bent glass tube with a Liebig's condenser, and distil with a heat sufficient to maintain the liquid in brisk ebullition. As soon as the ethereal fluid begins to pass over, supply fresh spirit through a tube into the matrass in a continuous stream, and in such quantity as to equal the volume of the fluid which distils over. This is best done by using a tube furnished with a stopcock to regulate the supply, connecting one end of the tube with a vessel containing the spirit raised above the level of the matrass, and passing the other end through a cork fitted into the matrass. When the whole of the spirit has been added, and forty-two fluid ounces have distilled over, the process may be stopped. Dissolve the chloride of calcium in the water, add the lime, and agitate the mixture in a bottle with the impure ether. Leave the mixture at rest for ten minutes, pour off the light supernatant fluid, and distil it with a gentle heat until a glass bead of specific gravity 0·735 placed in the receiver begins to float. The ether and spirit retained by the chloride of calcium and by the residue of each distillation may be recovered by distillation and used in a subsequent operation.

EXPLANATION OF PROCESS.—Alcohol consists of $C_4H_6O_2$, Ether of $C_4H_5O_1$, so it is evident that if by any means we can remove the equivalents of one atom of water from alcohol, we shall have succeeded in reducing it to the condition of ether. This statement will be rendered more apparent by referring to the theories of modern chemists who look upon ether as the oxide of what, until Dr. Frankland succeeded recently in insulating, was looked upon as an hypothetical base, *ethyl* (C_4H_5), and alcohol as its hydrated oxide (C_4H_5O+HO). At first sight it might be imagined that all we would require to explain the reactions that ensue upon the admixture of sulphuric acid and spirit, and the resulting production of ether, would be to attribute the abstraction of the equivalents of water from the spirit to the well known affinity of the acid for water; but we are compelled to decline accepting this theory, charming though it is from its simplicity, by many considerations, prominent amongst which are, that we have many substances possessing as great, if not greater, affinity for water as sulphuric acid possesses, and yet the result of their reactions upon alcohol is not ether; that *anhydrous* sulphuric acid, which, were this the true explanation, ought to be the most energetic agent in its production, fails in producing ether, and that heat is essential to its development. The theory first promulgated by Liebig, and subsequently adopted by most modern chemists, is, that by the action of the acid upon the alcohol we have an intermediate product formed, *sulpho-vinic acid* (C_4H_5O, HO, $2SO_3$); thus, $C_4H_6O_2 + 2SO_3HO = (C_4H_5O,HO,2SO_3) + 2HO$; which, as the process of distillation goes on, is resolved into ether, sulphuric acid, and water; thus, $(C_4H_5O,HO,2SO_3) = C_4H_5O + 2SO_3 + HO$. Were these the only substances produced, there would be no necessity for the subsequent steps directed for the purification of the ether; but in virtue of this process we have also developed sulphurous acid, carbon, water, olefiant gas (C_2H_2), and heavy oil of wine ($C_4H_5O + C_4H_4 + 2SO_3$). The production of the first four of these is thus accounted for, $(C_4H_5O + 2SO_3HO) = 2SO_2 + 2C + 4HO + C_2H_2$; the appearance of the heavy oil of wine is thus explained, $2C_2H_2 + C_4H_5O + 2SO_3HO = 2HO + (C_4H_4 + C_4H_5O + 2SO_3)$, The lime employed removes some of these impurities; viz., the water, sulphurous acid, and any sulphuric acid that may have been accidentally distilled over; and it also decomposes the heavy oil of wine, resolving it into ether, which distils over; sulphate of lime, which remains behind in the retort; and etherine (C_4H_4), which also remains behind in the retort, inasmuch as it will not distil over at the heat employed. Some spirit, also, distils over during the process, the greater portion of which is removed by the chloride of calcium. This theory, although very generally adopted by chemists, is not so universally; Mitsherlick conceiving the action of sulphuric acid upon alcohol as one of simple catalysis, in virtue of which the spirit is resolved into ether and water.

CHARACTERS.—A colourless, very volatile, and inflammable liquid, emitting a pungent and very characteristic odour, and boiling below 105°. A little of it poured upon the hand evaporates rapidly, producing a sensation of cold.

CHEMICAL PROPERTIES.—Its composition is C_4H_5O. It is extremely volatile; it boils between 96° and 98°; is highly combustible, burning with a white flame, and the formation of carbonic acid and water. Great cold is produced by its evaporation. When recently prepared, ether is perfectly neutral, but soon becomes acid by keeping. One part of ether dissolves in ten parts of water, while thirty-six parts of ether dissolve one of water; it combines in all proportions with alcohol. Sulphuric ether dissolves most resins, the volatile oils, and many of the vegetable alkaloids.

TESTS.—Specific gravity, 0·735. Fifty measures agitated with an equal volume of water are reduced to forty-one by an absorption of 18 per cent. It evaporates without residue.

ADULTERATIONS.—Ether frequently contains water and alcohol; from bad keeping, acetic acid is also often present. The latter may be detected by the effect on litmus paper, and water by the density being higher than that indicated. The presence of alcohol, as well as the quantity, if it be present, is satisfactorily ascertained by the test of the Pharmacopœia. If the solution of ether in water be not perfectly transparent, the presence of ethereal oil may be suspected.

THERAPEUTICAL EFFECTS.—The action of sulphuric ether when taken internally is that of a general diffusible stimulant; but its effects, which are rapidly produced, are equally transient. In very large doses it is a narcotic poison, producing death with symptoms similar to those caused by alcohol. Applied externally, the action is refrigerant, owing to the cold produced by its immediate evaporation, and it is consequently a popular remedy applied to the forehead in cases of head-ache; it has also been dropped over hernial tumours with the view of facilitating their reduction; the cold thereby induced unloading the vessels, and so diminishing the amount of congestion present. As a stimulant, ether is chiefly employed in spasmodic and nervous affections unaccompanied by inflammation, thus it is used with benefit in cramp in the stomach, in spasmodic or flatulent colic, in nervous palpitations, in hiccough, in nervous headache, during a paroxysm of spasmodic asthma, in aphonia, &c. It is also administered frequently with good effect in the advanced stages of fever when subsultus tendinum and hiccough are present; and as an immediate stimulant in fainting and asphyxia. In the employment of ether as a stimulant, the transient nature of its operation should be borne in mind, and consequently that the dose requires to be repeated at short intervals. The influence of ether over the system is much diminished by habit, it should be therefore administered to those who are accustomed to its use in much larger doses than to others. Ether was the first agent employed to produce, by its inhalation, insensibility during surgical operations. The great *disadvantages* attending its use as an anæsthetic, are the large quantity required to produce anæsthesia, the subsequent persistent taste and odour of ether experienced even for days by those to whom it has been administered, and the sickness of stomach incidental on its employment as well as on that of chloroform; its great *recommendations* are the complete state of anæsthesia it produces, and the safety attending its employment—a safety so remarkable that its exclusive use has become a law in the Massachusset's Hospital. Nevertheless, its employment is now altogether in this country supplanted by that of chloroform; in some parts of America, however, as already remarked, it still more than holds its ground, and many of the United States physicians and surgeons employ a mixture of two or three parts of ether, and one of chloroform to produce anæsthesia; the effects of such a mixture, when inhaled, have already been incidentally alluded to (see p. 426). Externally ether has been applied with friction as a local stimulant in rheumatic and neuralgic pains. In pharmacy it is employed to extract the active principle of many medicines.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥ij.; it is usually administered in some aromatic water. "Ether may be readily incorporated with water or any aqueous vehicle, by rubbing it up with spermaceti, employed in the proportion of gr. ij. for each fluid drachm of the ether" *(United States Dispensatory)*. The vapour of ether differing from chloroform in being of very light specific gravity, requires for its inhalation that the patient should be somewhat in the erect position, and in consequence of its volatility that an apparatus or ether-inhaler, of which many forms have been proposed, should be employed for its administration.

Ether, Pure. (Ether, free from alcohol and water, C_4H_5O.) (Take of ether, two pints; distilled water, two pints; lime, recently burned, a quarter of an ounce; chloride of calcium, perfectly dry, four ounces. Shake the ether with one pint of the water, and after separation has taken place decant the ether, and again shake it with the remainder of the water. Decant again, and put the washed ether into a retort with the lime and the chloride of calcium, and after digestion for twenty-four hours, distil with the aid of a gentle heat.) Specific gravity not exceeding 0·720. In this process the spirit is removed by agitation with the water, which, in its turn, is removed by treating it with the lime and chloride of calcium; it is only introduced for pharmaceutical purposes, being employed in the preparation of *aconitia*; in the *test* for cinchona flava, &c.

Spiritus Ætheris. Spirit of Ether. (Take of ether, ten fluid ounces; rectified spirit, one pint; mix. Specific gravity, 0·809. It does not affect litmus paper, or render water muddy; when agitated with twice its volume of concentrated solution of chloride of calcium, twenty-eight per cent. of ether separate by rest.) Uses and properties similar to those of ether. Dose, f℈j. to f℈iij. It is miscible with water in all proportions.

* *Oleum Æthereum*, L. (Rectified spirit, Oij.; sulphuric acid, f℥xxxvj.; solution of potash, and distilled water, of each, f℥j., or as much as may be sufficient; mix the acid cautiously with the spirit. Let the liquor distil until a black froth arises, then immediately remove the retort from the fire; separate the lighter supernatant liquor from the heavier one, and expose the former to the air for a day; add to it the solution of potash first mixed with water, and shake them together. Lastly, when sufficiently washed, separate the ethereal oil which subsides.) The ethereal oil is heavy oil of wine, the production of which will be readily understood on reference to the remarks on the mode of making ether. This preparation is only employed as an ingredient in the following compound:—

* *Spiritus Ætheris Compositus*, L. (Sulphuric ether, f℥viij.; rectified spirit, f℥xvj.; ethereal oil, f℈iij.; mix.) I have retained these two preparations, the first as being an important constituent of the second, which is commonly known as *Hoffman's anodyne liquor*. It is used in nearly the same cases as sulphuric ether, but its properties are more decidedly antispasmodic; the dose is f℈ss. to f℈ij. It is miscible with water in all proportions. This preparation is often prescribed in combination with laudanum, the disagreeable subsequent effects of which it usually prevents. Although no longer

officinal it is a valuable preparation, and consequently in great favour with many practitioners, being frequently prescribed with marked benefit as an addition to expectorant mixtures in cases of tickling cough, &c.

In cases of poisoning with ether, the stomach pump should be immediately used; cold affusion and the most powerful internal and external stimulants assiduously employed; and in extreme cases artificial respiration had recourse to.

ALCOHOL. *Absolute Alcohol.* (Hydrate of Oxide of Ethyl, C_4H_5O,HO) (=46).

SPIRITUS RECTIFICATUS. *Rectified Spirit.* (Alcohol, C_4H_5O,HO, with sixteen per cent. of water; obtained by the distillation of fermented saccharine fluids, and by the rectification of the product, if it be not of the proper density.) (Syn.: *Spirits of Wine.*)

SPIRITUS TENUIOR. *Proof Spirit.*

PREPARATION.—*Of Alcohol.* "Take of rectified spirit, one pint; lime recently burned, eighteen ounces. Having introduced the lime and the spirit into a matrass connected with a Liebig's condenser, apply heat until the lime begins to slake; and when this process is completed, distil by means of a chloride of zinc bath, until the liquid which comes over, together with that obtained during the slaking, measures one ounce and a half. Reject this, and continue the distillation into a fresh receiver, until the product measures sixteen ounces." In this process the water is abstracted from the rectified spirit by the lime, and it so converted into alcohol.—*Of Proof Spirit.* "Take of rectified spirit five pints; distilled water, three pints. Mix. Specific gravity, 0·920."

PHYSICAL PROPERTIES.—ALCOHOL, which has only a place in Appendix B in the Pharmacopœia, is a transparent, colourless liquid, with a pungent, rather agreeable odour, and an acrid burning taste. RECTIFIED SPIRIT (*Spiritus Rectificatus*, Spirit of Wine), is an article of the Materia Medica. PROOF SPIRIT (*Spiritus Tenuior,*) is directed by the pharmacopœial authorities to be prepared as already described. The specific gravity of proof spirit, according to the laws of the kingdom, is ·920 at 60° F.; and it is of this strength by the direction of the Pharmacopœia.

CHARACTERS.—*Of Rectified Spirit.* Colourless, transparent, very mobile and inflammable, of a peculiar pleasant odour, and a strong, spirituous, burning taste. Burns with a blue flame without smoke.

CHEMICAL PROPERTIES.—Absolute alcohol is a *hydrated oxide of ethyl;* its composition is C_4H_5O+HO. It boils at 173°; is very volatile, and highly inflammable, burning with a pale blue flame free from smoke; water and carbonic acid being the products of its combustion; it has never been frozen. It attracts water from the air, and therefore becomes weak if kept in an imperfectly closed vessel; is miscible with water in all proportions, a disengagement of heat, a condensation of bulk, and an increase of density accompanying their union. Alcohol dissolves the caustic alkalies and alkaline sulphurets; it also dissolves all the deliquescent inorganic salts, except carbonate of potash, but none of the salts which are insoluble or sparingly soluble in water, nor efflorescent salts. It likewise dissolves many vegetable substances, as all essential and most fixed oils, the vegetable alkaloids, sugar, resins, extractive, &c. for many of which purposes it is employed in pharmacy. Alcohol prevents the putrefaction of animal substances which are immersed in it, and hence its employment in the preservation of anatomical preparations. *Rectified* and *proof spirit* have similar properties to alcohol, their taste is milder, their boiling point higher according to the state of dilution, their inflammability less, and the colour of the flame with which they burn deeper yellow the more water they contain. *Proof spirit* is defined by law to be such that, at the temperature of 51° F., thirteen volumes of it weigh exactly as much as twelve volumes of water; one hundred parts of spirit of this strength consist of forty-nine parts by weight of absolute alcohol, and fifty-one parts by weight of distilled water at 60°.

TESTS.—*Of Alcohol.* Specific gravity, 0·795. It is entirely volatilized by heat, 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.—*Of Rectified Spirit.* Specific gravity, 0·838. Remains clear when diluted with distilled water. Odour and taste purely alcoholic. Four fluid ounces with three measures of the volumetric solution of nitrate of silver exposed for twenty-four hours to bright light, and then decanted from the black powder which has formed, undergoes no further change when again exposed to light with more of the test.

ADULTERATIONS.—The specific gravity is a sufficient test of the strength of alcohol and the weaker spirits, but in ascertaining their density, the temperature should be at the same time carefully noted, for the lower the temperature, the greater will be the density of the spirit. The rectified spirit of British commerce frequently contains fusel oil, a contamination derived from the corn during the process of distillation. Its presence is readily detected by the test of the Pharmacopœia with nitrate of silver, which, however, allows for a trace of fusel oil. The same test is applicable to both alcohol and proof spirit. The following were the characteristics and tests given for rectified spirit in the London Pharmacopœia:—"Colourless, not muddied on the addition of water, nor coloured red by sulphuric acid."

THERAPEUTICAL EFFECTS.—Alcohol is the intoxicating principle of all spirituous liquors. In moderate doses properly diluted, it acts as a general stimulant, exciting particularly the vascular and nervous systems; in somewhat larger quantity it produces the well-known effects of intoxication; and in excessive doses it acts as a powerful narcotic poison, rapidly causing death, preceded by slow pulse, contracted pupils, and coma: this effect is most usually observed when a large quantity of ardent spirits has been drank at once. As a stimulant, alcohol is employed in medicine to support the vital powers in the advanced stages of fevers, particularly those of a low or typhus character; for this purpose brandy—*Spiritus Vini Gallici*, formerly an article of the Materia Medica in the London Pharmacopœia—or whiskey is usually employed, but wine is generally preferred (see *Vinum*). It is often used in flatulent colic, in indigestion, in vomiting, and in fainting. As an external stimulant, spirit is a common ingredient in lotions for sprains and bruises, for many forms of external inflammations—as erysipelas and erythema, for various chronic skin diseases, to prevent excoriations in parts exposed to prolonged pressure, and with friction over the region of the heart in syncope and suspended animation. Diluted with six parts *by measure* of water, it has been used as an injection after tapping for the radical cure of hydrocele. In consequence of its producing cold by evaporation, alcohol is frequently added to cooling and evaporating lotions.

DOSE AND MODE OF ADMINISTRATION.—In fevers, brandy or whiskey is given diluted with water, or in the form of punch; the quantity which ought to be given depends so much on the circumstances of each particular case, that it would be impossible to lay down here any general rule on the subject. In the fever which proved so fatal to the British Legion in Spain in the year 1835, Dr. Lardner frequently gave so much as thirty-two ounces of brandy in the twenty-four hours.

* *Mistura Spiritus Vini Gallici*, L. (Brandy; cinnamon water, of each, f℥iv.; the yolks of two eggs; sugar, ℥ss.; oil of cinnamon, min. ij.; mix.) An agreeable and excellent stimulant in doses of f℥ss. to f℥iss.

* *Methylated Spirit.* (A mixture of pyroxylic spirit and spirit of wine.) This compound would scarcely require a notice here, were it not that it has been recently used fraudulently by some chemists for the preparation of medicinal tinctures, extracts, and spirituous liniments. It was introduced into commerce by the Board of Inland Revenue in the year 1854, with the intention of permitting spirit of wine to be used free of duty in certain trades and manufactures; the mixture of one part by measure of pyroxylic spirit with nine parts of spirit of wine forming so disagreeable a compound, that by no artificial process it was thought could the spirit be again rendered fit for potable purposes, an opinion which the ingenuity of recent experimentalizers has proved to be fallacious indeed. Methylated spirit is of a muddy yellowish colour, and has a most disagreeable odour and taste; its specific gravity is 0·815, and it boils at 169° F. The great cheapness of this compound compared with spirit of wine first suggested its use in pharmacy for the purposes above mentioned, but the matter having been lately referred to the Colleges of Physicians by the Board of Revenue, an unanimous report against its employment in pharmaceutical preparations was very wisely, in my opinion, come to by the three colleges.

In poisoning with ardent spirits, the contents of the stomach should be immediately evacuated by means of emetics or of the stomach-pump; and external stimulants, especially the cold affusion, assiduously employed. The coma of ordinary intoxication is best treated by the internal use of ammonia, or of the solution of the acetate of ammonia (see *Ammoniæ Acetatis Liquor*, p. 228); if apoplectic symptoms be present, cold lotions to the head, the application of leeches to the temples, and warmth to the extremities, will be found most useful.

AMMONIACUM. *Ammoniac.* Dorema Ammoniacum, *Don, Trans. Linn. Soc.* (A gum-resinous exudation from the stem; collected in Persia and the Punjaub.)

The plant indicated above, which is the true source of this drug as met with in commerce, although M. Buhse believes it to be the *Dorema aucheri*, is a native of Persia; but the ammoniacum of the ancients was procured from the *Ferula Orientalis*, a native of Morocco, in which country it is obtained from it even in this day. They both belong to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia*.

BOTANICAL CHARACTERS.—A glaucous-green plant, 7-9 feet high; stem about 4 inches in diameter, branching; leaves, large, 2 feet long, on downy petioles, sheathing at the base; flowers, immersed in wool, white, in proliferous, racemose umbels.

PREPARATION.—The gummy juice which pervades the whole plant oozes forth on the slightest puncture. During the warm season, the branches and stem are attacked by innumerable beetles, by which it is pierced in all directions; through these punctures the juice exudes, and soon concretes into a hard gum, when it is picked off by the country people. The ammoniacum which is imported in masses was directed in the London Pharmacopœia to be prepared for use in medicine as follows:—*Ammoniacum præparatum;* lump ammoniacum, ℔j.; water sufficient to cover it; boil together until they are mixed; strain the mixture through a hair sieve, and evaporate in a water-bath, constantly stirring that it may be hard when cold.

CHARACTERS.—In tears or masses; the tears from two to eight lines in diameter, pale cinnamon-brown, breaking with a smooth, shining, opaque, white surface; the masses composed of agglutinated tears; hard and brittle when cold, but readily softening with heat; has a faint odour, and a bitter, acrid, nauseous taste. Rubbed with water it forms a milky emulsion.

PHYSICAL PROPERTIES.—Ammoniac is met with in various-sized roundish tears, or in masses composed of the tears agglutinated together. They are of a yellowish or reddish-brown colour externally, internally they are white and shining like enamel, hard and brittle, and vary in size from that of a small pea to that of a walnut. The odour is peculiar, faintly nauseous, more powerful when heated; the taste is bitter and disagreeable.

CHEMICAL PROPERTIES.—Ammoniac is a gum-resin, containing about 80 per cent. of resin and 18 per cent. of gum, with a trace of volatile oil. It is softened by exposure to heat, is inflammable, and burns with a white flame. It does not dissolve in water, but is miscible with it, forming a milky emulsion, the gum which is soluble suspending the resin in the mixture. It is soluble in both ether and alcohol.

THERAPEUTICAL EFFECTS.—Ammoniac is a general stimulant of but little power; its effects were at one time generally believed to be chiefly manifested on the respiratory organs, and consequently it was classed amongst expectorants, and employed in chronic bronchitis; but any benefit that may have resulted from its use as such depended on its general stimulant properties; yet by many practitioners it is still highly prized as a stimulant expectorant. It possesses some antispasmodic powers, but is much inferior as such to the other fetid gum-resins. In the present day it is chiefly employed as an external stimulant, in the form of plaster, to scrofulous tumours, chronic enlargement of the joints, indolent glandular swellings, &c., in which it often proves useful, or as a vehicle for other more active remedies in chronic bronchial affections.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. in pills, or made into an emulsion with milk or water.

PREPARATIONS.—Emplastrum Ammoniaci cum Hydrargyro (which see, under head of Mercury), Emplastrum Galbani (page 55), Mistura, Pilula Scillæ composita (page 346).

Mistura Ammoniaci. Ammoniac Mixture. (Take of ammoniac, in coarse powder, a quarter of an ounce; distilled water, eight fluid ounces. Triturate the ammoniac with the water, gradually added until the mixture assumes a milky appearance, then strain through muslin.) This mixture has a milky appearance, the resin being suspended in the water by means of the gum. It was formerly commonly employed, and is still used as a basis for expectorant mixtures in chronic chest affections. Dose, f℥ss. to f℥j.

AMMONIÆ LIQUOR. *Diluted aqueous solution of ammonia* (described in the division *Antacids*) is a general stimulant, prompt, but temporary in its action. It is principally used in typhus fever when there is great deficiency of nervous power; in the advanced stages of continued fever when all inflammatory action has subsided; in the cold stage of intermittents; in the eruptive fevers should the eruption have receded from the skin, and in the latter stages of pneumonia, if there be much depression of the vital powers. Owing to its stimulant operation, ammonia is also found useful in spasmodic affections, which depend on the increased irritability that accompanies depression of the nervous system, as in hiccough, in subsultus tendinum, in the nervousness caused by excessive smoking or the use of intoxicating liquors, and in some forms of hysteria and of asthma. It is the best internal stimulant that can be employed in the coma of intoxication, and in poisoning with *sedatives*. As an external stimulant, the vapour of ammonia is inhaled in syncope, and in asphyxia. Solution of ammonia may be administered as a stimulant in the same doses as directed in the division *Antacids*; but it should be given repeatedly, and at shorter intervals.

AMMONIÆ CARBONAS. *Sesquicarbonate of Ammonia* (described in the division *Antacids*) is employed as a stimulant in the same cases as the aqueous solution of ammonia, to which it is usually preferred. The chief advantage that ammonia and the sesquicarbonate possess as stimulants in febrile diseases is, that they rouse the energies of the system without producing that disturbance of the brain which is liable to result from the use of vinous liquors. Dose, gr. v. to gr. x. dissolved in camphor mixture, or any simple vehicle, every four or five hours. It should not be administered in the solid state, from its liability to produce vomiting when thus given.

AMMONIÆ HYDROSULPHURETUM. *Solution of Hydrosulphuret of Ammonia.* (Hydrosulphuret of Ammonia$=NH_4S,HS$)($=51$).

PREPARATION.—Take of solution of ammonia, one fluid ounce. Conduct into this a stream of sulphuretted hydrogen so long as this gas continues to be absorbed, and then transfer the solution to a green glass bottle furnished with a well-ground stopper.

PROPERTIES.—At first a light yellow, after a time becoming a deeper greenish-yellow, very fetid liquid, emitting an odour of sulphuretted hydrogen gas, and having an acrid, very disagreeable taste.

CHEMICAL PROPERTIES.—It is a solution of the double sulphide of hydrogen, and of ammonium. After being kept for some time a portion of its hydrogen escapes, and it will contain bisulphide of ammonium (NH_4S_2), the presence of which intensifies its yellow colour. Exposed to the air it deposits sulphur, owing to the escape of some of the ammonia; and on the addition of any of the mineral acids, sulphuretted-hydrogen gas is evolved.

THERAPEUTICAL EFFECTS.—This preparation has nearly fallen into disuse. It is only mentioned in Appendix B to the Pharmacopœia, being introduced there as a test. It was formerly employed with the idea of de-oxygenising the system in diabetes, as also of diminishing the morbid appetite attendant on that disease. It possesses also some slight stimulant properties; nevertheless, it can be well spared from the list of *medicinal* agents. The dose is from min. iv. to min. vj. in one or two fluid ounces of some distilled or aromatic water.

AMMONIÆ HYDROCHLORAS. *Hydrochlorate of Ammonia.* (Syn.: *Ammoniæ Murias*, Ed., Dub. *Muriate of Ammonia, Chloride of Ammonium, Sal-ammoniac.*) NH_4Cl ($=53{\cdot}5$).

PREPARATION.—An article of the Materia Medica. It is procured by manufacturers on the large scale, by decomposing the sulphate of ammonia which is formed in the manufacture of coal gas, or from the carbonate of ammonia obtained by the distillation of bones. In either case the decomposing agent employed is common salt (chloride of sodium).

PHYSICAL PROPERTIES.—This salt generally occurs in large crystalline cakes, convex on one side, concave on the other, of a greyish-white colour, semi-transparent. It is tenacious, and difficult to reduce to powder; inodorous, with a pungent, acrid, bitter, and nauseous taste. Specific gravity, 1·45.

CHARACTERS.—In colourless, inodorous, translucent, fibrous masses, tough, and difficult to powder; soluble in water and in rectified spirit. Its aqueous solution when heated with caustic potash evolves ammonia, and when treated with nitrate of silver forms a copious, curdy precipitate.

TESTS.—When heated, it volatilizes without decomposition, and leaves no residue.

CHEMICAL PROPERTIES.—Muriate of ammonia, according to Kane, is composed of one equivalent of chlorine, two of hydrogen, and one of amidogene, its formula being $Cl,2H,NH_2$. It is permanent in the air; and if exposed to heat sublimes unchanged; is soluble in 2·72 parts of water at 60°, and in its own weight of boiling water; and is also soluble in alcohol. During its solution in water a great degree of cold is produced. This salt is best characterized by the evolution of gaseous ammonia, which takes place when it is treated with caustic potash, as directed in the *Characters*. The chlorine goes to the potassium to form chloride of potassium; whilst the ammonium unites with the oxygen to form ammonia; thus, $NH_4Cl + KO = KCl + NH_4O$. The white, curdy precipitate is chloride of silver.

THERAPEUTICAL EFFECTS.—Hydrochlorate of ammonia is not much employed in this country as an internal remedy; but on the Continent, especially in France and Germany, it bears a high character as a stimulant in mucous fevers as soon as the acute inflammatory symptoms have subsided, in the slighter cases of inflammations of the serous membranes, in the milder forms of pneumonia and of hooping cough, in mucous diarrhœa, in chronic rheumatism and gout, and in passive dropsies. I have found it useful in some cases of adynamic fever, and in the subacute forms of laryngitis; also in chronic affections of the liver, and in facial neuralgia. Dr. Watson describes a form of this latter affection, frequently but erroneously attributed to the presence of carious teeth, in which he has found its administration in thirty grain doses of great service. Should not the first four doses give relief, there will be no use in persevering with the remedy. M. Cless has employed it extensively in the early stages of tubercular phthisis, and, he states, with the most decidedly beneficial results. As a topical remedy muriate of ammonia is very generally used as an ingredient in discutient lotions, no remedy with which I am acquainted having equal power with it in promoting the reabsorption of effused blood, as so commonly met with in that well-known affection—*a black eye;* and, in consequence of the cold produced during its solution in water, as an external refrigerant.

DOSE AND MODE OF ADMINISTRATION.—Internally, gr. v. to gr. xxx. combined with some aromatic powder, in the form of pill or of bolus, or dissolved in some aromatic water. For external use it may be dissolved in water or in vinegar, in the proportion of from gr. cxx.

to ℥ss. of the salt in a pint of liquid, to which rectified spirit is generally added. A refrigeratory mixture may be prepared by dissolving five parts each of this salt and of nitre, in sixteen parts of water, which will reduce the temperature forty degrees.

INCOMPATIBLES.—Sulphuric and nitric acids; potash, soda, lime, magnesia, and their carbonates; and most metallic salts.

If an overdose of this salt has been taken, vomiting should be promoted by the use of tepid mucilaginous and demulcent drinks.

* AMMONIÆ SPIRITUS, E. *Spirit of Ammonia. Solution of Ammonia in Rectified Spirit.*

PREPARATION.—Rectified spirit, Oij.; fresh burnt lime, ℥xij.; muriate of ammonia in very fine powder, ℥viij.; water, f℥viss.; let the lime be slaked with the water in an iron or earthen vessel, and cover the vessel till the powder be cold; mix the lime and muriate of ammonia quickly and thoroughly in a mortar, and transfer the mixture at once into a glass retort; adapt to the retort a tube which passes nearly to the bottom of a bottle containing the rectified spirit; heat the retort in a sand-bath gradually, so long as anything passes over, preserving the bottle cool. The bottle should be large enough to contain one half more than the spirit used.

PROPERTIES.—This preparation, which has been omitted from the Pharmacopœia, is a transparent, colourless liquid, with a pungent, ammoniacal odour, and an acrid taste. It is very volatile, and acts as an alkali on vegetable colours. Specific gravity, about ·845.

THERAPEUTICAL EFFECTS.—Spirit of ammonia is a stimulant of some power, and may be used as such in the same cases as the aqueous solution of the gas. Dose, f℈ss. to f℈iss., in some aromatic water, or in camphor mixture. It is generally employed, however, in the following form only, which is officinal:—

Spiritus Ammoniæ Aromaticus. Aromatic Spirit of Ammonia. (Take of 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, six pints; water, three pints. Mix, and distil seven pints.) Specific gravity, 0·870. An excellent and agreeable stimulant in fainting, hysteria, nervous debility, and flatulent colic. Dose, min. xxx. to f℈j. in distilled water, or in camphor mixture.

ANETHUM. *Dill.* Anethum Graveolens, *Linn.* Plate 159, *Woodv. Med. Bot.* (The fruit; cultivated in England, or imported from middle and southern Europe.)

ANETHI OLEUM. *Oil of Dill.* (The oil distilled in England from dill.) A native of the South of Europe; belonging to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—An annual, 1-2 feet high; stem, striated; leaves, decompound, with fine capillary segments; flowers, yellow.

CHARACTERS.—*Of the Fruit.* Oval, flat, about a line and a half in length, with a pale membranous margin. Odour, aromatic; taste, warm, somewhat bitter.—*Of the Oil.* Colour, pale yellow; odour, pungent; taste, acrid sweetish.

PROPERTIES.—The fruit, commonly called *dill-seed,* is elliptical, flat, of a brownish colour, with a lighter coloured, thin, membranous margin. The odour resembles caraway; the taste is pungent, somewhat bitter. It contains about three per cent. of a light yellow volatile oil, on which its properties depend.

THERAPEUTICAL EFFECTS.—An aromatic stimulant, sometimes used in the flatulent colic of children, and in the form of dill water as a vehicle for other remedies, chiefly purgatives, the griping properties of which it corrects.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. lx. of the bruised fruit for adults.

Aqua Anethi. Dill Water. (Take of dill, bruised, twenty ounces; water, two gallons. Distil one gallon.) Dose, from f℥ss. to f℥ij. as a vehicle for more active remedies.

* ANGELICA. *Root of Angelica Archangelica.* Indigenous, but very rare; belonging to the Natural family *Umbelliferæ* (*Apiaceæ,* Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—Biennial, 4-5 feet high; stem, 1-2 inches thick, fistulose; leaves, bipinnate; flowers, greenish-white.

PROPERTIES.—The root is imported from Hamburgh; it consists of numerous branches of the thickness of the little finger, proceeding from a short spindle-shaped root-stalk, grayish-brown externally, whitish within. The odour is aromatic and agreeable; the taste warm, aromatic, and pungent. The fruit, commonly called *angelica seed,* is oval, obtuse, 1–2 lines long, of a yellowish-brown colour, flat, and longitudinally striated on one side, convex on the other; it has the odour and taste of the root. The medicinal properties of both root and fruit depend on a volatile oil, which may be obtained by distillation; a peculiar crystalline acid has been also found to exist in it, which has been named *angelicic* acid. The root contains, besides, bitter extractive and a bitter resin.

ADULTERATIONS.—On the Continent an adulteration of angelica root with the root of the *Ligusticum levisticum* (Lovage) has been indicated; it may be readily detected by its yellow-coloured pith when cut transversely, that of angelica root being white.

THERAPEUTICAL EFFECTS.—An aromatic stimulant and carminative, rarely if ever used. Dose of the *powdered root,* gr. x. to gr. xxx.; of the *bruised root,* gr. xxx. to gr. cx.

ANISI OLEUM. *Oil of Anise.* Pimpinella Anisum, *Linn.*

Anise. Plate 180, *Woodv. Med. Bot.* (The oil distilled from the fruit in Europe.) Illicium anisatum, *Linn.* Star Anise. Plate 369, *Nees, Plant. Med.* (The oil distilled from the fruit in China.) Pimpinella anisum is a native of Egypt and the Levant, extensively cultivated in various parts of Europe; it belongs to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia.* Illicium anisatum is a native of China, Japan, and Tartary, belonging to the Natural family *Winteraceæ.*

BOTANICAL CHARACTERS.—Annual, about a foot high; stem, smooth, erect, branching; leaves of the stem, decompound; flowers, small, white, in terminal umbels.

CHARACTERS.—*Of the Oil.* Colourless, or pale yellow; with the odour of anise, and a warm, sweetish taste. Concretes at 50°.

PROPERTIES.—The fruit, commonly called *aniseed,* is ovoid, composed of two mericarps, with five primary ridges, slightly hairy, of a yellowish-brown colour; it has a peculiar sweet, aromatic odour, and a warm, sweetish taste. Its properties depend on a volatile oil, of which it contains three per cent.; this oil is transparent and nearly colourless, having a slight greenish-yellow tinge; it congeals at 50° F., and does not become fluid again under 62°. Its specific gravity is ·980; and it has the odour and taste of the fruit.

ADULTERATIONS.—The oil of star-anise (*Illicium anisatum*), the *oleum badianæ* of French writers, which resembles oil of anise in odour and appearance, is often sold for it; the fraud is one of little consequence, as may be inferred from its being now officinal, but may be readily detected, as star-anise oil retains its fluidity at 35°; according to some authorities it is superior to the true oil of anise. The fruit of the hemlock has been confounded with *aniseed,* in consequence of which, fatal accidents have in more than one instance occurred; they may be distinguished by the odour, and by the elevated ridges of anise fruit being smooth at the margin, not crenulate.

THERAPEUTICAL EFFECTS.—Anise is an aromatic stimulant and carminative; and as such is employed in flatulent colic, and in the diarrhœa of infants and children. Its value in the treatment of colic was formerly so recognized, that Van Helmont termed it the *intestinorum solamen.* It is said to promote the secretion of milk in nurses. It is much used on the Continent to flavour liqueurs. Vogel states that it is poisonous to pigeons.

DOSE AND MODE OF ADMINISTRATION.—Of the bruised fruit gr. x. to gr. xxx.

Oleum Anisi, (an article of the Materia Medica). This oil is generally imported from Germany and the East Indies. Dose, min. ij. to min. viij. rubbed up with sugar.

* *Essentia Anisi.* (Take of oil of anise, one fluid ounce; rectified spirit, nine fluid ounces. Mix with agitation.) Dose, min. xx. to min. xl.

* *Aqua Anisi.* (Take of essence of anise, f℥j.; distilled water, cong. ss. Mix with agitation, and filter through paper.) Dose, f℥ss. to f℥ij.

ARMORACIA. *Horse-radish* (described in the division *Sialogogues*) is sometimes, though rarely, used as a warm stimulant, chiefly as an adjunct to other medicines; it was formerly classed amongst the Antiscorbutics, but is little employed in the present day. Sliced horse-radish is a useful addition to the warm foot-bath to render it more stimulant. The following is the officinal preparation:—

Spiritus Armoraciæ Compositus. Compound Spirit of Horse-radish. (Take of horse-radish, sliced, twenty ounces; bitter-orange peel, dried, twenty ounces; nutmeg, bruised, half an ounce; proof spirit, one gallon; water, two pints. Mix, and distil a gallon with a moderate heat.) Dose, min. xxx. to f℥ij.

ARNICA. *Arnica Root.* Arnica montana, *Linn.* (Syn.: *Leopard's Bane.*) Plate 123, *Steph. and Church. Med. Bot.* (The root, dried; collected in middle and southern Europe.) A native of the Alps and of the Pyrenees; belonging to the Natural family *Compositæ (Asteraceæ,* Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

BOTANICAL CHARACTERS.—Perennial, about a foot high; stem, hairy, simple and single-flowered, or compound and many-flowered; leaves, oval, entire; flowers, golden-yellow.

CHARACTERS.—*Of the Root.* 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; has a peppery taste, and peculiar odour.

PROPERTIES.—The whole plant has a strong, peculiar odour, and a herbaceous, acrid, somewhat bitter taste. The flowers and leaves are collected in July, and the roots in September. The flowers, although not officinal, are principally used at present; they consist of resin, on which probably their active properties chiefly depend, a bitter, active principle (*cytisin*), yellow colouring matter, gum, and some salts. Weber has also obtained from them a small quantity of blue volatile oil; and Mr. Bastick states that he procured from them a peculiar alkaloid which he named *Arnicina*; but his investigations require confirmation. They yield their active principles to water and to alcohol.

THERAPEUTICAL EFFECTS.—Arnica bears a high character on the Continent, particularly in Germany, as a stimulant in adynamic febrile affections, in chronic rheumatism, in paralysis, in amaurosis, &c., but it is very rarely used in this country. I have found a tincture of the flowers prove of service in nervous headache. It has gained reputation in regulating the disordered cerebral circulation that so frequently follows concussion, so much so as to be termed by some writers the *panacea concussorum*. In some cases of this class in which I tried it, I certainly found it of use. Externally employed as a lotion the tincture enjoys an extensive popular reputation in the treatment of bruises, ecchymoses, &c.; but, in my opinion, most undeservedly. From this repute it has received another of its synonyms—*panacea lapsorum*. Arnica is one of the most prominent articles in the Homœopathic Materia Medica, possessing, according to the professors of that system of quackery, the most wonderful therapeutic powers, and being employed by them in the treatment of the most opposite diseases.

DOSE AND MODE OF ADMINISTRATION.—Of the powder of the root, gr. x. three or four times a day. The flowers are usually given in the form of infusion or tincture.

Tinctura Arnicæ. Tincture of Arnica. (Take of arnica root, in fine powder, one ounce; rectified spirit, one pint. Macerate the arnica for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) Dose, min. xx. to f℥j.

* *Infusum Arnicæ.* (Arnica *flowers*, ℥ss.; boiling water, f℥xij.; infuse till cold, and strain.) Dose, f℥ij. to f℥ss.

* *Tinctura Arnicæ,* CODEX HAMBURGENSIS. Arnica *flowers*, ℥iss.; rectified spirit, f℥xvj.; digest for six days; express and filter so as to obtain ten ounces.) This tincture may be readily prepared by percolation, having previously macerated the flowers with a little of the spirit for twenty-four hours. It may be used both externally and internally in the same class of cases, and in the same doses in which the pharmacopœial tincture is to be prescribed.

INCOMPATIBLES.—The mineral acids; sulphate of iron; acetate of lead; and sulphate of zinc.

BALSAMUM PERUIFERUM. *Balsam of Peru* (described in the division *Expectorants*) is an excellent stimulant in alopecia or baldness from a deficient action in the hair bulbs, and is also useful for promoting the growth of the hair after diseases of the scalp have been cured. It may be applied in the form of pomade as follows:—Prepared lard, ℥ij.; white wax, gr. cxx.; melt together; remove from the fire, and when they are perfectly cold, add with constant agitation, balsam of Peru, f℥ij; and oil of rosemary, min. xx.

CAJUPUTI OLEUM. *Oil of Cajuput.* Melaleuca minor, *DC.* Plate 84, *Steph. and Church. Med. Bot. (M. Cajuputi).* (The oil distilled from the leaves in the Molucca Islands.) The tree from which this oil is obtained is a native of the Molucca Islands, and belongs to the Natural family *Myrtaceæ*, and to the Linnæan class and order *Polyadelphia Icosandria*.

BOTANICAL CHARACTERS.—Trunk, about twenty feet high, crooked, with scattered branches; leaves, smooth, deep green, 3–5 inches long; flowers, white, in short terminal spikes.

PREPARATION.—The volatile oil is procured from the leaves by distillation; the leaves are gathered in the end of September, macerated for 24 hours with water, and then put into a copper still with sufficient water to prevent empyreuma. The oil comes over with the water into the receiver and floats on the surface.

CHARACTERS.—Very mobile, transparent, of a fine pale bluish-green colour. It has a strong agreeable odour, and a warm aromatic taste, and leaves a sensation of coldness in the mouth.

PROPERTIES.—Cajuput oil is limpid, very mobile, transparent, and of a fine pale bluish-green colour. It has a strong agreeable odour, resembling a mixture of camphor, roses, and peppermint; the taste is warm and aromatic, leaving a sensation of coldness in the mouth. Its specific gravity is about ·919. It boils at 343°, and may be obtained nearly colourless by re-distillation. The composition of this oil is $C_{10}H_9O$. It is soluble in alcohol.

ADULTERATION.—In consequence of its high price, and the great demand for the oil when the cholera first raged in the British Isles, in 1832 and 1833, cajuput oil was often counterfeited with oil of rosemary coloured and flavoured with camphor and cardamom seeds. The fraud was one difficult of detection, but latterly it has been met with in a very pure state. As imported, it sometimes contains copper, which may be recognised by its affording a reddish precipitate when agitated with a solution of ferrocyanide of potassium.

THERAPEUTICAL EFFECTS.—Cajuput oil is a powerful diffusible stimulant, at present not much used. When Asiatic cholera appeared in Europe in 1832, it was highly extolled as a remedy for that disease, but it did not retain its reputation long. I have found it, added to carminative mixtures, of great use in the flatulent colic of children. It is much employed on the Continent in chronic rheumatism, gout, hysteria, and other nervous affections.

DOSE AND MODE OF ADMINISTRATION.—*Of the Oil.* Min. j. to min. x. rubbed up with sugar. It also forms a useful external rubefacient, for which purpose ʒss. may be dissolved in f℥ij. of rectified spirit, or in the following form:—

Spiritus Cajuputi. Spirit of Cajuput. (Take of oil of cajuput, one fluid ounce; rectified spirit, nine fluid ounces; dissolve.) Dose, min. v. to min. xl.; each ten minims contain one minim of oil.

* CALAMUS AROMATICUS. *Sweet Flag. Rhizome of Acorus Calamus.* Indigenous, belonging to the Natural family *Acoraceæ*

(*Orontiaceæ*, Lindley), and to the Linnæan class and order *Hexandria Monogynia.*

BOTANICAL CHARACTERS.—Rhizome, creeping, with many long roots; leaves, 2-3 feet high, bright green; flowers, pale green, arranged upon a spadix.

PROPERTIES.—The rhizome or root stalk, in the dried state as met with in the shops, is in flattened pieces from three to five inches long, and half an inch broad, with a corrugated, yellowish-brown, scaly cuticle; internally spongy, with a pinkish-yellow hue. It has a very agreeable odour, and a pungent bitter taste. Sweet flag-root is composed of soft resin, extractive, gum, inulin, a trace of volatile oil, some salts, and woody fibre. It yields its properties to alcohol and to water.

THERAPEUTICAL EFFECTS.—An aromatic stimulant, scarcely ever employed, and consequently omitted from the Pharmacopœia; I have only retained it in consequence of its being an indigenous remedy. It may be used as an adjunct to tonics in debility of the digestive organs. Dose, in powder, gr. xx. to gr. lx.; in infusion, prepared by digesting, ℥j. of the bruised rhizome in f℥xij. of boiling water for an hour, f℥j. to f℥ij.

INCOMPATIBLES.—Acetate of lead.

CALX CHLORATA. *Chlorinated Lime.* (Syn.: *Chloride of Lime, Bleaching Powder.*) (Hypochlorite of lime, CAO,ClO, with chloride of calcium, and a variable amount of hydrate of lime.)

PREPARATION.—It is an article of the Materia Medica in the British Pharmacopœia being usually prepared on the large scale for commercial purposes, by exposing hydrate of lime from the purest lime, to chlorine gas, the latter being supplied so gradually as to prevent the heat occasioned by the combination from rising above 62°. During this process one portion of the lime yields up its oxygen to part of the chlorine to form hypochlorous acid, which unites with some of the undecomposed lime to form hypochlorite of lime, whilst more of the chlorine unites with the resulting calcium to form chloride of calcium, thus, $2CaO+2Cl=CaOClO+CaCl$.

CHARACTERS.—A dull white powder, with a feeble odour of chlorine, partially soluble in water. The solution evolves chlorine copiously upon the addition of oxalic acid, and deposits at the same time oxalate of lime.

PHYSICAL PROPERTIES.—As commonly met with, this is a white or yellowish-white somewhat moist odour, with a faint powder of chlorine, and an acrid, disagreeable, persistent taste.

CHEMICAL PROPERTIES.—Hypochlorite of lime when pure is a mixture of one equivalent of hypochlorite of lime, one of chloride of calcium, and two of water, $CaO,ClO+CaCl+2\,Aq$. Exposed to the air it deliquesces, evolves hypochlorous acid, and attracting carbonic acid is converted into carbonate of lime and chloride of calcium. It is partially soluble in water, a little hydrate of lime being left undissolved; the solution has a strong alkaline reaction, and bleaches vegetable colours, especially if an acid be added so as to evolve the chlorine. Its best characteristics are its peculiar odour in solution, its bleaching properties, and the white precipitates it affords with solutions of nitrate of silver, of carbonates, and of oxalates.

TEST.—Ten grains mixed with thirty grains of iodide of potassium, and dissolved in four fluid ounces of water, produce, when acidulated with two fluid drachms of hydrochloric acid, a reddish solution, which requires for the discharge of its colour at least eighty-five measures of the volumetric solution of hyposulphite of soda.

ADULTERATIONS.—This compound frequently contains a very small quantity of chlorine, either from having been originally badly prepared, or from careless preservation; various processes have been described for *chlorimetry;* but for medical purposes the tests for the purity of the powder, as given in the Pharmacopœia, are amply sufficient. The theory upon which it is based is simple enough. When a solution of chlorinated lime is acted upon by an acid, chlorine is set free; as in this instance, the hydrochloric acid becoming decomposed, its hydrogen uniting with the oxygen of the hypochlorite of lime (CaOClO) to form water, chloride of calcium, and free chlorine, thus, $CaOClO+2HCl=2HO+CaCl+2Cl$; this chlorine reacting upon the iodide of potassium sets free iodine, which colours the solution red, but which colour is again discharged by the solution of hyposulphite of soda, in virtue of the production of iodide of sodium and tetrathionate of soda (NaO,S_4O_5); this equation accounts for their appearance, $2(NaO,S_2O_2)+I=NaI+NaOS_4O_5$. It is evident that the quantity of iodine set free from the iodide of potassium must depend on the amount of chlorine developed from the chlorinated lime by the action of the hydrochloric acid; and the amount of the iodine is calculated from the quantity of the volumetric solution consumed; but this solution is so constructed that 100 measures of it correspond to 12·7 grains of free iodine, so that it becomes but a matter of calculation to ascertain by the quantity of the volumetric solution consumed, *first*, the amount of iodine set free by the chlorine, and next, from that to estimate the amount of chlorine that must have been present in the ten grains of chlorinated lime operated upon. The quantity of iodine so set free amounts to 10·795 grains, equivalent to 3·017 grains of chlorine.

THERAPEUTICAL EFFECTS.—Hypochlorite of lime acts as a powerful stimulant, whether taken internally or applied locally; it also possesses, in a remarkable degree, the property of destroying fetid effluvia, particularly when arising from the decay of animal matter, and of arresting or preventing the putrefactive process, properties which it owes to the chlorine which it gradually evolves; presuming, as it generally does, that the fetid odour depends upon the presence of sulphide of hydrogen gas, the chlorine decomposes it, forming hydrochloric acid and sulphur; thus, $SH+Cl=HCl+S$. In medicine it has been chiefly administered as an internal remedy in the advanced stages of typhus fever, and in epidemic dysentery, being found particularly useful when the evacuations are very offensive.

As a topical agent it is employed with benefit in the form of lotion to foul or gangrenous ulcers with excessive discharge, extensive burns or scalds, in purulent ophthalmia, in chronic cutaneous diseases, particularly scabies, which it seldom fails to cure speedily and effectually, and as an injection in diseases of the rectum, the uterus, or vagina when accompanied by fetid discharges. In excessive mercurial salivation a gargle of one part of hypochlorite of lime dissolved in 100 parts of water will be found both very effectual in correcting the fetor, and in checking the excessive secretion. This substance has been employed as a *disinfectant;* that is, to prevent the spreading of epidemic diseases, and to destroy infection or contagion. No two words are more generally confounded than *deodorizer* and *disinfectant;* a deodorizer it undoubtedly is, but good grounds exists for doubting, if not for altogether denying, its powers of disinfection, properly so called. It is also used for the purpose of destoying noxious effluvia arising from the decay of animal or vegetable matter, but for this purpose it is, perhaps, inferior to *Solution of Chlorinated Soda.* In poisoning with sulphuretted hydrogen or hydrosulphuret of ammonia, chlorinated lime or soda is the best antidote; the solution should be given internally, and the vapour applied to the nostrils.

DOSE AND MODE OF ADMINISTRATION.—Internally, gr. ij. to gr. v. dissolved in water and sweetened with sugar, or in some aromatic distilled water. For external use solutions of various strengths are employed: in purulent ophthalmia, gr. x. to gr. lx. in f℥j. of water; for cutaneous diseases, ℥iij. to Oj. of water; for a lotion or injection, gr. xx. to gr. xxx. in f℥j. of water. Solutions of this substance should be always filtered to remove the insoluble hydrate of lime, and kept in well-stoppered bottles to prevent the escape of the chlorine. When it is desired to disengage the chlorine rapidly from hypochlorite of lime, any weak acid may be added to the solution. The following is the officinal solution of the Pharmacopœia:—

Liquor Calcis Chloratæ. Solution of Chlorinated Lime. (Take of chlorinated lime, one pound; distilled water, one gallon. Mix well the water and the chlorinated lime by trituration in a large mortar, and, having transferred the mixture to a stoppered bottle, let it be well shaken several times for the space of three hours. Pour out now the contents of the bottle on a calico filter, and let the solution which passes through be preserved in a stoppered bottle. Specific gravity, 1·035. One fluid drachm mixed with twenty grains of iodide of potassium, dissolved in four fluid ounces of water, when acidulated with two fluid drachms of hydrochloric acid, gives a red solution which requires for the discharge of its colour forty-six measures of the volumetric solution of hyposulphite of soda.) This test will be understood on reference to what has been already written upon the test for calx chlorata. The quantity of iodine set free amounts to 6·84 grains, equivalent to 1·63 grains of chlorine. This solution is that which is so generally employed in hospitals, sick rooms, &c.; it should be diluted for use. A fluid ounce as nearly as possible represents 44 grains of chlorinated lime.

INCOMPATIBLES.—Sulphuric acid, and its salts; the alkalies; and all soluble carbonates and oxalates.

In poisoning with chlorinated lime, albuminous liquids, such as white of egg, milk, flour and water, &c. and emetics, should be given: acids must be carefully avoided.

CAMPHORA. *Camphor.* (Camphora officinarum, *Nees, Laurineæ.* Plate 155, *Woodv. Med. Bot.* (*Laurus Camphora*). (A concrete volatile oil, obtained from the wood by sublimation, and re-sublimed in bell-shaped masses; imported from China.) The camphor tree is a native of China and Japan, and belongs to the Natural family *Lauraceæ*, and to the Linnæan class and order *Enneandria Monogynia*. The camphor obtained from the Dryobalanops camphora, a native of Borneo and Sumatra, belonging to the Natural family *Dipteraceæ*, which was officinal in the former edition of the Dublin Pharmacopœia, is never met with in European commerce, being altogether used by the Chinese, who pay a high price for it, employing it as a tonic and aphrodisiac, and also in affections of the eyes.

BOTANICAL CHARACTERS.—A handsome tree with a straight trunk, branching at the top; leaves, oval, pointed, shining, evergreen, emitting a strong odour of camphor when bruised; flowers, small, whitish, in axillary and terminal panicles; fruit, a small, rounded, fleshy drupe, with an acrid, aromatic taste.

PREPARATION.—Camphor is procured from the small branches, the leaves, the wood, and the root of the tree, which are cut into pieces, and boiled with water in an iron cucurbit, to which an earthen capital is luted; the camphor sublimes, and is condensed on straws placed in the capital. In this coarse state it is imported into Europe, when it is purified by being sublimed in glass vessels, quick lime having been previously mixed with the crude camphor to retain the impurities. Borneo camphor is found in cavities and fissures in the heart of the tree, in the crystalline state, deposited from an oily fluid.

PHYSICAL PROPERTIES.—Refined camphor is met with in hemispherical masses, perforated in the centre; it is white, translucent, shining, fragile, with a crystalline fracture, nevertheless tough, and pulverized with great difficulty, unless with the aid of a little rectified spirit. It is lighter than water, its density being 0.9857. It has a peculiar aromatic smell, and a bitter cooling taste.

CHARACTERS.—White, translucent, tough, and crystalline; has a powerful penetrating odour, and a pungent taste, followed by a sensation of cold; floats on water; volatilizes slowly at ordinary temperatures; is slightly soluble in water, but readily soluble in rectified spirit and in ether.

CHEMICAL PROPERTIES.—Camphor is a species of solid volatile oil; its composition is $C_{10}H_8O$. It evaporates at the ordinary temperature of the air, forming minute crystalline masses on the sides of bottles in which it is kept; in close vessels it fuses at 347° and boils at 399°, condensing unchanged. It requires 1000 parts of water for its solution, to which, however, it imparts both odour and taste; but it may be suspended in water in large quantity by means of mucilage, sugar, yolk of egg, &c. It is very soluble in alcohol, ether, chloroform (its best solvent), and the fixed and volatile oils. The solution in alcohol is precipitated by water. Milk dissolves an eighth of its weight of camphor, which it retains on the addition of water.

TEST.—Sublimes entirely when heated.

ADULTERATIONS.—Camphor is met with of great purity in this country, but is frequently adulterated on the Continent with muriate of ammonia. The sophistication may be readily detected by rubbing a suspected specimen in a mortar with a little quicklime, which liberates the ammonia; or by treating it with water, which dissolves out the muriate of ammonia.

THERAPEUTICAL EFFECTS.—Much difference of opinion exists as to the action of camphor on the animal economy, but the most constant and most marked effect which it produces is that of a general diffusible stimulant; and this is borne out by the symptoms which are caused when it is taken in an overdose, viz.:—great dyspnœa, violent palpitation of the heart, and continued vomiting. In the practice of medicine it has been used in a great variety of diseases, in consequence of the discrepancy which even still exists as to its effects; but the following are the principal maladies in which it proves decidedly beneficial. In the advanced stages of typhus fever, when nervous symptoms, as subsultus tendinum, delirium, &c. chiefly predominate. In spasmodic cholera, in which it should be given in large doses. In chronic bronchitis, occurring in broken-down habits, particularly when accompanied by profuse secretion; in spasmodic and nervous diseases, provided there is no inflammatory tendency in the system; in atonic gout, and chronic rheumatism; and in irritable and painful diseases of the urinary organs. As if to complicate the already difficult question of the action of medicines, camphor has been ordered in two exactly opposite conditions of the sexual appetite, as an *aphrodisiac* and an *anaphrodisiac;* this apparent contradiction can be explained by the dose employed, in *small* doses having the former, in large doses the latter effect. In chordee its use both externally and internally has been found of advantage. As an external application, camphor is very generally employed, dissolved in spirit or in oil, as an embrocation for muscular and rheumatic pains, for bruises, to glandular enlargements, and to chilblains. It is also used with much benefit as a stimulant to foul and indolent ulcers, and to gangrenous sores occurring in the old and debilitated. Made into an ointment with prepared lard, it has been recently employed on the Continent, and it is stated with success, in the treatment of chronic cutaneous diseases, particularly in those forms attended with much itching, which troublesome symptom it is stated speedily to allay. Camphor has been occasionally used in the form of vapour, to promote diaphoresis when the skin is dry and harsh, and in old cutaneous affections.

DOSE AND MODE OF ADMINISTRATION.—Gr. j. to gr. x. repeated at short intervals; it is usually given in the form of pill, or made into an emulsion with water by means of mucilage, sugar, yolk of egg, &c.; gr. cxx. of camphor may be permanently suspended in f℥viij. of water by means of f℥j. of thick mucilage, or it may be dissolved in new milk, as observed before.

PREPARATIONS.—Aqua, Linimentum, Linimentum Compositum (p. 324), Linimentum Saponis, Spiritus, Tinctura Camphoræ cum Opio (p. 380).

Aqua Camphoræ. Camphor Water. (Syn.: *Mistura Camphoræ. Camphor Mixture. Camphor Julep.*) (Take of camphor, broken in pieces, half an ounce; distilled water, one gallon. Enclose the camphor in a muslin bag, and attach this to the stopper of a jar containing the distilled water. Invert the jar, allow it to stand for at least two days, and pour off the solution when required.) This preparation contains so small a quantity of camphor, that it is used only as a vehicle for the more active stimulants. Dose, f℥j. to f℥ij.

Linimentum Camphoræ. Liniment of Camphor. (Take of camphor, one ounce; olive oil, four fluid ounces; dissolve the camphor in the oil.) A stimulating embrocation for deep-seated inflammation, glandular swellings, &c.

Linimentum Saponis. Liniment of Soap. (Take of hard soap, two ounces and a half; camphor, one ounce and a quarter; English oil of rosemary, three fluid drachms; rectified spirit, eighteen fluid ounces; distilled water, two fluid ounces. Mix the water with the spirit, and add the oil of rosemary, the soap, and the camphor. Digest at a temperature not exceeding 70° with occasional agitation until all are dissolved.) *Soap Liniment. Opodeldoc.*—A useful, stimulating liniment. Few preparations in the Pharmacopœia exemplify more thoroughly the importance of attending to the directions given than this: if made with the soap described in the Materia Medica, a more beautiful liniment could not be desired; but if made with common *white* Castile soap, the resulting liniment is thick and curdy; if with *mottled* Castile soap, up to 70° F. it forms a clear but *dark* solution; above 70° F. it becomes gelatinous; the difficulty is to find in commerce soap that answers the pharmacopœial conditions.

Spiritus Camphoræ. Spirit of Camphor. (Take of camphor, one ounce; rectified spirit, nine fluid ounces. Dissolve.) *Camphorated Spirit.* For external use chiefly; an excellent application when applied with friction in muscular and rheumatic pains. The camphor is partly precipitated by the addition of water.

* *Aqua Camphoræ,* UNITED STATES PHARMACOPŒIA. (Camphor, gr. cxx.; alcohol, min. xl.; carbonate of magnesia, ℥ss.; distilled water, Oij.; rub the camphor first with the alcohol, afterwards with the

carbonate of magnesia, and lastly with the water gradually added; then filter through paper.) One fluid ounce contains gr. iij. of camphor. Dose, f℥ss. to f℥iss. Sir James Murray has recently introduced a solution of camphor equal in strength to this, prepared by dissolving camphor in the *Aqua Magnesiæ bicarbonatis*. The carbonate of magnesia enables the water to dissolve more of the camphor, and also gives to the mixture slight antacid properties.

* *Camphor Ointment*. (Prepared lard, ℥j.; camphor, reduced to fine powder, ℥ss. Mix intimately.) Combined with extract of belladonna, locally applied, this ointment has been found of use in Chordee.

INCOMPATIBLES.—The following observations of M. Planche should be borne in mind in prescribing camphor:—With benzoïn, balsam of tolu, ammoniac, and mastic, it forms a soft mass which does not retain the pilular form; camphor is completely deprived of odour by being mixed with assafœtida, galbanum, sagapenum, and balsam of tolu; and the odour is very much weakened by olibanum, mastic, ammoniac, opoponax, benzoin, and resin of guaiacum.

CAPSICUM. *Cayenne Pepper* (described in the division *Epispastics*), is not much employed in medicine internally; it is a good stimulant in those forms of dyspepsia which depend on enfeebled and languid digestion, and in the collapse of cholera and of typhus. As a topical remedy it is used with much benefit as an adjunct to stimulating gargles in cynanche maligna, and in all forms of relaxed sore throat. For this purpose either the tincture or *Chili Vinegar* is generally employed. The dose of powdered capsicum is from gr. ij. to gr. viij., made into pill with crumb of bread.

Tinctura Capsici. Tincture of Capsicum. (Take of capsicum, bruised, three quarters of an ounce; rectified spirit, one pint. Macerate the capsicum for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) Dose, *internally*, min. xx. to f℥j.; as an adjunct to gargles, f℥ij. to f℥iv. in f℥viij. of an aqueous vehicle.

* *Chili Vinegar* (prepared by infusing ℥ss. of Cayenne pepper in Oij. of white wine vinegar for ten days, and straining) is added to gargles in the proportion of f℥j. to f℥viij. of infusion of roses.

* *Cayenne Lozenges* allowed to dissolve slowly in the mouth are very useful in the hoarseness and relaxed sore throat of public speakers and singers.

INCOMPATIBLES.—Ammonia; alkaline carbonates; sulphates; acetate of lead; nitrate of silver; and corrosive sublimate.

CARDAMOMUM. *Cardamoms.* Elettaria Cardamomum, *Maton, Trans. Linn. Soc.* vol. x., plates 4, 5. The Malabar Cardamom. (The seeds, contained in their capsules, which are to be removed when the seeds are employed; cultivated in Malabar.) *Fruit of Renealmia Cardamomum,* E. The various sorts of cardamons met with in commerce are obtained from the plants above enumerated, or from nearly allied species; but the true officinal, or *lesser* cardamom, is the product of that indicated by the Pharmacopœia. It is a native of Malabar; and belongs to the Natural family *Zingiberaceæ,* and to the Linnæan class and order *Monandria Monogynia.*

BOTANICAL CHARACTERS.—Stem, erect, 6–9 feet high, perennial; leaves, 1-2 feet long, enveloping the stem with their spongy sheaths; scapes, several, arising from the base of the stem, 1–2 feet long; flowers, alternate, on sub-erect racemes, 2-3 inches long, greenish-white, with violet stripes; capsule, oval, 3-celled.

CHARACTERS.—Seeds, obtusely angular, corrugated, reddish-brown, internally white, with a warm, aromatic, agreeable taste and odour, contained in ovate-oblong, triangular, pale-brown, coriaceous, ribbed capsules.

PHYSICAL PROPERTIES.—Cardamoms are the dried fruit, and are gathered in November; as met with in commerce, each fruit is ovato-oblong, obscurely triangular, from three lines to an inch in length, of a pale brownish-yellow colour, coriaceous. They contain numerous angular, reddish-brown seeds, which have an agreeable aromatic odour, and a grateful pungent taste.

CHEMICAL PROPERTIES.—Cardamoms are composed of volatile oil, fixed oil, fecula, colouring matter, mucilage, and nitrogenous matter; they yield their active principles to water and to alcohol. A cooled decoction is rendered blue by tincture of iodine.

THERAPEUTICAL EFFECTS.—Cardamoms are amongst the most agreeable of the aromatic stimulants, and are commonly employed as adjuvants to more active medicines of this class, or to correct the griping properties of some purgatives.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. v. to gr. xx.

PREPARATIONS.—Pulvis aromaticus (see *Cinnamon*), tinctura composita.

Tinctura Cardamomi Composita. Compound Tincture of Cardamom. (Take of cardamoms, bruised, a quarter of an ounce; caraway, bruised, a quarter of an ounce; raisins, freed from their seeds, two ounces; cinnamon, bruised, half an ounce; cochineal, in powder, sixty grains; proof spirit, one pint. Macerate the cardamoms and the other ingredients for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

CARUI. *Caraway*. Carum Carui, Linn. Plate 45, *Woodv. Med. Bot.* (The fruit dried, cultivated in England and Germany.)

CARUI OLEUM. *Oil of Caraway*. (The oil distilled in England from caraway.) Indigenous, belonging to the Natural family *Umbelliferæ* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia*.

BOTANICAL CHARACTERS.—Biennial; stem, 1-2 feet high; leaves, doubly pinnated, cut into linear segments; flowers, white or pale flesh-coloured, in dense umbels.

CHARACTERS.—Fruit usually separating into two parts which are about two lines long, curved, tapering at each end, brown, with five paler longitudinal ridges, having an agreeable aromatic odour, and a spicy taste. Colourless or pale yellow, odour aromatic, and taste spicy.

PROPERTIES.—The fruit commonly called *caraway-seeds* scarcely requires description; it has an agreeable fragrant odour, and a warm aromatic taste. It contains about five and a half per cent. of a light yellow volatile oil, upon which its aromatic properties depend.

THERAPEUTICAL EFFECTS.—Caraway is an agreeable aromatic stimulant, much employed by the cook and confectioner as a seasoning and flavouring agent. In medicine it is used for giving warmth to other preparations.

DOSE AND MODE OF ADMINISTRATION.—Of the seeds, gr. lx. to gr. cxx.

Oleum Carui. (An article of the Materia Medica in the Pharmacopœia.) Frequently added to cathartic pills and boluses. Dose, min. j. to min. x. This oil is often adulterated with oil of turpentine, which may be detected by the odour when dropped on a heated spatula.

Aqua Carui. *Caraway Water*. (Take of caraway, bruised, twenty ounces; water, two gallons. Distil one gallon.) Used as an aromatic vehicle for other medicines, and in the flatulent colic of children. Dose, f℥j. to f℥iv.

* *Essentia Carui*, D. (Take of oil of caraway, f℥j.; rectified spirit, f℥ix.; mix with agitation.) Aromatic and stimulant. Dose, f℈j. to f℈ij. This preparation affords us also a ready means of preparing the water, by adding a fluid drachm of it to ten fluid ounces of distilled water, mixing well by agitation, and subsequent filtration through paper.

CARYOPHYLLUM. *Cloves*. Caryophyllus aromaticus, *Linn.* Plates 2749, 2750, vol. liv. *Bot. Mag.* (The unexpanded flower-bud, dried; cultivated in Penang, Bencoolen, and Amboyna.)

CARYOPHYLLI OLEUM. *Oil of Cloves*. (The oil distilled in England from cloves.) The clove tree is a native of the Molucca Islands, and grows freely in various parts of the East and West Indies. It belongs to the Natural family *Myrtaceæ*, and to the Linnæan class and order *Polyandria Monogynia*.

BOTANICAL CHARACTERS.—Stem, 15-30 feet high; leaves, opposite, coriaceous, dotted, obovato-oblong; flowers, whitish, numerous, in terminal or axillary cymes.

CHARACTERS.—*Of Cloves.* About six lines long, dark reddish-brown, plump, heavy and entire, consisting of a nearly cylindrical body, surmounted by four teeth and a globular head, with a strong fragrant odour, and a bitter spicy pungent taste.—*Of the Oil.* Colourless when recent, but gradually becoming red-brown, having the odour of cloves and a pungent spicy taste. Sinks in water.

PROPERTIES.—Cloves are the undeveloped flowers, consisting of the tubular calyx with the unexpanded corolla, forming a small round ball between its four teeth. Their odour is peculiar, agreeably aromatic, and their taste pungent, somewhat acrid. They consist of 18 per cent. of volatile oil, 6 of an almost tasteless resin (*Caryophyllin*), 13 of tannin, 4 of extractive, 13 of gum, 28 of lignin, and 18 of moisture (Tromsdorff). The volatile oil is an article of the Materia Medica in the Pharmacopœia. As obtained by distillation, it consists of two volatile oils, one heavier, the other lighter than water, a mixture of the two forming oil of cloves of commerce. It is at first pale-yellow, but gradually acquires a reddish tint; has the odour and taste of cloves in a marked degree; is very soluble in alcohol, ether, strong acetic acid, and the fixed oils; and but very sparingly soluble in water, in which it sinks, its density being about 1.060. Cloves yield their properties to water and to alcohol.

TEST.—*Of Caryophyllum.* It emits oil when indented with the nail.

ADULTERATIONS.—Cloves from which the oil has been procured by distillation are sometimes mixed with good cloves; they may be distinguished by their lightness, and by their not becoming greasy when bruised with the nail. The oil is sometimes adulterated with oil of turpentine, which may be detected by the odour when it is dropped on a heated spatula.

THERAPEUTICAL EFFECTS.—Cloves and their oil are aromatic stimulants, and are employed in medicine as flavouring or corrective adjuncts to other substances; they are extensively used by the cook and confectioner. The oil dropped into the hollow of a carious tooth will in some cases relieve tooth-ache; they enter into the composition of the aromatic powder (see *Cinnamon*).

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. x. to gr. xxx.

Oleum Caryophylli. Dose, min. ij. to min. viij.; frequently added as a carminative to pill masses.

Infusum Caryophylli. Infusion of Cloves. (Take of cloves, bruised, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for half an hour, and strain.) an agreeable aromatic vehicle for more active remedies. Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—*With the infusion.* The mineral acids; lime water; sesqui-salts of iron; sulphate of copper; nitrate of silver; acetate of lead; tartar emetic; and gelatine.

* CASSIÆ CORTEX ET OLEUM. *Cassia Bark. Oil of Cassia. Bark and volatile oil of the bark of Cinnamomum Cassia.* The bark met with in English commerce is procured from the *Cinnamomum Aromaticum* (NEES), as formerly indicated by the Edinburgh College. It is a native of China, and is cultivated in Java; it belongs to the Natural family *Lauraceæ*, and to the Linnæan class and order *Enneandria Monogynia*.

BOTANICAL CHARACTERS.—Stem, arborescent, about fifty feet high; leaves, oblongo-lanceolate, triple-nerved, the nerves vanishing at the point of the leaf; petioles and younger branches silky-tomentose; flowers, white, in panicles.

PHYSICAL PROPERTIES.—No account has been given of how cassia bark is prepared, but it is more than probable that it is by a process similar to that by which cinnamon is procured. It is imported from Singapore in bundles tied with slips of the bamboo cane; resembling cinnamon in appearance, being often sold for it, but it is darker coloured, much thicker, and in simple quills. The odour is not so fragrant as that of cinnamon, and the taste is more pungent and somewhat bitter.

CHEMICAL PROPERTIES.—Cassia bark consists of 0·8 per cent. of volatile oil, four of resin, 14·6 of extractive, with woody fibre, &c.; the volatile oil is always imported; it is of a wine-yellow colour, has the odour and flavour of the bark, and is heavier than water, its density being 1·095. Cassia bark yields its active properties to alcohol, but only partially to water. The undeveloped flowers of *Cinnamomum aromaticum* are imported under the name of CASSIA BUDS (*Clavelli Cinnamomi*). They have the same properties as the bark, but are not employed in medicine.

ADULTERATIONS.—Oil of cassia is very frequently adulterated, especially on the Continent, with oil of cloves. The fraud is easily detected by the addition of fuming nitric acid, with which pure oil of cassia merely crystallizes; but if oil of cloves be present, it swells up, yields a large quantity of red vapour, and is converted into a thick reddish-brown oil.

THERAPEUTICAL EFFECTS.—Cassia and its preparations are precisely analogous in their operation to cinnamon, for which, as being much cheaper, they are usually substituted; their odour and taste are perhaps not quite so agreeable, and some have held them to be more astringent.

DOSE AND MODE OF ADMINISTRATION.—Of the bark, powdered, gr. x. to gr. xxx.

* *Oleum Cassiæ.* Dose, min. ij. to min. v.

* *Aqua Cassiæ.* (Cassia bark, bruised, ℥xviij.; water, cong. ij.; rectified spirit, f℥iij.; mix together and distil off one gallon.) An aromatic vehicle for more active medicines. Dose, f℥j. to f℥iv.

INCOMPATIBLES.—The sesqui-salts of iron, and gelatine.

CEREVISIÆ FERMENTUM. *Beer Yeast.* (The ferment, obtained in brewing beer.)

CHARACTERS.—Viscid, semifluid, frothy, exhibiting under the microscope numerous round or oval confervoid cells.

Yeast is employed as a stimulant in the advanced stages of typhus and adynamic fevers, and has been highly spoken of in cases where wine is inadmissible in consequence of inflammatory symptoms; it has been also administered in the form of enema in tympanitis. In a remarkable case of intense tympanitis, following parturition, I found its administration internally of great service. Its principal use at present, however, is for the preparation of a stimulating cataplasm as an application to foul and irritable sores, the fetor of which it corrects, at the same time promoting the separation of the sloughs. It has been used on the Continent with great benefit as an application to recent bruises; being simply spread on lint, and the injured parts covered with it; the sooner it is applied after the accident, the more prompt and certain are its effects said to be. The dose of yeast for internal use is two tablespoonfuls every three hours; it may be given with camphor mixture or with peppermint water.

Cataplasma Fermenti. Yeast Poultice. (Take of beer yeast, six fluid ounces; flour, fourteen ounces; water, heated to 100°, six fluid ounces. Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises.) This cataplasm should be renewed every six or eight hours; if it occasion much pain, the quantity of flour ought to be increased. Its efficacy depends upon the carbonic acid gas which it disengages.

CHLORI LIQUOR. *Solution of Chlorine.* (Chlorine gas dissolved in half its volume of water, and constituting 0·006 of the weight of the solution.)

PREPARATION..—Take of hydrochloric acid, six fluid ounces; black oxide of manganese, in fine powder, one ounce; distilled water, thirty-four fluid ounces. Introduce the oxide of manganese into a gas-bottle, and, having poured upon it the hydrochloric acid diluted with two ounces of the water, apply a gentle heat, and, by suitable tubes, cause the gas, as it is developed, to pass through two ounces of the water placed in an intermediate small phial, and thence to the bottom of a three-pint bottle containing the remainder of the water, the mouth of which is loosely plugged with tow. As soon as the chlorine ceases to be developed, let the bottle be disconnected from the apparatus in which the gas has been generated, corked loosely, and shaken until the chlorine is absorbed. Lastly, introduce the solution into a green-glass bottle furnished with a well-fitting stopper, and keep it in a cool and dark place.

EXPLANATION OF PROCESS.—Upon the addition of the hydrochloric acid to the black oxide of manganese, two atoms of the acid are resolved into their elements, the hydrogen uniting with the oxygen to form water, one atom of chlorine uniting with the manganesium to form chloride of manganesium, and the second atom of chlorine is conveyed into the water to be absorbed; thus, $MnO_2 + 2HCl = 2HO + MnCl + Cl$.

CHARACTERS.—A yellowish-green liquid, smelling strongly of chlorine, and immediately discharging the colour of a dilute solution of sulphate of indigo.

TESTS.—Specific gravity 1·003. Evaporated it leaves no residue. When twenty 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, which requires for its discharge seventy-five measures of the volumetric solution of hyposulphite of soda.

CHEMICAL PROPERTIES.—This solution contains about twice its bulk of chlorine gas. It bleaches all vegetable colours. By long keeping, particularly if exposed to light, chlorine water is converted into a weak solution of hydrochloric and hypochlorous acids; their production is accounted for by the decomposition of the water, its hydrogen uniting with an atom of chlorine to form hydrochloric acid; but the oxygen does not escape as generally stated, it unites with another equivalent of chlorine to form hypochlorous acid, thus, $2Cl+HO=HCl+ClO$. In consequence of these disadvantages, the Edinburgh Pharmacopœia contained this formula, by which an aqueous solution of chlorine may be obtained in a few hours.—"Chloride of sodium, gr. lx.; sulphuric acid (commercial), f℥ij.; red oxide of lead, 350 grains; water, f℥viij.; triturate the chloride of sodium and oxide together; put them into the water contained in a bottle with a glass stopper; add the acid, agitate occasionally till the red oxide becomes almost white. Allow the insoluble matter to subside before using the liquid." In this case the chlorine is disengaged from the chloride of sodium, one atom of oxygen of the red oxide of lead uniting with the sodium to form soda, with which an atom of the sulphuric acid unites to form sulphate of soda, a second equivalent of the acid uniting with the protoxide of lead to form sulphate of lead, whilst the chlorine is set free, thus, $NaCl+PbO_2+2SO_3=NaOSO_3+PbOSO_3+Cl$. It contains a small quantity of sulphate of soda dissolved, which, however, can in no wise interfere with its employment in medicine, and the white sulphate of lead remains as an insoluble precipitate in the bottom of the bottle. Another very convenient formula for its extemporaneous preparation is the following, taken from the Pharmacopœia of the Middlesex Hospital:—"Take of chlorate of potash, gr. cxx.; hydrochloric acid and distilled water, of each, two ounces; mix." The reaction that ensues is that six atoms of hydrochloric acid are resolved into their elements, the hydrogen uniting with the oxygen of the chlorate of potash to form water, in virtue of which the chlorate of potash is reduced to chloride of potassium, which is held in the solution, and we have six equivalents of chlorine set free, thus, $KOClO_5+6HCl=KCl+6HO+6Cl$. Two fluid drachms of this solution, added to eight ounces of water, constitute the *mistura chlorinii* of the hospital, the dose of which is from one to two table-spoonfuls; it may also be ordered as a gargle, in proportions somewhat stronger than these. What has been already written under the head of *chlorinated lime* (see p. 468), will enable the reader to understand the volumetric test of the Pharmacopœia, which demonstrates the existence of

2·662 grains of chlorine in each ounce of the solution.[1] Chlorine water is also characterized by its general bleaching properties, by its power of dissolving leaf gold, and by its not effervescing with carbonate of lime.

THERAPEUTICAL EFFECTS.—Taken in large quantity, chlorine water acts as a powerful irritant poison. In medicinal doses it operates as a stimulant, and as such is employed with benefit in the advanced stages of typhus fevers and of epidemic dysentery, in malignant sore throat, in scarlatina, and in chronic diseases of the liver. Chlorine gas, diluted with common air, has been inhaled in chronic bronchitis and in phthisis, but although the symptoms are often ameliorated under its employment, the benefit produced is not permanent. Externally, chlorine water has been used, largely diluted, as a wash to foul and indolent ulcers, and for chronic cutaneous diseases, in the form of gargle in cynanche maligna, and as a local bath in hepatitis.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥ij. in as many ounces of water sweetened with syrup. For external use f℥j. may be diluted with f℥j. of water.

INCOMPATIBLES.—Nitrate of silver; and the acetates of lead.

In poisoning with chlorine water the best antidote is albumen, as white of egg, or in its absence, milk or flour.

CINNAMOMUM. *Cinnamon.* Cinnamomum zeylanicum, *Nees*, *Laurineæ.* Plate 123, *Wight, Icon. Plant. Ind. Orient.* (The inner bark of shoots from the truncated stock; imported from Ceylon, and distinguised in commerce as Ceylon Cinnamon.)

CINNAMOMI OLEUM. *Oil of Cinnamon.* (The oil distilled from cinnamon; imported from Ceylon.) The cinnamon tree is a native of Ceylon and Malabar; it belongs to the Natural family *Lauraceæ*, and to the Linnæan class and order *Enneandria Monogynia.*

BOTANICAL CHARACTERS.—Stem, arborescent, about 30 feet high; branches, obscurely 4-cornered; leaves tapering into a blunt point, 3-nerved, smooth, and perfectly free from down, as also are the leaf-stalks; flowers, in terminal and axillary stalked panicles.

PREPARATION.—The inner bark of the branches, and the volatile oil obtained from it, are used in medicine. The bark is taken from branches which are three years old, they are lopped off the trees in the rainy season, and the bark immediately removed by making two opposite longitudinal incisions; the epidermis and green pulpy matter are afterwards scraped off, the smaller pieces introduced into the larger ones, and dried in the sun, the pieces contracting, as they dry, into the form of quills. The oil, which is an article of the Materia Medica in the Pharmacopœia, is obtained by macerating the coarser pieces of bark and the trimmings in sea-water for 48 hours, and submitting them to distillation.

CHARACTERS.—*Of the Bark.* About one-fifth of a line thick, in closely rolled quills which are about four lines in diameter, containing several small quills within them, light yellowish brown, with a fragrant odour and warm sweet aromatic taste: breaks with a splintery fracture.—*Of the Oil.* Yellowish when recent, gradually becoming red, having the odour and taste of cinnamon. Sinks in water.

PHYSICAL PROPERTIES.—Cinnamon is imported from Ceylon in bales and in boxes, some is also brought from Malabar. Three sorts are usually distinguished in commerce; the finest is in splintery rolls consisting of compound quills, the smaller being inclosed within the larger, from 30 to 40 inches in length: the pieces are very thin, generally not much thicker than writing paper, of a light brownish-yellow colour, smooth on the surface, with a splintery fracture. The odour is aromatic and fragrant, and the taste warm, sweetish, and feebly astringent. The inferior kinds are in coarser quills, not so much rolled, of a darker brown colour, and with a less agreeable odour and taste. Oil of cinnamon is imported from Ceylon; it is of a pale wine-yellow colour, becoming darker by age, and possesses intensely the peculiar odour and taste of the bark; it is heavier than water, its density varying from 1·038 to 1·041 (Christison).

CHEMICAL PROPERTIES.—Cinnamon bark consists of volatile oil, tannin, mucilaginous extractive, resin, an acid, colouring matter, and woody fibre. It yields its properties partially to water but more completely to alcohol. The volatile oil constitutes about 6 parts in a thousand of the fresh bark; it consists of a light and heavy oil, which may be obtained separate by distillation. The composition of oil of cinnamon is $C_{20}H_{11}O_2$ (Mulder); by exposure to the air it absorbs oxygen, and is converted into a mixture of *cinnamic acid*, two peculiar resins, and water. Strong nitric acid converts oil of cinnamon into a solid crystalline mass.

ADULTERATIONS.—Cinnamon bark may be distinguished by its physical properties from cassia bark which is often sold for it; in the London Pharmacopœia it was characterised as "being thin, much quilled, the smaller quills being included in the larger." The oil may be distinguished from oil of cassia by its more fragrant odour, and by the taste of the latter being more acrid and burning. The tests of the Edinburgh Pharmacopœia for the purity of oil of cinnamon apply equally to oil of cassia:—"Cherry-red when old; wine-yellow when recent; odour purely cinnamomic; nitric acid converts it nearly into a uniform crystalline mass."

THERAPEUTICAL EFFECTS.—Cinnamon is an excellent warm stimulant, and in consequence of its agreeable flavour is very much employed in medicine, principally as an aromatic adjunct to other substances. The watery solution is very commonly used as a vehicle for more active medicines. The oil is not much employed, but it forms an excellent addition to cathartic pill masses.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.

PREPARATIONS.—Aqua, Pulvis Aromaticus, Tinctura, Tinctura Lavandulæ composita. (See *Lavender*.)

Oleum Cinnamomi. Oil of Cinnamon. (An article of the Materia Medica). Dose, min. j. to min. v.

Aqua Cinnamomi. Cinnamon Water. (Take of cinnamon, bruised, twenty ounces; water, two gallons. Distil one gallon.) An agreeable vehicle for other Medicines. Dose, f℥ss. to f℥ij.

Pulvis Aromaticus. Aromatic Powder. (Take of cinnamon, four ounces; nutmeg, three ounces; saffron, three ounces; cloves, one ounce and a half; cardamoms, freed from their capsules, one ounce; refined sugar, twenty-five ounces. Reduce the ingredients separately to fine powder; mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.) Dose, gr. v. to gr. xx.

Tinctura Cinnamomi. Tincture of Cinnamon. (Take of cinnamon, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the cinnamon for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, fℨss. to fℨij.

COCCULUS. *Cocculus Indicus.* Anamirta Cocculus, *Wight and Arnott, Flor. Penins. Ind. Orient.* Plates 15, 16, vol. xiii. *Wallich, Asiat. Res. (Menispermum Cocculus.)* (The fruit dried; produced in Malabar and the Eastern Archipelago.) A native of Malabar and the eastern islands of India; belonging to the Natural family *Menispermaceæ,* and to the Linnæan class and order *Diœcia Monadelphia.*

BOTANICAL CHARACTERS.—A strong, climbing shrub; bark, corky, ash-coloured, cracked; leaves, roundish, leathery, smooth, six inches long, and as many broad; flowers, in lateral compound racemes; drupes, 2–3 globose.

CHARACTERS.—Somewhat larger than a full-sized pea, slightly ovate, blackish-brown, wrinkled, containing a yellowish oily bitter reniform seed, inclosed in a two-valved shell.

PHYSICAL PROPERTIES.—The fruit commonly known under the name of Cocculus Indicus is roundish, about the size of a large pea, with a dark-brown wrinkled perisperm, within which is the bivalved, one-celled fruit; the kernel is white and oily, and does not completely fill the shell. It is void of odour but has an intensely bitter taste.

CHEMICAL PROPERTIES.—The nucleus contains a peculiar, white, crystalline acid, which has been named *Picrotoxin,* resin, gum, a fatty acid, and other unimportant substances; the pericarp contains another peculiar principle which has been named *Menispermin,* and which possesses properties very nearly similar to those of Picrotoxin, the latter being the active principle of the drug. Picrotoxin is soluble in 150 parts of temperate water, 25 of boiling water, 2 of pure ether, and 3 of alcohol; but is insoluble in the fixed and volatile oils; its composition was stated to be $C_{12}H_7O_5$; but more recent examination has proved it to be a salifiable base containing nitrogen. Cocculus Indicus yields its active properties to alcohol, and but very imperfectly to either cold or boiling water.

TEST.—The seed should fill at least two thirds of the shell.

ADULTERATIONS.—As met with in commerce, either from having being gathered before being fully ripe or from long keeping, the kernel is often completely dried up, so as to leave the shell nearly if not quite empty. The Pharmacopœia therefore directs "that the seeds should fill at least two-thirds of the shell."

THERAPEUTICAL EFFECTS.—Cocculus Indicus is a powerful stimulant, in large doses producing death with tetanic convulsions and coma. It is used in India to poison fish; and in this country has been occasionally employed nefariously by brewers to give an artificial strength to beer. In medicine it is only employed externally to destroy vermin, and by some physicians as a stimulating application in the form of ointment to furfuraceous eczema, and porrigo of the scalp. Picrotoxin is highly poisonous; it may be used as a substitute for the drug.

PHARMACEUTICAL PREPARATIONS.—The following are the preparations employed:—

Unguentum Cocculi. Ointment of Cocculus. (Take of the seeds of Cocculus Indicus, eighty grains; prepared lard, one ounce. Beat the seeds well in a mortar, and rub them with the prepared lard.)

* *Unguentum Picrotoxin*, JAGER. (Picrotoxin, gr. x.; axunge, ℥j.; mix intimately.) These ointments have been applied in small quantities to the scalp night and morning in the cases above mentioned, and the head well cleansed with soap and warm water at least once daily. They should be used with great caution when the skin is not entire, as danger may arise from absorption. At present they have nearly, and in my opinion quite justly, fallen into disuse; and consequently Cocculus Indicus was omitted from the last editions of the Dublin and London Pharmacopœias.

CORIANDRUM.—*Coriander.* Coriandrum sativum, *Linn.* Plate 181, *Woodv. Med. Bot.* (The ripe fruit, dried; cultivated in Britain.)

CORIANDRI OLEUM. *Oil of Coriander.* (The oil distilled in England from Coriander.) A native of the south of Europe, scarcely indigenous; belonging to the Natural family *Umbelliferæ (Apiaceæ,* Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—Annual; stem, erect, leafy, about 18 inches high; leaves, scarcely stalked, and bipinnate, and cut; flowers, white, often with a reddish tint.

CHARACTERS.—*Of the Fruit.* Globular, nearly as large as white pepper, beaked, finely ribbed, yellowish-brown; has an agreeable aromatic odour and flavour.—*Of the Oil.* Yellowish, having the odour of coriander.

PROPERTIES.—The fruit commonly called *coriander*-seed is round, a little larger than white pepper, finely ribbed, of a brownish-yellow colour. When ripe it has an agreeable aromatic odour, and a warm peculiar taste. Its properties depend on volatile oil, of which it contains 4·7 parts in a thousand.

THERAPEUTICAL EFFECTS.—Coriander is employed in medicine as a flavouring adjunct in some officinal preparations, but is not used alone. The dose of the fruit is from gr. xxx. to gr. lx.

ELECTRICITY. GALVANISM. MAGNETIC ELECTRICITY. These powerful agents in the treatment of disease require some short notice here. They operate either as general or local stimulants according to the manner in which they are applied: under their influence the vascular and nervous systems, more especially the latter, being excited, the pulse increased in frequency, the muscles stimulated to involuntary action, and the general secretions augmented. The diseases, then, in which their use is indicated are those of debility; hence they are employed in all forms of paralysis of the nerves, both of sensation and of motion, when uncomplicated with any lesion of, or determination of blood to, the cerebro-spinal system; as in some forms of nervous deafness and of amaurosis, in aphonia, in long-standing cases of paraplegia and hemiplegia, in paralysis of the muscles of the fore-arm from the poison of lead or of mercury, in obstinate constipation, in the insensible stage of poisoning with opium, and in asphyxia. In suppression of the menstrual discharge, arising from loss of tone in the uterine organs, electrical shocks passed through the pelvis, from the sacrum to the pubis, are frequently productive of great benefit. In the loss of muscular power attendant on chronic rheumatism, and in chorea and other allied convulsive disorders, the employment of electricity often proves serviceable also. My own experience of its use as a remedial agent leads me to place more reliance on its employment in *local* than in *general* paralysis—more particularly when a single muscle or a certain class of muscles has become paralysed from any special cause. Thus I have derived peculiar benefit from its use in that particular form of paralysis of the muscles of the fore-arm which is produced by the action of lead, and which is so frequent a sequence of painters' colic; as also in those cases where a single muscle becomes paralysed, either from exposure to a draught of cold air, or from continued pressure on the nerve by which the muscle is supplied.* The entire subject of the therapeutical applications of the various forms of electricity has been recently carefully and ably studied by M. Duchenne (of Boulogne), and several memoirs on the subject published by him; amongst others, two in the 14th and 15th volumes of the *Dublin Quarterly Journal of*

* See *Edinburgh Monthly Journal of Medical Science*, vol. 6, p. 225.

Medical Science, which will well repay an attentive perusal. In Dr. Althaus' work on Medical Electricity the reader will also get much valuable information.

The different forms of electricity may in general be indifferently applied, but *galvanic* and *magnetic* electricity possess the advantages of being more readily employed, of not being interfered with by the state of the atmosphere, of the effects produced being more under control, and of the facility with which they may be applied to the different parts of the body; consequently these forms of electricity are in the present day most generally used.

For the application of common electricity, Leyden jars charged with the cylindrical or plate machine are employed, with the usual directors for discharging them; the patient may or may not be placed on an insulating stool or chair, according to the effect which it is wished to produce.

Galvanic electricity is applied by means of the usual galvanic troughs and insulated directors; the apparatus is objectionable in consequence of its not being very portable, and also from its requiring the use of acids to bring it into operation.

Magnetic-electricity is the most convenient and simple mode of employing this agent in the practice of medicine; it is most readily applied by means of an instrument consisting of a small battery, on Smee's principle, in connexion with a frame on which is fixed an upright or horizontal straight magnet, surrounded by a bundle of iron wires, round which are coiled some thousand yards of insulated large and small copper wire, divided into seven different portions, each of which terminates separately in a small brass knob, brought up through the bottom of the frame; by means of which arrangement we can readily augment or diminish the power of the current that is being administered. The shocks are produced by the continuity of the stream of electricity being broken by the alternate attraction and repulsion, by the magnet, of a piece of soft iron, which is kept in contact with a platinized screw by means of a piece of watch spring. More recently an excellent and simply constructed instrument, cheap in price, has been introduced from America, which possesses the great advantage of not requiring a fluid battery to put it into operation. The question as to whether the apparatus employed should be a volta-electric or magneto-electric one is thus ably summed up by Dr. Althaus in the work already referred to:—"The alleged inconveniences of volta-electric apparatuses, in which the current is induced by a single galvanic pair, are, —that they are expensive; that troublesome manipulations, involving loss of time, necessarily precede and follow the use of the machine, which is not ready to act at a moment's notice, as the battery requires charging and afterwards discharging; that acids are necessary to induce the current, whereby not only the battery, but also the bobbin of induction, are after a certain time spoiled; while, on the other hand, rotation machines are economical, always ready to act, and acids are not required in their use. But in my opinion the trifling loss of time incurred in charging and discharging the battery is scarcely worth consideration, and by a few simple precautions all the destructive effects of the acids may be avoided, excepting the spoiling of the battery, which now and then requires a new piece of amalgamated zinc, which can be easily procured. The inconveniences connected with the use of magneto-electric machines have generally been overlooked; but it is well to state, that these machines frequently get out of order; that the fixed horse-shoe magnet becomes in time demagnetised and requires re-magnetising; that, while with a self-acting voltaic apparatus the electrician can operate for several hours successively without assistance, when the magneto-electric apparatus is used an assistant is required to turn the handle connected with the endless chain of the apparatus, which puts in rotation the soft iron armature. This inconvenience, which is especially felt whenever prolonged applications are necessary, may, it is true, be avoided by the substitution of clock-work; but by this the rapidity of the intermittences cannot be so easily regulated. Besides, voltaic apparatuses furnish a much larger quantity of electricity than magneto-electric machines, a circumstance decidedly in favour of the former. However this may be, it is erroneous to suppose that the current induced by voltaic electricity and that induced by a permanent magnet of steel possess exactly the same physiological and therapeutical properties. Such is not the case, and the reason will be readily understood if we consider that the current induced by voltaic electricity rises at once from zero to its maximum, and then as quickly falls back to zero; while the variations in the density of the magneto-electric current are by no means so sudden. The magneto-electric current begins when the soft iron armature is withdrawn from the pole of the permanent magnet, it reaches its maximum when the armature is between the two poles, and is finally reduced to zero, if the armature arrives at the opposite poles of the magnet. This is the reason why the volta-electric current acts more on the motor nerves and muscles and the sentient nerves, and the magneto-electric current more on the retina; and, in all probability, this is also the reason why the magneto-electric current is more beneficial in the cure of rheumatic callosities than the volta-electric current. It is, therefore, necessary that the electrician should possess both sorts of induction machines; the volta-electric for the treatment of paralysis and neuralgia, and the magneto-electric, if induction currents are employed in treating deficiency of vision, and for the absorption of rheumatic callosities. A volta-electric apparatus fit for medical use must furnish two currents, viz., the primary current or extra-current induced by the action of the spirals of the thick wire upon themselves; and the secondary current, or the current induced in the second wire, which is long and fine. Duchenne has drawn considerable attention to the fact that there is a difference in the physiological action of the extra-current (called by him current of the first order) and of the current induced in the second wire (called by him current of the second order). According to Duchenne the current of the first order acts chiefly on the contractile power of the muscles, while the current of the second order acts chiefly on the sentient nerves; and on the retina when applied by means of moistened conductors to any point of the face or scalp animated by the trigeminal nerve. Duchenne has referred this difference of action to a special electric power in each of the currents, and is borne out in this supposition by M. Bouvier; but I am inclined to adopt the view first put forth by M. Becquerel,* viz., that the difference in the physiological effects of the two currents is merely due to the difference that exists in their tension. Duchenne's observations are correct, but his explanations are unsatisfactory, as there is no other difference than that which naturally arises from the physical condition of the wires; a current circulating in a short and thick wire possesses less tension than a current circulating in a long and fine wire. Therefore, the extra-current will have a trifling effect on the skin, which offers a great resistance to the passage of an electric current, and more effect on the contractile power of the muscles, which, in consequence of the large amount of water they contain, are better conductors of electricity; while the current induced in the second wire, which possesses a high tension, will not only powerfully affect the muscles, but also the skin and retina. I have mentioned in the second chapter that the physiological effect of induction currents differs according to the rapidity with which they succeed each other; this circumstance has also an important bearing upon the therapeutical action of induction currents. A rapidly interrupted current acts much on the nutrition and tonicity of paralysed muscles; and is very powerful in exciting the sentient nerves of the skin. It should, therefore, be employed in diseases where muscular nutrition is enfeebled, such as lead-palsy, Cruveilhier's atrophy, etc., and, on the other hand, in anæsthesia of the sentient nerves. But it will not do to employ a rapidly interrupted current, if we galvanise muscles paralysed by an hemiplectic attack; because irritation of the sentient nerves, which is always produced by rapid intermittences, must be carefully avoided in persons who have suffered from apoplexy. In such cases, therefore, and also if we galvanise delicate children or women, and for exciting the organs of sense, the current must be slowly interrupted."

There is one objection to the use of these instruments as pointed out by the late Dr. Golding Bird, namely, that a series of positive or negative currents in a definite direction cannot be administered by means of them, inasmuch as negative and positive electricity are alternately discharged by each conducting wire. To remedy this

---

* *Traité des applications de l'Electricété, etc.*, Paris, 1857.

defect in construction, that physician contrived a machine which he termed the "single-current electro-magnetic machine," of which a full description is given in his lectures on Electricity and Magnetism.

The good effects of any of the forms of electricity require a long time for their development, and its use should be consequently persevered in for some time, and not despaired of if immediate relief is not experienced. Care must, however, be taken to regulate the force or intensity of the shock, as over-excitement from electricity proves in general highly injurious in those very cases in which its employment, if properly regulated, is attended with the greatest service. In fine, it should be always borne in mind that electricity is only to be considered as an auxiliary to other modes of treatment.

ELEMI. *Elemi.* Botanical source undetermined, probably from Canarium commune, *Linn.* Plate 47, vol. ii. *Rumph. Amb.* (A concrete resinous exudation; chiefly imported from Manilla.) It is quite uncertain from what plant this substance is obtained, and even its commercial route is involved in much obscurity; what is met with in this country is brought chiefly from Holland. American elemi is obtained from the *Icica icicariba*, a plant belonging to the natural family *Amyridaceæ*.

CHARACTERS.—A soft, unctuous, adhesive mass, becoming harder and more resinous by age; of a yellowish-white colour, with a rather fragrant fennel-like odour; almost entirely soluble in rectified spirit.

The term elemi is applied to three or four resins of very different appearance, and much of what is sold under this name appears to be a very composite substance. It is only employed in medicine in the form of ointment as a stimulating dressing to old and indolent ulcers. The following will be found a useful formulary:—

Unguentum Elemi. Ointment of Elemi. (Take of Elemi, a quarter of an ounce; simple ointment, one ounce. Melt, strain through flannel, and stir constantly until the ointment solidifies.)

FŒNICULUM. *Sweet Fennel Fruit.* Fœniculum dulce, *DC.* (The fruit; imported from Malta.) *Fœniculum vulgare (Anethum fœniculum,* LINNÆUS) is an indigenous plant; belonging to the natural family *Umbellifera* (*Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—Biennial; stem, 4–8 feet high, fistulose; leaves, much divided, with very slender segments; flowers, dark-yellow.

CHARACTERS.—About three lines long and one line broad; elliptical, slightly curved, beaked, having eight pale-brown longitudinal ribs, the two lateral being double: taste and odour aromatic.

PROPERTIES.—The fruit commonly called *fennel-seed* is oval, about two lines long and one broad, of a dark-brown colour; it has an agreeable aromatic odour, and a warm, sweetish, somewhat acrid taste. These properties depend on a volatile oil which it contains. The oil of fennel of the shops is usually obtained from a cultivated variety of *Fœniculum vulgare,* which in consequence of the sweeter taste of the fruit is known under the name of *Fœniculum dulce,* and is therefore the variety which is officinal in the Pharmacopœia.

THERAPEUTICAL EFFECTS.—Fennel is a warm aromatic stimulant, but is not much used in the present day, unless as a carminative for infants; it may be employed in the same cases as anise and carraway.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. x. to gr. xxx.

Aqua Fœniculi. Fennel Water. (Take of sweet fennel fruit, bruised, twenty ounces; water, two gallons. Distil one gallon.) An aromatic vehicle for other medicines, but principally used as a carminative in cases of infantile flatulent colic. This water can also be readily prepared by mixing one fluid drachm of the *essence of fennel* (described below) with ten fluid ounces of water, mixing with agitation, and filtering through paper. Dose, *for infants,* f℥j.; *for adults,* f℥ss. to f℥ij.

* *Oleum Fœniculi. Oil of Fennel.* (Although no longer officinal, is still found in our shops; and is used for making the next preparation.) Dose, min. ij. to min. x.

* *Essentia Fœniculi. Essence of Fennel.* (Take of oil of fennel, f℥j.; alcohol, f℥ix.; mix with agitation.) Dose, min. xx. to min. xxx.

LAVANDULÆ OLEUM. *English Oil of Lavender.* Lavandula Vera, *DC.* Plate 55, *Woodv. Med. Bot. (L. Spica).* (The oil distilled in England from the flowers.)

It is from *Lavandula vera* (De Candolle) that the flowers are procured for medical use; this is a native of the central parts of Europe, and is cultivated in our gardens; it belongs to the Natural family *Labiatæ* (*Lamiaceæ,* Lindley,) and to the Linnæan class and order *Didynamia Gymnospermia.*

BOTANICAL CHARACTERS.—Stem, shrubby, 1–2 feet high; leaves, oblong-linear or lanceolate, quite entire; flowers, purplish-gray, in whorls of 6–10 flowers, in interrupted spikes. *Lavandula vera* may be readily distinguished from *Lavandula spica,* by its taller stature, its narrower leaves, and the absence of bracts.

PHYSICAL PROPERTIES.—The flowers are gathered when in full bloom, and dried in the shade: they have a peculiar fragrant odour, and a warm, somewhat bitter, aromatic taste.

CHARACTERS.—*Of the Oil.* Colourless or pale-yellow, with the odour of lavender, and a hot bitter aromatic taste.

CHEMICAL PROPERTIES.—They contain volatile oil, tannin, bitter extractive, and woody fibre. The oil, *Oleum Lavandulæ*, is obtained by the usual process of distillation; it is of a pale yellow-colour, has the peculiar fragrant odour of the flowers, and a warm aromatic taste. One pound of flowers yields about two drachms of oil. Its density according to Zeller is between ·870 and ·890; its composition $C_{15}H_{14}O_2$. Lavender flowers yield their properties completely to alcohol, but only partially to boiling water.

THERAPEUTICAL EFFECTS.—Lavender is a very agreeable aromatic stimulant, and its officinal preparations are consequently much employed for giving warmth and flavour to other medicines.

DOSE AND MODE OF ADMINISTRATION.—The flowers in powder are added to sternutatories on account of their agreeable odour.

Oleum Lavandulæ. Oil of Lavender. (An article of the Materia Medica.) Dose, min. ij. to min. v.

Spiritus Lavandulæ. Spirit of Lavender. (Take of English oil of lavender, one fluid ounce; rectified spirit, nine fluid ounces. Dissolve.) Rather a useless preparation, the next one being that generally employed. Dose, min. x. to min. xxx.

Tinctura Lavandulæ Composita. Compound Tincture of Lavender. (Take of English oil of lavender, one fluid drachm and a half; English oil of rosemary, ten minims; cinnamon, bruised, one hundred and fifty grains; nutmeg, bruised, one hundred and fifty grains; red sandal-wood, three hundred grains; rectified spirit, two pints. Macerate the cinnamon, nutmeg, and red sandal-wood in the spirit for seven days; then press out and strain; dissolve the oils in the strained tincture, and add sufficient rectified spirit to make two pints.) This preparation, generally known as *Lavender Drops*, is used as a cordial and stomachic to relieve nausea, flatulence, lowness of spirits, &c. Dose, min. xxx. to f℥ij. in water, or dropped on white sugar.

INCOMPATIBLES.—Sulphate of iron.

MASTICHE. *Mastich.* Pistacia Lentiscus, *Linn.* Plate 130, *Steph. and Church. Med. Bot.* (A resinous exudation from the stem, obtained by incision; imported from Turkey and the Levant.) A native of the South of Europe and of the Levant; belonging to the natural family *Terebinthaceæ*, and to the Linnæan class and order *Diœcia Pentandria.*

CHARACTERS.—Small irregular yellowish tears, brittle, becoming soft and ductile when chewed, having a faint agreeable odour.

Mastich exudes from incisions made into the tree; that which concretes on the stem is called *tear mastich;* that which falls on the ground, *common mastich.* It is in small, irregular, yellowish tears, which have a faint, agreeable odour, and a warm taste. Mastich is composed of volatile oil and of two resins, one soluble in alcohol, the other in ether; the first has acid properties, and is termed *Mas-*

tichic acid; the second is called *Masticine*, and it is to it mastiche owes its toughness. It is scarcely ever used at present, but was at one time much employed as an ingredient in *dinner pills*; Lady Webster's and Lady De Crispigny's pills, at one time famous, consisting of aloes, mastiche, rose leaves, and syrup of wormwood. It may be employed, softened by chloroform, as a temporary stuffing for hollow teeth.

MENTHÆ PIPERITÆ OLEUM. *English Oil of Peppermint.* Mentha piperita *Linn.* Plate 169, *Woodv. Med. Bot.* (The oil distilled in England from the fresh herb when in flower.) Indigenous; belonging to the natural family *Labiatæ* (*Lamiaceæ*, Lindley), and to the Linnæan class and order *Didynamia Gymnospermia.*

BOTANICAL CHARACTERS.—Root, creeping; stem, smooth, quadrangular; leaves, ovato-lanceolate, strongly serrated, acute, slightly hairy; flowers, violet-coloured, in lax, short, interrupted spikes; bracteas lanceolate.

CHARACTERS.—*Of the Oil.* Colourless or pale-yellow, with the odour of peppermint; taste warm aromatic, succeeded by a sensation of coldness in the mouth.

PROPERTIES.—Peppermint has an aromatic, to most persons agreeable, odour, and a warm, pungent taste, leaving a peculiar impression of coldness on the mouth, which is most marked during inspiration. These properties are due to a large quantity of volatile oil which exists in small vesicles or glands, chiefly in the leaves. The oil, *Oleum Menthæ piperitæ*—an article of the Materia Medica in the Pharmacopœia—is obtained by the usual process of distillation; the quantity procured varies from a 200th to a 320th; it is limpid and colourless, but acquires a greenish tint from age, and has the odour and taste of the plant in an intense degree. It is soluble in alcohol, and when agitated with water imparts to it both odour and taste. Its density is ·902, and its composition $C_{20}H_{20}O_2$.

THERAPEUTICAL EFFECTS.—Peppermint is perhaps the most powerful aromatic stimulant of the Labiate plants; and in consequence of its agreeable odour and taste, is very generally used to disguise nauseous medicines. It is also much employed to relieve sickness of the stomach, heartburn, and flatulent colic.

DOSE AND MODE OF ADMINISTRATION.—*Oleum Menthæ Piperitæ. Oil of Peppermint.* (An article of the Materia Medica.) Min. ij. to min v. dropped on sugar.

Aqua Menthæ Piperitæ. Peppermint Water. (Take of English oil of peppermint, one fluid drachm and a half; water, one gallon and a half. Distil one gallon.) This water can also be extemporaneously prepared by taking one fluid drachm of the spirit of peppermint, and ten ounces of distilled water, mixing with agitation, and filtering through paper. It is carminative, but is chiefly used as an agreeable vehicle for other medicines. Dose, f℥ss. to f℥ij.

Spiritus Menthæ Piperitæ. Spirit of Peppermint. (Take of English oil of peppermint, one fluid ounce; rectified spirit, nine fluid ounces—dissolve.) This spirit contains about forty-seven times as much oil of peppermint as Spiritus Menthæ Piperitæ, *Lond.* Stimulant and carminative. Dose, min. x. to f3j.

* MENTHA PULEGIUM. *Pennyroyal. (Fresh and dried flowering herb of Mentha pulegium).* Indigenous; belonging to the Natural family *Labiatæ (Lamiaceæ,* Lindley,) and to the Linnæan class and order *Didynamia Gymnospermia.*

BOTANICAL CHARACTERS.—This mint is distinguished by its prostrate stems, and small, frequently recurved leaves; both of which are thickly covered with short hairs.

PROPERTIES.—Pennyroyal has a strong, peculiar, aromatic odour, and a pungent, somewhat bitter, cooling taste; it contains a volatile oil on which its properties depend, and which is obtained by the usual process of distillation; it is of a pale greenish-yellow colour, with the odour and taste of the plant; its density is 0·925; and its composition $C_{10}H_8O$.

THERAPEUTICAL EFFECTS.—Pennyroyal is identical in action with peppermint, but as its odour and taste are not so agreeable, it is much less used. It is no longer officinal.

DOSE AND MODE OF ADMINISTRATION.—*Oleum Pulegii. Spiritus Pulegii. Aqua Pulegii*: they may all be prepared with pennyroyal in the same manner as the corresponding preparations of peppermint. The doses also are the same. Although no longer officinal, these preparations are found in all our shops, and are in pretty general use.

MENTHÆ VIRIDIS OLEUM. *English Oil of Spearmint.* Mentha viridis, *Linn.* Plate 170, *Woodv. Med. Bot.* (The oil distilled in England from the fresh herb when in flower.) Mentha Viridis, *Spearmint,* is an indigenous plant; belonging to the Natural family *Labiatæ (Lamiaceæ,* Lindley,) and to the Linnæan class and order *Didynamia Gymnospermia.*

BOTANICAL CHARACTERS.—Leaves, lanceolate, acute, glabrous, sessile; spikes, interrupted, cylindrical, loose; bracteas setaceous, somewhat hairy as well as the calyx.

CHARACTERS.—*Of the Oil.* Colourless or pale-yellow, with the odour and taste of spearmint.

PROPERTIES.—Spearmint has a strong, peculiar, to many persons disagreeable, odour, and a warm, bitter taste followed by a sense of coldness when air is drawn into the mouth; these properties are very much lost by drying. They depend on a volatile oil, of which the fresh herb contains only a 500th part. This oil is of a light-yellow colour, acquiring a reddish-brown tint by age; it possesses intensely the odour and taste of the plant. Its density is ·914; and its composition $C_{35}H_{28}O$ (Kane)

THERAPEUTICAL EFFECTS.—Spearmint resembles in its action peppermint; by some it has been said to repel the secretion of milk, and to act as an emmenagogue. As it is neither as powerful nor as agreeable as peppermint it is not so much used.

DOSE AND MODE OF ADMINISTRATION.—*Oleum Menthæ viridis. Oil of Spearmint.* (An article of the Materia Medica.) Min. j. to min. v.

Aqua Menthæ Viridis. Spearmint Water. (Take of English Oil of Spearmint, one fluid drachm and a half; water, one gallon and a half. Distil one gallon.) Carminative. Dose, f℥ss. to f℥ij.

* *Infusum Menthæ.* (Take of spearmint, dried and cut small, ℥ss; boiling water, Oss.; infuse for fifteen minutes in a covered vessel, and strain. The product should measure about eight ounces.) Used as a vehicle for other remedies in irritable states of the stomach. Dose, f℥j. to f℥ij.

MYRISTICA. *Nutmeg.* Myristica officinalis, *Linn. Suppl.* Plate 104, *Steph. and Church. Med. Bot.* (The kernel of the seed; imported from Sumatra and the Molucca Islands.)

MYRISTICÆ ADEPS. *Concrete Oil of Nutmeg.* (A concrete oil obtained by means of expression and heat from nutmegs).

MYRISTICÆ OLEUM. *Volatile Oil of Nutmeg.* (The oil distilled in England from nutmeg.) This tree (*Myristica fragrans*, Houtt) is a native of the Molucca Islands; belonging to the Natural family *Myristicaceæ*, and to the Linnæan class and order *Diœcia Monodelphia.*

BOTANICAL CHARACTERS.—A tree, 20–30 feet high; leaves, aromatic, oblong, acuminate, smooth, simple-nerved; flowers, pale-yellow, in axillary racemes; fruit, pyriform, about the size of a peach, smooth, dehiscing by two nearly equal longitudinal valves, and exposing the fleshy, scarlet arillus (*mace*), closely embracing the shell, within which is contained the kernel (*the nutmeg*).

CHARACTERS.—*Of the Nutmeg.* Egg-shaped or nearly round, about an inch in length, marked externally with reticulated furrows, internally greyish-red, with dark brownish veins. It has a strong peculiar odour, and a bitter aromatic taste.—*Of the Concrete Oil.* Of an orange colour, firm consistence, and fragrant odour like that of nutmeg; soluble in four times its weight of boiling alcohol, or half that quantity of ether.—*Of the Volatile Oil.* Colourless or straw-yellow, having the odour and taste of nutmegs.

PROPERTIES.—Nutmegs are too well known to require description; they are imported from the Moluccas. They have a peculiar, fragrant, powerful odour, and a warm, aromatic taste. Nutmegs consist of 31·6 per cent. of fat butyraceous fixed oil, 6 of volatile oil, 2·4 of starch, 1·2 of gum, 0·8 of acid, and 54 of lignin (Bonastre) The volatile oil, *Oleum Myristicæ,* which is obtained by distillation, is usually imported, but in the Pharmacopœia is an article of the Materia Medica, attributed to a British source. It is colourless or slightly yellow, of a rather viscid consistence, and has the odour and taste of nutmegs. Its density is ·948. The fixed oil, *Myristicæ adeps,* *Oil of Mace*, is procured by exposing bruised nutmegs to the vapour of boiling water, and pressing between heated plates of iron. It is imported in large rectangular cakes covered with the leaves of some monocotyledonous plant; is a soft solid, of a reddish yellow colour, with the odour and taste of nutmegs. It consists of an aromatic volatile oil, mixed with three fats; two of which are readily dissolved by alcohol; the third which is thus separated has been named *myristicine*. Mace is composed of a volatile oil, a red fat oil soluble in alcohol, a yellow fat oil insoluble in alcohol, alcoholic extractive, amidin, lignin, &c. Nutmegs and mace impart both odour and taste to boiling water; but they yield their active properties more completely to alcohol.

ADULTERATIONS.—Nutmegs from which the volatile oil has been obtained are sometimes mixed with good nutmegs, the holes which are bored in them being stopped up with powdered sassafras. This fraud is seldom attempted in the present day; it may be detected by the lightness of the nutmeg. Those nutmegs which are round, plump, heavy, and not worm-eaten, should be chosen.

THERAPEUTICAL EFFECTS.—Nutmegs are agreeable aromatic stimulants, chiefly used as flavouring ingredients. Taken in large quantity they prove narcotic, and consequently their use should be avoided by those of an apoplectic or paralytic tendency. The fixed oil has been employed externally as a stimulant in chronic rheumatism and paralysis.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. x. to gr. xxx.

Oleum Myristicæ. Oil of Nutmeg. (An article of the Materia Medica.) Min. j. to min. v. dropped on sugar or added to aperient pill masses.

Spiritus Myristicæ. Spirit of Nutmeg. (Take of volatile oil of nutmeg, one fluid ounce; rectified spirit, nine fluid ounces. Dissolve.) Stimulant and aromatic, an excellent addition to cathartic mixtures to prevent griping. This spirit differs widely from that of the last editions of the London and Edinburgh pharmacopœias, being infinitely (some hundred fold) stronger; each ten minims contain one minim of essential oil. The dose is min. x. to f℥j.

Myristicæ adeps. Concrete Oil of Nutmeg. (An article of the Materia Medica.) Used only in the preparation of the *Emplastrum Picis*.

PIMENTA. *Pimento.* Eugenia Pimenta, *DC.* Allspice Tree. Plate 26, *Woodv. Med. Bot.* (The dried unripe berries; from the West Indies.)

PIMENTÆ OLEUM. *Oil of Pimento.* (The oil distilled in England from Pimento.) (Syn. *Allspice. Jamaica pepper. Unripe berries of Eugenia pimenta.*) A native of the West Indies; belonging to the Natural family *Myrtaceæ*, and to the Linnæan class and order *Icosandria Monogynia*.

BOTANICAL CHARACTERS.—A handsome tree, about 30 feet high; leaves, oblong, pellucid-dotted, about 4 inches long; flowers, numerous, greenish-yellow, in terminal bunches or panicles; berry, succulent, dark-purple when ripe, 2-seeded.

CHARACTERS.—*Of the Berries.* Of the size of a small pea, brown, rough, crowned with the teeth of the calyx, yellowish within, and containing two dark-brown seeds. Odour and taste aromatic, hot, and peculiar.—*Of the Oil.* Colourless or slightly reddish when recent, but becoming brown by age, having the odour and taste of pimento. Sinks in water.

PROPERTIES.—Pimento is in the form of round blackish berries, rough, umbilicated with the persistent teeth of the calyx. The odour resembles a mixture of cloves, cinnamon, and nutmegs, whence the name *allspice*; the taste is pungent and aromatic, like that of cloves. These properties depend principally on volatile oil, of which Bonastre obtained 10 per cent. from the husk and only 5 per cent. from the kernel. This oil, *Oleum Pimentæ*, an article of the Materia Medica in the Pharmacopœia, is obtained from the berries by the usual process of distillation; it is of a yellowish colour when first drawn, but soon acquires a reddish tint; it has the peculiar odour of allspice, and a burning aromatic taste. Oil of allspice of commerce is heavier than water, its density being about 1·020. It is a mixture of a heavy and a light oil, which may be obtained separately by distillation with solution of potash, as the heavy oil forms crystalline compounds with the alkalies. Pimento communicates both odour and taste to boiling water, but it yields its properties more completely to alcohol.

THERAPEUTICAL EFFECTS.—Pimento is an aromatic stimulant, not much employed in medicine. Its preparations are chiefly used to communicate warmth and flavour to other substances.

DOSE AND MODE OF ADMINISTRATION.—In substance, from gr. xxx. to gr. lx.

Oleum Pimentæ. Oil of Pimento. (An article of the Materia Medica.) Dose, min. ij. to min. v.

Aqua Pimentæ. Pimento Water. (Take of pimento, bruised, fourteen ounces; water, two gallons. Distil one gallon.) Carminative and stimulant, used in the flatulent colic of children, and as a vehicle for other medicines. Dose, f℥j. to f℥ij.

INCOMPATIBLES.—The sesqui-salts of iron.

* PIPER LONGUM. *Long pepper. (Dried unripe spikes of Piper longum.)* A native of India, belonging to the Natural family *Piperaceæ*, and to the Linnæan class and order *Diandria Trigynia.*

BOTANICAL CHARACTERS.—A small, shrubby climber; leaves, alternate, petiolate, ovato-cordate; flowers, small, closely set on the axillary spadices.

PROPERTIES.—Long pepper consists of the spadices which are gathered before they are fully ripe, and dried in the sun. As met with in commerce, they are of a grayish colour, hard, about an inch and a half in length, cylindrical, striated diagonally on their surface. They have a somewhat aromatic odour, and a very pungent spicy taste. The composition of long pepper is almost identical with that of black pepper (see next article).

THERAPEUTICAL PROPERTIES.—This pepper is somewhat more acrid than *piper nigrum*, but it may be employed in the same cases. Dose, gr. v. to gr. xx.

PIPER. *Black pepper.* Piper nigrum, *Linn.* Plate 187, *Woodv. Med. Bot.* (The dried unripe berries, chiefly from the West Indies.) A native of the continent of India, cultivated in the East and West Indian Islands; it belongs to the natural family *Piperaceæ*, and to the Linnæan class and order *Diandria Trigynia.*

BOTANICAL CHARACTERS.—Stem, shrubby, climbing, 8–12 feet long, jointed, dichotomous; leaves elliptical, acuminate, 5–7-nerved; flowers, whitish, small, covering thickly a cylindrical, pendulous spadix; fruit, distinct, at first green, changing as it ripens to bright-red, and finally to black.

PREPARATION.—Before the berries on each spike have all changed to red, they are collected and dried in the sun, to constitute *black* pepper. *White* pepper is procured by soaking the fully ripe seeds in water, so as to enable the outer husks to be afterwards removed by rubbing.

CHARACTERS.—*Of the Berries.* Small, roundish, wrinkled; tegument brownish-black, containing a greyish-yellow globular seed. Odour aromatic. Taste pungent, and bitterish.

PHYSICAL PROPERTIES.—Black pepper is in the form of small spherical bodies, blackish and rough externally, white within, consisting of the outer wrinkled tegument, surrounding the hard smooth seed. It has a strong, peculiar aromatic odour, and a very pungent acrid taste. White pepper is the white nucleus, the outer black tegument having been removed.

CHEMICAL PROPERTIES.—Black pepper is composed of a neutral crystalline principle, which has been named *Piperin*, of a very acrid soft resin, balsamic volatile oil, extractive, gum, bassorin, starch, malic and tartaric acids, &c. The active principles are the *piperin*, resin, and volatile oil. Piperin may be readily prepared by Poutet's process as follows:—"Prepare an alcoholic extract of black pepper, digest in a solution of caustic potash, and agitate with water; filter and wash carefully with water what remains on the filter; dissolve it in warm alcohol, and crystallize by cooling." As usually met with, piperin is a dark yellow, resinous-looking substance, but it may be obtained in transparent, colourless, four-sided prisms; it is tasteless and inodorous, insoluble in cold water, dissolves sparingly in boiling water or cold alcohol, but is very soluble in boiling alcohol; it melts at 212°. It is a neutral principle; its composition, according to Wertheim and Rochleder, is $C_{70}H_{37}O_{10}N_2 + 2HO$. Black pepper imparts its properties partially to water, but more completely to alcohol.

THERAPEUTICAL EFFECTS.—Pepper is an acrid, aromatic stimulant, in general use as a spice. It also possesses remarkable febrifuge properties, which reside in the piperin. This substance has been employed with much success in the treatment of ague, and has succeeded in many instances in effecting a cure in cases where quina and other remedies have failed. An interesting account of the employment of piperin in the treatment of intermittent fevers in the Island of Trinidad, by Dr. Hartle, has been published in the 55th volume of the Edinburgh Medical Journal. As a stimulant, black pepper will be found a useful addition to bitters in atony of the digestive organs; externally it has been used in the form of ointment to chronic diseases of the scalp, and as an adjunct to rubefacient cataplasms.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. v. to gr. xx.

Confectio Piperis. Confection of Pepper. (Take of black pepper, in fine powder, two ounces; caraway, in fine powder, three ounces; clarified honey, fifteen ounces: rub them well together in a mortar.) This preparation was introduced into the pharmacopœias as a substitute for a quack medicine called *Ward's paste for piles.* It will be found useful in hemorrhoids occurring in the weak and debilitated. Dose, gr. lx. to gr. cxx.; to derive any benefit from its use it must be persevered in for two or three months.

* *Rubefacient Cataplasm,* PARIS CODEX. (Barley meal, ℥iv.; vinegar, ℥j.; whites of three eggs; water, sufficient to make a cataplasm of a proper consistence; spread on linen, and sprinkle over it half an ounce each of black pepper and of fennel in fine powder.) A speedy rubefacient.

* *Piperin* is given in doses of gr. iij. to gr. v. every hour until gr. xviij. have been taken. It may be made into pill with mucilage or conserve of roses.

INCOMPATIBLES.—Astringent vegetable preparations.

POTASSÆ PERMANGANAS. *Permanganate of Potash.* KO, Mn_2O_7 (=158).

PREPARATION.—Take of caustic potash, five ounces; black oxide of manganese, in fine powder, four ounces; chlorate of potash, three ounces and a half; dilute sulphuric acid, a sufficiency; distilled water, two pints and a half. Reduce the chlorate of potash to fine powder, and mix it with the oxide of manganese; put the mixture into a porcelain basin, and add to it the caustic potash, previously dissolved in four ounces of the water. Evaporate to dryness on a sand bath, stirring diligently to prevent spurting. Pulverize the mass, put it into a covered Hessian or Cornish crucible, and expose it to a dull red heat for an hour, or till it has assumed the condition of a semifused mass. Let it cool, pulverize it, and boil with a pint and a half of the water. Let the insoluble matter subside, decant the fluid, boil again with half a pint of the water, again decant, neutralize the united liquors accurately with the dilute sulphuric acid, and evaporate till a pellicle forms. Set aside to cool and crystallize. Drain the crystalline mass, boil it in six ounces of the water, and strain through a funnel the throat of which is lightly obstructed by a little asbestos. Let the fluid cool and crystallize, drain the crystals, and dry them by placing them under a bell jar over a vessel containing sulphuric acid.

EXPLANATION OF PROCESS.—On mixing the black oxide of manganese (MnO_2) with the chlorate of potash and applying heat, the chlorate of potash furnishes oxygen to the manganese, converting it into manganic acid (MnO_3) which unites with the potash to form manganate of potash, which on boiling is resolved into permanganate of potash, peroxide of manganese, and caustic potash, thus, $3KO\,MnO_3 = KO,Mn_2O_7 + MnO_2 + 2KO$. The insoluble matter that precipitates is the resulting peroxide of manganese, the solution consisting of the permanganate of potash and caustic potash; this latter is converted into sulphate of potash by the addition of the sulphuric acid, and by evaporation and crystallization we get a mixed mass composed of these two salts, for the separation of which, advantage is taken of the superior solubility of the permanganate, and finally we are directed to filter through asbestos, to avoid the decomposition that the solution of the permanganate would experience by the use of an organic filter; and to dry the resulting crystals under a bell jar in the vicinity of oil of vitriol, which abstracts from them their moisture, in virtue of its affinity for water.

CHARACTERS.—Dark-purple, slender, prismatic crystals, inodorous, with a sweet astringent taste, soluble in water. A single small crystal suffices to form with an ounce of water a rich purple solution, which when mixed with a little rectified spirit and heated, becomes yellowish-brown. The crystals heated to redness decrepitate, evolve oxygen gas, and leave a black residue, from which water extracts potash, recognised by its alkaline reaction, and by its giving, when acidulated with hydrochloric acid, a yellow precipitate with bichloride of platinum.

CHEMICAL PROPERTIES.—Permanganate of potash consists of one atom of potassa and one of permanganic acid, KO,Mn_2O_7. The description given of it in the pharmacopœial characters is so full as to leave but little more to be added; the brown colour alluded to, when treated, as directed, with rectified spirit, is due to the production of the hydrated peroxide, in consequence of the decomposition of the salt which always results on its being brought into contact with organic matter; the remainder of the characters require no explanation (see page 164).

TESTS.—Entirely soluble in cold water. Five grains dissolved in water require for complete decoloration a solution of forty-four grains of granulated sulphate of iron acidulated with two fluid drachms of dilute sulphuric acid.

The rationale of this test is that when so treated the permanganate of potash supplies oxygen to the protosulphate of iron, and with the aid of a portion of the sulphuric acid added converts it into persulphate of iron, being itself reduced to protoxide of manganese, which unites with more of the sulphuric acid employed to form sulphate of manganese, whilst the potash unites with another portion of sulphuric acid to form sulphate of potash; to reduce this statement to the form of an equation we will require ten atoms of protosulphate of iron, eight atoms of sulphuric acid, and one of permanganate of potash, thus, $10FeOSO_3 + KOMn_2O_7 + 8SO_3 = 5(Fe_2O_33SO_3) +$

$2MnOSO_3 + KOSO_3$. Reducing these equivalents to figures, we are enabled by a very simple sum in proportion to see that in the *tests* the salts are employed with strict reference to their atomic proportions, thus the chemical equivalent of granulated sulphate of iron is 139, of permanganate of potash 158, but we employ *ten* equivalents of sulphate of iron to explain the reactions, therefore $158 : 1390 :: 5 : 43{\cdot}98$.

THERAPEUTICAL USES.—Permanganate of potash has been exhibited both internally and externally as a remedial agent, and is also very generally employed as a deodorizer and for disinfectant purposes. Internally it has been employed in diabetes, on the recommendation of Mr. Sampson of London; in the hands of other practitioners, however, it has completely failed; in cases of typhus and typhoid fevers, with offensive dejecta; in gangrene of the lung; in cases of phthisis accompanied with offensive sputa, &c. But it is principally for its deodorizing powers, when used either as a wash or gargle, or sprinkled about places in which foul smells prevail, that it is to be valued, having latterly come into extensive use for such purposes under the name of *Condy's disinfecting fluid.* Its action in these cases undoubtedly is due to the facility with which it eliminates oxygen when brought into contact with organic matters, decomposing them, and forming with them other substances of an inodorous character. Schönbein, the discoverer of *ozone* and of *antozone*, believes that one if not three equivalents of the oxygen in permanganic acid exists in this peculiar allotropic condition, which he has described under the name of ozone, and to the existence of which in the atmospheric air he attributes its purifying influences; should further investigations establish the correctness of his views about this most curious principle, we may be induced to place confidence in this solution as a *disinfecting* agent properly so called (see p. 469). So far as I am enabled to judge, it is the only one of the class which at all seems to merit the title. As a deodorizer it is of unquestionable value, and as already stated is largely used for such purposes. It has also been used as a caustic, acting as such without the production of much pain; and has been recommended as an ingredient (gr. vi. of the salt to f℥j. of water) in gonorrhœa by Mr. Rich of Canada, who speaks with confidence of its value in such cases. My friend Mr. Wharton informs me that in a case of gangrenous ulcer in which he employed it, it not only corrected the fœtor, but *relieved the pain.*

DOSE AND MODE OF ADMINISTRATION.—Permanganate of potash, for internal use, should be ordered in solution in distilled water, the prescriber bearing in mind how readily all organic matter decomposes it. As a caustic the powder should be sprinkled lightly over foul and fungoid ulcers. The following is the officinal solution.

Liquor Potassæ Permanganatis. Solution of Permanganate of Potash. (Take of permanganate of potash, four grains; distilled water, one fluid ounce. Dissolve.) This may be looked upon as the officinal representative of *Condy's ozonized water*, a preparation which, however, is not so strong as the officinal solution, containing but 2·3 gr. of permanganate of potash to the ounce of water. *Condy's disinfectant* fluid, on the contrary, is much stronger than the officinal solution, containing 9·26 gr. of permanganate of potash to the ounce of water. Condy's disinfectant fluid can be sold at a much cheaper rate than the officinal solution, inasmuch as it appears to be made directly from the solution of permanganate of potash, without its being subjected to the process of crystallization, and is consequently not chemically pure; any impurities that it may contain, however, can in no way interfere with its satisfactory use as a deodorizing agent. The officinal solution may be administered internally in doses of min. x. to f℥j., or may be employed as a lotion or wash in the proportion of two to four fluid drachms of the solution to eight ounces of distilled water. For general use, in purifying cess-pools, sick-rooms, water-closets, etc., Condy's disinfecting fluid, from motives of economy, will doubtless be preferred.

POTASSA SULPHURATA. *Sulphurated Potash.* (Tersulphuret of potassium, KS_3, with sulphate of potash.) (Syn.: *Potasii sulphuretum, hepar sulphuris. Liver of sulphur.)*

PREPARATION.—"Take of carbonate of potash, in powder, ten ounces; sublimed sulphur, four ounces and a half. Mix the carbonate of potash and the sulphur in a warm mortar, and, having introduced them into a Cornish or Hessian crucible, let this be heated, first gradually until effervescence has ceased, and finally to dull redness, so as to produce perfect fusion. Let the liquid contents of the crucible be then poured out on a clean flagstone, and covered quickly with an inverted porcelain basin so as to exclude the air as completely as possible while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately enclosed in a green-glass bottle, furnished with an air-tight stopper."

EXPLANATION OF PROCESS.—In this process we find ten equivalents of sulphur reacting upon four of carbonate of potash, resulting in the production of three atoms of tersulphuret of potassium, one atom of sulphate of potash, and the expulsion of the four equivalents of carbonic acid, thus, $4KOCO_2 + 10S = 3KS_3 + KOSO_3 + 4CO_2$.

PHYSICAL PROPERTIES.—This preparation occurs in various sized pieces of a yellowish-green colour, hard and fragile; inodorous when quite free from moisture, but emitting the disagreeable odour of sulphuretted hydrogen when moistened. It has an acrid, bitter, alkaline taste.

CHARACTERS.—Solid greenish masses, liver-brown when recently broken, alkaline, and acrid to the taste, readily forming with water a yellow solution, which has the odour of sulphuretted hydrogen, and evolves it freely when excess of hydrochloric acid is dropped into it, sulphur being at the same time deposited. The acid fluid, when boiled and filtered, is precipitated yellow by bichloride of platinum, and white by chloride of barium.

CHEMICAL PROPERTIES.—It is a mixture of 3 equivalents of tersulphuret of potassium, and 1 of sulphate of potash ($3\ KS_3$ + KO,

SO_3), BERZELIUS. By exposure to the air it deliquesces, attracts oxygen, and is converted successively into hyposulphite, sulphite and sulphate of potash, becoming at last white and inodorous. Hepar sulphuris is readily soluble in water; the solution is of a yellow colour, and highly alkaline. Treated with hydrochloric acid, sulphide of hydrogen gas is evolved with the deposition of sulphur, this is accounted for by the reaction that ensues between three atoms of the tersulphide and three of hydrochloric acid, the three chlorines going to the three potassiums to form three chlorides of potassium, the three hydrogens to three of the nine sulphurs to form three atoms of sulphide of hydrogen, and the remaining six atoms of sulphur being deposited thus, $3KS_3+3HCl=3KCl+3SH+6S$; the yellow precipitate on the addition of bichloride of platinum proves the salt to be one of potash (see p. 164), whilst the white precipitate on the addition of chloride of barium demonstrates the presence of sulphuric acid.

TEST.—**About three-fourths of its weight are dissolved by rectified spirit.**

ADULTERATIONS.—Liver of sulphur is seldom met with in a pure state in the shops, in consequence of its undergoing decomposition so readily; advantage is taken in the pharmacopœial test of the insolubility of sulphate of potash in rectified spirit to estimate its amount; the progressive appearance of which has been already accounted for, and the amount of which should not exceed one fourth of the entire weight of the salt.

THERAPEUTICAL EFFECTS.—In large doses, sulphuret of potassium acts as a powerful narcotico-acrid poison, a few drachms producing death with convulsions and tetanic spasms. In small doses, it operates as a general stimulant, and as such is employed on the continent in the advanced stages of hooping cough, in chronic rheumatism, in rebellious skin diseases, &c.; but in this country it is rarely used as an internal remedy. As a topical agent it is applied dissolved in water in the form of lotion or bath, or made into an ointment with axunge, in chronic cutaneous diseases principally those of a scaly character, and has been also used in the obstinate eruptions which affect the scalp.

DOSE AND MODE OF ADMINISTRATION.—For internal use, gr. iij. to gr. x. dissolved in some aromatic water and sweetened with syrup.

**Balneum Sulphuratum*, RAYER. (Sulphuret of potassium, ℥iv.; tepid water, cong. xxx.; dissolve in wooden vessels.) This may be employed as a local or general bath in skin diseases.

**Unguentum Potassii Sulphureti*, DEVERGIE. (Solution of sulphuret of potash, 12 parts; carbonate of potash, 8 parts; axunge, 30 parts; mix.) For scabies and other cutaneous diseases.

INCOMPATIBLES.—The acids; and most metallic solutions.

In all cases of poisoning with this substance, the best antidotes are solutions of chlorinated lime or chlorinated soda, with emollient drinks.

ROSMARINI OLEUM. *English Oil of Rosemary.* Rosmarinus officinalis, *Linn.* Plate 24, *Steph. and Church Med. Bot.* (The oil distilled in England from the flowering tops.) A native of the south of Europe; belonging to the Natural family *Labiatæ (Lamiaceæ,* Lindley,*)* and to the Linnæan class and order *Diandria Monogynia.*

BOTANICAL CHARACTERS.—A shrub, 6–8 feet high; leaves, evergreen, sessile, lanceolate, revolute at the edge, glabrous on the upper surface, tomentose beneath; flowers, pale-blue, in small spikes at the extremities of the young branches.

PROPERTIES.—The dried tops have an aromatic agreeable odour, somewhat resembling peppermint, and a warm, pungent, bitter taste. These properties depend chiefly on a volatile oil, of which a pound of the fresh plant yields about one drachm. This oil, *Oleum Rosmarini,* is obtained by the usual process of distillation; it is limpid and colourless, with the odour and taste of the herb in an intense degree. Its density is 0·897; and its composition $C_{45}\ H_{38}\ O_2$, (Kane). Rosemary tops communicate their odour to boiling water, but more completely to spirit.

CHARACTERS.—*Of the Oil.* Colourless, with the odour of rosemary and a warm aromatic taste.

ADULTERATIONS.—Oil of rosemary is often adulterated with oil of turpentine; the fraud may be detected by the odour when dropped on a heated spatula, or by its not being completely soluble in alcohol.

THERAPEUTICAL EFFECTS.—Rosemary possesses the aromatic stimulant properties of the Labiate plants before described, and may be used for the same purposes. The oil is frequently added to stimulating liniments, principally on account of its odour.

DOSE AND MODE OF ADMINISTRATION.—Of the oil, min. ij. to min. v. dropped on sugar.

PREPARATIONS.—Linimentum Saponis (p. 472), Spiritus, Tinctura Lavandulæ composita (p. 490).

Spiritus Rosmarini. Spirit of Rosemary. (Take of English Oil of Rosemary one fluid ounce; rectified spirit, nine fluid ounces. Dissolve.) This spirit contains about thirty-one times as much Oil of Rosemary as Spiritus Rosmarini, *Lond.*, and corresponds to the Essence of Rosemary of the Dublin Pharmacopœia. Dose, min. x. to min. xxx. Each ten minims contain one minim of essential oil.

SABADILLA.—*Cevadilla* (described in the division *Anthelmintics*) is a powerful stimulant, and as such is used in the form of tincture as an external application in chronic rheumatism and paralysis, and over the region of the heart in hysterical and nervous palpitations. The powder of the seeds is employed to destroy pediculi, but its application is not unattended with danger, especially if the skin be broken. The active principle of cevadilla is *veratria,* as before mentioned, and it was principally as a means of affording this alkaloid that it was originally introduced into the London and Edinburgh Pharmacopœias. The process directed to be followed in the British Pharmacopœia for obtaining it, is described below.

DOSE AND MODE OF ADMINISTRATION.—Of cevadilla in powder, gr. j. to gr. v.

* *Tinctura Sabadillæ,* (Cevadilla seeds, (freed from their capsules according to the directions in the *Pharmacopœia* for preparing *veratria,* and bruised,) any quantity; rectified spirit, as much as will cover them; macerate for ten days, express, and filter.) For external use as an embrocation.

* *Extractum Sabadillæ.* (Evaporate the tincture with a gentle heat to a proper consistence.) Dose, gr. $\frac{1}{8}$th to gr. $\frac{1}{4}$th gradually increased. This extract may be advantageously substituted for *veratria.*

VERATRIA. *Veratria.* (An alkaloid, $C_{64}H_{52}N_2O_{16}$, obtained from cevadilla; not quite pure.)

"Take of cevadilla, two pounds; distilled water, a sufficiency; rectified spirit, a sufficiency; solution of ammonia, a sufficiency; hydrochloric acid, a sufficiency; purified animal charcoal, sixty grains. Macerate the cevadilla with half its weight of boiling distilled water in a covered vessel for twenty-four hours. Remove the cevadilla, squeeze it, and dry it thoroughly with a gentle heat. Beat it now in a mortar, and separate the seeds from the capsules by brisk agitation in a deep, narrow vessel, or by winnowing it gently on a table with a sheet of paper. Grind the seeds in a coffee-mill, and form them into a thick paste with rectified spirit. Pack this firmly in a percolator, and pass rectified spirit through it till the spirit ceases to be coloured. Concentrate the spirituous solution by distillation, so long as no deposit forms, and pour the residue, while hot, into twelve times its volume of cold distilled water. Filter through calico, and wash the residue on the filter with distilled water, till the fluid ceases to precipitate with ammonia. To the united filtered liquids add the ammonia in slight excess, let the precipitate completely subside, pour off the supernatant fluid, collect the precipitate on a filter, and wash it with distilled water till the fluid passes colourless. Diffuse the moist precipitate through twelve fluid ounces of distilled water, and add gradually with diligent stirring sufficient hydrochloric acid to make the fluid feebly but persistently acid. Then add the animal charcoal, digest at a gentle heat for twenty minutes, filter, and allow the liquid to cool. Add ammonia in slight excess, and, when the precipitate has completely subsided, pour off the supernatant liquid, collect the precipitate on a filter, and wash it with cold distilled water till the washings cease to be affected by nitrate of silver acidulated with nitric acid. Lastly, dry the precipitate first by imbibition, with filtering paper, and then on the steam bath."

EXPLANATION OF PROCESS.—The Cevadilla is first treated with water for the purpose of facilitating the separation of the seeds from the capsules; they are then ground, and exhausted with rectified spirit, by which the veratria, in combination with gallic acid, and some resinoid matter, is taken up: the solution is then concentrated, and poured into water, by which the resin is precipitated, and gotten rid of on filtration, but the gallate of veratria is still retained in solution by the weak spirit; on the addition of the ammonia, the gallic acid unites with it, and the veratria in a very impure state is set free, and being insoluble is precipitated, caught on the filter and washed with water: on the addition of the hydrochloric acid it unites with the veratria, to form hydrochlorate of veratria, which by digestion with animal charcoal is decolorized, and again decomposed by the second addition of ammonia, hydrochlorate of ammonia remaining in solution, veratria being precipitated; this is then washed until every trace of hydrochlorate of ammonia is removed, which is demonstrated by the non-production of a white precipitate (chloride of silver) on the addition of the acid solution of nitrate of silver.

CHARACTERS.—Pale grey, amorphous, without smell, but, even in the most minute quantity, powerfully irritating the nostrils; strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids, leaving traces of an insoluble brown resinoid matter. An active poison.

CHEMICAL PROPERTIES.—It is composed of $C_{64}H_{52}N_2O_{16}$ (Merck); is not volatile nor altered by exposure to the air; fuses at 230°, and cools into a transparent yellowish mass. It reacts alkaline, is nearly insoluble in cold water, requires 1000 parts of boiling water for its solution, is sparingly soluble in ether, but very soluble in alcohol. It forms salts with the acids, of which the hydrochlorate and the sulphate are alone crystallizable.

TESTS.—Heated with access of air it melts into a yellow liquid, and at length burns away, leaving no residue.

ADULTERATIONS.—Veratria very commonly contains lime; the adulteration may be readily detected by heating a small quantity in a platinum spoon, when, if it is pure, it will be completely dissipated, the lime, if present, being left behind.

THERAPEUTICAL EFFECTS.—In large doses, veratria operates as a powerful irritant poison, causing inflammation of the stomach and intestines when swallowed, and if applied to the surface of the body producing much irritation. Its action in small or medicinal doses does not appear to be well understood, but it would seem to be a general stimulant; increased action of the intestines, the kidneys, and the capillaries of the skin being in general produced by its administration. Its use in medicine was until lately confined to neuralgic diseases, for the treatment of which it was first introduced in the form of ointment as an external application by Dr. Turnbull; but the experience of numerous physicians who have tried it on his recommendation not coinciding with his extravagant praises of the remedy, it has fallen into disrepute. More recently it has been employed in France as an internal remedy in some inflammatory diseases, particularly pneumonia and acute rheumatism, for the former of which it was first proposed by M. Aran, and for the latter, in which its efficacy appears now to be well established, on the testimony of many French physicians, by M. Piédagnel. Applied in the form of ointment, veratria has been lately highly recommended in the treatment of scrofulous disease of the joints by Dr. Klingner of Glasgow. The action of cevadilla as a stimulant is similar to that of veratria, but of course much weaker.

DOSE AND MODE OF ADMINISTRATION.—Gr. 1-12th increased very cautiously. M. Piédagnel administers it in acute rheumatism in the form of pill, each pill containing 1-14th of a grain of the alkaloid. He prescribes at first three of these pills in the 24 hours, and increases the dose by one pill daily, until ten pills are arrived at, which quantity he does not exceed; but if pain in the throat or stomach, vomiting or diarrhœa be caused sooner, he suspends its use at once, and again resumes it as soon as these symptoms disappear should there be occasion. For an embrocation, gr. xxx. of the alkaloid may be dissolved in f℥j. of rectified spirit. Care should be taken that neither it or the ointment should be brought into contact with raw surfaces.

Unguentum Veratriæ. Ointment of Veratria. (Take of veratria, eight grains; prepared lard, one ounce; olive oil, half a fluid drachm. Rub the veratria and the oil together; then mix them thoroughly with the lard.)

* *Tinctura Veratriæ,* MAGENDIE. (Veratria, gr. iv.; rectified spirit, f℥j.; dissolve.) Dose, min. x. to min. xv.

In poisoning with veratria the treatment is the same as in poisoning with Colchicum. (See page 142.)

SERPENTARIA. *Serpentary.* (Syn.: *Virginian snake-root. Root of Aristolochia serpentaria.*) Aristolochia Serpentaria, *Linn.* Plate 180, *Steph. and Church. Med. Bot.* (The dried root; from the southern parts of North America.) A native of North America; belonging to the Natural family *Aristolochiaceæ,* and to the Linnæan class and order *Gynandria Hexandria.*

BOTANICAL CHARACTERS.—Stem, simple, flexuous, 8–10 inches high; Leaves alternate, cordiform, acuminate, slightly pubescent; Flowers, solitary, reddish-brown.

CHARACTERS.—A small roundish root-stock, with a tuft of numerous slender radicles, about three inches long, yellowish, of an agreeable camphoraceous odour, and a warm bitter camphoraceous taste.

PHYSICAL PROPERTIES.—As imported, serpentaria root consists of a tufted head with numerous attached radicles of a yellowish-brown colour externally, whitish within, with a short resinous fracture. The odour is aromatic, like that of valerian, and the taste warm and camphoraceous.

CHEMICAL PROPERTIES.—It consists of volatile oil, soft resin, bitter extractive, gum, albumen, starch, and some salts. It yields its properties to water and to alcohol.

THERAPEUTICAL EFFECTS.—Virginian snake-root, although at one time in great repute, is seldom employed in the present day. It appears to act as a general stimulant, and as such was used in typhoid fevers, in intermittents, in gangrenous affections, in amenorrhœa of the debilitated, etc. It is still very generally used in America.

DOSE AND MODE OF ADMINISTRATION.—In powder, a bad form, gr. x. to gr. xxx.

Infusum Serpentariæ. Infusion of Serpentary. (Take of serpentary, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for two hours and strain.) Dose, f℥ss. to f℥ij.

Tinctura Serpentariæ. Tincture of Serpentary. (Take of serpentary, bruised, two ounces and a half; proof spirit, one pint. Macerate the serpentary for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.) Dose, f℥j. to f℥ij.

INCOMPATIBLES.—Acetate of lead and nitrate of silver.

SINAPIS ALBA SEMINA.—*White mustard seed* (described in the division *Emetics,*) was at one time much employed as a stimulant in atonic forms of dyspepsia, but is very rarely used as such in the present day. It was taken whole in the dose of a dessert-spoonful three or four times a day.

SODÆ CHLORATÆ LIQUOR. *Solution of Chlorinated Soda.* (A mixed solution of hypochlorite of soda, NaO, ClO, (=74·5) chloride of sodium, and bicarbonate of soda.) (Syn. *Solution of Chloride of Soda. Chlorinated Soda. •Hypochlorite of Soda. Labarraque's disinfecting liquor.)*

PREPARATION.—Take of carbonate of soda, twelve ounces; chloride of sodium, four ounces; black oxide of manganese, in powder, three ounces; sulphuric acid, two fluid ounces and a half; distilled water, forty-four fluid ounces. Reduce the carbonate of soda to powder, dissolve it in thirty-six ounces of the water, and put the solution into a glass vessel. Mix the chloride of sodium, and the oxide of manganese, place them in a retort, and add to them the sulphuric acid, previously mixed with three ounces of the water, and allowed to cool. Heat the mixture gradually, and pass the evolved chlorine through a wash bottle containing five ounces of the water, and afterwards into the solution of carbonate of soda. When the disengagement of chlorine has ceased, transfer the solution to a stoppered bottle, and keep it in a cool and dark place.

EXPLANATION OF PROCESS.—In virtue of the reactions that ensue between the chloride of sodium, black oxide of manganese, and sulphuric acid, we have chlorine evolved; two atoms of sulphuric acid and one each of the salts being required to account for its development. The peroxide of manganese gives up one of its atoms of oxygen to the sodium, converting it into soda, which, uniting with one of the equivalents of sulphuric acid, forms sulphate of soda; the protoxide of manganese so produced unites with the second equivalent of sulphuric acid to form sulphate of manganese and the chlorine is set free, thus, $NaCl+MnO_2+2SO_3=NaOSO_3+$

$MnOSO_3 + Cl$. The chlorine on being conveyed into the solution of carbonate of soda converts it into bicarbonate of soda, chloride of sodium, and hypochlorite of soda—two equivalents of chlorine reacting upon four of carbonate of soda; two atoms of this latter salt give up their carbonic acid to the other two, thus producing two equivalents of bicarbonate of soda, and two equivalents of caustic soda; one of these two sodas parts with its oxygen to one of the two equivalents of chlorine, converting it into hypochlorous acid, which unites with the second equivalent of soda to make hypochlorite of soda, whilst the sodium so produced unites directly with the chlorine, forming chloride of sodium, thus, $4NaOCO_2 + 2Cl = 2(NaO\,2CO_2) + NaOClO + NaCl$.

CHARACTERS.—A colourless alkaline liquid, with astringent taste and feeble odour of chlorine. It decolorizes sulphate of indigo. It effervesces with hydrochloric acid, evolving chlorine and carbonic acid, and forming a solution which does not precipitate with bichloride of platinum.

CHEMICAL PROPERTIES.—Its precise composition has not been ascertained, but it is generally supposed to be a mixture of hypochlorite of soda, bicarbonate of soda, and chloride of sodium. Exposed to the air, chlorine escapes, and crystals of the carbonate of soda are gradually deposited. By evaporation with a gentle heat, crystals are obtained, which by solution in water afford a liquid with the same properties. It bleaches vegetable colours, first acting as an alkali on them. This solution may be destinguished from that of chlorinated lime by its not precipitating with the oxalates or carbonates. Its not precipitating with bichloride of platinum, is indicative of the absence of potash (see p. 164).

TESTS.—Specific gravity, 1·103. One fluid drachm, added to a solution of twenty grains of iodide of potassium in four fluid ounces of water and acidulated with two fluid drachms of hydrochloric acid, requires for the discharge of the brown colour which the mixture assumes, forty-three measures of the volumetric solution of hyposulphite of soda. It is not precipitated by oxalate of ammonia.

ADULTERATIONS.—The only sophistications to which this preparation, so far as I am aware, is liable, are either to have the solution of chlorinated lime substituted for it, or to have it not sufficiently charged with chlorine; the first of these will be evidenced by its precipitation on the addition of oxalate of ammonia, the second can be judged of by the volumetric test, which demonstrates the existence of 5·46 gr. of iodine, corresponding to 1·52 gr. of chlorine, in each fluid drachm.

THERAPEUTICAL EFFECTS.—This solution agrees precisely in its properties with hypochlorite of lime, and is employed for the same purposes (see page 377). For destroying noxious effluvia it is to be preferred to that substance, as the salt, *chloride of sodium*, which is left, does not deliquesce; while chloride of calcium is very deliquescent.

DOSE AND MODE OF ADMINISTRATION.—For internal use min. xx. to min. xxx. in a sufficiency of water, which may be sweetened with syrup. Externally it may be used as a lotion, f℥j. to f℥iv. in f℥viij. of water, or sprinkled about a room to destroy unpleasant odours, or as a topical application in the following form :—

Cataplasma Sodæ Chloratæ. Chlorine Poultice. (Take of solution of chlorinated soda, two fluid ounces; linseed meal, four ounces; boiling water, eight fluid ounces. Add the linseed meal gradually to the water, stirring constantly; then mix the solution of chlorinated soda.) An application to foul and gangrenous sores.

SODII CHLORIDUM. *Salt.* NaCl. (= 58·5).

PREPARATION.—Chloride of sodium is an article of the Materia Medica in the British Pharmacopœia. On the large scale it is procured by dissolving and crystallizing rock-salt, or by evaporating sea water, or the water of some mineral springs, in which it is contained in large quantities.

CHARACTERS.—In small white crystalline grains, or transparent cubic crystals, with a purely saline taste, imparting a yellow colour to flame, soluble in water. The solution is not precipitated by bichloride of platinum, but gives with nitrate of silver a white precipitate, soluble in ammonia but insoluble in nitric acid.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of sodium, and 1 of chlorine (Na Cl). It contains no water of crystallization, but when heated decrepitates, owing to some water being mechanically lodged between the tables of the crystals. Exposed to a bright red heat it fuses, and at a white heat volatilizes unchanged. The colour it imparts to flame is yellow, characteristic of its base. Chloride of sodium is permanent in the air when quite pure; and is equally soluble in cold and boiling water, requiring 2·7 parts of water for its solution. It is insoluble in absolute alcohol, but rectified spirit dissolves it slightly. Its not being precipitated by bichloride of platinum serves to distinguish it from a salt of potash; the white precipitate it yields with nitrate of silver is chloride of silver. It is neutral to test paper.

TESTS.—Free from moisture. The solution is not rendered hazy by chloride of barium nor by phosphate of soda after the addition of a mixed solution of ammonia and hydrochlorate of ammonia.

ADULTERATIONS.—As met with in this country, common salt does not contain any impurity which can interfere with its use for general or pharmaceutical purposes. Owing to the presence of chloride of magnesium, it is frequently slightly deliquescent; this impurity will be recognized by phosphate of soda employed as directed in the pharmacopœial test, the precipitate being the ammoniaco-magnesian phosphate; were it rendered hazy on the addition of chloride of barium, it would evidence the existence of a sulphate.

THERAPEUTICAL EFFECTS.—Chloride of sodium taken internally in moderate quantities acts as a mild stimulant to the digestive organs, promoting the assimilation of the food; on which account, as well as in consequence of its agreeable flavour, it is used generally by man in all parts of the world, as an adjunct to nearly every substance employed by him as an article of diet. It proves serviceable to digestion, too, inasmuch as it prevents, to a certain extent, the generation of intestinal worms in the alimentary canal, to which those who use little or no salt with their food are very subject. In somewhat larger doses salt acts as a mild cathartic, forming a principal ingredient in many mineral waters, in which it augments the operation of the other laxative salts. It acts as an emetic in doses of one or two ounces; and, in one instance, a pound of it taken at once occasioned death with all the symptoms of irritant poisoning. Applied to the surface of the body, it is a local stimulant, producing the effects of a rubefacient. Chloride of sodium is not much employed in medicine. As an emetic, it may be administered in narcotic poisoning in the absence of other substances; as a cathartic, it is not given alone, but is advantageously combined with the other saline cathartics (see page 157); as an anthelmintic, a strong solution has been injected into the rectum to destroy ascarides; as a general stimulant it is used in some forms of dyspepsia, and in scrofulous and other glandular enlargements; and as a topical agent it is added to both hot and cold baths, when they are intended to act as local stimulants. In America a saturated solution of common salt is employed with much success as a lotion in chronic granular ophthalmia. In cholera, and some other diseases in which the saline constituents of the blood are deficient, a solution consisting of gr. cxx. of chloride of sodium, and gr. xl. of carbonate of soda, dissolved in f℥lx. of water has been injected into the veins, but the results, although in some desperate cases apparently of use, on the whole do not appear to have been more successful than those which followed other methods of treatment; nevertheless, in the last outbreaks of the epidemic it has been again put strongly forward as an infallible remedy.

DOSE AND MODE OF ADMINISTRATION.—As a stimulant, gr. x. to gr. lx. As an emetic, ℥j. to ℥ij. dissolved in Oj. of water. For baths, ℔j. to ℔ij. may be added to from cong. iij. to cong. v. of either cold or warm water.

INCOMPATIBLES.—Nitrate of silver.

* STAPHISAGRIA, L. E.—*Stavesacre. Seeds of Delphinium staphisagria.* A native of the south of Europe; belonging to the Natural family *Ranunculaceæ*, and to the Linnæan class and order *Polyandria Trigynia.*

BOTANICAL CHARACTERS.—Stem, cylindrical, branching, downy, about 2 feet high; leaves, alternate, broad, palmated, smooth on the upper, downy on the under surface; flowers, purple, in lax racemes.

PROPERTIES.—Stavesacre seeds are about the size of a small pea, irregularly triangular, compressed, dark brown; they have a faint unpleasant odour, and a very acrid bitter taste. Their acridity depends upon an uncrystallizable alkaloid, *delphinia*, which constitutes more than 8 per cent. of the seed. Delphinia is a yellowish-white powder, highly acrid and poisonous, being in many respects somewhat analogous to veratria; its composition is said to be $C_{27}H_{19}O_2N$? The seeds yield their active properties to boiling water, but more completely to alcohol or to vinegar.

THERAPEUTICAL EFFECTS.—Stavesacre is a powerful irritant, at one time used in medicine as an emetic and anthelmintic, but employed at present only for the destruction of pediculi. An ointment prepared by mixing the powdered seeds with four times their weight of lard, or an infusion of the bruised seeds in vinegar, may be used for this purpose. Delphinia has been employed by Dr. Turnbull of London in rheumatic and neuralgic affections. The dose of it is from 1-12th to 1-4th of a grain frequently repeated.

In cases of poisoning with stavesacre or its alkaloid the treatment is the same as in poisoning with colchicum (see page 142).

SULPHUR, (described in the division *Cathartics*,) in small doses frequently repeated, acts as a stimulant to the cutaneous vessels, and is therefore administered occasionally with benefit in chronic diseases of the skin, particularly scabies, for which, however, it is more generally employed as an external application. The curative powers of sulphur in this disease appear to be specific, but it has been more recently shown that it acts as a poison to a small insect (*Sarcoptes hominis* of Raspail), which has been discovered to exist in the pustules of itch, and by which it is believed by many that the disease is produced. Whatever may be its *modus operandi*, sulphur is undoubtedly more generally successful in the cure of scabies than any other substance which has been hitherto employed. It is used on the continent, especially in France, with much effect, combined with carbonate of potash, in the proportion of 2 parts of sulphur and 1 of carbonate of potash to 8 parts of lard: when frictions are carefully made over the entire body with this sulphuro-alkaline ointment, the disease may be cured in a few hours. The surface is first well rubbed with soft soap for half an hour in a warm bath, and afterwards with this ointment. The treatment at present most successfully pursued in the British army is to boil with constant stirring two parts of sulphur and one part of quicklime in ten parts of water, until the lime and sulphur are united; the patient's body should first be well washed with warm water, then for half an hour with this wash, the sulphur gradually precipitating on the skin as the water evaporates; the patient is then put into a warm bath, and finally dressed in *clean* clothes, an important point, inasmuch as infected clothes will reproduce the disease: the solution should be preserved in a carefully stoppered bottle for use. Sulphur is also used as an external application in many other cutaneous eruptions, particularly in lepra and psoriasis, in the very chronic stages of which in the form of vapour, *sulphur-vapour bath*, its use is at times productive of good results. The dose of sulphur as a stimulant is from gr. x. to gr. xxx.; it may be given in the form of electuary made with treacle or with syrup. For external application either of the following ointments, or that above described, may be used.

Unguentum Sulphuris. Ointment of Sulphur. (Take of sublimed sulphur, one ounce; prepared lard, four ounces. Mix thoroughly;) the general form in which sulphur is applied externally.

TEREBINTHINÆ OLEUM.—*Oil of turpentine* (described in the division *Anthelmintics*), administered in small but frequently repeated doses, acts as a general stimulant to the system, and as such has been employed in the low stages of typhus and common continued fevers, in chronic rheumatism, in neuralgia, in hemorrhages from the mucous surfaces dependent on an atonic state of the vessels, to facilitate the passage of biliary calculi in sciatica, and to prevent the access of the fit in epilepsy. In the low stages of fevers its use in the form of *turpentine punch* (an ounce of turpentine, two ounces of brandy, eight ounces of boiling water, and sugar sufficient to sweeten) has long been a valuable remedy in the wards of the Meath Hospital; half of this should be taken for a dose, to be repeated, if necessary, every third hour.

Recently Dr. Frizelle has drawn the attention of the profession in this city to a tincture and extract prepared from the *Pinus Larix*. He has found these preparations of great service in the treatment of excessive secretions from the mucous membrane in general, but especially so from the pulmonary and urino-genital mucous membranes. The properties ascribed to these preparations are stimulating, slightly styptic, astringent, and expectorant. Its value also has been recognised by several physicians, in the intercurrent hæmoptysis of phthisis, in purpura, epistaxis, chronic mucous discharges, hematuria, &c. I have found the tincture of use in bronchial affections accompanied with excessive mucous secretion. The chemical history of the bark of Pinus Larix has been carefully investigated by Professor Aldridge, who, however, failed in obtaining from it any alkaloid. He found the bark to contain cellulose, starch, gum, tannin, resin, essential oil, red colouring matter, yellow ditto, extractive soluble in water, extractive soluble in alcohol. To search for an alkaloid 28lbs. were boiled with water acidulated with dilute sulphuric acid, filtered and neutralized by carbonate of soda; a copious red precipitate was thrown down; this was digested with water, acidulated with dilute sulphuric acid, when only a small quantity dissolved. The solution, decolourized by purified animal charcoal, evaporated to dryness, digested with alcohol 0·840, filtered and evaporated, yielded crystals which were deliquescent, and only partially soluble in water, and which proved to be a mixture of chloride of sodium and pinic acid; more recently Dr. Stenhouse has succeeded in finding in it a volatile crystallizable principle, acid in reaction, which he has termed *Larixinic acid*. The dose of the *extract* is gr. j. to gr. v.; of the tincture, min. xv. to f℥ij.

The local stimulant properties of turpentine have been already considered (see page 334); made into an ointment with three parts of prepared lard, I have occasionally found it a useful application in some very chronic cases of scaly eruptions on the scalp. Turpentine vapour-baths at a high temperature have been for some time very generally used and highly extolled in the south of France as a remedy in catarrhal and rheumatic affections; they are prepared by burning in a close chamber pine branches, to the vapour arising from which the patient is exposed, somewhat after the manner of the Russian vapour-baths.

Linimentum Terebinthinæ Aceticum. Liniment of Turpentine and Acetic Acid. (Take of oil of turpentine, one fluid ounce; acetic acid, one fluid ounce; liniment of camphor, one fluid ounce. Mix.) This is the officinal representative of *St. John Long's* liniment (see p. 335).

Unguentum Terebinthinæ. Ointment of Turpentine. (Take of oil of turpentine, one fluid ounce; resin, in coarse powder, sixty grains; yellow wax, half an ounce; prepared lard, half an ounce. Mix the ingredients together by the heat of a steam or water bath. When they are melted, remove the vessel, and stir until the mixture becomes solid.) A warm stimulant ointment.

The four following substances nearly allied to turpentine, and obtained from the same or nearly related coniferous trees, are employed as topical stimulants in the forms of ointments, plasters, or cerates.

PIX BURGUNDICA. *Burgundy Pitch.* Abies excelsa, *Lamarck.* Spruce Fir. Plate 208, *Woodv. Med. Bot.* (*Pinus Abies*). (A resinous exudation from the stem, melted and strained; imported from Switzerland.)

CHARACTERS.—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.

TESTS.—Without bitterness; free from vesicles; gives off no water when it is heated.

This substance as met with in the shops is usually a mixture of common turpentine, resin, and palm oil. It is in masses of a pale-yellow colour, with a terebinthinate odour and taste; when pure, according to Guibourt, it has a strong, agreeable, balsamic odour, and a sweet perfumed taste. In the London Pharmacopœia it was directed to be prepared for use in medicine "by a process similar to that for *prepared ammoniacum*," when it constitutes *Pix Burgundica præparata*. It is only used externally as a topical stimulant.

Emplastrum Picis. Pitch Plaster. (Take of 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. Boil all the ingredients together gently in a copper pan over a clear fire, and keep simmering for four or five hours, stirring constantly until the oil and litharge acquire a proper consistence for a plaster, adding more water during the process if necessary.) A stimulating plaster applied to the chest in chronic catarrhal complaints, and over the seat of the pain in local neuralgia and in chronic rheumatism.

PIX LIQUIDA. *Tar.* (A bituminous liquid, obtained from the wood of Pinus sylvestris, *Linn.*, and other pines, by destructive distillation.) Tar is prepared in the countries bordering on the Gulf of Bothnia, from various trees of the fir tribe, by a species of *distillatio per descensum.* The old wood and roots are closely packed into the upper part of a pit dug in the earth, in the bottom of which an iron pan is fixed; the timber is ignited and covered with sods of earth to prevent the escape of the volatile parts; and the tar gradually exudes and flows into the iron pan, from whence it is conducted by a pipe into barrels, each of which holds 31½ gallons.

CHARACTERS.—Thick, viscid, brownish-black, of a well-known peculiar aromatic odour. Water agitated with it acquires a pale-brown colour, sharp empyreumatic taste, and acid reaction.

Tar is a thick, tenacious, opaque liquid, of a dark-brown, almost black colour, with a strong peculiar odour, and a bitter disagreeable taste. It dries so slowly, even when exposed to the air, that it retains its liquid character for an almost indefinite period. It is composed of various resins, modified oil of turpentine, acetic acid, and water; communicates both odour and taste to water, which dissolves out its oil and acid; and is soluble in alcohol, ether, and the fixed and volatile oils.

Tar was formerly used in medicine in chronic catarrhal complaints, and in the form of vapour its inhalation was highly recommended by Sir Alexander Crichton in phthisis. In the present day, however, it is only used as a local stimulant in chronic cutaneous diseases.

* *Aqua Picis liquidæ.* (Tar, ℔ij.; water, cong. j.; mix, stirring with a stick for quarter of an hour; as soon as the tar has subsided, strain the liquor, and keep it in well-closed jars.) *Tar-water*, the formula for which has been omitted from the Pharmacopœia, was first introduced by Bishop Berkeley as a remedy for diseases of the chest and of the kidneys; the dose was from Oj. to Oij. daily. Its use is completely obsolete in the present day.

* *Unguentum Picis liquidæ.* (Take of tar, Oss.; yellow wax, ℥iv.; melt the wax with a gentle heat, then add the tar, and stir the mixture constantly until it concretes.) Tar ointment is often used, but in my experience rarely with benefit, as a stimulant in chronic diseases of the skin.

* *Oil of Pitch.* By distilling tar with water, a mixture of impure oil of turpentine, a *pyrogenous* oil, and some *pyretin* is procured; this liquid under the name of *oil of pitch (Huile de Cade* of the French) is very highly spoken of on the continent as a local application in many cutaneous diseases, especially obstinate forms of lichen, herpes, and eczema, but in some cases in which I tried it, the results were not at all satisfactory. Inunctions are made with it twice a-day. Most French pharmacologists restrict the term *huile de cade (Oleum Cadinum)* to a tarry oil obtained by the dry distillation of the wood of the *Juniperus oxycedrus.*

RESINA. *Resin.* (The residue of the distillation of the turpentines from various species of Pinus, *Linn.* and Abies, *Lam.*) Rosin or resin is met with in two forms, *yellow resin (resina flava)* and *brown resin* or *Colophony (resina nigra seu Colophonium).* The former is obtained when the application of heat is stopped before all the volatile oil is expelled from the pine turpentines; the latter when the process is continued until all the oil is distilled.

CHARACTERS.—Translucent, semi-opaque, yellowish, brittle, pulverizable; fracture shining; odour and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke.

Resin is a semi-transparent, very brittle solid, varying in colour from pale-yellow to brownish-black. It has a faint turpentine odour, but is quite tasteless; it consists of two resins which have been named *Pinic* and *Sylvic acids*; the composition of both is the same, viz.: $C_{40}H_{30}O_4$. In medicine, yellow resin alone is employed; it is used partly as a local stimulant, but principally to communicate a certain degree of consistency or adhesiveness to ointments, plasters, &c.

Ungentum Resinæ. Ointment of Resin. (Take of resin, in coarse powder, eight ounces; yellow wax, four ounces; simple ointment, sixteen ounces. Melt with a gentle heat, strain the mixture while hot, through flannel, and stir constantly until it cools.) This ointment, commonly known under the name of *Basilicon ointment*, is employed as a stimulating application to foul and indolent ulcers.

THUS AMERICANUM. *Common Frankincense.* Pinus Tæda, *Linn.* the Frankincense Pine, and Pinus palustris, *Miller's Dict.* the Swamp Pine. Plates 16, 17, and 20, *Lambert Pinus.* (The concrete turpentine, from the Southern States of North America.) Much confusion exists as to the relation existing between Burgundy pitch and Frankincense; but the former is generally believed to be obtained by melting the latter in water immediately after it has been removed from the tree and straining through a cloth.

CHARACTERS.—A softish bright-yellow opaque solid, resinous but tough, having the odour of American Turpentine.

Frankincense is chiefly imported from Canada in the form of yellowish or brownish-yellow tears, which are hard and brittle; it has an agreeable fragrant terebinthinate odour, stronger when bruised, and an acrid bitter taste. It is used in medicine only as an addition to some plasters, chiefly to give them odour and consistency. Its properties, nevertheless, are similar to those of the other turpentines. The London College directed it to be prepared for use as follows:— *Thus præparatum,* "Frankincense, ℔j.; water, sufficient to cover it; boil the frankincense in the water until it liquefies, and strain through a hair sieve; then, when cold, pour off the water and keep the frankincense for use."

* VERATRUM. *White hellebore. Rhizome of Veratrum album.* A native of the mountainous regions of central and southern Europe; belonging to the Natural family *Melanthaceæ,* and to the Linnæan class and order *Polygamia Monœcia.*

BOTANICAL CHARACTERS.—Rhizome, fleshy, cylindrical, giving origin to numerous undivided radicles; Stem, 1–4 feet high; Leaves, sheathing, plaited, ovato-oblong; Flowers, greenish-yellow, in a large spreading panicle.

PHYSICAL PROPERTIES.—As usually met with in the shops, white hellebore root consists of the rhizome with the radicles attached; it is in pieces of from two to three inches long, about the thickness of the little finger; covered with a rough, dark-brown bark; grayish-white internally. In the fresh state it has a strong, disagreeable smell, which is nearly lost by drying; but it retains the acrid, intensely bitter taste.

CHEMICAL PROPERTIES.—It is composed of a fatty matter, yellow colouring matter, starch, gum, lignin, and an alkaloid on which its acridity depends, and which has been named *veratria* (see page 503), combined with gallic acid *(Pelletier and Caventou).* More recently Simon has announced the discovery of two new vegetable alkaloids in white hellebore root, one of which he has called *Jervin,* and the other *Barytin.* The acridity of the root is extracted both by water and by alcohol.

THERAPEUTICAL EFFECTS.—The local action of white hellebore root is powerfully irritant. Snuffed up the nostrils it produces a copious flow of mucus with much sneezing; wherefore it was once used as an errhine—a class of medicines now quite obsolete—two or three grains of the root, finely powdered and mixed with ten or twelve grains of powdered liquorice-root, orris-root, or starch, being employed every evening; it enters into the composition of most cephalic snuffs. White hellebore root, when taken internally, is a powerful stimulant, even in not very large doses causing irritation and inflammation of the stomach. It was at one time much used in nervous affections and in chronic cutaneous diseases, both externally and internally; its employment in gout has been replaced by colchicum, and its application for the destruction of pediculi by stavesacre; so that at present it is scarcely put to any use: the dose of the powder is from gr. ij. to gr. v. cautiously increased.

* *Vinum Veratri.* (White hellebore, sliced, ℥viij.; sherry wine, Oij.; macerate for seven days and filter.) Dose, min. v. to min. x. In poisoning with white hellebore, the same treatment should be used as in poisoning with colchicum (see page 142).

VINUM XERICUM. *Sherry.* (A Spanish wine.)

CHARACTERS.—Pale yellowish-brown; containing about seventeen or eighteen per cent. of alcohol.

It would be quite foreign to the scope of this work to enter into any detailed account of the mode of preparation, or peculiar properties of the almost innumerable varieties of wine that are to be met with. The observations to be made will therefore refer to wines generally.

PROPERTIES.—Wine is a transparent liquid, of a yellowish, reddish-yellow, or deep red colour. It has a peculiar, agreeable odour *(bouquet)* and taste; both odour and taste vary exceedingly. Wine consists of water, alcohol, tartaric and acetic acids, bitartrate of potash, tartrate of lime, extractive matter, colouring matter, vegeto-animal matter, and a peculiar volatile oil or rather ether, which has been named œnanthic ether. In the white wines, tannin and colouring matter are less in proportion than in the red wines. The quantity of alcohol which is present in wine varies exceedingly, some of the weaker German wines containing only 6·90 per cent. by weight of alcohol, while strong Port wine contains 17·10 per cent. (Christison).

ADULTERATIONS.—The only adulterations of wine, which are of importance with reference to its use in medicine, are the additions of lead or of lime which are sometimes used for the purpose of correcting acescency. The former is detected by the black precipitate which is produced on the addition of sulphuretted hydrogen. The latter by the white precipitate formed with solution of oxalate of ammonia.

THERAPEUTICAL EFFECTS.—Wine is an excellent stimulant in the advanced stages of typhus fevers, being generally better suited for this purpose than any other alcoholic liquid. Its use is particularly called for when delirium is present with much sinking of the vital powers; or should the nervous symptoms, as singultus, subsultus tendinum, and sleeplessness unaccompanied by any local inflammation or congestion predominate. The use of wine in fever is not contra-indicated, as has been stated by many, when the tongue is dry or black, when the eyes are red or suffused, or when there is morbid heat of the surface; as wine often proves of great benefit when one or even more of these symptoms is present. Wine is also given with much advantage in convalescence from acute diseases, in chronic debility, especially when it is caused by excessive discharges, in mortification unaccompanied by inflammatory symptoms, in erysipelas and in tetanus. When any local congestion or inflammation is present or may be apprehended, the administration of wine in the treatment of disease is for the most part calculated to do mischief.

Although Sherry is the only wine officinal in the Pharmacopœia, Port is more generally employed in medicine: Claret and Madeira are also used. When its greater strength and its astringency are not objectionable, Port wine, when it can be had pure, now a matter of great difficulty, is always to be preferred. Madeira and Claret are often inadmissible on account of their acidity; but should this not be a contraindication to their use, the former is well adapted for debilitated or broken-down habits; the latter when the employment of stronger wines might prove injurious. Sherry is chiefly employed in the preparation of the medicated wines, but Cape wine is usually substituted by druggists on account of its cheapness; in a dietetical point of view, Sherry is the wine in most general use in the British Islands, and that calculated to agree best with most constitutions.

DOSE AND MODE OF ADMINISTRATION.—The quantity of wine which should be administered in the treatment of disease varies so exceedingly in different cases, that it is quite impossible to lay down any general rule thereon. From f℥viij. to f℥xx. is the quantity usually given in the 24 hours, and it should be borne in mind that there is a great tolerance of wine in disease. As an injection for the radical cure of hydrocele, two parts of port wine are diluted with one of water.

ZINGIBER. *Ginger.* Zingiber officinale, *Roscoe, Trans. Linn. Soc.* Plate 11, *Woodv. Med. Bot. (Amomum Zingiber.)* (The rhizome, scraped and dried; from plants cultivated in the West Indies, India, and other countries.) Supposed to be originally a native of the East Indies; at present cultivated in most tropical countries. It belongs to the Natural family *Zingiberaceæ,* and to the Linnæan class and order *Monandria Monogynia.*

BOTANICAL CHARACTERS.—Stem, annual, two to three feet high, cylindrical, invested with the smooth sheaths of the leaves; leaves, linear-lanceolate, smooth; flowers, yellowish with purple lips, in cone-shaped, radical or rarely terminal, solitary spikes; fruit, a 3-celled capsule.

PREPARATION.—The rhizome or root-stalk, which is biennial, is dug up at the commencement of the second year of its growth, cleaned, scalded with boiling water, and dried in the sun, when it constitutes what is called black ginger; to prepare white ginger, the rhizome is not scalded, but the outer coats are removed by scraping.

CHARACTERS—*Of the Rhizome.* Irregular-lobed decorticated pieces, three or four inches long, subcompressed, yellow-white but not chalky on the surface, with a short, mealy fracture, hot taste, and agreeable aroma. Powder yellowish-white.

PHYSICAL PROPERTIES.—As met with in commerce, ginger is in various-sized, flattened pieces, knotty, palmated, hard and compact. *Black ginger* is of a dirty gray colour, and rugose externally, yellowish brown and stringy within. *White ginger* is whitish or pale yellow externally, pale buff within, with a somewhat starchy texture.

The finer sorts of ginger are firm, sound, and heavy, and have a peculiar, rich, aromatic odour, and a warm, very pungent taste.

CHEMICAL PROPERTIES.—Ginger contains a pale yellow, volatile oil, an acrid soft resin, a sub-resin, gum, starch, extractive, nitrogenous matter, &c. Its properties, which depend chiefly on the volatile oil and soft resin, are extracted by water and by alcohol.

THERAPEUTICAL EFFECTS.—Ginger is a powerful aromatic stimulant; when taken in moderation increasing remarkably the tone of the digestive organs, and being consequently much employed as a condiment. In medicine it is principally used to give warmth and flavour to other drugs. Ginger acts as a special stimulant to the urino-genital mucous membrane, its use should be therefore avoided by persons who have any tendency to stricture of the urethra. As a local stimulant it is chewed in paralysis of the tongue, relaxation of the uvula, &c.; the powder made into a paste with boiling water and spread on linen is a speedy rubefacient.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. v. to gr. xxx.

Syrupus Zingiberis. Syrup of Ginger. (Take of tincture of ginger, one fluid ounce; syrup, seven fluid ounces. Mix with agitation.) Dose, f℥ss. to f℥ij.

Tinctura Zingiberis. Tincture of Ginger. (Take of ginger, bruised, two ounces and a half; rectified spirit, one pint. Macerate the ginger for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.) Dose, min. xv. to f℥j.

* *Essence of Ginger* commonly kept in shops is nothing more than a very strong tincture.

CHAPTER XIX.

STIMULANTS, SPECIAL.

ALL who look to a merely scientific classification of the Materia Medica object to the use of the terms *Specifics* and *Alteratives*, inasmuch as they are only employed to define agents with the rationale of the remediate modes of action of which we are unacquainted. While this may be fully admitted, the practical utility of such a nomenclature is, nevertheless, so great and so generally understood, that until medical science has arrived at a much more advanced stage of progress than has been as yet attained, it would, I think, be foolish to discard these terms in consequence of any theoretical ideas. I have, therefore, united both in the same chapter under the above title. In this division of medical agents, then, will be included those substances which, by a *special* or peculiar action on individual organs, or on the system generally, produce remediate effects. Those of them which give rise to some alteration, not well understood, in the nature or quality of vital action, are termed *alteratives;* while those which possess a special influence in the treatment of certain diseases are denominated *specifics.* Many alteratives and specifics have been already described in other classes of medicines, but the articles contained in this chapter cannnot, with a regard to accuracy or convenience in arrangement, be included in any of them ; inasmuch as the nature of the primary influence which some of these agents exert on the animal economy has not been satisfactorily ascertained; and others possess a peculiar influence over *certain organs* or *diseases* chiefly :—as examples of the former I may refer to Mercury, Iodine, and Gold: of the latter, to Nux-vomica, Cubebs, and Copaiba.

* ACTÆA RACEMOSA. *Cimacifuga Racemosa. Black Snake Root,* or *Cohosh,* Willd. Sp. Plant. ii. 1139. An inhabitant of the United States, growing in the shady woods from Canada to Florida, belonging to the Natural family *Ranunculaceæ,* and to the class and order *Polyandria Di-Pentagynia.*

BOTANICAL CHARACTERS.—A tall stately plant, stem herbaceous, six to eight feet high, root perennial. Leaves large, ternately decomposed. Flowers white, small, racemose, calyx white, four leaved, deciduous; petals minute, shorter than the stamens: pistil consisting of an oval germ, and a sessile stigma. Fruit, an ovate capsule, containing many flat seeds.

PHYSICAL AND CHEMICAL PROPERTIES.—The root (the part used) is thick, irregularly bent, varying in length from two to three or more inches, half an inch to an inch in thickness, rough, jagged, dark brown in color, peculiar, rather disagreeable odour, lost on keeping; taste rather acrimonious and astringent; boiling water extracts its virtues; according to an analysis of Mr. Tilghman of Philadelphia, it contains gum, starch, sugar, resin, wax, fatty matter, tannic and gallic acids, black coloring matter, green coloring matter, lignin, and salts of potassa, lime, magnesia, and iron. It is also supposed to contain some volatile principle not as yet insulated.

THERAPEUTICAL EFFECTS AND USES.—The physiological effects produced by actæa are not very marked; properties of a sedative character have been ascribed to it. Dr. Hilduth of Ohio found it in large doses to produce vertigo, impaired vision, nausea and vomiting, but no alarming narcotic symptoms; mild tonic properties have also been ascribed to it, as also special stimulant action over the uterus, and the secretions of the skin, kidneys, and bronchial mucous membrane. In America it enjoys reputation in the treatment of chorea, affections of the lungs resembling phthisis, hysteria, dropsy, but especially in the treatment of acute rheumatism, in which latter disease it has been found of great service by Professor Simpson of Edinburgh. Its use in my hands has not been attended with the happy results attributed to it by other practitioners; still I consider it one of those remedies which merit a more extended clinical investigation. Therefore I have introduced this notice of it, although it is not officinal in the British Pharmacopœia.

DOSE AND MODE OF ADMINISTRATION.—Either in the form of powder, decoction, tincture, or extract. Dose of the *powder*, gr. xv. to gr. xxx.

* *Decoctum Actææ. Decoction of Actæa.* (Take of the root, bruised, one ounce; water, one pint; boil for ten minutes, and filter.) Dose, f℥j. to f℥ij.

* *Tinctura Actææ. Tincture of Actæa.* (Take of the root bruised, four ounces; proof spirit, a sufficiency; macerate the root in a pint of the spirit for twenty-four hours, then transfer all to a percolator, adding spirit as may be required, and recover a pint of tincture.) This is a much stronger tincture than that usually met with in British pharmacy, but is about the strength of that used in America. Dose, f℥ss. to f℥ij.

Of those preparations the powder or tincture should be preferred: a resinous principle, obtained by precipitation on the addition of tincture to water, is, according to Dr. Wood, used by the American *Eclectics* in grain or two grain doses, under the incorrect title of *Cimacifugin.*

* AMMONIÆ ARSENIAS.—*Arseniate of Ammonia* ($HO2NH_4O$ $AsO_5=176$).

PREPARATION.—This compound is readily prepared by saturating a solution of arsenic acid with ammonia, taking care that the alkali be in excess, evaporating and crystallizing.

PROPERTIES.—Arseniate of ammonia crystallizes in white, transparent, small rhomboidal prisms. It is a neutral salt, and is soluble in water and in alcohol.

THERAPEUTICAL EFFECTS.—Arseniate of ammonia has not as yet been much employed in this country; but it has been for some time used in France as an internal remedy in the treatment of obstinate cutaneous diseases, particularly those of a scaly character. I have myself employed it very extensively with excellent effect, chiefly in cases where other arsenical preparations have failed to effect a cure, and in languid constitutions.

DOSE AND MODE OF ADMINISTRATION.—From 1-12th to 1-10th of a grain three times a day in pill; or the following solution, first proposed by Biett, may be prescribed:—

* *Solution of Arseniate of Ammonia.* (Arseniate of ammonia, gr. iss.; distilled water, f℥iij.; spirit of angelica, fℨvj.; dissolve.) Dose, fℨj. to fℨiij. in some aromatic water.

AMMONIÆ BENZOAS. *Benzoate of Ammonia.* $NH_4O,C_{14}H_5O_3$ $+HO(=148)$.

PREPARATION.—(Take of solution of ammonia, three fluid ounces; benzoic acid, two ounces; distilled water, eight fluid ounces. Dissolve the benzoic acid in the solution of ammonia previously mixed with the water; evaporate at a gentle heat; and set aside that crystals may form.)

EXPLANATION OF PROCESS.—This is a case of simple union of the acid with the base in virtue of which the salt is formed, and on evaporation it crystallizes out of the concentrated solution.

CHARACTERS.—In colourless laminar crystals, soluble in water and alcohol. It gives a bulky yellow precipitate with persalts of iron. Its aqueous solution when heated with caustic potash evolves ammonia, and when acidulated with hydrochloric acid gives a deposit of benzoic acid.

TEST.—When heated, it sublimes without any residue.

PHYSICAL AND CHEMICAL PROPERTIES.—These crystals are colourless and shining, taste not disagreeable, odour slightly that of benzoic acid, soluble in twelve parts of rectified spirit and in sixty of water. With the persalts of iron we get a bulky reddish-yellow precipitate —benzoate of iron; its other properties are as described in the pharmacopœial characters.

THERAPEUTICAL USES.—This medicine appears to possess special stimulant action over the mucous membrane of the lung and of the kidney; it also produces with uric acid a change similar to that effected by benzoic acid, to which, in consequence of its greater solubility, it should be preferred (see *foot note*, p. 338). It has been employed by Dr. Seymour in gout; and has also been beneficially employed in catarrhal affections of the bronchial mucous membrane, and of the bladder with phosphatic deposits in the urine; its value in removing the discoloration of the skin in jaundice has been signalized; restoring also to the fæces their natural colour.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. in water, to which some flavouring syrup may be added.

AMMONIÆ PHOSPHAS. *Phosphate of Ammonia.* $3NH_4O,PO_5+5HO(=194)$.

PREPARATION.—Take of strong solution of ammonia, eight fluid ounces; dilute phosphoric acid, twenty fluid ounces. Add the solution of ammonia to the phosphoric acid; dissolve by a gentle heat the crystalline precipitate which forms; and set the solution aside that crystals may again form. Remove the crystals, and, having dried them quickly on filtering paper placed on a porous brick, preserve them in a stoppered bottle. The mother liquor, if evaporated to half its bulk, will upon being mixed with two fluid ounces of strong solution of ammonia give additional crystals.

EXPLANATION OF PROCESS.—A simple case of union of the acid with the base: thus, $3NH_4O+3HO,PO_5+2HO=(3NH_4O,PO_5+5HO)$.

CHARACTERS.—In colourless transparent prisms, which upon exposure to air lose water and ammonia and become opaque; soluble in water, insoluble in rectified spirit. It evolves ammonia when heated with caustic potash; gives a canary-yellow precipitate with nitrate of silver; and when acidulated with hydrochloric acid is not affected by sulphuretted hydrogen.

TESTS.—If twenty grains of this salt be dissolved in water, and the solution of ammonio-sulphate of magnesia be added, a crystalline precipitate falls, which, when well washed upon a filter with a solution of ammonia diluted with an equal volume of water, dried, and heated to redness, leaves 11·44 grains.

CHEMICAL PROPERTIES.—This salt is insoluble in spirit, but very soluble in water, requiring only two parts of water for its solution. It evolves ammonia on being heated with caustic potash, the potash replacing the ammonia in the salt, thus $3NH_4O,PO_5+3KO=3KO,PO_5+3NH_4O$. The canary-yellow precipitate produced on the addition of nitrate of silver is phosphate of silver (see p. 186). The *test* is directed with the view of ascertaining the per centage of phosphoric acid present; on the addition of the ammoniaco-sulphate of magnesia to its solution, the resulting ammoniaco-magnesian phosphate precipitates; its production is accounted for by two atoms of magnesia replacing two out of the three ammonias in the phosphate of ammonia, and thus developing a salt the composition of which is one of ammonia, two of magnesia, and one of tribasic phosphoric acid ($NH_4O,2MgO,PO_5$); the ammonias thus set free unite with the sulphuric acid to form sulphate of ammonia, which is held in solution; this equation explains the entire reaction, $2(MgOSO_3+$

$NH_4OSO_3) + 3NH_4O,PO_5 = (NH_4O,2MgO,PO_5) + 3NH_4OSO_3$. The ammoniaco-magnesian phosphate, on being subjected to a red heat, not only parts with its ammonia and water of crystallization, but the character also of the phosphoric acid is altered, being changed from a *tribasic* into a *bibasic* acid, and the resulting salt being the bibasic phosphate *(pyrophosphate)* of magnesia ($2MgO,PO_5$); the 11·44 grains resulting from such treatment of 20 grains of the salt, being in strict proportion to the chemical equivalents.

THERAPEUTICAL EFFECTS.—The most important property possessed by this salt is the solvent action it exerts over urate of soda; an action which has naturally suggested its employment in cases where this morbid secretion abounds, as in gout, and in uric acid calculi; its use in rheumatism also has been advocated. Dr. Buckler of Baltimore has brought forward many cases of gout and rheumatism in which its exhibition apparently had been attended with advantage, and Dr. Garrod speaks favourably of its remedial powers; yet in the hands of other practitioners the success attending its exhibition has not been equally satisfactory. It is one of those medicines which may be still considered as upon their trial, and further clinical research is required to test its value.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xl. in water, to which some flavouring syrup may be added.

* AMMONII BROMIDUM. *Bromide of Ammonium.* NH_4Br (=98).

PREPARATION.—Bromide of ammonium can be prepared in a manner perfectly analogous to that in which bromide of potassium is prepared, substituting only for the liquor potassæ employed in that preparation liquor ammoniæ. For the reaction that ensues I must refer the reader to the explanations given under the head of *Potassii Bromidum.*

PHYSICAL PROPERTIES.—A white, or, as occasionally met with, lightish-brown salt, generally found in small crystals, of slight odour, and not unpleasant, at first cold, and then slightly pungent taste, soluble in water, very sparingly so in spirit.

CHEMICAL PROPERTIES.—This salt will be recognized as one of ammonia by rubbing it up in a mortar with quick lime, when the base will be set free, recognizable by the tests for ammonia already described (see p. 4), and as one of bromine by the tests hereafter to be described (see Potassii Bromidum).

THERAPEUTICAL USES.—The best description that has been as yet given of the medicinal properties of this salt is that it is a *laryngeal anæsthetic;* producing remarkable sedative effects over convulsive and irritant affections of this organ. Thus it has been used extensively to allay spasmodic affections of the muscular striæ of the respiratory system; its value in that most distressing affection, hooping cough, in controlling the paroxysmal exacerbations, being much insisted upon by Dr. Gibbs and many other observers. Dr. Griffith speaks highly of its value in full doses in the treatment of uterine and ovarian irritations, a value which in his opinion justifies its being called the utero-ovarian specific. In laryngoscopic examinations its preliminary employment has been suggested as useful in establishing a tranquil condition of the parts, and so a tolerance of the instrument. In the irritative hacking cough of phthisis its use has been occasionally found of advantage; in fact, although not officinal in our Pharmacopœia, many other preparations have found their way into it of far more equivocal pretensions.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xxx. dissolved in water, to which some flavouring syrup may be added. Dr. George Harly, who has employed it with great success in the treatment of hooping cough, states the dose to be one grain for each year the patient is old.

* ARSENICI IODIDUM. *Iodide of Arsenic. (Teriodide of Arsenic.* $AsI_3 = 456$).

PREPARATION.—"Iodine, ʒij.; arsenic, finely powdered, gr. lx; mix together and maintain in a state of fusion for some time in a digesting flask upon a sand-bath, at as low a temperature as possible; treat the mixture when cool with four ounces of cold alcohol, and pour off the solution from the residual arsenic; then pass into it a stream of arseniuretted hydrogen gas, until its colour is reduced to a wine yellow; and finally, evaporate immediately at a temperature not exceeding 122° F., until it crystallizes." GOPEL.

PROPERTIES.—This is an orange-red powder, odourless and tasteless. Exposed to the air it rapidly undergoes decomposition, iodine escaping and metallic arsenic being left; it is volatilized by heat. Iodide of arsenic is soluble in boiling alcohol, from which, as the alcohol cools, it is deposited in bright crystals. It is decomposed by water into free iodine, hydriodic and arsenious acids. Its composition is AsI_3.

ADULTERATIONS.—As met with in the shops, this preparation frequently contains uncombined metallic arsenic, which may be distinguished by the naked eye.

THERAPEUTICAL EFFECTS.—Iodide of arsenic is employed internally with much benefit in the treatment of chronic cutaneous diseases, particularly in the various forms of psoriasis and chronic eczema, especially when occurring in scrofulous habits, and in porrigo; in all of which I have used it extensively and with great success, even in very inveterate cases. Like other preparations of arsenic, its use must be continued for some time after the disease is cured, in order to prevent a relapse. In some cases in which the medicine had been taken daily for five or six weeks, the patients complained of soreness of the eyes, headache, or dryness of the mouth and fauces, which quickly disappeared on omitting the use of the remedy for a few days. It is administered with much benefit in the treatment of cancer, and, in conjunction with the use of an ointment containing iodide of lead as an external application, has produced excellent effects in the hands of many practitioners. On the continent it has been also employed as a topical application in the form of ointment, but its external use is not unattended with danger.

DOSE AND MODE OF ADMINISTRATION.—Iodide of arsenic should be at first given in doses of 1-10th of a grain, which may be cautiously increased to 1-4th of a grain three times a day. It is best administered in the form of pill made with conserve of roses, or with hard manna.

INCOMPATIBLES.—Acids; acidulous and metallic salts.

* ARSENICI ET HYDRARGYRI HYDRIODATIS LIQUOR. *Solution of Hydriodate of Arsenic and Mercury.* (Syn.: *Donovan's Solution.*)

PREPARATION.—Take of pure arsenic, in fine powder, gr. vj.; pure mercury, gr. xvj.; pure iodine, gr. lss.; alcohol, f℥ss.; distilled water, f℥ix. 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.

PROPERTIES.—This solution is of a pale greenish-yellow colour, odourless, with rather a styptic taste. Each f℥j. contains about $\frac{1}{12}$th of a grain of arsenic, $\frac{1}{4}$th of a grain of mercury, and $\frac{3}{4}$ths of a grain of iodine.

THERAPEUTICAL EFFECTS.—Donovan's solution, as this compound is ordinarily termed, has been found useful by many practitioners in the treatment of chronic cutaneous diseases, especially those of a scaly character, or in which the scalp is the seat of the disease. It has been also employed with benefit in venereal eruptions, both papular and scaly, in lupus, in impetigo, in pityriasis, etc. Its efficacy in these obstinate affections is supposed to be now so well established, that it was admitted into the last edition of the Dublin —although omitted perhaps unwisely from the British—Pharmacopœia. For further information on this subject, I must refer to Mr. Donovan's excellent memoirs in the 16th, 18th, and 22nd vols. of the *Dublin Journal of Medical Science.* In my own practice, however, I must confess that except in cases where the cutaneous disease is complicated with a syphilitic taint (a class of cases in which I must acknowledge having made many a happy hit with it), I have found it fail in effecting a cure, and in some instances I have seen it produce injurious constitutional effects; and when this occurred, the disease for which it was administered was invariably aggravated. This I have been inclined to attribute to the presence of the mercury in it, and I have therefore latterly substituted for this solution, a compound in which the mercury is replaced by iodide of potassium (see Arsenic, in the chapter on *Tonics*).

DOSE AND MODE OF ADMINISTRATION.—Min. x. to min. xxx. three times a day. It should be administered largely diluted with distilled water. The external use of the medicine in the form of lotion (f℥j. to f℥j. of distilled water) has been combined with its internal administration.

INCOMPATIBLES.—Acids; most salts; opium; and the salts of morphia.

* AURUM. *Gold.* Au=196·5. This metal was introduced into the last edition of the London Pharmacopœia, being used as a test, but none of its preparations are employed in this country in the practice of medicine. Although neither gold nor its salts are officinal in the British Pharmacopœia, they are frequently administered on the continent, and their virtues highly spoken of; and although it has been stated by many that metallic gold is perfectly inert, a powder of gold *(Pulvis auri)* is officinal in the Parisian Codex. It is prepared in several ways: one of the simplest and best is to rub any quantity of leaf-gold with 7 or 8 times its weight of sulphate of potash in an earthenware or glass mortar, as long as any fragments of the leaves are visible; and then to wash well with warm water, which dissolves out the sulphate of potash, and leaves the gold in the form of a fine powder. Powder of gold is said to be a much more effectual remedy both in primary and secondary syphilis than mercury; it is peculiarly applicable to those cases in which mercury is found to aggravate the disease, or in which the symptoms depend on the excessive use of preparations of that metal; in some instances it produces increased flow of saliva, without affecting the teeth, cheeks, or gums, as that metal does. It has been also used in chronic cutaneous diseases, in scrofulous affections, and in glandular enlargements. Powder of gold may be given internally in doses of gr. ¼ or gr. ½, gradually increased to gr. iij.; it should be made into pill with conserve of roses. It is, however, generally introduced into the system by means of friction on the gums and tongue, or applied on a portion of the skin deprived of the epidermis; it is also used as a local application to chancres in their primary stage. For these purposes either of the following preparations may be employed:—

* *Syrup of Gold.* (Powder of gold, gr. xxiv.; simple syrup, f℥j.; mix.)

* *Ointment of Gold.* (Powder of gold, gr. j.; axunge, gr. xv.)

* AURI IODIDUM.—*Iodide of Gold.* Au_2I=520.

PREPARATION.—(French Codex.) "Pour a solution of chloride of gold into a solution of hydriodate of potash as long as any precipitate falls; filter, and wash the powder well with alcohol, to dissolve out the excess of iodine; and then dry it."

PROPERTIES.—Iodide of gold is a greenish-yellow powder, insoluble in cold, and very sparingly soluble in boiling water. Exposed to a heat of about 300° F. the iodine is driven off, and metallic gold left. It is composed of 2 equivalents of gold and 1 of iodine, Au_2I (Graham).

THERAPEUTICAL EFFECTS.—This preparation is a very active poison, more so than corrosive sublimate; it is employed in venereal and scrofulous affections internally, in doses of 1-15th to 1-10th of a grain, in the form of powder, or of pill, combined with powdered gum arabic; it is decomposed by most vegetable substances.

* AURI PERCHLORIDUM.—*Perchloride of Gold. Sesquichloride of Gold.* $Au_2Cl_3 = 499 \cdot 5$.

PREPARATION.—(French Codex.) "Pure laminated gold; and nitric acid, of each, one part; hydrochloric acid, two parts; dissolve the gold in the mixed acids with a gentle heat, evaporate till the solution begins to emit chlorine; and set it aside to crystallize by cooling."

PROPERTIES.—Sesquichloride of gold is in the form of needle-shaped, prismatic crystals, of a ruby-red colour; it is inodorous, but has a very styptic, disagreeable taste. In dry air it remains unaltered, but deliquesces rapidly in damp air. Water, alcohol, and ether dissolve this salt; the solution is of a yellow colour, and is acid to litmus paper; exposed to the light, although kept in stoppered bottles, it is decomposed, and gold deposited on the surface. Sesqui-chloride of gold is composed of 2 equivalents of gold and 3 of chlorine, Au_2Cl_3 (Graham).

THERAPEUTICAL EFFECTS.—This salt is the most generally employed of the preparations of gold. It is exceedingly active; so small a dose as 1-15th of a grain has, in the hands of Cullerier, at the second dose produced gastric irritation, dryness of the tongue, redness of the throat, colic, and diarrhœa. It is employed, it is said with much success, in the treatment of syphilitic diseases both primary and secondary, particularly in cases where mercurial preparations fail to do good. It has been also used in scrofulous and herpetic affections, in cancer, &c. As an external application, it has been employed as a caustic to open cancer, to lupus, and to obstinate syphilitic ulcerations.

DOSE AND MODE OF ADMINISTRATION.—It may be given in doses of 1-20th to 1-15th of a grain, once a-day, made into pill with starch, or dissolved in distilled water. The same quantity intimately mixed with gr. v. of starch may be applied by friction to the gums and tongue.

* *Caustic of Recamier*, (Chloride of gold, gr. vj.; dilute nitro-hydrochloric acid, f℥j.; dissolve.) Applied by means of a piece of lint dipped in it; the eschar which forms falls off in a few days, and leaves a clean, healthy surface underneath.

* *Sodii Auro-terchloridum*, FRENCH CODEX. (Chloride of gold, 85 parts; chloride of sodium, 16 parts; dissolve in a small quantity

of distilled water; concentrate with a gentle heat, till a pellicle begins to form on the surface; then set aside to crystallize.) Chloride of gold and sodium crystallizes in long four-sided prisms, of an orange-yellow colour; it is employed in the same manner and in the same doses as sesqui-chloride of gold. It is less expensive, and nearly, if not quite as active. An ointment of it, prepared by mixing with trituration, 1-10th of a grain with gr. xxxvj. of axunge, may be applied to the skin denuded of the epidermis.

INCOMPATIBLES.—Most metals, and their salts; the alkalies; sugar; gum; charcoal; tannin; extractive.

In poisoning with chloride of gold, or with chloride of gold and sodium, the same treatment should be adopted as in poisoning with corrosive sublimate.

* AURI PEROXYDUM.—*Peroxide of Gold. Sesqui-oxide of Gold. Auric acid.* $Au_2O_3 = 417$.

PREPARATION.—(French Codex.) "Chloride of gold, 1 part; calcined magnesia, 4 parts; water, 40 parts; boil gently for a short time; wash the precipitate repeatedly with water until the washings no longer precipitate with solution of nitrate of silver, and then digest in cold, diluted nitric acid, to dissolve out the magnesia; dry the residuum without heat and in the dark."

PROPERTIES.—Auric acid is of a chestnut-brown colour, becoming yellowish when moistened. It is insoluble in water; is rapidly decomposed by exposure to light or heat; and combines with alkalies to form salts. It is composed of 2 equivalents of gold, and 3 of oxygen, Au_2O_3 (Berzelius).

THERAPEUTICAL EFFECTS.—It is used in the same cases as the other preparations of this metal, and has been especially recommended by M. Legrand for the treatment of scrofulous diseases of the bones. Dose, 1-10th of a grain to 1-4th of a grain.

* *Pills of Oxide of Gold,* MAGENDIE. (Oxide of gold, gr. vj.; extract of mezereon, ℈ij.; divide into 60 pills.) Dose, 2 to 10 daily.

BROMUM.—*Bromine.* Br = 80. This elementary fluid body was originally introduced into the London Pharmacopœia merely as being employed in the preparation of *Bromide of potassium;* the salt, however, and consequently the element itself, were omitted from the last edition, their employment in medicine having, until very recently, nearly fallen into disuse. Inasmuch, however, as it has reappeared in Appendix A of the British Pharmacopœia, being introduced there for the purpose of making the bromide of potassium, which is officinal, I think it proper to give some slight notice of *bromum* itself, which was originally discovered by Balard of Montpelier, in 1826.

PREPARATION.—It is obtained from sea water, and from the waters of many mineral springs—in which it exists in the forms of bromide of magnesium and bromide of sodium,—by first saturating with chlorine gas to separate it from the base, adding ether which dissolves out the bromine, and then separating it from the ether by means of solution of caustic potash, which combines with the bromine, forming bromide of potassium and bromate of potash; from these salts it is obtained by a process similar to that for procuring iodine. Of late years it has been prepared in large quantities in the United States, having been discovered in many of the brine springs throughout the state of New York. It should be preserved under a layer of water in a stoppered bottle.

PHYSICAL PROPERTIES.—At ordinary temperatures, bromine is a heavy, dark reddish-brown liquid, of a hyacinth-red colour when viewed by transmitted light. Its odour resembles that of chlorine, but it is much stronger and more disagreeable, whence its name (*Βρῶμος*, fetid). Its taste is very acrid. Specific gravity, 2·966.

CHEMICAL PROPERTIES.—Bromine is an elementary substance, It is scarcely soluble in water, water dissolving but two grains to the ounce at 60° F., and its solubility is not sensibly augmented by heat; it is soluble in alcohol, and still more so in ether; and is very volatile, one drop filling a large flask with its vapour; it boils at a temperature of 145° F. Bromine bleaches vegetable colours like chlorine. It combines with most metals, forming with them bromides.

TESTS.—Specific gravity, 2·966. Agitated with solution of soda in such proportion that the fluid remains very slightly alkaline, it forms a colourless liquid, which, if coloured by the addition of a small quantity of chlorine, does not become blue on the subsequent addition of starch.

ADULTERATIONS.—It may contain iodine, against which impurity the pharmacopœial test is directed; were it present on the addition of the chlorine it would be set free, and would strike a blue colour with the starch *(Iodide of Starch)*.

THERAPEUTICAL EFFECTS.—Until recently it was as a substitute for iodine that bromine was employed in medicine, with which indeed it appears to be closely allied in its physiological effects; thus it has been used in all cases where iodine is indicated; and its use and that of its salts has been had recourse to in cases where iodine from prolonged employment seemed to have lost its effect. In America it is largely used as a deodorizer, to purify the atmosphere of hospitals and of sick rooms where erysipelas, scarletina, gangrene, &c., have been prevalent.

DOSE AND MODE OF ADMINISTRATION.—It is seldom used in the uncombined state unless as a deodorizing agent; but the following solution has been employed by M. Pourche as a substitute for tincture of iodine:—bromine, one part; distilled water, forty parts; dissolve. Dose, min. v. to min. vj. in some aqueous vehicle three or four times a day. For external use a preparation four times the strength of this may be employed. Professor Smith of Louisville University, U.S., has proposed the following formulary for preparing a solution that may be used as a deodorizing agent. "Bromine, one troy ounce; bromide of potassium, 160 grains; distilled water, sufficient to make up four fluid ounces." This solution can be diluted in all proportions with water. The *bromide of potassium* and *bromide af iron* will be described hereafter. The other combinations of bromine which have been used in medicine are the following:—*bromide of ammonium*, already described (see p. 523), *bromide of barium*, which is soluble in water, is given in doses of one to five grains three times a day: the ointment is prepared by combining it with lard in the proportion of one part to ten. *Bromide of calcium* is prescribed in the form of pill made with conserve of roses; the dose of it is from three to ten grains. Two *bromides of mercury* have been used: the first, a sub-bromide, is a white insoluble powder; the dose of it is one to two grains daily; the second, a bromide, is fusible and volatile, and soluble both in water and alcohol; its dose is 1-16th of a grain, gradually increased to 1-4th of a grain daily.

COPAIBA. *Copaiva.* Copaifera multijuga, *Hayne, Darstellung;* and other species of Copaifera. (The oleo-resin, obtained from the trunk by incision; chiefly from the province of Para in Brazil.)

COPAIBÆ OLEUM. *Oil of Copaiva.* (The oil distilled from Copaiva.) The various species of the genus Copaifera from which the balsam is obtained are natives of South America and the West Indian islands; they belong to the Natural family *Leguminosæ (Fabaceæ,* Lindley), and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—Trees, 20–35 feet high; Leaves, abruptly pinnate; Leaflets, coriaceous, somewhat unequal, ovate; Flowers, in panicles.

PREPARATIONS.—The liquid resin exists in great abundance in the trees; it is procured by making deep incisions into the stem in the hot summer months, when in some instances 12 pounds of juice will exude in three hours. Many trees yield copaiva twice or three times in the year.

CHARACTERS.—*Of the Oleo Resin.* About the consistence of olive oil, clear, light yellow, with a peculiar odour, and an acrid aromatic taste.—*Of the Oil.* Colourless or pale yellow, with the odour and taste of copaiva.

PHYSICAL PROPERTIES.—*Copaiva*, or as it is commonly but improperly called, *Balsam* of Copaiva*, is a transparent, oily liquid, of a pale-yellow colour; inferior kinds are dark yellow. It has a strong, peculiar, and to most persons very disagreeable odour, and a bitter, acrid, very permanent and exceedingly unpleasant taste. Specific gravity, from ·950 to ·966, becoming denser by age.

CHEMICAL PROPERTIES.—Fresh copaiva is composed of 41 per cent. of volatile oil, 51·38 per cent. of hard yellow resin *(copaivic acid)*, 2·18 of brown soft resin, and 5·44 of water (Gerber). Exposed to the air it gradually thickens, and becomes darker coloured. It is insoluble in water, but is completely soluble in alcohol, ether,

---

* In strict pharmaceutical language the term *balsam* is confined to such of the resinous bodies as are known to contain either cinnamic or benzoic acids.

and the fixed and volatile oils. It dissolves magnesia and its carbonate, and forms with them after four or five hours a translucent mass, sufficiently consistent for pills. The volatile oil of copaiva *(Copaibæ Oleum)*, which is officinal in the Pharmacopœia, being an article of the Materia Medica, is obtained by distillation with water. It is transparent and colourless, has a density of 0·878, boils at 473°, and is soluble in alcohol and ether. Its composition is isomeric with that of oil of turpentine, being $C_{10}H_8$. *Copaivic acid* is composed of $C_{40}H_{32}O_4$; it is of a reddish-yellow colour, brittle, with a crystalline fracture; soluble in alcohol, ether, and the volatile and fixed oils; the alcoholic solution reddens litmus paper. By distilling off the oil from copaiva, a brownish, soft, resinous mass is left, which retains somewhat the odour of the balsam; this, which is sold in the shops as Copaiva-resin, is a compound of two resins, the one *Copaivic acid*, which may be dissolved out by rectified spirit, and the other a viscid resinous mass.

TESTS.—Perfectly soluble in rectified spirit. Dissolves one fourth of its weight of carbonate of magnesia by the aid of heat, and remains transparent.

ADULTERATIONS.—Copaiva is very much adulterated, so much so that it is difficult to meet with a perfectly pure specimen. The impurities usually found in it are oil of turpentine, and more recently, as pointed out by Mr. Redwood, the distilled oil of the *Gurjun balsam*—the produce of a species of Dipterocarpus; or some fixed oil, as castor-oil, poppy-seed oil, rape-oil, &c. Oil of turpentine, or any other volatile oil, is readily discovered by the odour, when it is dropped on a heated spatula. The presence of any fixed oil may be detected by the greasy areola which surrounds the spot of resin left, on gently evaporating, over the flame of a lamp, a drop or two of the suspected balsam on unsized paper. To the pharmacopœial may be added Planche's test for the usual adulteration, that with castor-oil,—"pure balsam agitated with solution of ammonia, of the density ·965, becomes clear and transparent in a few moments; but remains turbid if castor-oil be present." These tests are, however, not to be depended on; the only satisfactory means of ascertaining the goodness of copaiva, as has been suggested by Mr. Redwood, being the obtaining the oil by distillation:—pure specimens yield nearly 60 per cent., while those of inferior quality do not afford more than 30.

THERAPEUTICAL EFFECTS.—Copaiva is a special stimulant to the mucous membranes, its action being particularly directed to that of the bladder and urethra. In many instances its administration is followed by a cutaneous eruption which closely resembles urticaria; and when given in large doses it produces vomiting and purging. The principal use of copaiva is in the treatment of gonorrhœa, for which it is undoubtedly the best remedy with which we are acquainted. The practice is still followed by many, of not administering copaiva in this disease, until all inflammatory symptoms are subdued by antiphlogistic treatment. But the majority of surgeons in the present day prescribe it in the very earliest stage, and with the best results; indeed, the earlier it is given, the more speedy and the more effectual will be the cure. In the treatment of gonorrhœa, the use of copaiva should be always continued for 8 or 10 days after the discharge has completely ceased. It has long been a mooted point, whether copaiva and cubebs owe their remedial efficacy in the treatment of gonorrhœa to their general influence over the constitution, resulting upon their absorption and being carried through the system in the course of the general circulation, or to *local* action, being applied directly to the diseased surface through the intervention of the urine. The practical fact that gonorrhœa in the female is far less amenable to treatment by these medicines than in the male subject first gave rise to this question, and this remarkable difference in the amenability to treatment between the two sexes was sought to be accounted for by supporting the view that its action was local, and that inasmuch as in the female the disease is never limited to the urethra, but pervades the greater portion if not all of the vagina, with the entire surface of which the urine does not come into contact, consequently its remedial powers were not to be looked for equally in the female as in the male, a state of affairs which could scarcely exist were its effects purely constitutional. Against this view was most fairly urged the argument, that did its remedial powers depend upon its local action, balsam should produce far more beneficial effects when used as an injection, and thus brought directly into contact with the diseased surface, which, however, repeated clinical experience has proved not to be the fact. Thus the question stood until modern times, when a most curiously interesting case, occurring in the practice of M. Ricord, has proved that the true solution of the difficulty is found in a combination of both theories. A patient who had a fistulous opening in his urethra, a little anterior to the scrotum, contracted gonorrhœa, which affected the canal both anteriorly and posteriorly to the fistulous opening. This man was able to make water either through the fistula, or, by approximating its edges, through the meatus externus. M. Ricord put him on balsam, and directed him to pass all all his water through the fistulous opening, which he did, and, as the result, that portion of the urethra which was posterior to the fistula, and with which the urine came into contact, was cured of the gonorrhœa, whilst that portion of it which was anterior to the fistula remained as bad as ever. He was then directed to make his water through the entire trajet of the urethra, and after a few days the cure was completed. Two other cases subsequently presented themselves to M. Ricord's notice, in which the same condition of parts existed, and in which a like practice was pursued, save that in one copaiva, in the other cubebs, was employed, but in each case with a similar result. The fair inference from all these experiments is that copaiva or cubebs do not solely act either through the constitution, or locally, but that in their passage through the system they *first* undergo some modification, and subsequently produce their specific effects by local action. That they undergo some change in their passage through the system, although we have hitherto failed in ascertaining the nature of that change, is proved by the fact that balsam injections have signally failed to cure gonorrhœa; but that Dr. Hardy has successfully treated many cases of gonorrhœa in the female by making them first swallow the balsam, and subsequently inject the vagina with their own urine. Copaiva has been also employed with benefit in leucorrhœa, in chronic catarrh of the bladder, in the chronic bronchitis of the old and debilitated, especially when the bronchial secretion is profuse, and in chronic dysentery. It communicates a peculiar odour to the urine of patients; and in most cases where the use of this medicine has been continued for a few days, its presence may be recognised in this secretion by heating the urine as in the process for detecting albumen, when it will present a milky aspect; this is a fact to be always borne in mind, as it might lead to error from simulating the presence of albumen in the urine; it may be distinguished from that abnormal product by its not subsiding to the bottom of the vessel after a few hours rest, as albumen does.

DOSE AND MODE OF ADMINISTRATION.—Min. x. to f℥j. repeated three or four times a day. In consequence of its very nauseous taste, a great many ways have been proposed for administering copaiva, such as converting it into an emulsion with yolk of egg, liquor potassæ, or gum arabic; to make a good emulsion with gum arabic and copaiva requires some little experience at the hands of the compounder. The following directions, extracted from *Mohr and Redwood's Practical Pharmacy*, pp. 342–3, will be found to afford a successful result:—

"The mucilage used for making copaiva into an emulsion, ought to be rather thicker than that made according to the Pharmacopœia. On this account, and also with the view of obviating the chance of any acid, caused by fermentation, being present in the mucilage, it is better to use powdered gum-arabic. If the mucilage be ordered, one-third the quantity of gum may be substituted. One drachm of the gum will suffice for three of the oleo-resin, and these may be formed into an emulsion with five or six ounces of water, in the following way. The gum is first triturated with a little water, in a Wedgewood's mortar, so as to form a thick mucilage; to this a few drops of the copaiva are added, and the trituration is continued until the ingredients are completely mixed. More of the copaiva is then put in, and the trituration maintained, until the mixture assumes the condition of a thick emulsion. This must now be diluted with a little water (f℥ss. or ℥j.) before adding more copaiva. Without this dilution the mixture would assume a condition in which it would no longer mix with water. When the whole of the copaiva has been mixed in, with sufficient water to prevent it from becoming too thick, the remainder of the water may be added. Tincture or other ingredients should not be introduced until the emulsion has been completely formed. If, instead of adding the oil gradually to the mucilage, the mucilage were added to the oil, a good emulsion would not be formed; and, although it is desirable on commencing the admixture to have the mucilage rather thick, yet, after part of the oil has been incorporated, some degree of dilution becomes necessary Mucilage answers better than an alkali for making an emulsion with castor oil or copaiva, but the alkali forms the best emulsion with oil of almonds. A good emulsion formed with either of these agents alone, is often caused to separate if the other be added. Thus the emulsion made with oil of almonds and potash will lose, in a great measure, its milky character, on the addition of mucilage. The presence of soluble salts in an emulsion generally tends to cause a separation of the oil. Much spirit will produce a similar effect, especially in emulsions made with mucilage; and acids, in those made with alkali. Alkaline salts, however, in small quantity, are beneficial. Thus, a little borax will often be found greatly to improve an emulsion."

But copaiva appears to me to act with greater certainty, and to cause less disgust when given floating on a wine-glass of water to which a drachm of some aromatic tincture, as that of orange-peel, has been added. It is sometimes prescribed in the form of pill, prepared by boiling the balsam with calcined magnesia or with hydrate of lime; a sufficient degree of consistency will be obtained in 4 or 5 hours with the latter, while from 12 to 15 hours will be required to produce the same result with the former. The process of M. Thierry is as follows:—Rub together in a marble mortar 15 parts of *pure* copaiva, and 1 part of hydrate of lime (or 2 parts of calcined magnesia); put the mixture over a water-bath, and stir from time to time till the lime has disappeared; keep up the fire for 4 hours, or for 15 hours if magnesia be used. The mass may be divided into gr. vj. pills, of which from 6 to 12 may be taken two or three times daily.

More recently copaiva has been administered enclosed in gelatine capsules, for preparing which the following method is followed:— the polished bulbous extremities of iron rods are oiled with almond oil, and then dipped into a warm concentrated aqueous solution of ordinary or bleached gelatine, which is of the consistence of thick honey; they are then rotated quickly till the gelatine congeals, when the capsules are to be removed gently with three fingers, and laid on a loose hair-sieve to dry; when perfectly dry they are filled to the margin by means of a glass drop tube with copaiva, and the mouth closed with a little of the warm solution of gelatine (*Steege*). *Gelatine capsules of copaiva* contain each about gr. x. of balsam; but a spurious sort is very commonly sold in which the capsules are filled with train oil.

M. Jozeau has recently proposed to administer copaiva in the form of saccharated capsules in the treatment of gonorrhœa; these he terms *Copahine-Mège*, because M. Mège was associated with him in their preparation; they are stated not to occasion nausea, sickness, or purging, and their therapeutical efficacy has now been well proved. They are prepared as follows:—Copaiva is surcharged with oxygen by means of nitric acid, the latter being added in proportions varying with the copaiva acted upon. It is then well washed with water to remove all traces of the acid, which is effected when it no longer reddens litmus paper. A tenth part of cubebs in fine powder, the same quantity of carbonate of soda, and a sixteenth part of calcined magnesia are added to it; the mixture is allowed to stand until it is quite solidified, and then made into small masses of the size of sugar plums, and covered with sugar which has been coloured with cochineal. When there is neither pain nor inflammation present, five of these saccharated capsules are taken three times a day, and the dose increased by one capsule every day until purging is produced.

The nostrum known as *Frank's specific solution*—now nearly fallen into disuse—may be very closely imitated as follows:—Copaiva, 2 parts; liquor potassæ *vel* sodæ, 3 parts; distilled water, 7 parts; boil for a quarter of an hour, then add spirit of nitric ether, 1 part; allow it to stand a few hours, and draw off the clear liquor by means of an orifice in the lower part of the vessel. The dose of this mixture is f℥ij. three times a day.

Copaiva is also administered in the form of *enema*, the bulk of which should be small, from f℥j. to f℥ij. of copaiva to f℥iij. of decoction of barley, the rectum having been first cleared of its contents by a purgative enema; although highly recommended by Velpeau, the inconveniences attendant upon this plan of treatment, in the majority of cases will prove a decided barrier to its employment.

Oleum Copaibæ. Oil of Copaiva. The oil is preferred by many to any other preparation of copaiva, but I have seen it frequently fail to do good; the dose is from min. xv. to min. xxx. dropped on sugar, three or four times a day.

* *Resina Copaibæ. Resin of Copaiva.* This preparation is very properly discarded from practice; the dose of it is from gr. x. to gr. xxx.

CUBEBA. *Cubebs.* Cubeba officinalis, *Miquel, Comment.* Plate 175, *Steph. and Church. Med. Bot.* (The unripe fruit, dried; cultivated in Java.)

OLEUM CUBEBÆ. *Oil of Cubebs.* (The oil distilled in England from cubebs.) A native of Java and the Prince of Wales' Island; belonging to the Natural family *Piperaceæ,* and to the Linnæan class and order *Diandria Trigynia.*

BOTANICAL CHARACTERS.—Stem, sarmentaceous, articulated, terete; leaves petiolated, oval, coriaceous; flowers, on an elongated, pendant spadix; fruit, a pedunculated small berry; the peduncles are nearly equal to the petiole.

CHARACTERS.—*Of the Fruit.* The size of black pepper, globular, wrinkled, blackish, supported on a stalk of rather more than its own length; has a warm camphoraceous taste and characteristic odour.—*Of the Oil.* Colourless or pale greenish-yellow, having the peculiar odour and taste of cubebs.

PHYSICAL PROPERTIES.—Cubebs are the dried unripe berries; they are about the size of black pepper, wrinkled on the surface, brownish externally, whitish and oily within. They have a small portion of the peduncle attached, whence the name *piper caudatum* has been applied to them. Their odour is strong, peculiar, aromatic; their taste warm, pungent, and very spicy.

CHEMICAL PROPERTIES.—Cubebs are composed of 2·5 per cent. of green volatile oil, 1 per cent. of yellow volatile oil, 4·5 of a peculiar principle named *Cubebin* (which is probably identical with *Piperin*), 1·5 of balsamic resin and wax, lignin, &c. The volatile oil, *Oleum Cubebæ*, is obtained by the usual process of distillation with water; it is of a pale, greenish-yellow colour, transparent and limpid, with the peculiar odour and taste of cubebs. Its density is 0·929; and its composition $C_{15}H_{12}$, being isomeric with oil of turpentine. Cubebs yield their properties very partially to boiling water, but completely to alcohol.

THERAPEUTICAL EFFECTS.—Cubebs possess the stimulant and carminative properties of the other peppers; but they also exercise a specific influence over the urinary organs, indicated by their power in arresting urethral discharges. They are only employed in medicine in the treatment of gonorrhœa, for which they are held by many to be as efficacious as copaiva, if not more so. Nothing is known as to the manner in which cubebs cure gonorrhœa; that they are absorbed is proved by the odour acquired by the urine of patients taking them, and that they undergo some changes in their passage through the system, will be acknowledged as being highly probable, on an attentive consideration of what has been already written under the head of copaiva; but their specific influence appears to be exercised chiefly if not only in the early stages of the disease, so that they usually fail to prove beneficial when the discharge has existed for any time; they should be therefore administered on its first appearance; when, *if the running be not checked in from three to five days*, their continued use will in most instances do more harm than good. Cubebs have been also employed in leucorrhœa and in catarrh of the bladder, with doubtful benefit.

DOSE AND MODE OF ADMINISTRATION.—In powder, which is the best form, gr. lx. to gr. cxx. three times a day. The powder should be always prepared fresh for use, as owing to the volatility of the oil, it deteriorates rapidly; they can be readily ground for use, as required, in a small coffee mill; inattention to this point, in my experience, is a fertile source of disappointment so far as their remedial efficacy is concerned. The larger the dose in which cubebs are given, the more certain will be their effect; they may be administered suspended in milk or in water, or in combination with copaiva.

Oleum Cubebæ. Oil of Cubebs. (Prepared according to the general directions for distilling volatile oils, see page 259.) Dose, min. x. to min. xxx. dropped on sugar, three or four times a day. It is not so certain in its effects as the powder.

* *Tinctura Cubebœ. Tincture of Cubebs.* (Cubebs, bruised, ℥v.; rectified spirit, Oij.; macerate for fourteen days, strain, express, and filter.) This tincture is generally added to mixtures containing copaiva. Dose, fℨj. to fℨij. three or four times a day.

* *Crampton's Powders.* (*Freshly* powdered cubebs, ℥ij.; powdered gum arabic, gr. cxx.; powdered nitrate of potash, gr. xl.; mix and divide into eight powders.) This was a favourite formulary with the late Sir Philip Crampton in gonorrhœa, and I have frequently tested its great value. Dose, one powder in half a tumblerful of water every third hour.

HYDRARGYRUM. *Mercury.* (Hg=100.) Mercury is met with in the metallic state in the quicksilver mines of South America. It is principally brought to England from Almaden in Spain, from Idria in Illyria, and from Moschel in Bavaria, where it is extracted from the native sulphuret, *Cinnabar.*

PREPARATION.—Metallic mercury is procured from cinnabar either by distilling with caustic lime or by roasting the ore. As met with in commerce, it is in general sufficiently pure for medical purposes; the London College, however, directed it to be strained, and in the Pharmacopœia this process is contained for purifying it:—

"Take of mercury of commerce, three pounds; hydrochloric acid, three fluid drachms; distilled water, a sufficiency. Place the commercial mercury in a glass retort or iron bottle, and applying heat cause two pounds and a half of the metal to distil over into a flask employed as a receiver. Boil on this for five minutes the hydrochloric acid diluted with nine fluid drachms of distilled water, and having, by repeated affusions of distilled water and decantations, removed every trace of acid, let the mercury be transferred to a porcelain capsule, and dried first by filtering paper, and finally on a water bath." The usual impurities found in quicksilver are bismuth, lead, tin, and zinc; from these it is freed by distillation, during which process, however, a small portion of the mercury is converted into oxide; treating it with hydrochloric acid removes this in the form of corrosive sublimate, the hydrogen of the acid uniting with the oxygen to form water, the chlorine uniting with the mercury to form chloride of mercury, thus $HgO+HCl=HO+HgCl$. Elutriation with water removes the corrosive sublimate, leaving the mercury quite pure."

CHARACTERS.—Brilliantly lustrous and easily divisible into spherical globules.

PHYSICAL PROPERTIES.—At ordinary temperatures, mercury is liquid; it has a silver-white colour with a bluish shade, and is very brilliant. Its specific gravity is 13·56 when liquid, and 15·612 when solid.

CHEMICAL PROPERTIES.—Mercury is a simple metallic substance, its symbol being Hg. It boils at 662°, and solidifies at 39° or 40° below zero, crystallizing in regular octohedrons; exposed to the air at the usual temperature, it remains unaltered if pure, but otherwise the surface soon tarnishes. Agitated for some time in contact with the air, it is converted into a grayish-black powder, which was formerly called *Æthiops per se;* this, according to some chemists, is a suboxide of mercury, but according to others it is the metal in a state of very minute division. Mercury combines with most metals to form *amalgams;* the smallest trace of it communicates a white stain to gold or silver.

TEST.—Volatilizes with heat without any residue.

ADULTERATIONS.—By the application of the pharmaceutical test, the usual impurities, tin, lead, zinc, or bismuth, are readily detected.

THERAPEUTICAL EFFECTS.—As long as mercury remains in the state of metal, it is now generally agreed that it does not exercise any influence on the human body, and that in all cases in which its specific action is manifested, it had been first converted into oxides or salts. The inhalation of mercurial vapours, which, as has been recently proved, contain some oxide, for any lengthened period, produces a singular train of symptoms principally affecting the nervous system; the most remarkable of these is the *shaking palsy* or *tremblement metallique*, in which the muscles of the arms become so unsteady, as almost to place them completely out of the control of the individual. This affection is common amongst the workers in quicksilver mines, gilders, and others whose trade exposes them to the vapour of this metal. To cure the disease, which in my experience is most difficult indeed, the patient must be removed from the contaminated atmosphere which has produced it, and get nourishing diet, with tonics, more particularly preparations of iron. The shower-bath, and magnetic electricity (see page 485), are also powerful auxiliaries in restoring the nerves to a healthy state. More recently Professor Melsens, of Brussels, has proposed the employment of iodide of potassium for the removal of the symptoms caused by mercurial poisoning, and published some cases in which its use proved altogether effectual.

The effects on the human body of the different preparations of mercury which are employed in medicine are very complex, and as they are possessed in common by most of the mercurial compounds, they may be most conveniently considered here

The *topical* effects of the preparations of mercury are generally somewhat irritant, *remotely* they act as special stimulants both to secretion and excretion. The most remarkable effect of mercury is its action on the salivary glands, *salivation.* When this medicine, is introduced into the system in such a manner as to excite this peculiar state, it at first produces increased vascular action, shortly followed by a metallic or brassy taste in the mouth, and a slight mercurial fetor of the breath; the gums become somewhat swollen and spongy at their edges, soon presenting a slight degree of ulceration; the lining membrane of the cheeks, and sometimes also of the palate, acquires a leaden hue and is swollen; and an increased flow of saliva takes place, accompanied by pain in the teeth on the least pressure. If these symptoms be allowed to advance, or if more mercury be administered, the cheeks, the tongue, and the throat swell and ulcerate and a copious flow of saliva, sometimes amounting to several pints in the twenty-four hours, is induced; this excessive salivation is accompanied by slow fever and rapid emaciation. The quantity of a mercurial preparation required, or the length of time for which it must be administered, to produce the above effects, varies exceedingly in different constitutions and under different circumstances. Individuals are sometimes met with, in whom almost the minutest dose of any preparation of mercury will produce most violent salivation; while, on the other hand, some persons appear to be totally insensible to this peculiar operation of the drug, and the practitioner would do well, previous to administering mercury in any shape, to ascertain from his patient if he were aware of the existence in his case of any such idiosyncracy.

It has been held by many that the production of this specific effect of mercury is necessary to the development of its curative powers, and most unquestionably it occurs, that in the majority of instances its sanitary influence in the treatment of disease is contemporaneous with its action on the salivary glands. In former days the opinion entertained was, "the greater the amount of salivation, the greater the remedial power of the mineral;" now-a-days the aim of the modern surgeon is *just to touch the gums*, and to keep them tender, without the induction of a serious amount of ptyalism. Great attention must always be paid not to allow salivation to proceed too far, as a frightful train of symptoms, in many instances followed by death itself, is the usual result of excessive salivation. In the early stage mercurialism is most decidedly influenced by the administration of active saline cathartics, of nauseating doses of tartar emetic, and by keeping the surface of the body warm, and the face and neck cool; whilst, if it show a tendency to develop itself in excessive salivation, this will be checked by the internal administration of twenty or thirty grains of chlorate of potash, twice or thrice a day; a gargle of the same salt will also be found of use.

Salivation is very rarely produced in children below the age of ten years by the action of mercury, and they consequently bear the administration of comparatively larger doses of any preparation of mercury than adults; nevertheless, instances do occasionally occur in which even at a very early age the mouth and gums become affected by it; and I have myself witnessed its occurrence in a child not quite two years old. In infants and very young children to whom mercury has been for some time administered, a discharge of several copious, fetid, green stools is to be regarded as an evidence that the system has been saturated with the metal, and to be looked upon in the same light as the occurrence of salivation in more advanced life.

One of the most common inconveniences experienced during a mercurial course is the griping produced by the mineral, and the tendency it exhibits to run off by the bowels, *mercurial diarrhœa:* whenever this train of symptoms presents itself, it is hopeless to look for its beneficial effects; diarrhœa more generally follows its internal administration than any other way in which it is exhibited; to guard against it, the preparation used is usually combined with opium and aromatics.

The effects of mercury on the system are sometimes accompanied by a peculiarly alarming state, first described by Mr. Pearson under the name of "*mercurial erethism;*" "it is characterized by great depression of strength, a sense of anxiety about the præcordia, frequent sighing, trembling, partial or universal, a small, quick, and sometimes intermitting pulse, occasional vomiting, a sense of coldness, and pale, contracted countenance, but the tongue is seldom furred, nor are the vital or natural functions much disordered." When these or the greater part of these symptoms are present, any sudden or violent exertion of the animal powers, such as rising suddenly in bed, will often prove fatal. These symptoms are best combated by an immediate discontinuance of the mercury, the exhibition of cordials and opiates—the latter of which I have found especially beneficial—in small but frequent doses, and rest in the horizontal posture, with free exposure in the open air both by day and night. The use of mercurials is also frequently attended with, or followed by, several forms of diseases of the skin: of these the most important is *mercurial eczema,* which often occurs when only a very small quantity of mercurial preparation has been taken. In its milder forms it resembles the acute stage of *eczema rubrum,* arising from other causes; but it more frequently assumes a much severer character, when it is ushered in by fever, difficult respiration, dry cough, and tightness across the chest, with a general smarting and burning feel of the skin over the whole body. These symptoms are soon followed by an eruption of minute vesicles, which break and discharge a very fetid fluid. As the disease increases in severity the eruption extends over the face and the whole of the body, which become covered with incrustations; the fever assumes a typhoid type, the difficulty of breathing increases and is accompanied by bloody expectoration; spots of purpura appear, and death ensues, preceded by delirium or convulsions. On the first appearance of this eruption the use of mercury ought to be immediately relinquished, and the accompanying symptoms treated by the means appropriate for the individual case, any account of which would be quite foreign to the scope of this work.

The therapeutical powers of mercury, and for which it is employed in the treatment of disease, depend on its properties as an *anti-phlogistic,* an *anti-syphilitic,* an *alterative,* and a *deobstruent.* An account of the most important diseases for which mercurials are administered is subjoined, but only a very general allusion can be made to them they are so numerous.

In *inflammatory diseases,* both acute and chronic, mercury is very much employed: it is peculiarly adapted for those forms of inflammation which frequently result in the effusion of coagulable lymph or of serum; amongst which may be enumerated croup, laryngitis, pleuritis, pneumonia, pericarditis, peritonitis (particularly that form of it which attacks lying-in-women), meningitis, &c. In all these diseases the previous use of local blood-letting is in most cases attended with advantage, and the mercurial (calomel and hydrargyrum cum cretâ are the preparations best adapted) should be introduced into the system as quickly as possible, so as just *to touch the gums;* but the production of free salivation usually proves injurious. In iritis, mercury is the chief remedy on which reliance is to be placed. In hepatitis, in nephritis, in metritis, and in synovitis, its use is productive of decided benefit. In epidemic dysentery, and in pestilential cholera, especially when occurring in warm climates, very large doses of calomel given at the very onset of the disease will frequently cut it short; as this power, however, is possessed by calomel alone, it will be again referred to. In the fevers of our climate, unless when inflammation of some particular organ is present, the use of mercury is injurious; but in fevers of warm climates it is for the most part found to be serviceable. The curative powers of mercury in inflammatory diseases depend much on the character of the inflammation; thus, while it generally acts beneficially in simple acute inflammations, and in those of a syphilitic character, it is less serviceable in rheumatic and seldom admissible in scrofulous inflammations. Scurvy and granular disease of the kidney also contraindicate its employment.

The history of the *syphilitic disease* is closely connected with that of mercury, as for many hundred years it was supposed to be completely incurable without the long-continued use of mercurials, and that in large quantity. Of late, however, it has been established on very satisfactory evidence, that most, if not all, cases of syphilis may be cured by its guarded administration in minute doses, aided by simple local and general treatment. Indeed by some it is considered that mercury is not at all required in the treatment of syphilis in any of its stages, but the general experience of the present age is that when judiciously employed, so as to produce a moderate ptyalism, mercury cures the disease more rapidly, and affords greater security against relapses, than any other plan of treatment.

In chronic enlargements of the abdominal viscera unconnected with malignant disease, in glandular swellings, in morbid depositions, in adhesions of parts consequent on inflammation, where hemorrhage has taken place into the substance of the brain or of the lungs, and for the removal of effusions into any of the shut cavities of the body, mercury, administered so as to produce its specific action, generally proves very efficacious. In paralysis, especially when dependent on derangements of the brain and nervous system, its use is often attended with decided benefit. In many other diseases of the nervous system, as in hydrocephalus, in mania, in epilepsy, in chorea, in tetanus, in hysteria, in tic doloureux, &c., mercury has been also employed in many instances with advantage.

DOSE AND MODE OF ADMINISTRATION.—To remove obstruction of the bowels, metallic mercury has been given in doses of one or two pounds, followed by active cathartics; but the absurdity of the principle on which it was administered, that of acting as a mechanical agent, is too manifest to require any observation. As before remarked, the specific action of mercury is not manifested so long as it retains the metallic state; but as there are some general rules which apply equally to the different mercurial preparations employed to produce salivation, they will be most conveniently considered in this place. And first, with respect to preparatory treatment: it will be always advisable, in acute inflammations, to subdue the severity of the symptoms by antiphlogistic measures, and in broken down or enfeebled constitutions, to strengthen the system by the use of tonics, previously to the administration of mercury. Owing to the neglect of these precautions, it frequently occurs that the physician is baffled in his attempts to produce ptyalism, or when produced, it is excessive, and with great difficulty controlled. "I am strongly of opinion," says the late Mr. Colles, in his valuable work on the Venereal Disease, "that the want of a due preparatory process has of late years contributed to bring this valuable remedy into much disrepute." The various ways in which it has been proposed to introduce mercury into the system may all be reduced to four heads —*internal administration, the iatroleptic method, fumigation, the endermic method.* To produce its specific effects, by its internal exhibition, three classes of preparations have been employed, viz., those in which the mercury exists in the metallic state finely subdivided, or, according to Donovan and others, in the state of oxide; those in which the mercury exists in the state of protosalt; and, finally, those in which it exists in the state of persalt. To this method of administering mercury, to produce its specific effects upon the system in the treatment of syphilis, many and grave objections are to be alleged, in consequence of which the majority of practitioners in such cases prefer the iatroleptic method, or that by fumigation; the former of these consists in rubbing in some mercurial ointment, either in the region of the groins or axilla, until its effects be produced; the latter can be conducted either in the dry or moist way, the latter of which is much to be preferred, and which can be readily managed by Mr. Henry Lee's apparatus for the purpose, in which, by the heat of a spirit lamp, some one or other of the preparations hereafter described are volatilized, together with steam, and brought into contact with the entire person of the patient, save, unless in exceptional cases, the head and face. This can be readily managed by putting the patient sitting naked on a cane-bottomed chair, under which the apparatus is placed; his person is then surrounded with a sheet, or, better still, an india rubber cloak made for the purpose, and he is subjected to the combined action of the fumes of the mercury and the steam of the water, for a space of time varying from fifteen to thirty minutes, the period being regulated by his strength; the result of which proceeding is, that he speedily bursts out into a profuse perspiration, and the mercurial preparation, in the very finest form of which it is susceptible, is brought into contact with the body of the patient when in that condition in which it is best prepared for its absorption. The great advantages attending this method of introducing mercury into the system in syphilitic cases are, its extreme simplicity, the little trouble attending its employment, the certainty with which it affects the system, the slight amount of salivation it induces, and the thorough exemption from mercurial diarrhœa. Messrs. Fannin, of Grafton-street, supply for a small sum the entire apparatus. To Mr. Langston Parker, of Birmingham, is the profession indebted for this, which I consider *the great modern improvement* in the treatment of syphilis. The *endermic* method consists simply in dressing a blistered surface with some mercurial preparation. Of all these plans of introducing mercury into the system in infantile syphilis, the iatroleptic method is to be preferred; it can be easily and effectually carried out by smearing the baby's swathe with mercurial ointment, and putting it round its stomach, or by applying a few turns of a flannel roller, similarly anointed, round its legs. With respect to the general treatment during a mercurial course, the most important points to be observed are, the necessity of rest and quietness of both mind and body, the maintaining the temperature of the surface uniform by warm clothing, and the use of a moderate diet, free from all stimulating food and drink.

In the following preparations, a portion of the mercury is converted into the sub-oxide, but the greater part of it is merely mechanically reduced to a finely divided state.

Pilulæ Hydrargyri. (See page 150.) Dose, gr. iij. to gr. v., night and morning; if it should occasion irritation, a fourth of a grain of opium may be added to each pill.

Hydrargyrum cum Cretâ. (See page 149.) This is the mildest preparation of mercury; nevertheless, perhaps, the most certain for the production of salivation, not even excepting calomel, over which it possesses the advantage of not being apt to run off by the bowels; it is also from its mildness and certainty of action especially adapted for weak and enfeebled habits, and is very properly preferred to any other in the diseases of infancy and childhood. It may be given in doses of from gr. ij. to gr. v. three or four times daily; but if it be desirable to produce a rapid action on the system, gr. ij. may be given every second or third hour; these observations apply also to the following preparation.

* *Hydrargyrum cum Magnesiâ.* (See page 150.)

Emplastrum Ammoniaci cum Hydrargyro. Ammoniac and Mercury Plaster. (Take of ammoniac, twelve ounces; mercury, three ounces; olive oil, one fluid drachm; sulphur, eight grains. Heat the oil, and add the sulphur to it gradually, stirring till they unite. With this mixture triturate the mercury, until globules are no longer visible; and lastly, add the ammoniac, previously liquefied, mixing the whole carefully.) Applied to indolent buboes, enlarged glands, especially when of a syphilitic origin, to venereal nodes, and as a resolvent in many diseases.

Emplastrum Hydrargyri. Mercurial Plaster. (Take of mercury, three ounces; olive oil, one fluid ounce; resin, one ounce; litharge plaster, six ounces. Dissolve the resin in the oil with the aid of heat; let them cool; add the mercury, and triturate till its globules disappear. Then add to the mixture the litharge plaster, previously liquefied, and mix the whole thoroughly.) Applied as a resolvent in glandular enlargements, and over the region of the liver in chronic induration of that organ.

Linimentum Hydrargyri. Liniment of Mercury. (Take of ointment of mercury, one ounce; solution of ammonia, one fluid ounce; liniment of camphor, one fluid ounce. Liquefy the ointment of mercury in the liniment of camphor with a gentle heat; then add the solution of ammonia gradually and mix with agitation.) A stimulating liniment, applied to indolent tumours, &c.; f℥j. contains about gr. x. of mercury. It produces salivation very speedily.

Unguentum Hydrargyri. Ointment of Mercury. (Take of mercury, one pound; prepared lard, one pound; prepared suet, one ounce. Rub them well together until metallic globules cease to be visible.) The manufacture of this ointment is always conducted on the large scale, never being made by the apothecary; the extinction, as it is technically termed, of the quicksilver, being a slow and laborious process. Various substances at different times have been suggested to facilitate this process, such as rancid lard, egg oil, turpentine, sulphurated oil, &c., all of which are open to the objection of making the ointment too irritant for continued use. The addition to the mass of a small portion of old mercurial ointment however is not open to this objection, and, in some unexplained manner, much facilitates the extinction of the quicksilver. The chemical state in which the mercury exists in this ointment, has long been a debated question amongst pharmaceutical chemists; some holding it to be one of simple mechanical subdivision; others, prominent amongst whom is Mr. Donovan of this city, contending that it is in the condition of suboxide, a view which he supported by, in my opinion, a conclusive experiment, and which induced him long ago to suggest as a substitute for this ointment one composed of suboxide of mercury, which would possess the great advantages of being far cheaper, and capable of being rubbed in, in a far shorter time than the present ointment. This ointment is frequently employed for introducing mercury into the system; and for this purpose gr. xx. to gr. xl. may be rubbed carefully into the inside of the thighs or arms night and morning. Should it be desirable to produce speedy salivation, it may be used as a dressing to blistered surfaces, and gr. lx. or gr. cxx. placed in each axilla. When employed to promote the dispersion of glandular enlargements, it should be rubbed over the seat of the disease. Mercurial ointment is also smeared over the inflamed surface in phlegmonous erysipelas—a practice often productive of very beneficial results. A milder ointment is generally used as a dressing to venereal sores.

* *Mercurial Soap*, HEBERT. (Take of mercury, and nitric acid, of each, ℥iv.; put these ingredients into a matrass capable of holding twice the above quantity, and stir the mixture from time to time until the solution shall have been effected at the ordinary temperature of the atmosphere. Introduce into a porcelain capsule, ℔j. ℥j. of calf's fat, melt this by the aid of a water-bath, and then add the solution of mercury, stirring the ingredients together till they have acquired an adhesive consistence. To every ℥v. of the ointment thus formed add f℥ij. of caustic solution of soda (density 1·33), and rub them together on a porphyry slab until combination be effected.) The soap thus formed is perfectly soluble in water. It is employed on the continent with much benefit in the treatment of those cutaneous affections in which preparations of mercury usually prove useful; it is applied to the parts either alone or dissolved in water; care must be taken to suspend its use if it be found to produce irritation or inflammation.

HYDRARGYRUM AMMONIATUM. *Ammoniated Mercury*. NH_2Hg_2Cl (=251·5). (Syn.: *Hydrargyri Ammonio-chloridum*, Lond., Dub.; *Hydrargyri Præcipitatum album*, Ed.)

PREPARATION.—"Take of corrosive sublimate, three ounces; solution of ammonia, four ounces; distilled water, three pints. Dissolve the corrosive sublimate in the water with the aid of a moderate heat; mix the solution with the ammonia, constantly stirring; collect the precipitate on a filter, and wash it well with cold 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 the product at a temperature not exceeding 212°."

EXPLANATION OF PROCESS.—To explain the reactions that ensue in this preparation, we will require two equivalents each of the corrosive sublimate and of the ammonia; one atom of the ammonia gives up its base to one atom of the chlorine of the corrosive sublimate to form chloride of ammonium, which is removed by the elutriation directed; the second atom of ammonia parts with two of its four hydrogens, which, uniting with the oxygen of the two ammonias, form two atoms of water, and is thereby reduced to *amidogene* (see p. 4), which precipitates in conjunction with the two mercuries and one chlorine, forming the salt which from its colour and mode of preparation is known as *white precipitate*. This equation explains the reactions,—$2HgCl + 2NH_4O = NH_4Cl + 2HO + NH_2Hg_2Cl$.

PHYSICAL PROPERTIES.—This preparation is in the form of a bulky, snow-white powder, odourless, but having a styptic metallic taste.

CHARACTERS.—An opaque white powder on which cold water, alcohol, and ether have no action. Digested with caustic potash, it evolves ammonia, acquiring a pale yellow colour, and the fluid, filtered, and acidulated with nitric acid, gives a white precipitate with nitrate of silver. Boiled with a solution of chloride of tin it becomes grey, and affords globules of metallic mercury.

CHEMICAL PROPERTIES.—According to Kane it is a true chloro-amidide of mercury, its formula being $HgCl + HgAd$, but the general view at present entertained of its composition is that it is a substitution compound in which two atoms of mercury replace two out of the four atoms of hydrogen in the chloride of ammonium; thus, $NH_4Cl + 2Hg = NH_2Hg_2Cl + 2H$. It is insoluble in cold water; by boiling water it is decomposed into sal-ammoniac, which is dissolved, and into a heavy yellow powder (*chloro-amidide* and *binoxide of mercury,* Kane), which is insoluble in water. White precipitate may be distinguished from calomel by solution of ammonia, which does not alter the former, but blackens the latter. When heated suddenly, it is completely dissipated. By boiling it with the solution of chloride of tin, its chlorine is abstracted, the chloride of tin becoming converted into bichloride, and metallic mercury as the consequence being set free. The other characters require no comment.

TEST.—Entirely volatilized at a heat under redness.

ADULTERATIONS.—I have never met with any impurity in this preparation. The London College gave the following tests for its purity:—"Totally evaporated by heat. It is entirely dissolved by hydrochloric acid without effervescence. When heated with solution of potash it emits ammonia and becomes yellow."

THERAPEUTICAL EFFECTS.—White precipitate is not used as an internal remedy. Externally in the form of ointment it is an excellent application in many forms of chronic cutaneous diseases, as in herpetic eruptions, sycosis menti, impetigo, acne of the face, &c.

Unguentum Hydrargyri Ammoniati. Ointment of Ammoniated Mercury. Syn.:—*Unguentum Præcipitati albi,* Ed. (Take of ammoniated mercury, sixty-four grains; simple ointment, one ounce; mix thoroughly.)

HYDRARGYRUM CORROSIVUM SUBLIMATUM. *Corrosive Sublimate.* (Syn.:—*Bichloride of Mercury, Corrosive Muriate of Mercury, Oxymuriate of Mercury, Chloride of Mercury.)* HgCl (=135·5).

PREPARATION.—"Take of sulphate of mercury, twenty ounces; chloride of sodium, dried, ten ounces; black oxide of manganese, in fine powder, one ounce. Reduce the sulphate of mercury and the chloride of sodium each to fine powder, and having mixed them and the oxide of manganese thoroughly by trituration in a mortar, place the mixture in a tall matrass of green glass, and by a regulated heat applied through the intervention of sand, let the corrosive sublimate be sublimed. The matrass must now be broken in order to remove the sublimate, which should be kept in jars or bottles impervious to light."

EXPLANATION OF PROCESS.—The reactions in virtue of which corrosive sublimate is formed in this process take place exclusively between the sulphate of mercury and the chloride of sodium, the chlorine of the latter joining to the metallic mercury to form chloride of mercury, whilst the sodium unites first with the oxygen of the mercurial salt to form soda, which then unites with its sulphuric acid to form sulphate of soda, thus, $HgOSO_3 + NaCl = HgCl + NaOSO_3$. The object with which the oxide of manganese is directed to be employed, is lest the sulphate of mercury should contain any subsulphate, which in that case, by supplying oxygen to it, it would convert into sulphate of mercury; the objection to the presence of subsulphate is that it would produce calomel, which would thus be present as an impurity in the corrosive sublimate (see p. 133). If the sulphate be pure there will be no necessity to employ the oxide of manganese.

PHYSICAL PROPERTIES.—Corrosive sublimate is met with in the form of a white, semi-transparent, crystalline mass, or as a white powder; by careful sublimation it may be obtained in regular crystals, the primary form of which is the right rhombic prism. It is inodorous but has an intensely acrid and disagreeable taste. Its specific gravity is 6·5.

CHARACTERS.—In heavy, colourless masses of prismatic crystals, possessing a highly acrid, metallic taste, more soluble in alcohol, and still more so in ether, than in water. Its aqueous solution gives a yellow precipitate with caustic potash, a white precipitate with ammonia, and a curdy white precipitate with nitrate of silver.

CHEMICAL PROPERTIES.—Although this salt is very generally called a bichloride, recent chemical investigations prove it to be a proto-chloride, its composition being HgCl; to obviate the confusion likely to arise from this varying nomenclature the Pharmacopœial authorities, most wisely in my mind, with the object of precision call this salt by a name which admits of no doubt. It is permanent in the air; fuses at 509°, and boils at 563°; the vapour is colourless, but very acrid. It is soluble in 16 parts of cold and 3 parts of boiling water, in 2⅓ parts of cold alcohol, and in 1½ of boiling alcohol, and in 3 parts of cold ether. Its solubility is much increased by the addition of hydrochloric acid or of the alkaline muriates. A solution of corrosive sublimate gives a yellow precipitate with hydrates of potash, soda, or lime, *peroxide of mercury*, the oxygen of whichever hydrate is employed going to the mercury to form peroxide of mercury which precipitates, and the chlorine going to the base to form a chloride, which is held in solution, thus, $KO + HgCl = HgO + KCl$; a red precipitate with the alkaline mono-carbonates (3HgO,HgCl), four equivalents of corrosive sublimate reacting upon three equivalents of whichever carbonate be employed, three out of the four chlorides becoming decomposed, the three chlorines going to the three sodiums (presuming carbonate of soda to be the salt) to form three chlorides of sodium, whilst the three oxygens of the soda unite with the three mercuries, which precipitate with the fourth atom of corrosive sublimate, whilst the three carbonic acids instead of escaping unite with three other equivalents of carbonate of soda to form bicarbonate of soda, thus, $4HgCl + 6NaOCO_2 = (3HgO,HgCl) + 3NaCl + 3(NaO,2CO_2)$; a scarlet precipitate with iodide of potassium, *iodide of mercury*, produced in virtue of a double decomposition, the iodine going to the mercury, the chlorine to the potassium, thus, $KI + HgCl = HgI + KCl$, the precipitate is soluble in an excess of either solutions; and a black precipitate with sulphuretted hydrogen, *sulphide of mercury*, the sulphur going to the mercury, and the hydrogen and chlorine uniting to form hydrochloric acid, thus, $HgCl + SH = HgS + HCl$. Dropped on gold it does not tarnish it, but if the moistened surface be touched with a piece of iron or zinc, mercury is immediately precipitated, and leaves a white stain on the gold, which may be removed by heat, this is commonly known as the *galvanic test.* Corrosive sublimate may be removed from its solution in water by agitation with ether; it coagulates albumen. The white precipitate with ammonia, alluded to in the *characters, hydrargyrum ammoniatum,* has been already explained (see p. 545). The precipitate with nitrate of silver is chloride of silver.

TESTS.—Entirely soluble in ether. When heated it sublimes without decomposing, or leaving any residue.

ADULTERATIONS.—Corrosive sublimate seldom contains any impurities; its subliming without any residuum, and its complete and easy solubility in sulphuric ether, the tests given in the Pharmacopœia, are sufficient to detect the most probable impurities, calomel and sal ammoniac, the former being insoluble in ether, the latter not being volatilizable.

THERAPEUTICAL EFFECTS.—Corrosive sublimate is a powerful irritant poison, a few grains producing death preceded by rapid and excessive inflammation of the digestive tube, with great derangement of the nervous system, and coma. In small repeated doses it possesses the usual action of a mercurial, but salivation is more slowly produced by it, and its effects are more decidedly *alterative* than those of any other preparation of the metal. It is consequently much employed in the treatment of secondary syphilis by those who believe that ptyalism is not essential to the curative effects of mercury. Corrosive sublimate is also employed with much benefit in chronic cutaneous diseases, especially when of syphilitic origin, in rheumatism, in arthritis, periostitis, &c.; in which cases it is advantageously combined with a vegetable diaphoretic or tonic. In the treatment of venereal affections of the tongue I have met with marked success from its employment. A solution of one grain of corrosive sublimate in two ounces of tincture of bark, in teaspoonful doses, three or four times a day, is a favourite remedy with Sir W. Wilde in various forms of chronic ophthalmic inflammations. Dissolved in water it forms a useful lotion in some cases of psoriasis, and is an excellent collyrium in the milder forms of ophthalmia. It has also been used in America with great success in the treatment of onychia maligna. Equal parts of it and of sulphate of zinc are to be thickly powdered over the diseased surface, and the whole to be covered over with pledgets of lint steeped in tincture of myrrh.

DOSE AND MODE OF ADMINISTRATION.—1-16th to 1-8th of a grain made into pill with crumb of bread, twice or three times daily. I have even increased the dose to 1-6th of a grain three times daily with excellent effect in some chronic cases of secondary syphilitic disease. Corrosive sublimate, no matter in what form prescribed, should only be taken *after meals*; if taken on an empty stomach it is apt to produce an amount of gastric disturbance that will call for an interruption in its use. For a lotion or collyrium, gr. ss. to gr. j. may be dissolved in f℥j. of distilled water.

* *Pilulæ Corrosivi Sublimati*, DZONDI. (Corrosive sublimate, gr. xij.; dissolve in sufficient distilled water, and add crumb of bread, and white sugar, of each a sufficiency to make 240 pills.) Each of these pills contains a 20th of a grain of sublimate. Dose, 4 daily, to be increased gradually until 30 (containing one grain and a half of corrosive sublimate!) are taken in the day.

INCOMPATIBLES.—The alkalies and their carbonates; lime, and its carbonate; tartar emetic; nitrate of silver; acetate of lead; iodide of potassium; albumen; soaps; almond mixture; decoction of bark, &c.

In cases of poisoning with corrosive sublimate, albumen, as white of egg, is the best antidote; it should not be given, however, in too great quantity, as the compound formed is soluble in an excess of albumen. According to Peschier each four grains of corrosive sublimate call for the exhibition of one egg. The yolk of egg has been recently proved to be an equally, if not more, efficacious antidote. In their absence, wheaten flour, milk, protochloride of tin, or iron filings, may be used. Miahle has proposed the hydrated sulphuret of iron as the best antidote in poisoning with this salt, but Orfila states that it only acts if taken immediately, and that if ten or fifteen minutes elapse before it is administered it is useless.

HYDRARGYRI IODIDUM RUBRUM. *Red Iodide of Mercury.* (Syn.: *Biniodide of Mercury, Iodide of Mercury.*) HgI(=227).

PREPARATION.—"Take of corrosive sublimate, four ounces; iodide of potassium, five ounces; boiling distilled water, four pints. Dissolve the corrosive sublimate in three pints, and the iodide of potassium in the remainder of the water, and mix the two solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and, having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding 212°."

EXPLANATION OF PROCESS.—This is a simple case of double decomposition, the chlorine of the corrosive sublimate going to the potassium to form chloride of potassium, and the iodine to the mercury to form iodide of mercury, which is precipitated, thus, $HgCl+KI=KCl+HgI$.

PHYSICAL PROPERTIES.—Red iodide of mercury is a brilliant scarlet powder, which may be obtained in rhomboidal crystals by sublimation. It is inodorous, but has a strong metallic taste. The specific gravity of its vapour is 15·68, being the heaviest gaseous substance known.

CHARACTERS.—A crystalline powder of a vermilion colour, becoming yellow when gently 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 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.

CHEMICAL PROPERTIES.—It is composed of one equivalent of mercury, and one of iodine, HgI. It is permanent in the air, heated moderately becomes yellow, at a temperature of 400° fuses, and at a higher temperature sublimes. Cooled rapidly it recovers its red colour, but when cooled slowly it remains yellow, in which state, when rubbed, the red tint is immediately reproduced. It requires more than 6000 times its weight of water for solution; but is much more soluble in alcohol and acids, particularly with the aid of heat. It is soluble in a boiling solution of common salt, but a mere trace only is retained as it cools. It is also soluble in a solution of iodide of potassium. By digestion with a solution of soda it is decomposed, its iodine going to the sodium to form iodide of sodium, whilst oxide of mercury is precipitated, thus, $NaO+HgI=NaI+HgO$; the blue colour produced by the subsequent addition of starch and nitric acid is iodide of starch. (See p. 564.)

TESTS.—Entirely volatilized by a heat under redness, and entirely soluble in ether.

ADULTERATIONS.—Owing to faulty preparation, iodide of mercury is apt to contain some of the green iodide. This as well as any fixed impurity is guarded against by the tests of the *Pharmacopœia*—ether not dissolving the green iodide.

THERAPEUTICAL EFFECTS.—The red iodide of mercury is an exceedingly active preparation, producing violent inflammation when placed in contact with the skin. In medicinal properties it appears much to resemble corrosive sublimate, and may be employed in the same cases. In doses of 1-12th of a grain given twice daily, and continued for some time, I have found it an excellent tonic in scrofulous habits. I have also used it extensively with very beneficial effects in the treatment of organic diseases of the heart, more especially in those valvular affections which permit regurgitation. Dr. Fuller recommends it in cases of syphilitic rheumatism. As a topical remedy, it is applied with benefit in the form of ointment to chronic glandular and periostitic enlargements, especially when of syphilitic origin. Cazenave speaks highly of its use in lupus, applied in the form of ointment composed of equal parts of iodide, lard, and oil; he applies it but to a small portion at a time. Its use, however, requires much caution, when applied to raw surfaces. More recently it has been employed successfully in the treatment of goitre in the East Indies by Dr. Mouat. An ointment containing it being spread over the enlarged thyroid, which is then exposed to the direct rays of the hot sun. An account of this practice will be found in the 24th volume of the *Dublin Quarterly Journal of Medical Science*, page 500.

DOSE AND MODE OF ADMINISTRATION.—Gr. 1-16th to gr. 1-8th made into pill with any of the tonic vegetable extracts, or dissolved in water by the agency of iodide of potassium.

Unguentum Hydrargyri Iodidi Rubri. Ointment of Red Iodide of Mercury. (Take of red iodide of mercury, in very fine powder, sixteen grains; simple ointment, one ounce; mix thoroughly.) This ointment contains but one-fourth as much red iodide of mercury as unguentum hydrargyri iodidi rubri, *Dub.*

HYDRARGYRI IODIDUM VIRIDE. *Green Iodide of Mercury* (Syn.: *Subiodide of Mercury, Iodide of Mercury.*) $Hg_2I(=327)$.

PREPARATION.—"Take of mercury, by weight, one ounce; iodine, two hundred and seventy-eight grains; rectified spirit, a sufficiency. Rub the iodine and mercury in a porcelain mortar, occasionally moistening the mixture with a few drops of the spirit, and continue the trituration until metallic globules are no longer visible, and the whole assumes a green colour. The product thus obtained should be dried in a dark room, on filtering paper, by simple exposure to the air, and preserved in an opaque bottle."

EXPLANATION OF PROCESS.—In this process two equivalents of mercury are rubbed up with one of iodine, and as the result we get the subiodide of mercury; thus, $2Hg+I=Hg_2I$.

CHARACTERS.—A dull green powder, insoluble in water, which darkens in colour upon exposure to light. When gradually 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.

TESTS.—Entirely volatilized by a heat under redness. When it is shaken in a tube with ether nothing is dissolved.

PROPERTIES.—This is a dull greenish-yellow powder, insoluble in water, alcohol, and ether; its composition is Hg_2I. Exposed to light, or by the application of heat, it is readily resolved into metallic mercury and the red iodide; if rapidly heated, however, it may be fused and sublimed unchanged. It is insoluble in solution of chloride of sodium. Its specific gravity is 7·75.

THERAPEUTICAL EFFECTS.—The green is a much milder preparation than the red iodide of mercury; but in other respects its properties are nearly similar. It is peculiarly adapted as an alterative for the diseases of infancy and childhood, more particularly for the chronic cutaneous affections to which children are so liable, and especially for those seated on the scalp. It is also an excellent application in the form of ointment applied over chronic glandular enlargements.

DOSE AND MODE OF ADMINISTRATION.—Gr. j. to gr. iij. in pill; for children 1-6th of a grain to half a grain, combined with dried carbonate of soda and aromatic powder. Occasionally, in consequence of its being converted by keeping into red iodide of mercury, from the presence of this salt, it produces very violent and unexpected symptoms.

* *Unguentum Hydrargyri Iodidi.* (Iodide of mercury, ℥j.; white wax, ℥ij.; lard, ℥vj.; to the wax and lard melted together, add the iodide, and rub well together.)

* HYDRARGYRI IODO-CHLORIDUM. *Iodo-chloride of Mercury.*

PREPARATION.—"Take of pure iodine, 25 parts; spirit of wine, sp. gr. 827·7, 200 parts; calomel, 50 parts; dissolve the iodine in the spirit of wine; introduce the calomel into a matrass, apply the heat of a water-bath, and gradually add the alcoholic solution of iodine, shaking the mixture from time to time; continue the heat until the saturation is complete, which may be known by the precipitated salt becoming of a brilliant scarlet colour; filter and wash the salt on the filtering paper with a little rectified spirit to free it from any adhering tincture of iodine; then dry it with blotting paper."—DANNECY.

PROPERTIES.—The salt thus obtained is perfectly homogeneous, in small cubical crystals of a brilliant scarlet colour; it is insoluble in water, but soluble in alcohol; it may be sublimed by heat without undergoing decomposition. This salt appears to be a true chemical compound analogous to the ammonio-chloride of mercury, the iodine taking the place of the ammonia in that preparation.

THERAPEUTICAL PROPERTIES.—This salt has now been used with much success for some years in France as a topical application in *acne rosacea,* and my own experience of its action in this troublesome affection is most favourable. Many of the French physicians combine its internal administration with its external employment; however, in a few cases in which I administered it internally, so much gastric irritation resulted that I ceased to employ it so.

DOSE AND MODE OF ADMINISTRATION.—This preparation seems to be fully as active a poison as corrosive sublimate; the dose of it is from 1-16th to 1-12th of a grain in pill. For external use an ointment may be prepared by rubbing it up with prepared lard and glycerine in the proportion of gr. vij. of the salt, to ℥j. of lard, and fℨj. of glycerine. A small portion of this ointment may be smeared on the affected surface for 3 nights in succession, and then omitted for 3 nights; and it may be repeated in this manner for several applications.

HYDRARGYRI NITRATIS UNGUENTUM. *Ointment of Nitrate of Mercury.* (Syn.: *Unguentum Citrinum,* Ed.)

PREPARATION.—"Take of mercury, by weight, four ounces; nitric acid, eight 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; melt the lard in the oil, by a steam or water bath, in a porcelain vessel capable of holding six times the quantity; and, while the mixture is hot, add the solution of mercury, also hot, mixing them thoroughly. If the mixture do not froth up, increase the heat till this occurs."

EXPLANATION OF PROCESS.—The reactions that ensue between the nitric acid and mercury have been already explained (see page 217). Independent of these reactions, however, the nitric acid, by oxidizing it, produces some complicated, and hitherto not satisfactorily explained action, upon the fatty matter employed; this is evidenced by the escape of nitric oxide gas upon the admixture of the solution of mercury with the melted lard. In my opinion, an important item has been omitted in the pharmacopœial directions, viz., *to keep the mixture constantly but slowly stirring with a wooden spatula, always in the same direction, until it cools.* Whilst attached as surgeon to the Peter-street Dispensary, I enjoyed frequent opportunities of observing the making of this ointment, under the supervision of my friend, Dr. Coulton, the respected resident medical officer of that Institution, and was forcibly struck with the importance of attending to this portion of the process, which, when carefully carried out, left nothing to be desired in the resulting product.

PROPERTIES.—When recently prepared, this ointment is of a golden-yellow colour, and has an odour of nitrous acid. But it does not keep well, as it but too frequently acquires after some time a grayish colour and becomes hard, when it is no longer fit for use. If an animal or fish oil, such as neat's-foot oil, trotter oil, or cod-liver oil, be substituted for the vegetable oil in the preparation of citrine ointment, the resulting ointment is of a dark brown, not golden, colour; but it keeps well, and is in my experience more efficacious as a remedial agent. An ointment so prepared is now generally kept in most of the shops in Dublin and dispensed under the name of brown citrine ointment (*Unguentum Citrinum fuscum*). Prepared with fresh butter it also keeps well, but its colour is very pale.

THERAPEUTICAL EFFECTS.—Citrine ointment is an excellent application in many forms of chronic ophthalmia, being especially useful when the eyelids are the seat of the disease; for this purpose it is generally diluted with an equal weight of lard. It is also a useful application when diluted with from four to six times its weight of white wax ointment, to herpetic eruptions, and to chronic eczema or herpes of the scalp, provided no inflammatory symptoms be present. An ointment composed of equal parts of citrine, sulphur, and tar ointments, will be found of great service in many chronic cutaneous diseases, especially of the scalp. The following formula for a dilute citrine ointment was contained in the last edition of the London Pharmacopœia:—

* *Unguentum Hydrargyri Nitratis mitius.* (Ointment of the

nitrate of mercury, ℥j.; lard, ℥vij.; rub together.) Should be prepared fresh for use.

* HYDRARGYRI OXYDUM NIGRUM. *Black Oxide of Mercury. Sub-oxide of Mercury.*

PREPARATION.—This oxide has been omitted from the Pharmacopœia, but the following process for its preparation was contained in that of London of 1836: "sub-chloride of mercury, (*calomel*) ℥j.; lime water, cong. j.; mix and frequently shake them. Set by, and when the oxide has subsided, pour off the liquor; lastly, wash it in distilled water until nothing alkaline can be perceived, and dry in the air, wrapped in bibulous paper."

EXPLANATION OF PROCESS.—In this case the chlorine of the calomel goes to the calcium to form chloride of calcium, whilst the oxygen of the lime goes to the mercury to form suboxide of mercury, thus, $Hg_2Cl + CaO = CaCl + Hg_2O$.

PROPERTIES.—This is a black, or grayish-black, heavy powder, tasteless and odourless. Its density is 10·69; its composition, Hg_2O. Exposed to heat it is resolved into metallic mercury and the oxide, and this change takes place slowly at ordinary temperatures, under the action of strong light; it then acquires a yellowish tinge. It is insoluble in water, and in the solutions of the alkalies, but it dissolves in nitric and acetic acids, combining with them to form salts.

ADULTERATIONS.—This preparation frequently contains the higher oxide, which may be detected by digesting for a short time with dilute hydrochloric acid, and straining; the acid dissolves out the higher oxide only, which is thrown down in the form of a yellow precipitate on the addition of solution of potash. If it contains any fixed impurity it will not be entirely dissipated by heat. Metallic mercury may be detected by the black oxide not being completely soluble in acetic acid.

THERAPEUTICAL EFFECTS.—Black oxide of mercury produces the usual effects of the mercurial preparations, but owing to its varying composition, and the difficulty of preserving it unchanged, is not employed internally. It is applied externally in the form of ointment (consisting of 1 part of oxide to 5 of lard); and it forms the active part of *black wash*, a most excellent application to chancres and other venereal sores, and one which is in very general use. Black oxide of mercury is also employed for mercurial fumigations.

* *Lotio nigra. Black wash.* (Calomel, gr. xvj.; lime water, f℥iv.; mix.) This wash must be well shaken, so as to suspend the black oxide every time it is used. The proportions here ordered are far less than ordinarily directed, but as usually prescribed there is a great excess of undecomposed calomel. It is employed with benefit in most foul and indolent sores, although not of a venereal origin.

* HYDRARGYRI OXYDUM RUBRUM. (Syn.: *Red oxide of Mer-*

cury. Binoxide of Mercury. Oxide of Mercury. Peroxide of Mercury.)

PREPARATION.—Chloride of mercury *(corrosive sublimate)*, ℥iv.; solution of potash, f℥xxviij.; distilled water, Ovj.; dissolve the bichloride in the water; strain and add the solution of potash. The liquor being poured off, wash in distilled water the powder thrown down, until nothing alkaline can be perceived, and dry it with a gentle heat. *London Pharmacopœia*, 1836.

EXPLANATION OF PROCESS.—The reactions in this case are similar to those described in the last preparation, save that, inasmuch as it is the chloride that is employed, we have the *oxide* instead of the sub-oxide of mercury precipitated, thus, $HgCl + CaO = CaCl + HgO$.

PHYSICAL PROPERTIES.—This oxide is met with in the form of an orange-red powder, odourless, with a disagreeable metallic taste. Specific gravity, 11·074.

CHEMICAL PROPERTIES.—Its composition is HgO, being a protoxide. At a heat below redness it is entirely resolved into metallic mercury and oxygen, and is therefore frequently employed in chemistry for procuring that gas. It is very slightly soluble in water, the solution acting feebly alkaline on vegetable colours. This oxide is not to be confounded with the red oxide described page 216, from which *physically* it is very different indeed, although identical in chemical composition. The preparation here described is that generally understood by the name, red oxide, whilst that is more generally known by the name *nitric oxide.*

ADULTERATIONS.—This preparation seldom contains any impurity. The best test of its freedom from adulteration is its complete solubility in hydrochloric acid.

THERAPEUTICAL EFFECTS.—Red oxide of mercury is not employed internally in medicine in the present day, and consequently has been omitted from the Pharmacopœia. It was formerly used to produce salivation. The dose is from gr. ¼th to gr. iss. in pill. It may be applied externally for the same purposes as the nitric oxide (see page 216), than which it is less caustic. It forms the active part of *yellow wash*, which is preferred by some to *black wash* as an application for venereal sores.

* *Lotio flava. Yellow wash.* (Corrosive sublimate, gr. viij.; lime water, f℥iv.; mix.)

HYDRARGYRI SUBCHLORIDUM. CALOMELAS.—*Calomel* (described in the division *Cathartics*) is the most generally used, and one of the mildest preparations of mercury. It may be employed to produce the general effects of mercurials as before described; but it is almost exclusively administered in the treatment of inflammatory and febrile affections, in which it is usually given in combination with small doses of opium, which promote its antiphlogistic powers and prevent it from acting on the bowels. As a *sedative* in dysentery and in epidemic cholera, its use has been before alluded to (see page 541); in these diseases, it is given in very large doses,—twenty grains every hour or every second hour until one hundred and twenty or eighty grains are taken, or in single doses of thirty to one hundred and twenty grains,—with the very best effects. In the late epidemics of cholera in Europe, however, its administration in small doses frequently repeated, one or two grains every five or ten minutes, obtained many advocates. As an *alterative* it is very generally administered to children, who, as before remarked, are not nearly so susceptible of the influence of calomel, or indeed of any other mercurial, as adults. To produce ptyalism, this is perhaps the most convenient of all the mercurial compounds, as salivation may be produced with it in a very short space of time, and with very little disturbance to the system generally. Its use as a cathartic has been before described (see page 134). Calomel is also added to other medicines to promote their peculiar effects; thus it is combined with digitalis or squill to produce *diuresis;* and with Dover's powder or antimonials to increase their *diaphoretic* properties.

DOSE AND MODE OF ADMINISTRATION.—As an *antiphlogistic*, gr. ij. to gr. v. combined with one-fourth to one-half of a grain of opium. As an *alterative* gr. j. to gr. iij. twice a day. To produce *ptyalism*, gr. iij. to gr. v. are usually given night and morning; but by administering calomel in grain doses every hour, a sixth of a grain of opium being added to each dose should it affect the bowels, salivation may be produced in from 12 to 24 hours, provided proper preparatory treatment has been employed.

Pilulæ Calomelanos compositæ (see page 234). Dose as an alterative, gr. v. to gr. x.

Unguentum Calomelanos. Ointment of Calomel. (Take of calomel, eighty grains; prepared lard, one ounce; mix thoroughly.) This ointment was originally suggested by Pereira, who speaks of it in the highest terms, looking upon it as by far the most generally useful of all our ointments. I have also found it of great service in many chronic forms of cutaneous diseases.

HYDRARGYRI SULPHAS. *Sulphate of Mercury.* (Syn.: *Persulphate of Mercury, Bipersulphate of Mercury.*) HgO, SO_3 (=148).

PREPARATION.—"Take of mercury, by weight, twenty ounces; sulphuric acid, twelve fluid ounces. Heat the mercury with the sulphuric acid in a porcelain vessel until the metal disappears, then continue the heat until a dry white salt remains."

EXPLANATION OF PROCESS.—In this process one equivalent of sulphuric acid is resolved into sulphurous acid which escapes, and oxygen which unites with the mercury, converting it into the peroxide of mercury, which then unites with a second equivalent of the sulphuric acid employed, forming sulphate of mercury, thus, $Hg + 2SO_3 = SO_2 + HgOSO_3$.

CHARACTERS.—A white, crystalline, heavy powder, rendered yellow by affusion of water.
TEST.—Entirely volatilized by heat.

This preparation, the composition of which is HgO,SO_3, has not been used in medicine. It is introduced into Appendix A of the Pharmacopœia only as being employed in the preparation of *calomel*, and of *corrosive sublimate*.

* HYDRARGYRI SULPHURETUM RUBRUM. *Red Sulphuret of Mercury.* (Syn: *Hydrargyri Bisulphuretum, Cinnabaris, Cinnabar.)* HgS (=116). This compound of mercury has been omitted from the Pharmacopœia.

PREPARATION.—Mercury, lbij.; sulphur, ℥v.; mix the mercury with the sulphur melted, and as soon as the mass swells up, remove the vessel from the fire; and cover the vessel closely to prevent the mass from taking fire. Then reduce the material to powder as soon as it is cold, and sublime it.

EXPLANATION OF PROCESS.—A simple case of union of the sulphur with the mercury. The directions with respect to the combustion are given in consequence of the sulphur being employed in excess, which takes fire, but which is at once extinguished by exclusion of the atmospheric air.

PHYSICAL PROPERTIES.—This is the most common ore of mercury. When prepared for medical use it occurs in the form of dark red crystalline masses, which when reduced to fine powder are of a brilliant rich red colour, and then constitute the pigment *vermilion.* It is without odour or taste, and is insoluble in water, alcohol, or ether. Its specific gravity is 8·1.

CHEMICAL PROPERTIES.—Cinnabar is composed of 1 equivalent of mercury and 1 of sulphur, its formula being HgS. It is permanent in the air; by exposure to heat it is at first blackened, and then totally dissipated. It is inflammable, burning with a blue flame, and a sulphurous-acid odour.

ADULTERATIONS.—Cinnabar is very liable to be adulterated with red lead, with realgar *(sulphuret of arsenicum)*, with red oxide of iron, and with earthy impurities. When heat is applied, oxide of iron or any other earthy matter will be left; if the impurity be red-lead, metallic globules of lead will remain. Sulphuret of arsenicum may be detected by the usual tests for the preparations of that metal (see pages 210, 211). In the last edition of the London Pharmacopœia it is stated to be "sublimed by heat; potash being added, the mercury runs into globules."

THERAPEUTICAL EFFECTS.—Cinnabar is not used as an internal remedy. It is the preparation of the metal generally employed for mercurial fumigations; for which purpose it is thrown on a plate of heated iron, and the fumes thus evolved either inhaled to produce salivation, or directed on ulcerated parts. Mercurial fumigations, however, may be conducted in a much more easy manner, as proposed by the late Mr. Colles, "by directing the intended dose of cinnabar or black oxide of mercury to be mixed with melted wax, and with a cotton wick moulded into a small candle; this may be stuck on a common plate, and then burned under a curved glass funnel, which is to be raised about an inch from the plate." Fumigations with the *mercurial candle* may be conveniently directed on any part of the body. They were highly recommended by Mr. Colles for those obstinate ulcerations which occur about the roots of the nails. For *direct* local action this is the best way to employ mercurial fumigation; to produce the specific constitutional effects of mercury, however, fumigation should be conducted in the manner already described (page 542). It has been latterly suggested in syphilitic diseases of the respiratory tract, such as of the throat, larynx, nasal fossæ, &c., to employ mercurial fumigation through the agency of *mercurial cigarettes;* these can be prepared as follows:—"Roll up bibulous paper into the shape of a cigar; soak it in a weak solution of nitrate of potash, and then drop on each fifteen or twenty minims of the *liquor hydrargyri nitratis acidus;* dry it and keep for use;" these are to be cautiously smoked, every exertion being made to bring the smoke into contact with the diseased surface.

* HYDROCOTYLE ASIATICA. *Thick-leaved Pennywort.* An inhabitant of India, Southern Africa, and the Islands of the Indian ocean, growing in moist, marshy ground, belonging to the Natural family *Umbelliferæ.*

This plant has long enjoyed a reputation in India as being a valuable agent in purifying the blood, and has had attributed to it diuretic properties also. Of late years, moreover, it has been strongly recommended by Dr. Boileau as a medicine possessed of valuable remedial properties in elephantiasis, and in the treatment of various eczematous affections. I have tried it in some cases of this latter disease, and at first fancied that I perceived some improvement, but on the whole it has disappointed my expectations. Still I consider it a remedy that deserves more extended investigation, as from Dr. Boileau's statements, which are supported by those of M. Lepine, it must be possessed of some therapeutic value. It has been administered in the form of infusion, syrup, powder, and *granules.* These granules are composed of the alcoholic extract evaporated to dryness and formed into pills, which are then coated with sugar. Six to twelve, or more of them, may be administered daily. The infusion can be prepared by infusing an ounce of the dried plant in a pint of boiling water, the whole to be consumed in divided doses during the day.

* HYDROGENII PEROXYDUM. *Peroxide of Hydrogen.* HO_2(= 17). In the year 1818 this substance was discovered by the celebrated chemist Thenard. The process by which he originally obtained it is that still followed, by acting upon peroxide of barium with hydrochloric acid, when the chlorine unites with the barium to form chloride of barium, and the two oxygens unite with the one hydrogen to form the peroxide of hydrogen, thus $BaO_2+HCl=BaCl+HO_2$. The chloride of barium is gotten rid of from the solution by the continuous addition of sulphuric acid, when sulphate of barytes is precipitated, and hydrochloric acid set free, thus $BaCl+SO_3HO=BaOSO_3+HCl$. More peroxide of barium is now added, and so on the process is proceeded with until the water contains about ten times its volume of peroxide of hydrogen. When this is effected, and at a stage of the process when free hydrochloric acid is present in the solution, instead of adding peroxide of barium, sulphate of silver is added, which precipitates chloride of silver, setting free sulphuric acid, thus $AgOSO_3+HCl=AgCl+SO_3HO$. The sulphuric acid is gotten rid of by the cautious addition of barytic water, when it is precipitated as sulphate of barytes.

This is a very tedious process, and it has been lately proposed to supersede it by forcing a stream of carbonic acid through water, and dropping into the water at the same time the peroxide of barium in a finely powdered state; this, parting with an atom of its oxygen, is reduced to the condition of protoxide, which, uniting with the carbonic acid, is thrown down as carbonate of barytes, but the oxygen, instead of escaping, unites with an equivalent of water, converting it into peroxide of hydrogen.

PROPERTIES.—Peroxide of hydrogen dissolved in water is a colourless fluid, with a peculiar odour, and acrid taste. A concentrated solution, when dropped on the hand, produces a white spot; it is decomposed by fibrine, but not by albumen: it is readily resolved into water and oxygen by various substances; discharges the vegetable colours, and is consequently possessed of bleaching properties. Peroxide of hydrogen when free from water is also readily decomposed into water and oxygen by a temperature over 60°; but when mixed with water it is far more stable, not becoming decomposed under a temperature of 100°. By some chemists the oxygen in the peroxide of hydrogen is supposed to exist in the *positive*, whilst that of peroxide of manganese exists in the *negative* state—the latter representing *ozone*, the former *antozone;* the union of the two constituting neutral oxygen.

THERAPEUTICAL USES.—To Dr. W. B. Richardson of London the profession is indebted for the introduction amongst our list of remedial agents of this remarkable substance. From his experiments it would seem to be a medicine possessed of remarkable remedial energy, resembling in its action over the glandular system the preparations of iodine; thus it has been used in the discussion of glandular enlargements, such as of the mesentery, and of the thyroid body. It has proved of value in the treatment of the difficult breathing of phthisis and of bronchitis, as also in that form of pulmonary congestion attendant upon valvular diseases of the heart; in hooping-cough, also, it has been found of service.

DOSE AND MODE OF ADMINISTRATION.—f℥ss. to f℥ss. freely diluted with water.

INDIGO.—*Indigo.* A peculiar colouring matter obtained from the leaves of several species of the genus *Indigofera*, especially *tinctoria*, *argentea*, *anil*, and *disperma;* which are natives of India, and belong to the Natural family *Leguminosæ* (*Fabaceæ*, Lindley), and to the Linnæan class and order *Diadelphia Decandria.*

PREPARATION.—The plants are cut down just before the flowers appear, placed in large vats and covered with water; in which they are left for about 12 hours, until fermentation takes place, which process is sometimes promoted by using lime water. The liquor, which has acquired a yellow colour, is drawn off into another vat, beaten with rods, and constantly agitated until it becomes blue, and the indigo precipitates. It is then drained on calico, pressed and dried.

PHYSICAL PROPERTIES.—Indigo as met with in commerce, is of a deep blue colour shaded with violet, smooth and hard; when rubbed acquiring a metallic appearance. It is inodorous, but has a somewhat metallic taste.

CHEMICAL PROPERTIES.—Indigo is a compound substance consisting of a glutinous matter, indigo blue (*indigotin*), indigo brown, and indigo red. The formula of indigo blue is $C_{16}H_5NO_2$. It is insoluble in water, in cold alcohol and in ether; but is partially soluble in boiling alcohol.

THERAPEUTICAL EFFECTS.—Some years ago indigo was employed on the continent in the treatment of nervous and spasmodic affections, and it was stated with great success. The diseases in which it was found to be peculiarly beneficial were idiopathic epilepsy, chorea, hysteria, and convulsions. It was also administered in these countries in epilepsy and aggravated hysteria with partial beneficial results, but they were so uncertain that it has now fallen into disuse, and is only retained in Appendix B of the Pharmacopœia, being introduced there for the purpose of making the solution of the sulphate of indigo.

DOSE AND MODE OF ADMINISTRATION.—It should be given in as large doses as the stomach will bear, but as it acts with much difference on different individuals, the dose ought not at first to exceed five grains three times a day, but should be rapidly increased until ℥j. or even more is taken daily. It is best administered in the form of electuary, made with one part of indigo and two of syrup or honey, with which aromatics are in general combined.

Solution of Sulphate of Indigo. Sulphate of Indigo$=HO,C_{16}H_4NO,2SO_3$. (Take of indigo, five grains; pure sulphuric acid, one fluid drachm; distilled water, ten fluid ounces. Mix the indigo and the sulphuric acid in a small test tube, and apply the heat of a water bath for an hour. Pour the blue liquid into the distilled water, agitate the mixture, and, when the undissolved indigo has subsided, decant the clear liquid into a stoppered bottle.) Only used as a test.

* *Compound Pills of Indigo.* (Indigo, gr. xv.; opium, powdered, gr. ij.; extract of valerian; and extract of cinchona, of each, gr. xxij.; mix and divide into 24 pills.) Dose, 4 daily. This combination has been highly praised by M. Michel, in idiopathic epilepsy; he directs for the patient at the same time a wine-glassful of infusion of arnica morning and evening.

IODUM. *Iodine.* (I=127.) This elementary substance was first described in 1811, by M. Courtois, of Montpelier, who recognized its presence in kelp, in which it exists in combination with potassium, sodium, and magnesium.

PREPARATION.—Iodine is an article of the Materia Medica in the British Pharmacopœia. It is procured by the manufacturers on the large scale from the ashes obtained by carefully burning various species of sea-weed. These ashes, technically called *kelp*, are lixiviated with water, to which they yield about half their weight of salts. The mother liquor is poured off from the salts (sulphate and carbonate of soda and chloride of potassium), which are deposited by evaporation and crystallization; it is then treated with oil of vitriol, which sets free carbonic acid, sulphuric acid, and sulphuretted hydrogen gas, and sulphur is precipitated, whilst the iodine is converted into hydriodic acid. To the mother liquor peroxide of manganese is added, which decomposes the hydriodic acid, its oxygen uniting with the hydrogen to form water, setting free the iodine, which is recovered by sublimation, whilst the resulting protoxide of manganese unites with the sulphuric acid to form sulphate of manganese, thus, $HI+MnO_2+SO_3=HO+I+MnOSO_3$. M. Burruel has suggested this modification of the process. After as much of the salts as possible are gotten rid of by crystallization, the mother liquor is to be evaporated to dryness, and the resulting mass ignited with peroxide of manganese, by which all the sulphides, sulphites, and hyposulphites are converted into sulphates. The residuum, dissolved in water, is to be treated with a mixture of two parts and a half of sulphate of iron, and one part of sulphate of copper, so as to precipitate the subiodide of copper; this is heated with binoxide of manganese and sulphuric acid, when the iodine is disengaged in violet vapours, which condense into black crystals as they cool. Iodine as it occurs in commerce being however seldom sufficiently pure for medical purposes, is ordered to be purified as follows:—"Take of iodine of commerce, one ounce. Introduce the commercial iodine into a porcelain capsule of a circular shape, cover this as accurately as possible with a glass matrass filled with cold water, and apply to the capsule the heat of boiling water for twenty minutes. Let the matrass be now removed, and should colourless acicular prisms of a pungent odour be found attached to its bottom, let them be separated from it. This being done the matrass is to be restored to its previous position, and a gentle and steady heat (that of a gas lamp answers well) applied, so as to sublime the whole of the iodine. Upon now allowing the capsule to cool, and lifting off the matrass, the purified product will be found attached to the bottom of the latter. When separated it should be immediately enclosed in a bottle furnished with an accurately ground stopper."

PHYSICAL PROPERTIES.—Iodine is generally met with in the form of small crystalline scales, often accreted into masses of a bluish-black colour with a metallic lustre. It has a strong disagreeable odour resembling that of chlorine, and a very acrid taste. From a solution in liquid hydriodic acid, it may be obtained in tolerably large crystals, which are oblique octohedrons with a rhombic base. Its density is 4·948.

CHARACTERS.—Laminar crystals of a peculiar odour, dark colour, and metallic lustre, which, when heated, yield a beautiful violet-coloured vapour; very sparingly soluble in water, but freely dissolved by alcohol, by ether, and by a solution of iodide of potassium. The aqueous solution strikes a deep blue colour with starch.

CHEMICAL PROPERTIES.—Iodine is an elementary body existing in combination in both kingdoms of nature; its equivalent is 127. It evaporates slowly at the usual temperature if exposed to the air, and more rapidly if moistened; fuses at 224° and boils at 356°. Exposed to an increased temperature it is volatilized in the form of a beautiful violet-coloured vapour, from whence it has derived its name (Ἰώδης, violet). Iodine requires 7000 parts of pure water for its solution, to which it imparts a brownish colour; is much more soluble in alcohol, and very soluble in ether. The presence of tannin in water renders iodine more soluble in that liquid, which property may be taken advantage of in prescribing it in medicine, the addition of any astringent tincture or syrup increasing its solubility. Solutions of the iodides in water dissolve much iodine. The best characteristic of iodine is its action on starch, forming with it an *iodide of starch*, blue in colour; so delicate is this test that it will detect one grain of iodine in a million grains of water; a temperature of 160°, however, destroys this colour, a fact which should be borne in mind when applying this test.

TESTS.—Entirely soluble in ether. It sublimes without leaving any residue, and the portion which first comes over does not include any slender colourless prisms emitting a pungent odour. 12·7 grains dissolved in an ounce of water containing fifteen grains of iodide of potassium require for complete decoloration 100 measures of the volumetric solution of hyposulphite of soda.

ADULTERATIONS.—Iodine is frequently adulterated with fixed substances, such as charcoal, plumbago, black oxide of manganese, &c., all of which may be readily detected by their not being sublimed on the application of heat, or by their being left as an insoluble residue when iodine is treated with alcohol. Attention has been also directed by Professor Christison to an adulteration of much consequence, that with water, of which it frequently contains from 15 to 20 per cent.: that is to say, ℥j. of iodine may contain gr. xc. or even more of water. It may be readily detected by pressing a specimen between folds of filtering paper, or by shaking it in a very dry bottle. If greater accuracy be required, the volumetric test of the Pharmacopœia may be applied, which admits of no impurity, and which will be understood by reference to what has been already written, page 468. The slender pungent crystals alluded to in the *tests* are *iodide of cyanogen*, an occasional impurity sometimes present to the extent of one per cent., and to which attention was first directed by Meyer and Klobach.

THERAPEUTICAL EFFECTS.—Introduced into the stomach, iodine exerts a local irritant action on that viscus, causing nausea and vomiting; in large doses, it produces the effects of an irritant poison; but in many instances, even when taken in enormous quantities, it has caused scarcely any effect if dissolved in a large quantity of fluid. In slight or medicinal doses, iodine acts as a special stimulant to the glandular system, generally affecting at the same time the organs of secretion, stimulating them to increased action. Under the continued use of small doses of this medicine, the removal or palliation of disease will sometimes take place without any perceptible action on the system generally; in other instances, much emaciation and derangement of the digestive functions will be produced; while the very reverse effect, namely, deposition of fat and increased appetite, is very frequently observed as the consequence of a lengthened administration of iodine. So far as I have observed, the deposition of fat is consequent on its administration in small doses; the absorbents are thus stimulated to *moderately* increased action, whereby food is more thoroughly assimilated, and the individual grows fat; in large doses the action of the stomach is interfered with, the appetite more or less impaired, but the action of the absorbents, intensified by the iodine, exhibits itself on the adipose tissue already stored up, and consequently the individual grows thin. Recently an extract of the *Fucus vesiculosus* in two to five grain doses three times a-day has been suggested for the purpose of reducing obesity; for which purpose it is stated to be very effectual. I entertain no doubt that any property in this respect that it may possess is due to the iodine it contains. A curious statement, the truth of which I am inclined to doubt, for I cannot discover any authentic record of its having been witnessed in this country, was put forward some years ago on the continent: that absorption of the mammæ in females and wasting of the testicles in males have been produced by the continued administration of iodine.

A remarkable train of symptoms, characterizing a peculiar disordered state of the system which has been named *iodism*, occasionally arises when the use of iodine in frequent small doses has been persisted in for a long time. These symptoms are nausea, headache, general languor and loss of appetite, followed by vomiting and purging, extreme depression, frequent small pulse, great weakness, fainting, and dry cough occasionally attended with inflammation of the mucous membrane lining the air-passages, and terminating in death, if the use of the iodine be not abandoned in time. Iodism is, however, in the present day, rarely witnessed, and when it does occur, is easily checked by suspending the use of the medicine. A far more common idiosyncrasy in connection with iodine is the development in some individuals of symptoms resembling coryza. I know two or three persons in whom the smallest dose either of iodine or iodide of potassium will immediately develop these symptoms.

Iodine is a most valuable remedial agent in the treatment of glandular enlargements, and in scrofulous affections; but its employment is contra-indicated when acute inflammation is present. In bronchocele it has proved more successful than any other remedy; indeed there are few cases, unless where the thyroid gland has become completely indurated, which will withstand the use of iodine when continued steadily for six weeks or two months; and even cases where the gland is much indurated are often remarkably relieved. In the innumerable varieties of scrofulous affections, this remedy is most extensively employed and with decided advantage. It is found particularly beneficial in glandular swellings, tumours, abscesses, ulcers, ophthalmia, and diseases of the bones occurring in scrofulous constitutions. Iodine has also proved eminently successful in chronic enlargements of the abdominal viscera, particularly of the liver, spleen, and ovaries. There are no remedies which in my experience prove so successful in the treatment of cutaneous diseases, especially those of a chronic character, as iodine and its preparations; but to prove beneficial, their administration must be persisted in for some time, until in fact the system is manifestly brought under their influence. In fine, iodine has been proposed as a remedy in phthisis, in amenorrhœa, in leucorrhœa, in gout, in palsy, in chorea, in ascites, &c.; but in all these cases its success is very equivocal. The inhalation of the vapour of iodine was at one time very much used in the treatment of phthisis and of chronic bronchitis, but general experience has proved its inutility. An injection, originally suggested by Sir Ranald Martin, composed of one part of tincture of iodine and three parts of water, is used with most successful results after tapping, for the radical cure of hydrocele. Topically, iodine is employed in the form of tincture, of ointment, or of a solution in water, as a local stimulant in many forms of chronic cutaneous diseases, to enlarged glands, in chronic swellings of the joints, to inflamed bursæ, to buboes, over large chronic abscesses, in erysipelas, &c.; but its external employment requires caution, as if employed in too concentrated a form, it is apt to excite severe local inflammation. A remarkable case of this kind has been placed on record by me in vol. 40 of the *Dublin Medical Press*, p. 65. No matter in which of these ways iodine be employed, whether internally, or as an injection in hydrocele, or painted on the surface for any length of time, it is absorbed and can be detected by chemical reagents in the various secretions. That generally selected for this purpose is the urine; and inasmuch as the iodine, although introduced in the free state, becomes combined with some base in its transit through the system, it is essential, previous to applying the starch test, to set it free, which is generally done by nitric acid. Presuming the base with which it has associated itself to be sodium, three equivalents of the iodide will require four equivalents of nitric acid, one of which is resolved into nitric oxide gas, which escapes, and three atoms of oxygen, which unite with the three sodiums to form three sodas, which uniting with the remaining three nitric acids form three nitrates of soda, whilst the three iodines unite with three equivalents of starch to form three iodides of starch; thus, $3NaI + 4NO_5 + 3Am = NO_2 + 3NaONO_5 + 3AmI$. After using it as an injection for the radical cure of hydrocele, I have thus detected it within five minutes in the urine of the patient.

DOSE AND MODE OF ADMINISTRATION.—Iodine is not administered in substance; and as it is usually given in combination with iodide of potassium, there are no simple preparations of it contained in the Pharmacopœia. As a rule, iodine and its preparations should be administered *before* meals, when we wish to produce decidedly its specific effects.

Linimentum Iodi. Liniment of Iodine. (Take of iodine, one ounce and a quarter; iodide of potassium, half an ounce; rectified spirit, five fluid ounces. Dissolve the iodine and the iodide of potassium in the spirit.) This preparation is solely for external use; it should be applied cautiously, as likely to vesicate; to produce which latter effect it is well suited.

Unguentum Iodi Compositum. Compound Ointment of Iodine. (Take of iodine, thirty-two grains; iodide of potassium, thirty-two grains; proof spirit, one fluid drachm; prepared lard, two ounces. Rub the iodine and the iodide of potassium well together, with the spirit, in a glass or porcelain mortar, add the lard gradually, and mix thoroughly.) A convenient form for embrocation over enlarged glands, with a view to their dispersion.

Tinctura Iodi. Tincture of Iodine. (Take of iodine, half an ounce; iodide of potassium, a quarter of an ounce; rectified spirit, one pint. Dissolve the iodine and the iodide of potassium in the spirit.) This may be used as a paint, over enlarged glands, &c.; it may be applied for a long time before it will vesicate; it may be also administered internally in ten to twenty minim doses; it is miscible with water.

* *Ioduretted Mineral Waters,* LUGOL. (These solutions are of three strengths—No. 1 containing ¾ gr. of iodine and i½ gr. of iodide of potassium; No. 2, gr. j. of iodine and gr. ij. of iodide of potassium; No. 3, gr. i¼ of iodine, gr. ij½ of iodide of potassium; dissolved respectively in eight ounces of distilled water.) These three solutions are of a convenient and useful strength for the employment of iodine. Lugol's plan of using them was to commence the treatment with six ounces daily of No. 1, which was to be persevered with for two weeks, when the entire quantity was to be consumed daily for a week or so longer: the patient then was to proceed to No. 2, and consume the entire quantity each day, and finally to complete the cure with No. 3.

INCOMPATIBLES.—Ammonia, sulphur, phosphorus, metals and their salts, hydrosulphates, sulphuric, nitric, and hydrocyanic acids, and the vegetable alkaloids.

In poisoning with iodine, emetics should be administered, and their operation aided by the use of demulcent and amylaceous drinks, as starch, flour, &c., diffused through tepid water or milk.

OLEUM MORRHUÆ. *Cod-Liver Oil.* Gadus Morrhua, *Linn.* (The oil extracted from the fresh liver by a steam heat not exceeding 180°.)

PREPARATION.—Although this oil is directed in the Pharmacopœia to be obtained from the liver of the common Cod, it is also procured from other allied species, such as Ling—*Gadus lota*, the Dorse—*Gadus callarias*, the Torsk—*Gadus brosma*, &c. Much of what is met with is imported from Newfoundland, and from the North of Europe, where it is prepared by exposing the livers to the sun to putrefy, when the oil runs from them, and is received in vessels placed underneath: thus prepared according to M. de Jongh, it constitutes the *pale* oil of commerce; by boiling the residuum, the *brown* oil is procured; and the *light brown* oil is the *impaired* pale oil, either from the livers having lain too long, or in consequence of the pale oil having being kept too long in warehouses, or exposed to damp. What is drawn in this country is procured by simply boiling the fresh livers (exposing them to a temperature not higher than 192° F., DONOVAN), expressing and filtering.

CHARACTERS.—Pale yellow, with a slight fishy odour, and bland fishy taste.

PHYSICAL PROPERTIES.—As generally met with, cod-liver oil is transparent, varying in colour from pale straw yellow to rich golden brown, with the odour of fresh boiled cod, and a greasy, bland taste, leaving a disagreeable impression on the palate. Some specimens have a very rancid odour, and an exceedingly nauseous taste. Three varieties of different colours, as above described, are met with in the shops.

CHEMICAL PROPERTIES.—According to the analysis of M. de Jongh, it contains three peculiar principles, one of which has been named *gaduine*, oleic and margaric acids, glycerine, traces of butyric, acetic, fellic and choleïc acids, salts of soda, lime, and magnesia, some other unimportant substances, phosphorus, phosphoric acid, iodine, and chlorine, with a trace of bromine. The *pale* oil contains the greatest quantity of iodine, chlorine, bromine, phosphorus, and salts; while the *brown* oil is richest in the component parts of the bile, butyric, and acetic acids. It appears then from this analysis, that the medical properties of the oil are due to the presence of the powerful elements, iodine, chlorine, phosphorus, and bromine, naturally combined with other constituents, probably of less importance, in an *organic oil.*

ADULTERATIONS.—When cod-liver oil was first used extensively in medicine, it was not only very much adulterated, but other oils, both animal and vegetable, were substituted for it, in consequence of the demand exceeding the supply. Now, however, it is very generally met with of excellent quality, and the goodness of a specimen may be readily judged of by its physical properties.

THERAPEUTICAL EFFECTS.—Professor Bennett of Edinburgh was unquestionably the first British physician of modern times to direct the especial notice of the profession to this most valuable therapeutic agent, for until the publication of his book in 1841, cod-liver oil, although at one time much employed in England, had fallen completely into disuse. It is as a remedy for phthisis that this oil has proved so important an addition to the Materia Medica, and from the vast experience of its efficacy which has been accumulated within these last fifteen or twenty years, I do not think that I am asserting too much for it when I state that its use has to some extent removed tubercular consumption from the list of incurable diseases. It is employed with benefit in all stages of the disease, nor do any local symptoms, except perhaps severe hæmoptysis, contra-indicate its use. Should any of these, such as intercurrent pneumonia or pleuritis, diarrhœa, sweating, vomiting, &c., be present, they should be treated by the remedies applicable to each, but in the mean time the administration of the oil need not be suspended. It must be therefore remembered that it is as an adjunct to other treatment cod-liver oil proves so valuable a remedy in phthisis; and in the hands of those who look upon it as a *sole* remedy in this disease, it can only be productive of disappointment. As the remedial efficacy of cod-liver oil in consumption depends probably to a great extent on the readiness with which an animal oil is assimilated in the human economy, it is especially requisite, in order to obtain the full benefit derivable from its use, that the patient should breathe a healthy atmosphere, and as far as practicable take exercise in the open air. I am far, however, from believing that the remedial powers of this medicine are solely due to the property here referred to, nor do I think that, as some physicians have suggested, equal effects are produced by other fatty matters, whether alone or combined artificially with iodine, bromine, &c. Besides phthisis, cod-liver oil has been employed in a great number of diseases, but it appears to be particularly useful in chronic rheumatism, in scrofulous abscesses and caries of the bones, in arthritis, in rickets, in strumous ophthalmia, and in obstinate cutaneous affections. It is productive of very great service in the treatment of many forms of neuralgia; and I have employed it in some cases of diabetes with much benefit. In most of these diseases its external application is beneficially combined with its internal use; and to prove successful, its administration must be persevered in for a very long period, in some instances even for years.

DOSE AND MODE OF ADMINISTRATION.—Cod-liver oil should in all cases be given at first in small doses: for adults a dessert spoonful, and for young persons a teaspoonful three times a day; and this quantity should be gradually increased until a table spoonful is taken three times daily. I have not seen any advantage in giving a larger quantity than this, but some physicians prescribe so much as a pint of the oil in the 24 hours. It is most readily taken floating on a glass of water or boiled milk; to the former some aromatic tincture, as of orange or lemon-peel, may be added, or it may be given made into an emulsion with a solution of potash and some aromatic water. But no matter how it is attempted to be disguised, it creates in some persons an intolerable disgust, leaving a most disagreeable and permanent impression on the mouth and fauces, which, together with the length of time its administration must be persisted in, prevented it for a long period from coming into general use. When this disgust exists, or when its administration by the mouth commences to upset the stomach, cod-liver oil may be introduced into the system *iatroleptically;* used in this way I have seen really remarkable results ensue; the only objection to it is the disagreeable smell it leaves hanging about the person: similar beneficial results, but in a minor degree, follow the inunction of salad oil. The late Dr. Ure suggested the adoption of the livers of the codfish as a diet for patients who are recommended to take the oil; and in order to prevent the dissipation of the oil during the cooking, the livers should be suddenly immersed in boiling water, to which sufficient salt has been added to raise the boiling point to 220° F. He states that he had used this diet himself without inconvenience, employing mashed potato as a vehicle for the oil, which exudes on cutting the liver. Dr. Copland recommends the liver to be used as an article of diet, prepared in the following way:—The stomach of the fish is well washed, two parts filled with the fresh liver, and firmly tied at each end so as not to allow any of the oil to escape whilst being boiled. This is eaten *quite warm*, with a little salt and spice, in which state he says that it is very palatable. In all cases the oil sits most easily on the stomach when it is taken during or immediately after meals, being thus digested with the food.

The oil obtained from the liver of the Skate, *Raia clavata*, has been proposed as a substitute for cod-liver oil; it is stated to be less disagreeable to the taste, and also more efficacious in its therapeutical effects.

NUX VOMICA. *Nux Vomica.* Strychnos Nux Vomica, *Linn.* Plate 52, *Steph. and Church. Med. Bot.* (The seeds imported from the East Indies.) A native of the Indian Continent, of the Coasts of Coromandel, and of the Island of Ceylon; belonging to the Natural family *Apocynaceæ* (*Loginaceæ*, Lindley), and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A moderate sized tree; trunk, thick, with a grayish mottled bark, covered in parts with a reddish-brown efflorescence; branches, opposite, long; leaves, oval, shining, leathery, 5-nerved; flowers in small terminal corymbs, greenish-white; fruit, ovoid, orange-coloured, one-celled, pulpy, about the size of a small apple, containing many seeds.

CHARACTERS.—*Of the Seeds.* Nearly circular and flat, about an inch in diameter, umbilicated and slightly convex on one side, externally of an ash-grey colour, thickly covered with short satiny hairs, internally translucent, tough and horny, taste intensely bitter, inodorous.

PHYSICAL PROPERTIES.—Strychnos seeds, *nux-vomica*, are about an inch in diameter and two lines thick, round, nearly flat, umbilicated, and slightly convex on one side, concave on the other. Externally they are of an ash-gray colour, satiny, covered with short yellowish hairs; internally they consist of a horny, whitish or yellowish albumen, which separates into two parts, and contains, in a small cavity in the circumference, the embryo with its two acuminate cotyledons. Nux-vomica seeds are with difficulty reduced to powder; they are inodorous, but have an acrid, intensely bitter taste. The bark has been occasionally met with in British commerce under the name of False Angustura bark (see Cusparia).

CHEMICAL PROPERTIES.—Nux-vomica consists of two peculiar alkaloids, *strychnia* and *brucia*, in combination with a peculiar acid, *igasuric* or *strychnic acid*, with other unimportant matters. More recently M. Denoi has obtained from it a third alkaloid, which he proposes to term *igasuria;* the properties of which are nearly analogous to those of brucia. The medicinal properties of nux-vomica depend on its alkaloids, of which strychnia is the more active, and is officinal in the British Pharmacopœia. *Brucia* is not employed in medicine, and therefore need not be particularly described here. In most of its properties it resembles strychnia, but it is soluble in 500 parts of boiling water, and produces a rich red colour with nitric acid, which change does not occur with perfectly pure strychnia. *Igasuria* is still more soluble in water than brucia, requiring only 200 parts of boiling water for its solution.

Powdered nux-vomica is of a grayish-yellow colour; it yields its active principles to water and diluted alcohol, but not to ether.

ADULTERATIONS.—According to Christison, powdered nux-vomica is frequently adulterated with common salt, but I have never met with this impurity; it may be readily discovered by treating the powder with cold water, filtering, evaporating, and crystallizing.

THERAPEUTICAL EFFECTS.—In very small doses nux-vomica appears to act as a tonic; but in somewhat larger doses it operates as a special stimulant to the medulla oblongata and spinal marrow, without affecting the sensorium. Its effects are principally exerted on the nerves of motion, as indicated by the spasmodic twitchings of the voluntary muscles, which, when the dose is large or the use of small doses has been continued for some time, amount to violent tetanic spasms, producing at the same time a marked bitter taste in the mouth, and occasionally copious perspiration. It is a very active poison, so small a dose as gr. xxx. of the powder, or gr. j. of pure strychnia having proved fatal; the symptoms which precede death are simply those of tetanus and asphyxia, the spastic rigidity of the muscles continuing for a long time, even after death. As a medicinal agent, the principal use of nux-vomica is in the treatment of chronic paralytic affections; but as it does not prove equally serviceable in all forms of paralysis, and in some proves absolutely injurious, it will be necessary to state the circumstances which demand or contra-indicate its use.

When paralysis is the consequence of inflammatory action in the brain or spinal marrow, or is produced by what is the most common cause, the pressure of effused blood on the nervous centres, nux-vomica always proves injurious, unless the inflammatory action had been previously subdued, or a length of time had elapsed since the effusion had taken place. It proves beneficial more frequently in general than in partial paralysis, and in paraplegia than in hemiplegia. It is, however, often of service in palsy of certain organs, as in incontinence of urine depending on paralysis of the muscles of the bladder, and, when applied by the endermic method, in some forms of amaurosis. Nux-vomica and its alkaloid have been also employed in the treatment of other affections of the nervous system, as in chorea, epilepsy, and nervous tremors; in the latter of which it appears to have proved of most service. I have used extract of nux-vomica with much advantage as an addition to purgatives in constipation depending on want of tone in the muscular coat of the larger intestines, one of the most frequent causes of this state in females, and one which is distinctly characterized by the great secretion of flatus, and colicky pains which accompany it; for a nearly similar reason it is a most useful remedy in the constipation of painter's colic. In epidemic dysentery, its beneficial effects have been highly spoken of in Germany and in Sweden; and I have derived much benefit from the administration of the extract in chronic diarrhœa, especially that form of the disease which may be termed *nervous* diarrhœa. It has been also found successful occasionally in the treatment of amenorrhœa, of hypochondriasis, of dyspepsia, of gastrodynia, of prolapsus ani, of impotence, of prurigo, &c. It is remarkable that when administered in paralysis the effects of nux-vomica on the muscular system are principally, though not, as was at one time imagined, entirely, confined to the paralysed parts.

DOSE AND MODE OF ADMINISTRATION.—Nux-vomica may be administered in powder in doses of gr. ij. gradually increased to gr. v.

Extractum Nucis Vomicæ. Extract of Nux-Vomica. (Take of nux-vomica, one pound; rectified spirit, a sufficiency. Apply steam to the nux-vomica until it is thoroughly softened, then dry rapidly, and reduce to fine powder. Exhaust the powder by boiling it with successive portions of the spirit until the latter comes off nearly free from bitterness. Strain, distil off the spirit, and evaporate by a water bath to a proper consistence.) Dose, gr. ss. gradually increased to gr. iij. in the form of pill. When carefully prepared, this extract is an excellent preparation, and might be used instead of strychnia, which is very difficult to prepare, and in general is much adulterated.

Tinctura Nucis Vomicæ. Tincture of Nux Vomica. (Take of nux vomica, two ounces; rectified spirit, one pint. 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 with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.) In consequence of its intense bitterness, this tincture is not much used internally; it is, however, a most excellent remedy in the treatment of nervous tremors, and of other nervous symptoms which are so often dependent on dyspepsia and hypochondriasis. Externally it may be employed in the form of embrocation to paralyzed parts. Dose for internal administration, min. x. to min. xxx.

STRYCHNIA. *Strychnia.* (An alkaloid, $C_{42}H_{22}N_2O_4$, obtained from Nux Vomica.)

PREPARATION.—"Take of nux vomica, one pound; acetate of lead, 180 grains; solution of ammonia, a sufficiency; rectified spirit, a sufficiency; distilled water, a sufficiency. Subject the nux vomica for two hours to steam in any convenient vessel; chop or slice it; dry it by the vapour bath or hot-air chamber, and immediately grind it in a coffee mill. Digest the powder at a gentle heat for twelve hours with two pints of the spirit and one of the water, strain through linen, express strongly and repeat the process twice. Distil off the spirit from the mixed fluid, evaporate the watery residue to about sixteen ounces and filter when cold. Add now the acetate of lead, previously dissolved in distilled water, so long as it occasions any precipitate; filter; wash the precipitate with ten ounces of cold water, adding the washings to the filtrate; evaporate the clear fluid to eight ounces, and when it has cooled add the ammonia in slight excess, stirring thoroughly. Let the mixture stand at the ordinary temperature for twelve hours; collect the precipitate on a filter, wash it once with a few ounces of cold distilled water, dry it on the vapour bath, and boil it with successive portions of rectified spirit, till the fluid scarcely tastes bitter. Distil off most of the spirit, evaporate the residue to the bulk of about half an ounce, and set it aside to cool. Cautiously pour off the yellowish mother liquor (which contains the brucia of the seeds) from the white crust of strychnia which adheres to the vessel. Throw the crust on a paper filter, wash it with a mixture of two parts of rectified spirit and one of the water, till the washings cease to become red on the addition of nitric acid; finally, dissolve it by boiling it with an ounce of rectified spirit, and set it aside to crystallize. More crystals may be obtained by evaporating the mother liquor."

EXPLANATION OF PROCESS.—As already remarked, nux vomica contains two alkaloids, strychnia and brucia, in combination with igasuric acid. By digestion in alcohol and water, the seeds are exhausted of their two salts, and on the addition of acetate of lead we have acetates of strychnia and brucia formed, whilst igasurate of lead is precipitated. On the addition of ammonia these salts are decomposed, acetate of ammonia being held in solution, strychnia and brucia precipitated: these are now dissolved in spirit, the spirituous solution evaporated when the strychnia is deposited, whilst the brucia remains in the mother liquor; the strychnia is washed until the washings cease to become red on the addition of nitric acid, or in other words, until it is thoroughly freed from any adhering brucia; the process is finally completed by solution in boiling spirit, and subsequent crystallization.

CHARACTERS.—In right square octohedrons or prisms, colourless and inodorous: sparingly soluble in water, but communicating to it its intensely bitter taste; soluble in boiling rectified spirit, in ether, and in chloroform. Pure sulphuric acid forms with it a colourless solution, which on the addition of bichromate of potash acquires an intensely violet hue, speedily passing through red to yellow. A very active poison.

TESTS.—Not coloured by nitric or sulphuric acid; leaves no ash when burned with free access of air.

Strychnia crystallizes in colourless minute octohedrons, but as met with in commerce it is usually in the form of a grayish white granular powder; it is odourless, but has an intensely bitter taste. It is soluble in 2500 parts of boiling, and in 6667 parts of cold water; but this last solution, if still further diluted with 100 times its weight of water, tastes strongly bitter. It dissolves in diluted alcohol, but if pure is scarcely soluble in *absolute* alcohol or ether. It is permanent in the air, acts as an alkali on vegetable colours, and combines with acids to form salts. Strychnia is very liable to adulteration, and as met with in commerce is never free from brucia and colouring matter, and consequently among the characteristics of the alkaloid, the Edinburgh College has stated that it is strongly reddened by nitric acid, which, as before remarked, does not occur unless brucia be present.

DOSE AND MODE OF ADMINISTRATION.—1-16th of a grain gradually and slowly increased until its effects are produced; always diminishing the dose at first, when a different sample of the drug is employed. It is usually given made into pill with crumb of bread, or with conserve of roses; having first taken the precaution to dissolve the strychnia in rectified spirit, or some weak acid, which insures the equal distribution of the alkaloid amongst the several pills. A solution also may be made by dissolving a grain in f℥ij. of rectified spirit, with the aid of min. ij. of sulphuric, hydrochloric, or acetic acid; so that every min. x. of this solution will contain 1-12th of a grain of the salt of strychnia (a solution of this kind has now become officinal). When applied by the *endermic* method, gr. ¼ of the alkaloid, or any of its salts, may be sprinkled over the surface previously denuded of the cuticle, or the solution described below may be used.

Liquor Strychniæ. Solution of Strychnia. (Take of strychnia, in crystals, 4 grains; dilute hydrochloric acid, six minims; rectified spirit, two fluid drachms; distilled water, six fluid drachms. Mix the hydrochloric acid with four drachms of the water, and dissolve the strychnia in the mixture by the aid of heat; then add the spirit and the remainder of the water.) Dose, min. v. to min. x. cautiously increased up to min. xx.

No matter how administered, great attention is requisite during the use of nux-vomica or its alkaloid, in consequence of their great activity as poisons, and from the fact of some individuals being much more susceptible of their effects than others. The only antidote known, and one which it must be confessed leaves nothing more to be desired, is tobacco. The physiological experiments of the Rev. Professor Haughton leave no room for doubt that strychnia and nicotina are reciprocally antagonistic, nor is clinical experience wanting to confirm that which physiological experiments have taught us. When summoned to a case of poisoning by strychnia, nicotina is the remedy which should be used, if we have it readily accessible; but in such a case as this, where time is all important, delay is not admissible, and the preparation of tobacco to be used is that at hand; half an ounce of tobacco in any shape should be boiled for a few seconds in half a pint of water, the fluid strained, and its temperature reduced by the addition of cold water, so as to admit of its being drank; of this a fourth part should be at once administered, and we are to be guided as to its repetition by the effect produced. Should the spasms continue, repeat the dose; if complete muscular relaxation ensues, we should be content. If through misadventure we should have given an overdose of tobacco, general diffusible stimulants will correct the error. Of course *nicotina*, as affording us a more exact method of apportioning the dose, is in all cases where procurable to be preferred. It should be administered in one minim doses in some warm sherry or brandy and water, our repetition of the doses being regulated by the effects produced.

* PEPSINA.—*Pepsine. Medicinal pepsine.* The active principle of the gastric juice in animals. Pepsine combined with starch.

PREPARATION.—The following is the process proposed by M. Boudault for the preparation of this substance. The rennet bags of sheep are reversed and washed under a stream of water; the mucous membrane is then scraped off with a knife, reduced to a pulpy state and digested for 12 hours in distilled water. The solution thus obtained is filtered and neutral acetate of lead added so as to throw down the peptate of lead, which is then decomposed by a stream of sulphuretted hydrogen. The sulphuret of lead is separated by filtration and the resulting solution acidulated by the addition of lactic acid. It is then evaporated at a temperature not exceeding 100° F. to a syrupy consistence, and dried starch added in such proportion that one part of the resulting compound will have the power of dissolving four parts of fibrin at a temperature of 98° F.

PROPERTIES.—*Medicinal pepsine* thus obtained is in the form of a fine light powder of a fawn colour, with a faint odour of recently vomited matter, and a nauseous bitter taste. It forms a turbid solution with water in consequence of the presence of the starch, but the pepsine and lactic acid are completely dissolved. It is also soluble in weak spirit but not in strong alcohol. The watery solution precipitates with salts of lead and mercury, but not with nitrate of silver. If a solution of pepsine in water be heated to a temperature of 120° F. it becomes turbid and no longer possesses its digestive properties.

ADULTERATIONS.—Pepsine is often very badly prepared, or undergoes decomposition from being kept in a damp place exposed to the air, and is consequently inert. The only reliable test for its goodness is its power of dissolving fibrin as above indicated. The test adopted by the Imperial Commission for the preparation of the new French Codex is as follows:—Mix 20 grains of pepsine with 1 oz. of water, acidulated with 2 drops of hydrochloric acid, and add 120 grains of fibrine, deprived of water by pressure between bibulous paper or folds of calico. After a lapse of some hours, the fibrine should be partly in a state of pulp suspended at the bottom of the vessel. On filtering the syrupy solution, if the liquid gives no precipitate with 2 drops of nitric acid, the digestion may be considered efficient, and the pepsine pure. During the operation a heat of 120° F. should be maintained, but not exceeded. This same test will also detect some spurious preparations which are sometimes sold for true medicinal pepsine.

THERAPEUTICAL PROPERTIES.—This substance was first introduced into the practice of medicine by M. Corvisart under the name of *poudre nutrimentive (pepsine acidifée)* as a remedy in dyspepsia and consumption. It can, however, in my opinion be regarded in no other light than as an artificial aid to digestion, supplying the deficiency of gastric juice which exists in some disordered states of the stomach, and therefore should be employed as a palliative only and not as a medicine. Its properties indicate in what cases it is likely to prove useful; but like other therapeutical agents too highly vaunted at first, it is now falling much into disuse.

DOSE AND MODE OF ADMINISTRATION.—Numerous preparations, solutions, wines, syrups, &c. of pepsine have had their proposers and supporters, but M. Boudault's powder, or the wine, as hereafter described, are the only ones deserving of use. The powder may be given in doses of 15 grains immediately before meals, and can be taken when spread between two thin slices of bread and butter, or dissolved in a tablespoonful of soup, which however should not be hotter than new milk.

* *Vinum Pepsine. Wine of Pepsine.* (Take one-fourth of the recent stomach of the calf and macerate it, with occasional shaking, in a bottle of sherry wine for a week. Filter through bibulous paper, and preserve for use in a well corked bottle.) Dose, f℥ss. to f℥j. at each meal.

* PHYSOSTIGMA VENENOSUM. *Calabar Bean. Ordeal Bean of Old Calabar.* The plant which furnishes this seed is a native of Africa, growing in marshy places in the vicinity of Attarpah and Old Town in Calabar; belonging to the Natural family *Leguminosæ*, sub-order *Papilionaceæ*, tribe *Euphaseolæ*. Its title *ordeal* bean it derives from the fact of its being used as a test of innocence or the reverse in the case of parties accused of witchcraft in Calabar; if rejected by vomiting and the individual recovers, he is adjudged innocent, but if it purges or kills the accused, he is adjudged guilty.

BOTANICAL CHARACTERS.—A large creeping plant, turning from right to left. Root spreading, with numerous fibrils, and often small succulent tubes attached. Stem two inches in diameter at thickest part, attaining a height of fifty feet; wood of stem porous, containing limpid, astringent, and acrid fluid. Leaves alternate, stipulate, petiolate, pinnately trifoliate. Inflorescence axillary; flowers about an inch long, half an inch broad. Calyx campanulate. Corolla papilionaceous, of a pale pink colour, with a purplish tinge. Stamens ten, diadelphous. Pistil more than one and a half inch long; ovary stipitate, rough on the surface; style curved, smooth, except below the stigma, where the concavity is curved with a continuous line of hairs, which give a marked barbate appearance; stigma blunt, covered by a remarkable ventricular sac or hood, which extends along the upper part of the convexity of the style, and from which appearance it derives its present name, derived from φυσάειν, to inflate, and στιγμα, applied to the upper part of the style. Ovules 2–3. Legume, when full grown, about seven inches long, elliptico-oblong, dehiscent. Seeds 2–3, about an inch long, three quarters of an inch broad, weighing from forty to fifty grains. Pilum dark, sulcate, extending along the whole convex placental edge of the seed, other edge straight. Cotyledons pale, hypogeal.—BALFOUR.

CHEMICAL PROPERTIES.—The active principle of the Calabar bean is an alkaloid undoubtedly possessed of most subtle poisonous properties. Dr. Christison has ascertained that it is soluble in alcohol, having obtained from the seeds an extract amounting to about 2·7 per cent. of the quantity operated upon. More recently Messrs. Jobst and Hope have succeeded in insulating the active principle, which, according to their statement, exists only in the cotyledons.

THERAPEUTICAL EFFECTS.—For the first accurate description of the effects produced by this medicine we are indebted to Professor Christison, who carefully examined into its physiological effects upon rabbits, and subsequently upon his own person. He describes the symptoms following the mastication and swallowing of twelve grains of the seed as being, first, giddiness increasing in intensity, torpor, slight twitching of the pectoral muscles, sluggishness of articulation, great irregularity of the pulse as also of the heart, accompanied with tumultuous action of that organ, great pallor of countenance, extreme prostration, accompanied with marked loss of muscular power, which he attributed rather to a want of an exercise of the powers of volition than to any absolute deficiency in the muscular power; the intellectual functions remained perfectly unaffected. In a wholesale case of poisoning with this bean in Liverpool, the symptoms described present a close resemblance to those placed on record by Dr. Christison, but in addition to those he described, well-marked *contraction* of the pupil of the eye was observed, a symptom which recent observations on the action of this medicine had led the gentleman, in whose charge the cases were, to look for. The only use, so far as I am aware, to which the Calabar bean has been as yet applied is to produce contraction of the pupil. This can be done either by introducing a minute proportion of the alcoholic extract or of a paper prepared for the purpose into the eye, when contraction of the pupil will present itself in a period of time varying from ten to thirty minutes. Mr. Squire has introduced to the notice of the profession two preparations of calabar, one a paper impregnated with the alcoholic extract, a second composed of gelatine similarly impregnated, and rolled out into sheets; both are divided into small squares, one of which is generally sufficient to produce the desired effect. For this important addition to our ophthalmic therapeutics we are indebted to Drs. Frazer, Robertson, Wells, &c.

In poisoning by the Calabar bean, an accident not unlikely to occur from careless keeping, and the blandness of its taste, the treatment should be first emetics, then strong coffee and diffusible stimulants.

* PLUMBI IODIDUM. *Iodide of Lead.* Pb. I (=230·5.)

PREPARATION.—Take of nitrate of lead; iodide of potassium, of each, ℥j.; distilled water, Oij. Dissolve, with the aid of heat, the nitrate of lead in a pint, and the iodide of potassium in half a pint of water, and mix the two solutions when cold. Decant the clear solution when the precipitate has subsided, and having transferred the latter to a filter, wash it with the remainder of the water. Finally, dry the product at a temperature not exceeding 212°, and preserve it in a close bottle.

EXPLANATION OF PROCESS.—This is a simple case of double decomposition, the oxygen and nitric acid of the nitrate of lead going to the potassium to form nitrate of potash, whilst the iodine goes directly to the metallic lead to form iodide of lead, thus $PbONO_5 + KI = KONO_5 + PbI$. Of these two salts the nitrate of potash remains in solution, whilst the iodide of lead is precipitated. In preparing this salt, a precisely similar reaction would ensue were acetate used instead of nitrate of lead; but the resulting iodide is soluble to some extent in acetate of potash, and hence would be a source of loss in the product.

PROPERTIES.—Iodide of lead occurs in the form of a fine golden-yellow powder, or in brilliant crystalline scales of the same colour; odourless and tasteless. It is permanent in the air, but by exposure to light loses its brilliancy, and consequently the light should be excluded from it: by heat it is fused. It is soluble in 1990 parts of cold, and 1330 parts of boiling water, and is very slightly soluble in alcohol and ether (Wittstein); it is more soluble in solution of potash. The composition of iodide of lead is Pb I.

ADULTERATIONS.—I have not met with any adulterations in iodide of lead.

THERAPEUTICAL EFFECTS.—The effects of this preparation are not well understood; according to some, its internal use produces the constitutional action of lead (see p. 111); according to others, that of iodine. In this country it is rarely given internally. Externally it is applied in the form of ointment to chronic glandular enlargements, indolent ulcers, and obstinate cutaneous affections occurring in strumous habits. In porrigo capitis I have used it with excellent results, and increased experience confirms the opinions I have published on its efficacy in this disease, for which I was the first to propose its employment.* It is also used with very great benefit as an application to cancerous tumours, for which purpose it is particularly adapted from its not producing any cutaneous irritation, and from its being more actively promotive of absorption than the other preparations of iodine.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. to gr. v. made into pill with conserve of roses or extract of liquorice.

* *Unguentum Plumbi Iodidi.* (Iodide of lead, ℥j.; simple ointment, ℥viij.; rub together and mix.) Half a drachm of this ointment may be rubbed in very gently twice a day over cancerous or other tumours. I usually employ it at first of half this strength.

INCOMPATIBLES.—Sulphuric and carbonic acids; and their salts.

POTASSII BROMIDUM. *Bromide of Potassium.* K Br. (=119.)

PREPARATION.—"Take of solution of potash, two pints; bromine, four fluid ounces or a sufficiency; wood charcoal, in fine powder, two ounces; boiling distilled water, one pint and a half. Put the solution of potash into a glass or porcelain vessel, and add the bromine in successive portions, with constant agitation, until the mixture has acquired a permanent brown tint. Evaporate to dryness; reduce the residue to a fine powder, and mix this intimately with the charcoal. Throw the mixture in small quantities at a time into a red-hot iron crucible, and when the whole has been brought to a state of fusion, remove the crucible from the fire and pour out its contents. When the fused mass has cooled, dissolve it in the water, filter the solution through paper, and set it aside to crystallize. Drain the crystals, and dry them with a gentle heat. More crystals may be obtained by evaporating the mother liquor and cooling. The salt should be kept in a stoppered bottle."

EXPLANATION OF PROCESS.—When a solution of caustic potash and bromine are boiled together we have two salts formed, bromide of potassium and bromate of potash. To explain the reactions we require six equivalents each of potash and of bromine; five equivalents of potash part with their five equivalents of oxygen, the five potassiums so resulting uniting with five equivalents of bromine to form five equivalents of bromide of potassium; the five atoms of oxygen, instead of escaping, unite with one atom of bromine to form bromic acid, which unites with the sixth equivalent of potassa employed to form bromate of potash, thus, $6KO + 6Br. = 5KBr. + KOBrO_5$. To get rid of this latter salt charcoal is employed, which removes its oxygen in the form of carbonic oxide gas, leaving bromide of potassium behind, thus, $KOBrO_5 + 6C = 6CO + KBr$.

CHARACTERS.—In white transparent cubical crystals, 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 in water is mixed with a little chlorine, ether agitated with it, on rising to the surface, exhibits a red colour.

---

* *Neligan on Diseases of the Skin*, 1852. *Neligan on Diseases of the Scalp*, 1848, p. 43; and *Dublin Quarterly Journal of Medical Science*, new series, vol. viii. p. 164.

PROPERTIES.—This salt crystallizes in colourless, transparent, rectangular prisms or cubes. It is inodorous, but has an acrid saline taste; it is very soluble in water, and but slightly soluble in alcohol. The crystals are unalterable in the air, exposed to heat they decrepitate, and fuse at a red heat without undergoing any change. The composition of bromide of potassium is KBr. The white precipitate, on the addition of tartaric acid, alluded to in the *characters*, is cream of tartar, indicative of its being a salt of potash, whilst the red colour assumed by the ether is due to its having dissolved the bromine set free from the salt on the addition of chlorine, thus, $KBr+Cl=KCl+Br$.

TESTS.—Ten grains require for complete decomposition eighty-four measures of the volumetric solution of nitrate of silver. A solution of this salt mixed with mucilage of starch and a drop of an aqueous solution of bromine does not exhibit any blue colour.

ADULTERATIONS.—If this salt contains any sulphate, it will give a white precipitate with solution of chloride of barium. It is often adulterated with chloride of potassium or chloride of sodium. This sophistication is provided for by the volumetric test, which indicates the presence of gr. 6·72 of bromine in the ten grains operated upon. Dr. Garrod has recently called attention to the fact of iodide of potassium being sold in many of the London houses for the bromide. If such a fraud be now attempted it will readily be detected by the blue colour that, under the conditions stated in the test, would be produced *(iodide of starch).*

THERAPEUTICAL EFFECTS.—The effects of bromide of potassium are generally stated to be analogous to those of iodide of potassium, which will be presently stated: in this opinion, my own experience of its action leads me to a certain extent to coincide. In one remarkable respect, however, it differs in its action from iodide of potassium, coryza rarely, if ever, following its administration. Dr. Williams of London employed it internally in enlargements of the spleen, in which he states that it possesses unusual, if not specific powers; but it has not proved equally successful in the hands of other practitioners. Sir C. Locock records cases in which he found bromide of potassium remarkably efficacious in hysterical epilepsy in doses of from 5 to 10 grains daily, especially when the disease accompanied or depended on the menstrual state. Anæsthetic laryngeal properties similar to those described under the head of bromide of ammonium (see p. 523) have been attributed to this salt also, and its use under precisely similar conditions has been much insisted upon. It is also stated to possess equal value with the bromide of ammonium in the treatment of nymphomania, priapism, ovarian excitement, &c. Externally it has been employed in the form of ointment to scrofulous and indolent swellings.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. to gr. xij. three times a day, dissolved in water and sweetened with syrup. For an ointment, gr. xx. to gr. cxx. of the salt, may be combined with ℥j.

of lard; if a stronger ointment, or one resembling the compound iodine ointment, be wished for, min. vj. of bromine are to be added to this.

INCOMPATIBLES.—Acids; acidulous and metallic salts.

POTASSII IODIDUM. *Iodide of Potassium.* (Syn.: *Hydriodate of Potash.)* KI(=166).

PREPARATION.—Take of solution of potash, one gallon; iodine, in powder, twenty-nine ounces, or a sufficiency; wood charcoal, in fine powder, three ounces; boiling distilled water, a sufficiency. Put the solution of potash into a glass or porcelain vessel, and add the iodine in small quantities at a time with constant agitation, until the solution acquires a permanent brown tint. Evaporate the whole to dryness in a porcelain dish, pulverize the residue, and mix this intimately with the charcoal. Throw the mixture, in small quantities at a time, into a red-hot iron crucible, and, when the whole has been brought to a state of fusion, remove the crucible from the fire and pour out its contents. When the fused mass has cooled, dissolve it in two pints of boiling distilled water, filter through paper, wash the filter with a little boiling distilled water, unite the liquids, and evaporate the whole till a film forms on the surface. Set it aside to cool and crystallize. Drain the crystals, and dry them quickly with a gentle heat. More crystals may be obtained by evaporating the mother liquor and cooling. The salt should be kept in a stoppered bottle.

EXPLANATION OF PROCESS.—On boiling iodine and a solution of potash together we have two salts formed, iodide of potassium and iodate of potassa—six equivalents of iodine reacting upon six of potash. Five equivalents of the latter are resolved into oxygen and potassium; the five potassiums unite with five equivalents of iodine to form five equivalents of iodide of potassium, whilst the five oxygens unite with the sixth equivalent of iodine to form iodic acid, which unites with the remaining equivalent of potash to form iodate of potash, thus, $6I+6KO=5KI+KOIO_5$. By the action of the charcoal, the iodate of potash is resolved into carbonic oxide gas, which escapes, and iodide of potassium, thus, $6C+KOIO_5=6CO+KI$.

PHYSICAL PROPERTIES.—This salt crystallizes in white, semi-opaque, anhydrous cubes or quadrangular prisms; at present it is generally met with in fragments of well-defined cubes, six to eight lines square, and having a pearly lustre; it has a pungent, saline, rather disagreeable taste, but is inodorous.

CHARACTERS.—In colourless, generally opaque, cubic crystals, readily soluble in water, and in a less degree in spirit. It commonly has a feeble alkaline reaction; its solution mixed with mucilage of starch gives a blue colour on the addition of a minute quantity of solution of chlorine. It gives a crystalline precipitate with tartaric acid.

CHEMICAL PROPERTIES.—Iodide of potassium is composed of one equivalent of potassium and one of iodine, KI. It does not deliquesce when pure, unless there is much moisture in the atmosphere; exposed to heat it decrepitates, and fuses at a red heat, but is not decomposed, though after fusion it has an alkaline reaction. 100 parts of water at 64° dissolve 143 parts of the salt: it is soluble in

5 or 6 parts of alcohol. The watery solution is neutral when pure; it possesses the property of dissolving iodine in large quantity, forming a brown liquid termed *ioduretted iodide of potassium*; its solution when mixed with starch gives no blue colour, but on the addition of a trace of chlorine a blue colour is struck; the chlorine replacing the iodine in the salt, and iodine being set free, thus, $KI + Cl = KCl + I$. Tartaric acid throws down from its solution cream of tartar, indicative of the nature of its base.

TESTS.—The addition of tartaric acid and mucilage of starch to its watery solution does not develope a blue colour. Solution of nitrate of silver added in excess forms a yellowish white precipitate, which, when agitated with ammonia, yields by subsidence a clear liquid in which excess of nitric acid causes no turbidity. Its aqueous solution is only faintly precipitated by the addition of lime.

ADULTERATIONS.—Iodide of potassium, as met with in the form of large cubical crystals, seldom contains any other impurity than iodate of potash, an impurity, however, from which commercial samples are seldom free, and from the presence of which, on keeping, they gradually become yellow. Formerly, when it was not so carefully crystallized, it was very frequently adulterated with carbonate of potash. This fraud is readily detected by the alkalinity of the specimen, by its being deliquescent, and by its giving white precipitates with nitrate of baryta or with lime-water. Water is sometimes present as an impurity; it may be detected by drying the salt and ascertaining the loss of weight. If the salt contains *iodate of potash*, it becomes of a yellowish colour and emits an odour of iodine when kept for some time; its presence may be readily detected by adding tartaric acid to a solution in distilled water; if any iodate be present free iodine will be immediately developed, the presence of which will be at once evidenced by the blue colour struck on the addition of mucilage of starch. The production of free iodine under these circumstances is thus accounted for: on the addition of tartaric acid to a solution of iodide of potassium an atom of water is resolved into its elements, the oxygen uniting with the potassium, forms potassa, which with an atom of water and of tartaric acid forms cream of tartar, whilst the hydrogen unites with the iodine to form hydriodic acid, thus, $KI + 2HO,\overline{T} = KOHO\overline{T} + HI$. The hydriodic acid meeting with the iodate of potash at once resolves it into iodide of potassium, water, and iodine: to account for this reaction we require six equivalents of hydriodic acid and one of iodate of potash; the six hydriodic acids are resolved into their elements, the six hydrogens uniting with the six oxygens of the iodate of potash to form six equivalents of water, the resulting iodine and potassium unite to form iodide of potassium, whilst six equivalents of iodine are set free, thus, $6HI + KOIO_5 = 6HO + KI + 6I$. The freedom from chloride of potassium or of sodium, impurities not unfrequently met with, is ascertained if the clear liquid, which results on allowing its solution to rest, after the addition of nitrate of silver and ammonia, does not become turbid again on the addition of nitric acid. The addition of a solution of nitrate of silver to a solution of iodide of potassium results in a double decomposition, the iodine going directly to the metallic silver to form a yellowish iodide of silver, which is precipitated, whilst the oxygen and nitric acid of the silver go to the potassium to form nitrate of potash, thus, $KI + AgO,NO_5 = AgI + KONO_5$. Were chloride of potassium or sodium present a precisely similar reaction would ensue, but chloride of silver is *soluble* in caustic water of ammonia, from which solution it is reprecipitated on the addition of nitric acid; iodide of silver is *insoluble* in caustic water of ammonia, hence if the liquor becomes turbid on the addition of nitric acid a chloride must have been present.

THERAPEUTICAL EFFECTS.—Iodide of potassium is in many respects analogous in its operation to iodine; but it frequently produces very different physiological and therapeutical effects. Like iodine it is taken into the circulation, and may be detected in the different secretions and excretions for several days after it has been swallowed. In some persons iodide of potassium when given even in very small doses produces coryza, and swelling of the face and tongue, followed by ptyalism; these effects I have seen produced in individuals who had not taken more than ten grains of the salt. While on the other hand, many have continued its use for months without the production of iodism, or any other physiological effect whatever. In the different varieties of scrofula and in bronchocele, iodide of potassium is generally given in combination with iodine, the beneficial effects of which in these diseases it seems to increase much. In secondary syphilitic affections, few remedies are so much employed in the present day, or with so much benefit, as iodide of potassium: it is peculiarly adapted for those cases in which mercury has been administered in large quantity in the primary stage, or where the individual is of a scrofulous habit. The particular forms of secondary syphilis in which it is of most service are, sore throat, nodes, caries, and other diseases of the bones, and the tubercular eruptions of the skin. This salt has been also employed with much benefit in the treatment of articular rheumatism, in chronic rheumatism with alteration of structure, in lumbago, in sciatica, in periostitis, in dropsy, in amenorrhœa, in leucorrhœa, in chronic induration and enlargement of various organs, &c. I have already, when speaking of the therapeutical effects of iodine, referred to the efficacy of its salts in the treatment of cutaneous diseases; and it is from the iodide of potassium especially that I have derived the most beneficial results; in the various forms of psoriasis and lepra,* in icthyosis, and in lupoid ulcerations, my experience of it is highly favourable, and I have frequently seen recovery follow its use in cases in which arsenic had failed to produce any amendment. The

* See *Dublin Quarterly Journal of Medical Science*, new series, vol. viii. p. 240 and *Neligan's Treatise on Diseases of the Skin*, 1852.

external use of iodide of potassium in the form of ointment or of bath is usually advantageously combined with its internal administration. Professor Melsens, of Brussels, has proposed the use of iodide of potassium to remove the discoloration of the skin which is sometimes consequent on the internal employment of nitrate of silver, but his views have not been as yet sufficiently tested practically; he gives it in enormous doses, half a drachm, or even more, three times daily, and exposing the patient at the same time to a hot vapour-bath, the iodine is brought to the surface, when it may be readily detected in the perspiration.

DOSE AND MODE OF ADMINISTRATION.—Gr. ij. to gr. xv. three times a day; some physicians prescribe it in very large doses, gr. lx. to ℥ss. in the 24 hours, in which quantity it is said not to produce any injurious effects. My own experience, however, is in favour of small doses, four or five grains daily, continued for a long time. It is best administered simply dissolved in water sweetened with syrup, or in some bitter infusion or decoction, as infusion of quassia, or decoction of elm-bark. The power of the solution of dissolving iodine has been before referred to.

PREPARATIONS.—Linimentum Iodi (p. 565), Tinctura Iodi (p. 565), Unguentum, Ungentum Iodi compositum (p. 565).

Unguentum Potassii Iodidi. Ointment of Iodide of Potassium. (Take of iodide of potassium, sixty-four grains; distilled water, one fluid drachm; prepared lard, one ounce. Dissolve the iodide of potassium in the water, and mix thoroughly with the lard.) A useful application rubbed over glandular enlargements wherever situated. The addition of the water is important, as otherwise the ointment will be gritty; it may be preserved unchanged for months by the addition of a few drops of caustic potash; this addition will also restore the white colour to an ointment which had already become yellow.

* SODII IODIDUM. *Iodide of Sodium.* NaI(=150.) (Syn.: *Hydriodate of Soda.)* This salt is not contained in the British Pharmacopœia.

PREPARATION.—Take of iron filings, ℥iij.; distilled water, f℥xxxij.; iodine, ℔j.; carbonate of soda, a sufficiency; place the iron filings with the water in a glass matrass, apply heat, and add the iodine gradually with constant agitation; as soon as the mixture has acquired a greenish colour, filter, and add the carbonate of soda dissolved in distilled water until all the iron is thrown down; filter, and evaporate the liquor to dryness; dissolve the residuum again in distilled water, and evaporate with a gentle heat until a pellicle forms on the surface; then set it aside to crystallize.

PROPERTIES.—This salt crystallizes in striated prismatic crystals somewhat resembling nitrate of potash; they have a bitter, slightly acrid taste, but not at all so disagreeable as that of the iodide of potassium. The crystals deliquesce rapidly, and acquiring a pink colour give off free iodine, being converted into the iodate and carbonate of soda—a serious objection to the use of this preparation, but which may be obviated to a great extent by fusing the salt and reducing it to powder shortly after it is prepared. It is very soluble in water and in alcohol.

THERAPEUTICAL EFFECTS.—Iodide of sodium appears to be nearly analogous in action with iodide of potassium, to which it is preferred by Gamberini and other Italian physicians as being more readily assimilable, less disagreeable to the taste, and not so apt to derange the digestive organs. I have used it rather extensively for some years, and its chief advantages appear to me to be that while possessing equally powerful therapeutical effects with the similar salt of potassium, it forms an admirable substitute in cases in which the administration of the latter has been continued for a long time, and the system seems to become insensible to its action, and also in those cases with which the salt of potash appears to disagree. In the treatment of cutaneous affections especially, my experience of it is decidedly favourable.

DOSE AND MODE OF ADMINISTRATION.—Same as of iodide of potassium (see page 582).

* SULPHUR IODATUM. *Iodated Sulphur.* (Syn.: *Sulphuris Iodidum. Iodide of Sulphur.)*

PREPARATION.—"Pure iodine, in powder, ℥j.; sublime sulphur, gr. cxx.; mix the iodine and sulphur by trituration in a mortar, and, having transferred the powder to a Florence flask, heat it gently till fusion is effected. When the flask has cooled, let it be broken in order to the withdrawal of the product, which should be immediately enclosed, and preserved in a well-stopped bottle."

PROPERTIES.—This compound is met with in brownish plates, with a radiated crystalline structure. It has a strong odour of iodine, and an acrid taste. Its elements are easily disunited, the iodine escaping entirely when it is left exposed to the air. Its composition is probably S_2I.

THERAPEUTICAL EFFECTS.—Iodide of sulphur has not been much used internally in medicine; its effects seem to resemble those of iodine; the dose is from gr. j. to gr. iij. three times daily in pill. Externally in the form of ointment it has been employed with much success in the treatment of obstinate cutaneous diseases, particularly lupus, porrigo, acne indurata, herpes, and lepra. My own experience of it in chronic lichenoid eruptions, in the local forms of psoriasis, and in acne indurata, is very favourable.*

* *Unguentum Sulphuris Iodidi.* (Iodide of sulphur, powdered, gr. xxx.; lard, ℥j.; rub together.) A stronger ointment than this may be used in many cases.

INCOMPATIBLES.—Acids; acidulous and metallic salts.

---

* See *Neligan on Diseases of the Skin*, 1852.

CHAPTER XX.

TONICS.

(Corroborants.)

TONICS are medicines, the continued administration of which, in debilitated and relaxed conditions of the body, imparts strength and vigour without producing any sudden excitement. Tonics to a certain extent are stimulants, inasmuch as they arouse the vital energies, but the excitement is slowly produced, and the effect is permanent; if, however, they are given when the system is in a healthy state, their primary action, like that of stimulants, is often followed by collapse. This, then, is another example of how necessary it is to remember that medicines are but relative agents, their effects being almost entirely dependent on the state of health or disease in which they are administered. Amongst those who have paid attention to the mode in which medicines act on the human economy, a difference of opinion exists as to whether tonics produce their effects by means of the nervous or circulatory system, and this is a question which bears much on the indications for the therapeutical employment of these remedies. It can not be doubted but that some agents which are very generally and very beneficially had recourse to with the view of giving tone to the body, such as the shower bath, cold salt water bathing, open air exercise, &c., must produce their effects solely through the nervous system; and it is in my opinion equally as certain that those medicines which act as tonics, whether taken into the stomach or applied to some absorbing surface, do so by being first taken into the circulation, the nervous and muscular systems being secondarily acted on through the blood. The peculiar symptoms caused by the administration of quina in large doses, which will be described when speaking of that alkaloid, prove in a special manner that this is the correct view to take of the mode of action of these remedies. There is no class of medicines which requires more discrimination in their administration than tonics; nor any, the injudicious use of which more frequently produces evil consequences. The diseases in which these remedial agents are principally employed, must manifestly be those of diminished power; in no case, however, should they be prescribed where there is a tendency to irritation or inflammation of the digestive organs, or where the secretions are in a depraved state, without the previous use of means calculated to remove the former or correct the latter; to effect which, the employment of mild purgatives will, in most instances, be found best adapted. They are also indicated in some diseases which are inflammatory in their nature, such as erysipelas, diffuse inflammation, and relative affections, which assume, as they most frequently do, a typhoid type, or are presented in asthenic habits. Tonics have a marked action on the various organs of secretion, their effects being to restore them to a healthy state; they are consequently administered with the view of diminishing secretion when it is excessive, or of restoring it when deficient, if either condition depends, as it often does, on inertia or want of tone in the secreting organ. They thus frequently act as diuretics, laxatives, emmenagogues, &c. Independently of their tonic properties, some of the remedies contained in this class possess a specific power in ague and other periodical diseases, and hence have been denominated *Febrifuges:* as examples, I may refer to cinchona bark, arsenic, &c. As already remarked, most astringents are tonics (see page 67).

ACIDUM HYDROCHLORICUM DILUTUM. *Dilute Hydrochloric Acid.*

PREPARATION.—"Take of hydrochloric acid, f℥iij.; distilled water, f℥viij. Mix, and preserve in a stoppered bottle."

TESTS.—Specific gravity 1·05. Six fluid drachms require for neutralization ninety-nine measures of the volumetric solution of soda.

The volumetric test indicates the presence as nearly as possible in the quantity operated upon of gr. 36, equivalent to 10·3 *per cent.* of hydrochloric acid gas.

Hydrochloric acid (described in the division *Caustics*), when properly diluted, acts as a tonic, and as such is employed in those forms of fever which were formerly supposed to depend on a putrescent condition of the fluids of the body, as in petechial fevers, malignant scarlatina, phagedenic ulceration of the throat, scurvy, &c. It is also an excellent tonic in diphtheria, in debility of the digestive organs, particularly when attended with a deposit of phosphates from the urine, and in that state of the alimentary canal which favours the generation of worms. Independently of its action as a caustic, dilute hydrochloric acid is an excellent addition to gargles in ulcerated sore throat, when there is no tendency to inflammation present; it is also employed with much advantage in the sore throat of scarlatina.

DOSE AND MODE OF ADMINISTRATION.—Min. xv. to fʒj. It should be administered largely diluted with some bitter infusion, as infusion of quassia, or it may be substituted for sulphuric acid in preparing the infusion of roses; fʒj. to fʒij. may be added to an eight ounce gargle.

INCOMPATIBLES.—Alkalies; tartar emetic; tartrate of potash; nitrate of silver; acetate of lead; and all carbonates.

ACIDUM NITRICUM DILUTUM. *Dilute Nitric Acid.*

PREPARATION.—"Take of nitric acid, two fluid ounces; distilled water, thirteen fluid ounces. Mix, and preserve in a stoppered bottle."

TESTS.—Colourless. Specific gravity 1·101. Six fluid drachms require for neutralization 100 measures of the volumetric solution of soda.

The volumetric test indicates the presence in the quantity operated upon of gr. 54, equivalent to 14·9 *per cent.* of anhydrous acid.

Nitric acid (described in the division *Caustics*), when properly diluted, acts as a general tonic, but its powers as such are less manifest than those of the other mineral acids. It is principally used internally in the treatment of chronic hepatitis, in affections consequent on the excessive administration of mercury, and in secondary syphilitic diseases. In syphilis it has been proposed as a substitute for mercury, but its beneficial influence appears to be limited to those cases in which scrofula or very great debility forbids the use of that medicine, but which, as has been so ably shown by the late Mr. Colles of this city, are very few in number, and frequently depend rather on its injudicious administration.

DOSE AND MODE OF ADMINISTRATION.—Min xv. to fʒj. It may be administered in the same form as hydrochloric acid; but it is most usually given in the compound decoction of sarsaparilla.

INCOMPATIBLES.—Alcohol; alkalies; oxides; earths; sulphate of iron; acetate of lead; acetate of potash; and all carbonates and sulphurets.

ACIDUM NITRO-HYDROCHLORICUM DILUTUM. *Dilute Nitro-hydrochloric Acid.*

PREPARATION.—"Take of nitric acid, two fluid ounces; hydrochloric acid, four fluid ounces; distilled water, twenty-six fluid ounces. Add to the water first the nitric, and then the hydrochloric acid. Mix, and preserve it in a stoppered bottle."

TESTS.—Specific gravity 1·074. Six fluid drachms require for neutralization 93·88 measures of the volumetric solution of soda.

The varying nature of this acid (see p. 202) renders it almost, if not quite, impossible to give a satisfactory per centage of its composition; the dilute solution here ordered appears from its saturating properties to be *quam proxime* of the same strength as the dilute solutions of the other mineral acids.

THERAPEUTICAL EFFECTS.—Nitro-muriatic acid was at one time employed internally in the same cases as nitric acid; but at present it is principally used externally in the form of bath. Thus employed, it is a very useful remedy in chronic induration or abscess of the liver, in secondary syphilitic eruptions, and in syphilitic or mercurial cachexia. I have found this acid, administered internally, of the most marked value in the treatment of scarlatina; I have also used it with great benefit as a gargle in sore throats presenting a tendency to run into low and malignant forms of ulceration. When its employment has been continued for some time, it frequently causes salivation, which is to be regarded as evidence of its sanatory influence.

DOSE AND MODE OF ADMINISTRATION.—Internally min. xv. to f℥j.

* *Balneum Acidi Nitro-muriatici.* (Strong nitro-muriatic acid, f℥ivss.; water, cong. iij.; mix in a wooden vessel.) This is to be used daily in the form of a foot-bath; the feet should be kept in the bath for from 15 to 20 minutes, and afterwards rubbed well with flannels. Dr. Scott of Bombay affirms that this bath operates like a charm, and produces immediate ease, when employed during the passage of biliary calculi through the duct.

* *Mistura Acidi Nitro-muriatici,* MACNAMARA. (Dilute nitric acid, f℥j.; dilute muriatic acid, f℥ij.; syrup of roses, f℥ss.; infusion of roses, to f℥viij.; mix.) Dose, f℥ss. to f℥ij. In my opinion this is the only way in which this acid should be prescribed. So ordered we get it *fresh*, an important consideration in a therapeutical point of view; it is prescribed in this way that I have found it so useful in scarlatina. If we order the officinal preparation, we cannot predicate how long it may have been prepared, and consequently we cannot depend on its remedial virtues. Having had a rather extensive field afforded me for treating scarlatina, I can with confidence recommend this mixture. If used sufficiently early, its value is incalculable in preventing bad throat symptoms.

ACIDUM PHOSPHORICUM DILUTUM. *Dilute Phosphoric Acid.*

Phosphoric acid, $3HO,PO_5(=98)$, dissolved in water.

PREPARATION.—"Take of phosphorus, four hundred and thirteen grains; nitric acid, four fluid ounces; distilled water, one pint, or a sufficiency. Place the nitric acid diluted with ten ounces of the water in a tubulated retort connected with a Liebig's condenser, and, having added the phosphorus, apply a very gentle heat until five fluid ounces of liquid have distilled over. Return this to 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 syrupy consistence is obtained. Dissolve this when cool in such an amount of distilled water that the volume shall become one pint."

EXPLANATION OF PROCESS.—By the action of nitric acid upon phosphorus, the latter becomes oxidized, each equivalent uniting with five equivalents of oxygen to form phosphoric acid (PO_5), and nitric oxide gas escapes. To reduce this statement to the form of an equation, we will require three equivalents of phosphorus and five of nitric acid; thus, $3P + 5NO_5 = 3PO_5 + 5NO_2$. During the process each equivalent of phosphoric acid associates with itself three equivalents of water to form the tribasic acid. The orange vapours that escape are those of nitric oxide gas.

CHARACTERS.—A colourless liquid with a sour taste, and strong acid reaction. With ammonio-nitrate of silver it gives a canary-yellow precipitate soluble in ammonia, and dilute nitric acid. Evaporated it leaves a residue, which melts at a low red heat, and upon cooling exhibits a glassy appearance.

CHEMICAL PROPERTIES.—Three varieties of phosphoric acid are recognized by chemists, each of which is identical so far as the amount of oxygen and phosphorus they contain is concerned, all having this composition, PO_5. They differ from each other, however, in the quantity of *basic* water with which they are associated. The first of these, composed of one atom of water and one of acid, is termed *monobasic* or *monohydrated* phosphoric acid, and has this composition, $HOPO_5$; it also is known by the name *metaphosphoric* acid. The second contains two equivalents of water, is called *bibasic* or *dishydrated* phosphoric acid, and has this composition, $2HO,PO_5$, it is also known by the name *pyrophosphoric* acid. The third contains three equivalents of water, is called *tribasic* or *trishydrated* phosphoric acid, and has this composition, $3HO,PO_5$. This is the variety officinal in the Pharmacopœia. When these acids unite with bases to form salts, their basic water is replaced with one, two or three atoms of base, according as they are monobasic, bibasic, or tribasic. They are distinguished from each other as follows: the monobasic acid alone possesses the power of coagulating albumen; the bibasic acid yields a *white* precipitate ($2AgO,PO_5$), the tribasic acid a *yellow* precipitate ($3AgO,PO_5$) with a solution of the ammonio-nitrate of silver. In some works on chemistry the monobasic, bibasic, and tribasic acids, with the object of briefly distinguishing them, are respectively written thus, $a PO_5$, $b PO_5$, $c PO_5$.

TESTS.—Specific gravity 1·08. It is not precipitated by sulphuretted hydrogen, chloride of barium, nitrate of silver acidulated with nitric acid, or by the solution of albumen. 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. Six fluid drachms poured upon 180 grains of litharge in fine powder leave after evaporation a residue, which heated to dull redness weighs 215·5 grains.

ADULTERATIONS.—The most usual impurity found in this acid is nitric acid, derivable from want of care in its manufacture. This can be detected by the iron test directed in the Pharmacopœia, which will be understood by reference to p. 90. Were it affected by sulphuretted hydrogen, metallic impurities would be indicated; if by chloride of barium, sulphuric acid, and if by nitrate of silver, hydrochloric acid is present; whilst, did it coagulate albumen, it would be the monobasic, not the tribasic acid. The volumetric test establishes the presence in the quantity operated upon, of gr. 37·7, as nearly as possible equivalent to ten *per cent.* of anhydrous acid.

THERAPEUTICAL EFFECTS.—Diluted phosphoric acid possesses the tonic properties of the other mineral acids, and may be employed in cases of debility of the digestive organs, and in general cachexia. It is particularly adapted for those cases in which there is a deposit of phosphates from the urine; the earthy phosphates being soluble in an excess of their own acid. It has been also used, and it is stated with much benefit, in cases of unusual depositions of phosphate of lime, as in exostosis, or in the formation of bony tumours. Hus recommends its use in the first stage of typhoid fever; and Paris states that it is of great value, used largely diluted as a common drink, in modifying the morbid thirst in diabetes, a statement which my own experience leads me to corroborate. In loss of the sexual appetite its employment has also, on theoretical grounds, been suggested, but in several such cases in which I gave it a fair trial it completely failed. Of all the mineral acids it is that the prolonged administration of which the system will best tolerate, a fact which is to be accounted for by its presence in flesh and other substances of food, especially from the vegetable kingdom, and it is to the absence of this acid from the diet of sailors that scurvy is in a great measure to be attributed: in the ordinary process of preparing meat for sea stores the greater portion of the acid is extracted, and goes to waste in the form of brine. On the addition to the dietary of articles containing this acid the scurvy is cured, although the sailor continues to use the salted beef, from which fact as from others stated by Liebig in his *Letters on Chemistry*, p. 425, the inference is fairly to be drawn that it is to the exclusion of this acid from the diet of the sailor that scurvy is mainly to be attributed, and not alone to the use of salted provisions, as but too generally supposed; my friend and colleague Professor Morgan, who has pursued the investigation of this most important subject with his usual vigour and ability, has proved that the acknowledged superior value of lemon-juice over citric or tartaric acids in combating scurvy is due to the presence in it of notable traces of phosphoric acid, an ingredient hitherto unsuspected in it, but the presence of which in lemon-juice has been verified for him by a careful analysis by Professor Galloway, the distinguished Professor of Chemistry in the Museum of Irish Industry. From this statement, therefore, it would appear that diluted phosphoric acid is not so much used as it deserves to be.

DOSE AND MODE OF ADMINISTRATION.—Min. xx. to f℥j. properly diluted.

INCOMPATIBLES.—Lime water; calcareous salts; carbonate of soda; and strychnia.

In cases of poisoning with this acid, the same treatment should be followed as in poisoning with hydrochloric acid (see p. 200).

ACIDUM SULPHUROSUM. *Sulphurous Acid.* Sulphurous acid, $SO_2(=32)$, dissolved in water.

PREPARATION.—"Take of sulphuric acid, four fluid ounces; wood charcoal, recently burned, dry, and in coarse powder, one ounce; water, two fluid ounces; distilled water, twenty fluid ounces. Put the charcoal and the sulphuric acid into a glass flask; heat by a gas lamp; and pass the evolved gas first through a small wash bottle containing the two ounces of water, and afterwards to the bottom of a pint bottle containing the distilled water, which must be kept cold. Continue the distillation until the bubbles of gas in the wash bottle appear to be equalled by those passing through the fluid in the larger bottle. The product should be kept in a stoppered bottle, and in a cool place."

EXPLANATION OF PROCESS.—In this process the sulphuric acid is deprived of one atom of oxygen by its action upon the charcoal; the carbon uniting with the oxygen escapes, as carbonic acid and carbonic oxide gases, whilst the sulphurous acid gas, first freed from any sulphuric acid that may have come over with it by being passed through the wash bottle, where the sulphuric acid will be retained, is conducted into distilled water, and the process is allowed to proceed until the water becomes saturated with the gas; this equation explains the reaction, $2SO_3HO+C=2HO+CO_2+2SO_2$.

CHARACTERS.—A colourless liquid with a strong suffocating sulphurous odour. It gives no precipitate, or but a very slight one, with chloride of barium, but a copious one if solution of chlorine be also added.

CHEMICAL PROPERTIES.—This is a solution of sulphurous acid gas in water. The gas itself is colourless; of very irritating odour; irrespirable; incombustible and a non-supporter of combustion; it is powerfully antiseptic; and discharges animal and vegetable colours, being consequently extensively used in bleaching operations. Water at 60° absorbs 42·82 volumes of the gas (Apjohn), and the solution possesses in a marked degree all the properties of the gas. If perfectly free from sulphuric acid it has no effect upon chloride of barium, but on the addition of chlorine it at once precipitates the sulphate of barytes, sulphuric and hydrochloric acids being formed by the decomposition of the water through the combined agency of the gases, the oxygen of the water going to the sulphurous to convert it into sulphuric acid, whilst the hydrogen uniting with the chlorine forms hydrochloric acid, thus, $SO_2+Cl+HO=SO_3+HCl$. Sulphurous acid combines with bases to form salts, *sulphites* of the respective bases employed.

TESTS.—Specific gravity 1·04. One fluid drachm mixed with a little mucilage of starch does not acquire a permanent blue colour with the volumetric solution of iodine until 164 measures of the latter have been added to it. When evaporated it leaves no residue.

ADULTERATIONS.—The only sophistication to which this acid is liable is that the water may not be sufficiently charged with the gas; this is provided for in the volumetric test, which is so constructed that one hundred measures of the solution of iodine are equivalent to gr. 3·2 of sulphurous acid. The rationale of the test is this, were a solution of iodine added to a simple solution of starch it would at once strike a blue colour, forming with it *iodide of starch;* but when this solution contains sulphurous acid, a reaction similar to that already described as occurring between the solutions of sulphurous acid and of chlorine takes place, in virtue of which we have sulphuric and hydriodic acids formed, neither of which produce a blue colour with starch. This equation explains the reaction, $SO_2 + I + HO = SO_3 + HI$. When at last all the sulphurous acid has disappeared from the solution, the iodine can now strike the blue colour with the starch, and it then comes to be but a simple sum in proportion to ascertain how much sulphurous acid must have been present in the solution. One hundred measures being equal to gr. 3·2, what are one hundred and sixty-four measures equal to? Answer. Gr. 5·248 in the quantity operated upon, or something less than ten per cent. of sulphurous acid.

THERAPEUTICAL USES.—Sulphurous acid may be used either internally or externally; internally, in consequence of its exceedingly suffocative properties, it is very rarely indeed employed; largely diluted, it has been used in the treatment of that most troublesome form of vomiting attendant upon *sarcina ventriculi.* This disease, originally described by Mr. Goodsir, appears to depend upon some organic disease of the stomach, in consequence of which the process of digestion is interfered with, and so modified that a species of fermentation is set up in that organ, and the contents are expelled by vomiting; the vomited matter on standing for some time becoming covered with a yeasty-looking froth, in which abound these sarcinæ, as also the *torulæ* proper to yeast. Now the power of sulphurous acid in arresting the fermenting process when proceeding too energetically has been long known and applied in the manufacture of cider, &c., and it was but a legitimate application of the inductive process to extend its use to the treatment of a disease which had so much in common with the fermenting process. To Dr. William Jenner we are indebted for this most valuable addition to our remedial agents, in a disease so distressing in its symptoms and so uncontrollable by ordinary medicines; he has also suggested the use of the *sulphite of soda*, a salt which readily gives out this acid, and which, although not officinal, is met with in our shops, and may be given in from ten to sixty-grain doses, dissolved in a little water: it should be given immediately after each meal. It is, however, principally externally that sulphurous acid is employed; when applied locally it acts as a caustic, and is used in those forms of cutaneous affections which appear to depend upon the production and extension of a low form of vegetable parasite, such as porrigo favosa, &c.

DOSE AND MODE OF ADMINISTRATION.—*Internally,* min. x. to min. lx. largely diluted with water; *externally,* one part may be diluted with three of water, and applied to the diseased surface with a bit of sponge. One part of sulphurous acid, with two of glycerine, forms a convenient solution for external application.

ANTHEMIS. *Chamomile Flowers.* Anthemis nobilis, *Linn.* Common Chamomile. Plate 980, vol. xiv. *Engl. Bot.* (The flower-heads, single and double, dried; wild and cultivated in Britain.)

ANTHEMIDIS OLEUM. *English Oil of Chamomile.* (The oil distilled in England from chamomile flowers.) Indigenous, belonging to the Natural family *Compositæ* (*Asteraceæ*, Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

BOTANICAL CHARACTERS.—Stem, about a foot long, procumbent; leaves, bipinnate, a little downy; branches, numerous, each branch terminated by a single flower, whose disk is yellow, at length conical, and ray white.

CHARACTERS.—*Of the Flowers.* The single variety consists of both yellow tubular and white strap-shaped florets; the double of white strap-shaped florets only; all arising from a conical scaly receptacle; and both varieties, but especially the single, are bitter and very aromatic.—*Of the Oil.* Pale blue or greenish-blue, but gradually becoming yellow; with the peculiar odour and aromatic taste of the flowers.

PHYSICAL PROPERTIES.—Chamomile flowers have a strong, peculiar, rather agreeable odour, and an aromatic bitter taste.

CHEMICAL PROPERTIES.—Their most important chemical constituents are bitter extractive and volatile oil. The latter, *Oleum Anthemidis*, is an article of the Materia Medica in the Pharmacopœia, in which the English oil is directed to be employed, and can be obtained by the usual process of distillation. It is of a greenish blue colour, and has the peculiar odour and the aromatic taste of the flowers. A hundred weight of flowers yields from f℥iss. to f℥ij. of the oil. Its specific gravity is 0·9083. It contains a hydrocarbon, and an oxidated oil, the last of which, treated with potash, gives *valerianic acid* (Gerhardt and Cahours). Chamomile flowers yield their active properties to both water and alcohol. The single variety of the chamomile flower should be preferred for medical purposes.

THERAPEUTICAL EFFECTS.—Chamomile is an aromatic and bitter tonic. It was formerly in high esteem as a remedy for intermittent fever, but its employment as an internal medicine is at present restricted to those forms of dyspepsia which depend on debility or want of tone of the digestive organs; in which cases it is exceedingly useful. A concentrated infusion, especially if used warm, produces vomiting, and was consequently at one time much used to aid the action of emetics. Chamomile flowers are commonly employed for preparing warm fomentations. A strong infusion applied cold two or three times a day is an excellent application in simple weakness of the eyes, and in the milder forms of hemorrhoidal discharges.

DOSE AND MODE OF ADMINISTRATION.—The powder is not administered, the dose would be from gr. xxx. to gr. cxx.; the dose of the oil is from min. iij. to min. viij.

Extractum Anthemidis. Extract of Chamomile. (Take of chamomile flowers, one pound; oil of chamomile, fifteen minims; distilled water, a sufficient quantity. Digest the chamomile in six pints of the water for twelve hours, pour off the clear liquor and press; again digest, and press as before. Evaporate the mixed liquors by a water bath to a proper consistence, adding the oil of chamomile at the end of the process.) As generally prepared this extract lost all its volatile oil in consequence of the protracted ebullition to which it was subjected. The present formulary is a decided improvement, and the resulting extract is a valuable bitter tonic, but too rarely used in the present day; it makes a valuable addition to aperient pill masses, such as of rhubarb, in habitual constipation and dyspepsia. Dose, gr. v. to gr. xxx.

Infusum Anthemidis. Infusion of Chamomile. (Take of chamomile flowers, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for fifteen minutes and strain.) If taken warm it produces vomiting. The dose of the cold infusion is f℥j. to f℥ij.

INCOMPATIBLES.—*With the infusion:* the mineral acids; sesquisalts of iron; sulphate of copper; nitrate of silver; acetate of lead; and corrosive sublimate.

* ARGENTI CHLORIDUM.—*Chloride of silver.* This salt is readily obtained by the double decomposition of solutions of nitrate of silver and of chloride of sodium. When first precipitated it is white, but on exposure to light soon acquires a dark brown, almost black colour. It is insoluble in water or in alcohol, and is void of odour and taste.

THERAPEUTICAL EFFECTS.—Chloride of silver has been employed both in America and on the Continent as a substitute for the nitrate of silver in the treatment of several diseases; and has been also used with success as a remedy in primary and secondary syphilitic affections. It is stated not to produce the discoloration of the skin caused by the nitrate; but from its limited employment hitherto, I do not think that such a conclusion can be depended on; the more especially as it is admitted by all that the nitrate of silver is converted into the chloride immediately on its being taken into the stomach.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. four or five times daily, made into pill with conserve of roses or extract of liquorice.

ARGENTI NITRAS.—*Nitrate of silver* (described in the division *Caustics*) may be administered internally in much larger doses than might *a priori* be supposed from its caustic action when applied to the surface of the body; whence it would appear to be decomposed by the free acids of the stomach. Nevertheless, when taken in large quantity, it acts as a powerfully corrosive poison. In small but frequently repeated doses, this salt is an excellent tonic, and also appears to have a specific influence over some convulsive disorders. As a tonic, it is one of the best that can be employed in the early stages of tubercular phthisis; in chronic affections of the stomach especially when there is morbid sensibility of the gastric and intestinal nerves; and in angina pectoris. The principal convulsive disorders in which nitrate of silver has been used are epilepsy and chorea, in both of which it proves very frequently successful, perhaps more so than most other remedies. Its administration must, however, be persevered in for a very long time; and this is attended with a very serious disadvantage, and one which has brought this remedy into great disrepute, namely the communication of an indelible and permanent leaden or bluish-grey hue to the skin over the whole body. Various attempts have been made to account for this phenomenon, but none are at all satisfatory to my mind; it is certain that this consequence has occurred so frequently (I have myself seen several instances of it), and is of so disagreeable a nature, as to more than counterbalance its remedial powers. In most cases the appearance of this remarkable discoloration is preceded by a curious *greasy* appearance of the face, as if the patient had left his room without washing. The most certain method to prevent the discoloration of the skin, is not to continue the use of the medicine too long. The late Dr. James Johnson, of London, stated "that there is no instance on record where the complexion has been affected by the medicine when restricted to three months' administration." The late Dr. A. T. Thomson suggested the combined use of dilute nitric acid to prevent the decomposition of the nitrate; and more recently, Dr. Patterson, of Rathkeale, proposed the employment of the iodide (prepared by precipitating a solution of nitrate of silver, with a solution of iodide of potassium), instead of the nitrate of silver, which he asserts is equally efficacious as a remedy, without possessing this great disadvantage. The plan of treatment proposed by Dr. Melsens of Brussels, for removing the discoloration when it has occurred, has been referred to (see page 582).

DOSE AND MODE OF ADMINISTRATION.—1-6th of a grain gradually increased to gr. ij. or gr. iij. three times a day; in some instances so large a dose as gr. xv. has been taken. It is best administered in the form of a pill, as the solution blackens the skin wherever it touches it, and also acts more energetically on the stomach. The pills should be made with some vegetable extract, as extract of gentian or of liquorice; crumb of bread is frequently ordered for this purpose, but, unless washed, it contains chloride of sodium, which decomposes nitrate of silver.

INCOMPATIBLES.—Spring and river water; the alkalies, and their carbonates; lime water; hydrochloric, sulphuric, phosphoric, tartaric and hydrocyanic acids, and their soluble salts; iodide of potassium; solution of arsenite of potash, and of arseniate of soda; solution of soap; and astringent vegetable infusions.

In poisoning with nitrate of silver, the best antidote that can be employed is common salt; its administration should be followed by demulcent drinks, and if inflammatory symptoms arise, the usual antiphlogistic means.

ARGENTI OXIDUM. *Oxide of Silver.* $AgO(=116)$.

PREPARATION.—"Take of nitrate of silver, in crystals, half an ounce; solution of lime, three pints and a half; distilled water, ten fluid ounces. Dissolve the nitrate of silver in four ounces of the distilled water, and, having poured the solution into a bottle containing the solution of lime, shake the mixture well, and set it aside to allow the deposit to settle. Draw off the supernatant liquid, collect the deposit on a filter, wash it with the remainder of the distilled water, and dry it at a heat not exceeding 212°. Keep it in a stoppered bottle."

EXPLANATION OF PROCESS.—On adding a solution of nitrate of silver to one of lime, the nitric acid of the nitrate of silver goes to the lime to form nitrate of lime, which is held in solution, and the oxide of silver is precipitated, thus, $AgONO_5+CaO=CaONO_5+AgO$. Lime water is preferable to potash water in this operation as being perfectly free from carbonic acid; the only objection to its use is the great bulk of it required.

PHYSICAL PROPERTIES.—Oxide of silver when first precipitated is an olive brown powder which becomes darker coloured when dried; it is odourless and tasteless; its specific gravity is 7·143.

CHARACTERS.—An olive-brown powder, which at a low red heat gives off oxygen, and is reduced to the metallic state. It dissolves completely in nitric acid without the evolution of any gas, forming a solution which has the characters of nitrate of silver.

TEST.—29 grains heated to redness leave 27 grains of metallic silver.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of metallic silver, and 1 of oxygen (AgO). It is slightly soluble in water, the solution acting on vegetable colours feebly alkaline; and is freely soluble in solution of caustic ammonia with which it forms a highly explosive compound. Oxide of silver is readily resolved, by heat or by prolonged exposure to light, into oxygen gas and metallic silver. In the pharmacopœial test 29 grains are stated to yield 27 grains of metallic silver, numbers in exact proportion to their chemical equivalents; did its solution in nitric acid evolve any gas, it would indicate the presence of carbonate of silver, attributable to the employment in the preparation of the oxide of an alkaline solution contaminated with a carbonate, as already referred to.

THERAPEUTICAL EFFECTS.—This preparation has been employed for some years back in the same cases as the nitrate of silver, over which it does not appear to me to possess any advantages, certainly none sufficient to warrant its introduction into the Pharmacopœia. It has been chiefly recommended as a remedy in chronic affections of the stomach and in menorrhagia. As a local application, oxide of silver has been applied in the form of ointment to the urethra in gonorrhœa, by means of a bougie.

DOSE AND MODE OF ADMINISTRATION.—In pill, gr. ss. to gr. ij. three times a day. To prepare an ointment of it, gr. lx. may be combined with ℥j. of lard.

ARSENICUM ALBUM.—*Arsenic* (described in the division *Caustics*) is a powerful irritant poison, a few grains being sufficient to occasion death. Its effects when taken in poisonous doses vary remarkably; in some instances the most prominent symptoms are those of inflammation of the gastro-intestinal membrane; while in others, coma and extreme depression of the circulation are most marked. When administered in minute doses for a short period, it appears to act as a general tonic, without producing any remarkable physiological effect; but if its use be long continued, or the doses given be too large, it acts as a slow poison. In medicine it has been principally used internally as an *anti-periodic*, in the treatment of ague, and of other diseases of an intermittent type, as in forms of neuralgia, chorea, and periodic headache; and its employment in these affections is often attended with the most beneficial results, more especially in cases in which quinia either disagrees with the patient or fails to cure the disease. In chronic cutaneous diseases, particularly chronic eczema and lichen, those of a scaly character, and those which affect the scalp, arsenic is prescribed with excellent effect; in many cases, however, it will be found to fail in effecting a cure even after it has been taken for some time, when an immediate good result will be often obtained by employing a different preparation of the metal from that which had been previously prescribed; and in all cases of skin disease I have found the best results to follow from repeatedly changing the form in which arsenic is given; as also from combining it with other tonics, with stimulants or with purgatives, according to the state of the general health of the patient. It has been also employed as an internal remedy, in epilepsy; in chronic rheumatism, especially when attended with change of structure in the joints; in passive dropsy; in secondary syphilis; in lupus, &c. When the use of any arsenical preparation has been continued for some time, especially in gradually increasing doses, it produces in most persons, and in some much sooner than in others, peculiar symptoms which seem to indicate the saturation of the system with the medicine; the most common of these are gastric derangements with loss of appetite and pain after eating; puffing or swelling of the face and hands; and itching, redness and swelling of the eyelids accompanied often by tenderness of the eyes, and not unfrequently by conjunctivitis. I have also noticed in some cases sharp headache, and flushings of the face occurring frequently, to follow the administration of arsenic for even a short period. When any of these symptoms occur the employment of the arsenic should be suspended for a few days, active purgatives given, and its use recommenced in smaller doses. So far from considering the development of this *arsenical saturation* necessary to the therapeutical action of the metal, I have generally seen beneficial results produced more certainly and more quickly in those persons in whom it does not occur.

DOSE AND MODE OF ADMINISTRATION.—The employment of arsenic as a remedy requires great caution, and its effects must be carefully watched; it may be administered in substance in doses of from 1-16th to 1-8th of a grain made into pill with crumb of bread; but, in consequence of the great difficulty of accurately dividing so small a quantity into pills, some of the liquid preparations described below are usually preferred. Should any preparation of arsenic be prescribed for persons who are liable to derangement of the digestive organs, it is advisable that the dose should be always taken immediately *after* meals.

LIQUOR ARSENICALIS. *Arsenical Solution.* (Take of arsenious acid, eighty grains; carbonate of potash, eighty grains; compound tincture of lavender, five fluid drachms; distilled water, a sufficiency. Place the arsenious acid and the carbonate of potash in a flask with ten ounces of the water, and apply heat until a clear solution is obtained. Allow this to cool. Then add the compound tincture of lavender, and as much distilled water as will make the bulk one pint.)

TESTS.—Specific gravity 1·009. 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 eighty-one measures have been added.

EXPLANATION OF TEST.—The principle upon which this test is founded has been already given when discussing that for acidum sulphurosum, page 590. By the oxygen of the soda, the arsenious is converted into arsenic acid, whilst the iodine unites with the sodium to form iodide of sodium. So long, therefore, as any arsenious acid is present, no free iodine can exist, but when the arsenious acid is all converted into arsenic acid, the free iodine strikes the blue colour with the starch. Omitting the potash of the arsenite and the carbonic acid of the soda salt, which are unnecessary in explaining the reactions, this equation represents what takes place— $AsO_3 + 2NaO + 2I = AsO_5 + 2NaI$. One hundred measures of the volumetric solution represent 4·95 grains of arsenious acid, so that 81 measures are equivalent to, *quam proximè*, 4 grains of arsenious acid in each ounce. Consequently, one fluid drachm of this preparation, commonly known as Fowler's solution, contains gr. ss. of arsenious acid. Dose, min. ij. gradually increased to min. viij. two or three times a day.

* *Arsenical Solution*, DEVERGIE. (Arsenic; and carbonate of potash, of each, gr. ij.; distilled water, f℥xvj.; tincture of cochineal, sufficient to colour it; dissolve.) Every fluid ounce contains 1-8th of a grain of arsenic. Dose, f℥j. to f℥ij. two or three times a-day. The advantage it possesses over Fowler's solution is that the preparation being so much weaker and consequently the dose so much larger, dangerous accidents from an over-dose are not so likely to occur. Either solution is incompatible in prescription with acids, lime water, chloride of calcium, sulphate of magnesia, sulphate of iron, sulphate of copper, alum, iodide of iron, nitrate of silver, infusion and decoction of bark, &c.

* *Liquor Arsenici Chloridi.* (Arsenious acid in small fragments, ℥ss.; hydrochloric acid, f℥iss.; distilled water, Oj.; boil, until dissolved, the arsenious acid with the hydrochloric acid mixed with an ounce of the water; then add sufficient water that the entire may accurately fill a pint measure.) *De Valangin's Mineral Solution.* This preparation is incorrectly named, as it is only a solution of arsenic in hydrochloric acid. Each fluid ounce contains a grain and a half of arsenious acid; it is therefore weaker than Fowler's solution. By many it is preferred to any other preparation of arsenic for internal use, especially as being less liable to produce poisonous symptoms or to derange the digestive organs; and increased experience of its effects since the fourth edition of this book was published induces me to alter the opinion then expressed, and to recommend it as a safe and useful preparation in many cases. Dose, min. iij. to min. x. three times a day.

**Pilulæ Asiaticæ.* (Arsenious acid, gr. lx.; black pepper, ℥j. and gr. lx.; liquorice root powdered; and mucilage, of each, q. s.; mix, and divide into 800 pills.) This is a most excellent combination, and one highly praised in the East Indies as a remedy for elephantiasis, lepra, psoriasis, and syphilitic eruptions; I have found it especially useful in languid habits of body and in cases where other preparations have been continued for sometime without producing benefit. Each pill contains about 1-13th of a grain of arsenious acid. Dose, one or two daily.

* *Ioduretted Solution of the Iodide of Potassium and Arsenic,* NELIGAN. (Arsenical solution, min. lxxx.; iodide of potassium, gr. xvj.; pure iodine, gr. iv.; syrup of orange flowers, f℥ij.; dissolve.) Every drachm of this solution contains five minims of arsenical solution, a grain of iodide of potassium, and a fourth of a grain of iodine; it may be administered in a wineglassful of water, and being very agreeable to the taste, is easily taken even by children. I have used it very extensively in the treatment of obstinate cutaneous diseases with excellent results.* It is of a rich wine yellow colour, and keeps unchanged for months.

In poisoning with arsenic, if the stomach-pump be at hand it should be immediately used, and the stomach repeatedly washed out with tepid water, in which the hydrated sesquioxide of iron is suspended. The mode of preparing this substance, which is the best antidote for arsenic, and the manner in which it is to be used, will be described hereafter (see *Ferri Peroxydum Hydratum).* In the absence of the stomach-pump, emetics of sulphate of zinc or sulphate of copper should be administered, and vomiting promoted by demulcent drinks. Magnesia has been also recently proposed as an antidote for arsenic; from the observations of Christison it appears that dense or *heavy* magnesia possesses little or no action on it, but magnesia in the gelatinous state, or the *light* magnesia at present

* See *Treatise on Diseases of the Skin*, Dublin, 1852.

pretty generally manufactured, removes arsenic from its solution in water. If light calcined magnesia be used as an antidote in cases of poisoning with arsenic, it should be administered in the proportion of between thirty and fifty parts to one of the poison.

AURANTII CORTEX. *Bitter Orange Peel.* Citrus Bigaradia *Risso, Hist. Nat. des Orang.*, plate 30. (The outer part of the rind, dried; from the ripe fruit imported from the south of Europe.)

AURANTII AQUA. *Orange-flower water.* Citrus Bigaradia *Risso, Hist. Nat. des Orang.*, plate 30. The bitter orange tree; and Citrus Aurantium *Risso*, plates 3, 4, the sweet orange tree. (The distilled water of the flowers; prepared mostly in France.) The bitter orange tree, which has only been lately separated as a distinct species from the Citrus aurantium (described in the division *Refrigerants).* It differs, in being a smaller tree with more distinctly winged leaf-stalks, in the bitterness of the pulp, and the greater aroma of the rind of the fruit.

PROPERTIES.—The rind of the Seville or bitter orange is cut into narrow pieces and dried, the inner white part having been previously removed. It is in rugged, uneven slices, of a dark orange-yellow colour; has a peculiar fragrant odour, and a warm bitter taste, both of which depend on a volatile oil which exists in concave minute vesicles. This oil, which is an article of the Materia Medica in the Pharmacopœia, is prepared on the continent both by expression and distillation; its composition is $C_{10}H_8$, being isomeric with oil of turpentine. Bitter orange peel yields its aroma and taste to both water and alcohol. The leaves are aromatic and bitter; they are used on the continent, but at present are not employed in this country.

CHARACTERS.—Thin, of a dark orange colour, nearly free from the white inner part of the rind; having an aromatic, bitter taste, and fragrant odour. Nearly colourless, fragrant.

TEST.—Not coloured by sulphuretted hydrogen.

ADULTERATIONS.—The rind of the sweet orange is often substituted for that of the bitter orange; it does not possess the peculiar aroma of the latter. The sophistication may be readily detected by the vesicles in which the volatile oil is contained being convex in the sweet and concave in the bitter orange.

THERAPEUTICAL EFFECTS.—Bitter orange peel and leaves are feebly tonic. They are employed in medicine principally for their agreeable flavour. The following preparations are officinal.

PREPARATIONS.—*Of the Rind.* Infusum, Syrupus, Tinctura.—*Of the Water.* Syrupus Aurantii Floris.

Infusum Aurantii. Infusion of Orange Peel. (Take of bitter orange peel, cut small, half an ounce; boiling distilled water, ten fluid ounces Infuse in a covered vessel, for fifteen minutes, and strain.) An agreeable vehicle for more active remedies. Dose, f℥ss. to f℥ij.

Syrupus Aurantii. Syrup of Orange Peel. (Take of tincture of orange peel, one fluid ounce; syrup, seven fluid ounces. Mix.) Only used as a flavouring agent, but not so agreeable as that prepared from orange flower water. Dose, f℥ss. to f℥ij.

Tinctura Aurantii. Tincture of Orange Peel. (Take of bitter orange peel, cut small and bruised, two ounces; proof spirit, one pint. Macerate the orange peel for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) A favourite and most agreeable addition to tonic mixtures. Dose, f℥ss. to f℥ij.

Syrupus Aurantii Floris. Syrup of Orange Flower. (Take of orange flower water, eight fluid ounces; refined sugar, three pounds; distilled water, sixteen fluid ounces, or a sufficiency. Dissolve the sugar in the distilled water, by means of heat; strain, and when nearly cold add the orange flower water, with a sufficient quantity of distilled water, if necessary, to make the product four pounds and a half. The specific gravity should be 1·330.) Perhaps the most agreeable syrup in the Pharmacopœia. Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—The salts of iron; and lime water.

BARII CHLORIDUM. *Chloride of Barium.* (Syn.: *Baryta Murias. Muriate of Baryta.*) $BaCl+2HO(=122)$. This salt is only retained in Appendix B of the Pharmacopœia for purposes of chemical analysis, and no formulary is given for its preparation. The following is the formulary that was contained in the last edition of the Dublin Pharmacopœia:

PREPARATION.—"Take of carbonate of barytes, coarsely powdered, ℥x.; pure muriatic acid, f℥viij.; distilled water, as much as is sufficient. Dilute the acid with a pint and a half of the water, add the carbonate of barytes, and, when effervescence has ceased, evaporate to dryness. Transfer the residue to a Hessian crucible, and having exposed it to a low red heat for twenty minutes, suffer it to cool, then reduce it to a coarse powder, and boil it for ten minutes with a pint and a half of water. Pour off the solution, boil the undissolved residue with ten additional ounces of water, and again decant. Pass the decanted solutions through a paper filter, and having evaporated the resulting liquid to the bulk of about fourteen ounces, suffer it to cool, that crystals may be formed. The mother liquor, by further evaporation and cooling, will yield additional crystals. *Or*, Take of sulphate of barytes, ℔iss.; lamp-black, ℥iv.; pure muriatic acid, f℥xiv.; distilled water, a sufficient quantity. Heat the sulphate of barytes in a covered crucible, and, while red hot, throw it into distilled water. Let it now, after being reduced to a very fine powder in the manner directed in the formula for *Creta Præparata*, be mixed intimately with the lamp-black, and exposed in a Hessian crucible, for two hours to a strong red heat. The crucible being removed from the fire, and permitted to cool, its contents are to be reduced to a coarse powder, and boiled for fifteen minutes with two quarts of water, after which the solution is to be poured off on a paper filter. The undissolved residuum is to be again boiled with one quart of water, and the resulting liquor decanted on the same filter. To the filtered solutions, placed in a large capsule beneath a flue with a good draught, let the muriatic acid be gradually added, as long as it produces effervescence, and then, by means of a sand heat, evaporate to dryness. Boil the residuum with two quarts of water, pass the solution through a paper filter, and having evaporated it down to one quart, suffer it to cool that crystals may be formed. By further concentration the mother liquor will yield additional crystals."

EXPLANATION OF PROCESS.—The first of these two processes requires but little comment. On treating carbonate of barytes with muriatic acid, its carbonic acid is expelled, and we have water and chloride of barium formed, thus, $BaOCO_2 + HCl = CO_2 + HO + BaCl$. In the second process, the sulphate of barytes is deoxidized by the charcoal employed, its oxygen uniting with the carbon to form carbonic acid, and its sulphur uniting directly with the barium to form sulphide of barium, thus, $BaOSO_3 + 2C = 2CO_2 + BaS$. The resulting sulphide of barium, on being treated with hydrochloric acid, is decomposed, its sulphur uniting with the hydrogen of the acid to form sulphide of hydrogen gas (hence the directions with respect to the flue) whilst the chlorine unites with the barium to form chloride of barium, thus, $BaS + HCl = SH + BaCl$. The object of giving two formularies for its preparation is to afford the operator an opportunity of selecting either the carbonate or the sulphate of barytes to make the chloride from, according to the facility with which he can procure either salt; one will furnish as good a result as the other.

PHYSICAL PROPERTIES.—This salt crystallizes in flat four-sided tables of the rhombic prism series, beveled at the edges. It is colourless and transparent; odourless; with an acrid, bitter taste. Specific gravity, 3·097.

CHEMICAL PROPERTIES.—Chloride of barium is composed of one equivalent of barium, one of chlorine, and two of water of crystallization, $BaCl + 2HO$. It is permanent in ordinary states of the atmosphere, but in very dry air effloresces slightly; is fused by a strong heat; is soluble in about twice its weight of temperate and in somewhat less of boiling water; and is said to be soluble in 400 parts of absolute alcohol. Sulphuric acid and the soluble sulphates produce a heavy white precipitate, insoluble in nitric acid, with a solution of this salt.

ADULTERATIONS.—As met with in the shops, this salt is very seldom adulterated. If made by the second of the two processes described, it is sure to be free from impurities; but if made by the first process, it may contain lime, iron, lead, or copper; these will each be recognized by the following tests formerly contained in the London Pharmacopœia:—"The solution is not precipitated by ammonia or hydrosulphuric acid, or, after being supersaturated by sulphuric acid, by carbonate of soda." The Edinburgh College gave the following test, by which the freedom from any impurity may be readily ascertained:—"100 grains in solution are not entirely precipitated by 100 grains of sulphate of magnesia." The rationale of which test will be understood by reference to their chemical equivalents, that of chloride of barium being 122, whilst that of sulphate of magnesia is 123. To effect complete precipitation, therefore, it is evident that one hundred grains of this salt will require a shade more than one hundred grains of sulphate of magnesia.

THERAPEUTICAL EFFECTS.—Chloride of barium was at one time much employed in scrofulous and cancerous diseases, and in chronic glandular enlargements, in consequence of its supposed tonic and deobstruent properties. In the treatment of diarrhœa its use has been recommended by Mr. Albert Walsh, of this city. In the present day, however, it has fallen almost completely into disuse. In large doses (an ounce or more) it is a narcotico-acrid poison.

DOSE AND MODE OF ADMINISTRATION.—It is used only in solution.

Barii Chloridi Solutio. Solution of Chloride of Barium. (Take of chloride of barium, in crystals, one ounce; distilled water, a sufficiency. Dissolve the chloride of barium in eight fluid ounces of the water, and add as much distilled water as will make the bulk of the solution ten fluid ounces.) Dose, min. v. to min. xx. properly diluted. It is much employed as a test for detecting the presence of sulphuric acid and the sulphates.

INCOMPATIBLES.—Sulphuric acid; sulphates; carbonates; and phosphates.

In poisoning with this salt, the best antidotes are the soluble sulphates, as sulphate of magnesia or sulphate of soda.

BISMUTHUM ALBUM. *White Bismuth.* (Syn.: *Bismuthi Nitras*, Lond. *Bismuthi Subnitras*, Dub. *Magistery of Bismuth.*) $BiO_3,NO_5(=288)$.

PREPARATION.—Take of bismuth, in coarse powder, two ounces; nitric acid, two fluid ounces and a half; distilled water, one gallon. Dilute the nitric acid with three ounces of the 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 particles of metal which may remain undissolved. Evaporate the solution till it is reduced to two fluid ounces, and pour it into half a gallon of the water. When the precipitate which forms has subsided, decant the supernatant liquid, and agitate the sediment with the remainder of the water. After two hours, again decant, and, having placed the product on a filter, dry it at a temperature of 212°.

EXPLANATION OF PROCESS.—When nitric acid is poured upon bismuth, the metal becomes oxidized at the expense of the acid, and nitric oxide gas is given off, occasioning the effervescence alluded to. To explain the reactions we will require one equivalent of bismuth and four of nitric acid, and it will be convenient to divide the process into two stages, in the first of which one equivalent of the nitric acid is resolved into nitric oxide gas, which escapes, and three atoms of oxygen, which unite with the one equivalent of bismuth to form teroxide of bismuth, which now unites with the remaining three equivalents of nitric acid to form ternitrate of bismuth, thus, $Bi+4NO_5=NO_2+BiO_3 3NO_5$. In the second stage of the process, the solution of ternitrate of bismuth concentrated to two ounces is poured into water and thereby resolved into two salts, one the subnitrate of bismuth (BiO_3NO_5), which being insoluble is precipitated, the other the supernitrate of bismuth ($BiO_3 9NO_5$), which is held in solution. To account for their appearance we require four equivalents of ternitrate of bismuth; three equivalents of the teroxide of bismuth unite with three equivalents of nitric acid to form the subnitrate of bismuth, whilst the fourth equivalent of teroxide of bismuth unites with the remaining nine nitric acids to form the supernitrate of bismuth thus, $4(BiO_3,3NO_5)=3(BioO_3,NO_5)+BiO_3 9NO_5$. The remaining steps of the process are directed to washing the resulting subnitrate to free it from any adhering supernitrate, and subsequently drying it.

PHYSICAL PROPERTIES.—This salt is met with in the form of a heavy white crystalline powder, with a pearly lustre, which appears under the microscope to be composed of transparent prisms. It is inodorous and tasteless. If not quite pure it becomes of a grayish colour when exposed to the light.

CHARACTERS.—A heavy white powder in minute, crystalline scales, blackened by sulphuretted hydrogen, insoluble in water, but forming with nitric acid a solution which, poured into water, gives a white crystalline precipitate, and with sulphuric acid diluted with an equal bulk of water a solution which is blackened by sulphate of iron.

CHEMICAL PROPERTIES.—The composition of this substance has been variously stated; it is most generally believed to consist of 3 equivalents of oxide of bismuth, and 1 of nitric acid, ($3BiO_3+NO_5$); but according to some recent researches of Buchner it appears to be BiO,NO_5+2BiO,HO; while according to Wittstein it is $4Bi_2O_3+3NO_5+9HO$. It is very insoluble in water, but is readily dissolved by nitric acid. The black colour produced under the conditions stated in the Pharmacopœia, on the addition of sulphate of iron, is due to the development of nitric oxide gas (see page 90).

TESTS.—Dissolves in nitric acid without effervescence. The solution gives no precipitate with dilute sulphuric acid.

ADULTERATIONS.—As generally met with, this salt is tolerably free from impurities. It sometimes contains carbonates, which may be detected by the effervescence produced when the powder is dissolved in nitric acid. Did its solution in nitric acid precipitate on the addition of diluted sulphuric acid, the presence of lead would be indicated; and in France M. Lassaigne has recently indicated the presence of arsenic in the powder, in such minute quantities however as to have no effect in the small doses in which white bismuth is usually prescribed in this country: it may be detected by first acting on the preparation with *pure* sulphuric acid in a porcelain capsule, evaporating to dryness, and testing the residue in Marsh's apparatus (see page 211).

THERAPEUTICAL EFFECTS.—In large doses nitrate of bismuth has acted as an irritant poison, causing inflammation of the stomach and intestines; and a case is on record in which gr. cxx. produced symptoms of poisoning, but this most probably resulted from the arsenical impurity above indicated, for M. Monneret has recently given it in very large doses from gr cxx. to gr. ccclx. daily without the production of any ill effects. Accounts vary much as to its medicinal action; according to some practitioners, in small doses from five to six grains three times daily, it acts with much certainty in painful derangements of the stomach; others state that to prove beneficial it must be given in at least twenty grain doses; while Monneret always commences its administration in such doses that one hundred and twenty grains are taken in the course of the day, and the quantity is rapidly augmented until three quarters of an ounce or one ounce constitutes the daily dose. The beneficial results derived from its use in these affections have been generally ascribed to its tonic properties; more recently, however, they are said to be owing to a peculiar sedative action which it exerts on the nerves of the stomach. In my opinion they are in some measure attributable to the insoluble character of the powder, which, coating and lining the inner surface of the stomach, protects it to a certain extent from direct contact with the food, its action in this point of view being principally mechanical. The forms of dyspepsia in which alone it proves serviceable are those chronic affections attended with much pain, but unaccompanied by organic disease. It has been also employed in chlorotic dyspepsia and in diarrhœa, especially the colliquative diarrhœa of phthisis. In the last edition of this work Dr. Neligan expressed his opinion of this medicine in the following terms:—"My own experience of its use is not at all favourable, and surely there must be some uncertainty as regards the action of a medicine the dose of which, as exhibited by different practitioners, varies so much." I have quoted the passage inasmuch as my experience is totally at variance with his on this point; I have found it of the greatest service in many of the diseases enumerated, especially so in simple gastrodynia, and I think that the varying character of the testimony borne as to its value is to be ascribed to its not having been prescribed in sufficiently large doses, my experience on this point coinciding with that of Monneret. Applied externally in the form of powder, white bismuth allays irritation and itching in cutaneous diseases; it should be diluted with an equal quantity of starch in fine powder; and in cases attended with much discharge, as in some forms of chronic eczema, oxide of zinc and carbonate of lead may be combined with it with much advantage.

DOSE AND MODE OF ADMINISTRATION.—For dose see last paragraph. It may be made into an electuary or bolus, with some aromatic powder and syrup, or honey suspended in some bitter mixture, as infusion of calumbo, by the agency of mucilage, or in the form of the officinal lozenges: Monneret recommends the dose to be taken during meals, and he usually gives it in broth or milk.

Trochisci Bismuthi. Bismuth Lozenges. (Take of white bismuth, fourteen hundred and forty grains; carbonate of magnesia, four ounces; precipitated carbonate of lime, six ounces; refined sugar, thirty ounces; gum arabic, in powder, one ounce; distilled water, six fluid ounces; oil of cinnamon, half a fluid drachm. Add the dry ingredients to the water; mix thoroughly, and boil till the mixture is reduced to a proper consistence. Then remove it from the fire, add the oil of cinnamon, and again mix thoroughly. Divide the mass into 720 square lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains two grains of white bismuth. Dose, 6 to 12 lozenges three or four times a day.

**Liquor Bismuthi Ammoniaco-Citratis. Solution of the Ammonio-Citrate of Bismuth,* SQUIRE. (Dissolve 430 grains of metallic bismuth in sufficient nitric acid, then add ammonia to the solution. Well wash the resulting precipitate with distilled water; gradually add the moist oxide thus precipitated to a boiling solution of citrate of ammonia, made by exactly neutralizing 480 grains of citric acid with ammonia; the precipitate will be slowly but entirely dissolved. The solution should then be neutralized with ammonia, and water added to make up ℥xx. Each drachm contains three grains of oxide of bismuth.) This preparation represents in composition a proprietary medicine now enjoying an extended reputation under the name of *Schacht's Liquor Bismuthi*, which, however, is stated only to contain one grain of oxide of bismuth in each drachm. I have subjected Schacht's preparation to rather an extended clinical experience, and must confess that I have been disappointed in the results, although using it in cases likely to be benefited by the exhibition of bismuth; for instance, in cases of uncomplicated gastrodynia improving under the use of the subnitrate of bismuth, I have substituted for it the liquor bismuthi, and found that they retrograded until put back on the subnitrate, when they rapidly improved again; and in other instances I have reversed the experiment, but always with the same result. Nevertheless, being a medicine in extensive consumption, I have thought it only proper to notice it here. Dose, from f℥j. to f℥iv.

INCOMPATIBLES.—Potash, soda, ammonia, and their carbonates.

CALCII CHLORIDUM. *Chloride of Calcium.* (Syn.: *Muriate of Lime, Hydrochlorate of Lime.*) Chloride of calcium dried at a dull red heat, CaCl (=55·5). It should be kept in a well-closed bottle.

PREPARATION.—An article of the Materia Medica in the Pharmacopœia; but by the following process a satisfactory result will be obtained:—"Take of chalk, in small fragments, ℔ij.; pure muriatic acid, Oijss.; distilled water, Oj.; slaked lime as much as is sufficient: into the acid, first diluted with water, introduce the chalk in successive portions, and when the effervescence has ceased, boil for ten minutes. Add now, stirring well, a very slight excess of slaked lime, and throw the whole upon a calico filter. Acidulate the filtered solution slightly by adding a few drops of muriatic acid, then evaporate it to dryness, and expose the residuum to a low red heat in a Hessian crucible. Finally reduce the product rapidly to a coarse powder in a warm mortar, and enclose it in a well-stopped bottle."

EXPLANATION OF PROCESS.—On adding hydrochloric acid to chalk, its carbonic acid is expelled, and water and chloride of calcium are found, thus, $CaOCO_2+HCl=CO_2+HO+CaCl$. The object with which the slaked lime is added is to free the resulting salt from iron and magnesia, the not unusual impurities of chalk. Were these present, the hydrochloric acid would produce with them chloride of iron and of magnesium, and these would, by the lime employed, be resolved into oxides of iron and of magnesium that would be precipitated, and chloride of calcium, thus, $FeCl+MgCl+2CaO=FeO+MgO+2CaCl$.

PHYSICAL PROPERTIES.—This salt is usually met with in colourless translucent masses, but it crystallizes from a concentrated solution in long striated four and six sided prisms. It is inodorous, and has an acrid, bitter, saline taste.

CHEMICAL PROPERTIES.—Crystallized chloride of calcium is composed of one equivalent of calcium, one of chlorine, and six of water of crystallization, $Ca\,Cl + 6\,HO$. Exposed to the air it deliquesces rapidly. It is very soluble in water and in alcohol; by heat the water of crystallization is driven off, and at a red heat it fuses.

TESTS.—Dry, but very deliquescent, and entirely soluble in twice its weight of water. The solution is not precipitated by lime.

ADULTERATIONS.—This salt should be perfectly colourless, the presence of iron, with which it is occasionally contaminated, giving it a yellowish tinge. The adulteration with magnesia may be detected by lime giving a white precipitate with a solution of the salt.

THERAPEUTICAL EFFECTS.—Chloride of calcium acts as an irritant poison in large doses. In medicine, it was at one time much employed in the treatment of bronchocele and in scrofulous diseases, being given internally, and at the same time used externally dissolved in water in the form of bath; its action was said by some to be tonic and deobstruent, by others cathartic. In the present day, however, it has nearly fallen into disuse, although lately proposed as a remedy for lupus. This salt forms a principal ingredient in many mineral waters.

DOSE AND MODE OF ADMINISTRATION.—Chloride of calcium is always administered in solution; the following is a convenient formula:—

Liquor Calcii Chloridi. Solution of Chloride of Calcium. (Take of chloride of calcium, one ounce; distilled water, a sufficiency. Dissolve the chloride of calcium in eight fluid ounces of the water, and add as much distilled water as will make the bulk of the solution ten fluid ounces.) This solution is only introduced as a test into Appendix B of the Pharmacopœia, but as already stated is a convenient formulary for its internal exhibition. Dose, min. x. to f℥j.

Solution (Saturated) of Chloride of Calcium. (Take of chloride of calcium, three hundred and thirty-six grains; distilled water, one fluid ounce. Dissolve.) Only used as a test.

INCOMPATIBLES.—Sulphuric acid, and the soluble sulphates; potash and soda, and their carbonates; and carbonate of ammonia.

CALUMBA. *Calumbo.* Cocculus palmatus, *DC.* Plate 30, *Steph. and Church. Med. Bot.* (The root, sliced transversely and dried; from Mozambique.) A native of the forests of Mozambique and Oibo in Africa; belonging to the Natural family *Menispermaceæ*, and to the Linnæan class and order *Diœcia Hexandria.*

BOTANICAL CHARACTERS.—An annual climber; root, perennial, tuberose; stem herbaceous; leaves, alternate, cordate at the base, 5–7 lobed, somewhat hairy; flowers, diœcious, small, green, in axillary racemes; fruit, a drupe or berry, one-celled, one-seeded.

PREPARATION.—The roots are dug up in March, cut horizontally into slices, and dried in the shade; the offsets or tubers from the main root only are used.

PHYSICAL PROPERTIES.—As met with in commerce, calumbo root is in circular flat pieces, from 3 to 10 lines thick, and from half an inch to three inches in diameter. The pieces consist of a brownish-yellow rugous epidermis, a thick yellowish inner bark, and a light, spongy, woody centre, of a grayish-yellow colour. The flat surfaces are depressed in the centre, and marked with concentric yellowish lines. It has a feeble, somewhat aromatic odour, and a strong, purely bitter taste.

CHARACTERS.—Slices flat, circular, or oval, about two inches in diameter, and from two to four lines thick, softer and thinner towards the centre, greyish-yellow, bitter. A decoction, when cold, is blackened by the solution of iodine.

CHEMICAL PROPERTIES.—Calumbo contains a crystalline, very bitter neutral principle, which has been named *Calumbin*, and on which its medicinal properties depend, about a third of its weight of starch, a trace of volatile oil, gum, wax, &c. Its bitter principle is dissolved by cold and boiling water, by alcohol, and by ether. As boiling water dissolves out some starch also, a warm infusion becomes cloudy as it cools; the pharmacopœial authorities therefore employ cold water for preparing the officinal infusion, a great improvement, inasmuch as the active principle is as completely extracted and the resulting infusion is quite transparent.

ADULTERATIONS.—The root of a species of bryony *(Bryonia epigæa)*, and the root of *Frasera walteri* (American or false calumbo), have been at times sold for the true calumbo root. The former may be at once detected by its disagreeable, bitter, somewhat acrid taste, the latter by its infusion becoming dark-green on the addition of a sesqui-salt of iron, an infusion of the true root remaining unchanged by the same test. Another false calumbo is met with in the French drug market, which is known by its containing no starch, a cooled decoction not being affected by tincture of iodine.

THERAPEUTICAL EFFECTS.—Calumbo is an excellent bitter tonic, being slightly aromatic, but free of all astringency. It is most usefully employed in the various forms of dyspepsia depending on want of tone in the digestive organs, and in irritability of the stomach accompanied by vomiting, when there is no tendency to inflammation present; for this latter affection it is peculiarly adapted in consequence of its property of arresting vomiting, whether it be the consequence of disease or of the administration of emetics. It is also used with much benefit to allay the sympathetic vomiting of pregnancy, and that which depends on diseases of the other abdominal viscera. The *anti-emetic* property of calumbo probably depends on its active principle *calumbin*, which, in addition to its action as a bitter, possesses also narcotic properties. In the advanced stages of diarrhœa and dysentery, when the use of tonics is indicated, calumbo is an excellent remedy.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xxx.

Extractum Calumbæ. Extract of Calumbo. (Take of calumbo, in powder, one pound; proof spirit, four pints. Macerate the calumbo in two pints of the spirit for twenty-four hours; pack in a percolator, and pass the remainder of the spirit slowly through it; distil off the spirit, and evaporate the residue to a proper consistence.) This extract, the formulary of which was contained in the last edition of this work (extracted from the Bavarian Pharmacopœia), is an excellent tonic. Dose, gr. x. to gr. xxx.

Infusum Calumbæ. Infusion of Calumbo. (Take of calumbo, in coarse powder, half an ounce; cold distilled water, ten fluid ounces. Macerate for one hour, and strain.) Infusion of calumbo is usually employed as a vehicle for the more active tonics, and is given in doses of from f℥j. to f℥iij. The salts of iron, the alkalies, or their carbonates do not alter the colour of this infusion, and consequently may be advantageously combined with it in prescription.

Tinctura Calumbæ. Tincture of Calumbo. (Take of calumbo, bruised, two ounces and a half; proof spirit, one pint. Macerate the calumbo for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—Tincture of iodine; nitrate of silver; and the acetates of lead.

* CANELLA ALBA, CORTEX. *Canella bark, Bark of Canella alba.* This, the *White Wood* or *Wild Cinnamon* tree of the West Indian islands and of South America, belongs to the Natural family *Meliaceæ (Canellaceæ,* Lindley), and to the Linnæan class and order *Dodecandria Monogynia.*

BOTANICAL CHARACTERS.—A handsome tree, 40–50 feet high; leaves, alternate, obovate, shining, coriaceous; flowers, small, glaucous blue, in clusters at the extremities of the branches; fruit, a small, bluish-black berry, generally one-celled.

PHYSICAL PROPERTIES.—Canella bark is met with in pieces of from 3–12 inches long, generally quilled, and from one to three lines thick. They are of a yellowish or pinkish-white colour, have a faint aromatic odour, and an acrid very spicy taste. This bark is often called *false Winter's bark,* as it is frequently sold for the bark of *Drymis winteri,* which was formerly officinal in the Dublin Pharmacopœia, from which, however, it can be readily distinguished, the inner surface of the canella bark being white, that of Winter's bark, dark coloured.

CHEMICAL PROPERTIES.—The medicinal activity of canella bark is due to volatile oil and bitter extractive; it also contains a peculiar crystalline principle resembling *mannite* in its properties, and which has been named *Cannellin.*

THERAPEUTICAL EFFECTS.—Canella is an aromatic tonic of some power; it is seldom employed alone in this country, but is used as an adjunct to the bitter tonics in dyspepsia. It is also combined with cathartics in debilitated states of the digestive organs, and to correct their griping qualities. Dose, in powder, gr. x. to gr. xxx.

CASCARILLA. *Cascarilla.* Croton Eluteria, *Bennett, Journ. Proceed. Linn. Soc.* Plate, p. 150. vol. iv. *Pharm. Journ,* 2nd series. (The bark; from the Bahama Islands.) Croton eluteria is a native of the Bahamas, being found chiefly on the island of Eluthera, whence its specific name; it belongs to the Natural family *Euphorbiaceæ,* and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—A moderate sized tree; branches, angular, somewhat compressed; leaves, alternate, ovate, smooth, silvery beneath; flowers, whitish, monœcious, in compound axillary racemes.

CHARACTERS.—In quills, two or three inches in length, and from two to five lines in diameter, dull brown but more or less coated with white crustaceous licheus; breaks with a short resinous fracture; is warm and bitter to the taste; and emits a fragrant odour when burned.

PHYSICAL PROPERTIES.—Cascarilla bark occurs in short broken quills or flattened pieces, generally somewhat twisted. It is of a reddish-brown colour, with a whitish or reddish-yellow fissured epidermis; hard, breaking with a close compact fracture; has an aromatic, bitter taste, and a peculiar agreeable odour, which becomes very fragrant when the bark is burned.

CHEMICAL PROPERTIES.—According to the analysis of Duval, this bark contains a bitter, crystalline, neutral principle, which has been named *Cascarillin*, a peculiar form of tannin, albumen, a red colouring matter, fatty matter, wax, gum, odorous volatile oil, resin, starch, pectic acid, salts of lime and potash, and woody fibre. It yields its active properties to both water and alcohol; the colour of the infusion is deepened by the sesqui-salts of iron.

ADULTERATIONS.—Copalchi bark, obtained from the *Croton pseudo-china*, a native of Mexico, has been occasionally substituted in commerce for cascarilla bark, which it resembles much both in odour and properties. The quills are much longer than those of cascarilla bark, more completely covered with minute white lichens, and have no transverse cracks.

THERAPEUTICAL EFFECTS.—Cascarilla is an aromatic tonic, possessing but little astringency. It is principally used as an agreeable addition to other remedies of this class in atonic dyspepsia, in the advanced stages of diarrhœa and dysentery, and in convalescence from fevers or other acute diseases. It has been also employed in intermittents as a substitute for cinchona bark, and it is stated with great success; but this probably has arisen from its being confounded with a species of cinchona which is named Cascarilla.

DOSE AND MODE OF ADMINISTRATION.—In powder, gr. x. to gr. xl.

Infusum Cascarillæ. Infusion of Cascarilla. (Take of cascarilla, in coarse powder, one ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for one hour, and strain.) Dose, f℥ss. to f℥ij.

Tinctura Cascarillæ. Tincture of Cascarilla. (Take of cascarilla, bruised, two ounces and a half; proof spirit, one pint. Macerate the cascarilla for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—Lime-water; salt of iron; sulphate of zinc; tartar emetic; nitrate of silver; and acetate of lead.

* CENTAURIUM.—*Common Centaury. Erythræa centaurium.* Indigenous; belonging to the Natural family *Gentianaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Annual, 8–10 inches high; stem, nearly simple; leaves, ovato-oblong, in distant pairs; flowers, handsome, rose-coloured, in corymbose panicles near the top of the stem.

The whole of this plant is odourless, but has a strong, purely bitter taste. It should be collected when in flower, and dried with a stove heat; every part except the flowers contains bitter extractive. It imparts its properties, which depend on the bitter extractive, to boiling water. The common centaury is scarcely ever used in the present day, except as a domestic remedy; nevertheless, although omitted from the Pharmacopœia, it forms an excellent indigenous substitute for gentian. It is best given in the form of infusion (prepared with ℥ss. of the dried herb, and f℥xij. of boiling water), in doses of f℥j. to f℥ij.

CETRARIA. *Iceland Moss.* (Syn.: *Liverwort.*) Cetraria islandica, *Acharius, Lichenogr.* Plate 205, *Woodv. Med. Bot.* (*Lichen islandicus*). (The entire lichen; a native of the north of Europe.) Cetraria islandica is a native of the northern parts of the British Isles, and of the colder regions of both the New and Old Worlds. It belongs to the Natural family *Lichenaceæ* (*Lichenales,* Lindley), and to the Linnæan class and order *Cryptogamia Algæ.*

BOTANICAL CHARACTERS.—*Thallus* foliaceous, erect, tufted, laciniated, channelled, dentato-ciliate; *Apothecia,* brown, appressed, flat, with an elevated border.

PHYSICAL PROPERTIES.—As met with in the shops, Iceland moss is grayish or brownish-white, silvery, with a faint peculiar odour, and a mucilaginous, somewhat bitter taste.

CHARACTERS.—Foliaceous, lobed, crisp, cartilaginous, brownish-white, paler beneath, bitter, and mucilaginous. A strong decoction gelatinizes on cooling.

CHEMICAL PROPERTIES.—It consists of two starchy matters (*lichenin* and *inulin*), a bitter principle (*cetrarin*), two acids (*lichestearic and lichenic acids*), with uncrystallizable sugar, gum, extractive, colouring matter (*Chlorothalle*), some salts, and amylaceous fibre. By maceration in cold water the bitter principle is extracted, and the water acquires a brownish colour. On boiling in water about 65 per cent. is dissolved, and when sufficiently concentrated, the liquid cools into a firm jelly.

THERAPEUTICAL EFFECTS.—Iceland moss is a mild bitter tonic, and as it is also nutritive, forms an excellent article of diet in diseases of debility, and in convalescence from acute diseases. It is used also as an article of food, the bitter principle having been previously removed by maceration in cold water or in a weak alkaline ley (water, 300 parts, and carbonate of potash, 1 part); but when its tonic powers are required, the bitter principle should not be removed, as is frequently done.—*Cetrarin* is the tonic principle of Iceland moss, it has been obtained in a separate state by the process described below, and has been used in Italy, it is stated, with much success as a substitute for sulphate of quinia.

Decoctum Cetrariæ. Decoction of Iceland Moss. (Take of Iceland moss, one ounce; distilled water, one pint and a half. Wash the moss in cold water to remove impurities; boil it with the distilled water for ten minutes in a covered vessel, and strain while hot. The product should measure about a pint.) Dose, f℥j. to f℥ij.

***Cetrarin* (Iceland moss, coarsely powdered, any quantity; digest in rectified spirit as long as it acquires a bitter taste; distil off the greater part of the spirit and filter while hot. The impure cetraric acid which is deposited as the liquor cools, may be purified by redissolving in boiling alcohol and crystallizing.) Dose as a febrifuge, gr. ij. to gr. v. every three hours. Sixteen grains thus given in divided doses are said to be sufficient to check the return of the fit in ague.

INCOMPATIBLES.—Potash; the salts of lead and of copper; the sesquisalts of iron; and iodine.

CHIRATA. *Chiretta.* Ophelia Chirata, *DC.* Plate 252, vol. iii. *Wallich, Plant. Asiat. (Gentiana Chirata.)* (The entire plant; collected in northern India when the fruit begins to form.) A native of the northern parts of the continent of India; belonging to the Natural family *Gentianaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Annual; stems, smooth, jointed, branched, erect, about 3 feet high; leaves, opposite, amplexicaul, very acute; flowers, yellow, very numerous, stalked, in terminal panicles.

PREPARATION.—The whole plant is pulled up at the time the flowers begin to decay, and dried in the sun for use. It is imported in bundles tied with strips of cane, and packed in large chests.

CHARACTERS.—Stems about three feet long, of the thickness of a goose-quill, round, smooth, pale brown, branched; branches opposite; flowers small, numerous, panicled; the whole plant intensely bitter.

PHYSICAL PROPERTIES.—As met with in the shops, chiretta consists of the root, stems, and branches. The stems are round and smooth, about the thickness of a writing pen, with a shining brown epidermis, and a yellow spongy pith. The whole plant has a purely bitter and unpleasant taste, without any astringency.

CHEMICAL PROPERTIES.—Chiretta is composed of resin, yellow bitter matter, brown colouring matter, gum, malic acid, salts of potash and lime, and traces of oxide of iron *(Lassaigne* and *Boissel).* It yields its bitterness to water and to alcohol.

ADULTERATIONS.—Bundles of another plant bearing some resemblance to chiretta are sometimes found mixed with it in the chests in which it is brought to this country; they may be, however, readily detected, as they do not possess the least bitter taste.

THERAPEUTICAL EFFECTS.—Chiretta is a powerful, purely bitter tonic, bearing much resemblance to gentian. Under its use the bowels are relaxed and the secretion of bile promoted; it is therefore peculiarly adapted as a tonic for dyspepsia accompanied by constipation. It is much employed in the East, where its febrifugal properties are held in high estimation by the European practitioners, who use it instead of cinchona when the latter is not to be procured.

DOSE AND MODE OF ADMINISTRATION.—In powder, a bad form, gr. x. to gr. xx.

Infusum Chiratæ. Infusion of Chiretta. (Take of chiretta, bruised, a quarter of an ounce; distilled water, at 120°, ten fluid ounces. Infuse in a covered vessel, for half an hour, and strain.) Dose, f℥ss. to f℥ij.

Tinctura Chiratæ. Tincture of Chiretta. (Take of chiretta, bruised, two ounces and a half; proof spirit, one pint. Macerate the chiretta for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

* CHONDRUS CRISPUS. *Carragheen, or Irish moss.* This substance consists of this and many allied species, dried and bleached in the sun. For medicinal use it is principally gathered by the peasantry on the south-west coast of Ireland. As commonly met with it is of a yellowish-white colour, dry and very crisp, in most of its properties resembling Iceland moss, but being more mucilaginous and less bitter. It forms a somewhat similar jelly with boiling water or milk, and is frequently used as a substitute for that substance. Dr. Frank, of Wolfenbüttel, recommends the following compound powder of Irish moss as a diet for phthisical patients, and for children affected with *tabes mesenterica.*

Carragheen Jelly. Take of carragheen moss, cleaned, gr. xxx.; spring water, f℥xvj.; boil down to one-half, strain with expression, and add to the strained liquor, white sugar, ℥iv.; gum arabic, powdered, ℥j.; and powdered orris-root, gr. xxx.; heat to dryness with a gentle temperature, stirring constantly so as to obtain a pulverulent mass, to which ℥iij. of arrowroot are to be added with trituration. A jelly is prepared with this powder, by rubbing a teaspoonful of it with a little cold water, and then pouring a cupful of boiling water on it. It has a most agreeable odour and taste, and is highly nutritious.

CINCHONA FLAVA. *Yellow Cinchona Bark.* Cinchona calisaya, *Weddell, Hist. Nat. des Quinguinas,* Plates 2, 3 bis, and 28. (The bark; collected in Bolivia and southern Peru.)

CINCHONA PALLIDA. *Pale Cinchona Bark.* Cinchona Condaminea, *DC. vars.* chahuarguera *Pavon,* and crispa *Tafalla.* Plates 1 and 2, *Howard's Illustrations (Cinchona chahuarguera and C. crispa).* (The bark; collected about Loxa in Ecuador.)

CINCHONA RUBRA. *Red Cinchona Bark.* Cinchona succirubra, *Pavon MS. Nueva Quinologia.* Plate 9, *Howard's Illustrations.* (The bark; collected on the western slopes of Chimborazo.)

This most valuable medicine appears to have been unknown in Europe until about the year 1640, when the Countess of Chinchon, wife of the Viceroy of Peru, on her return to Spain brought it into notice,—hence its name *Cinchona* bark; it also was long known as the *pulvis Comatissæ*, or Countess' powder. Another of its synonyms, *Jesuits' bark,* was derived from the fact of its having been extensively traded in by the Jesuits; at first it was supposed that it was the produce but of one tree, but as time rolled on, the varieties of the tribe were quickly extended, so that at present the most recent authority on the subject, Weddell, admits of twenty-one species. One of the great difficulties attending upon the classification, is that trees of the same species are so altered by climate and the height at which they are found, as to present all the appearance of those of a new species. A great deal of the confusion, however, which so long existed regarding the natural history of the Cinchona barks, has been cleared up by the investigations of Weddell in their native country; a full account of which, and of all else relating to so important a medicine, is contained in the third edition of Pereira's great book,—an account complete and comprehensive up to the time; moreover possessing for the student of the Materia Medica a melancholy interest, as being the last portion of the work which the author was spared to emend. All the cinchona trees are inhabitants of the Andes, growing at different elevations from 3,937 to 10,728 feet above the level of the sea, and in the region extending from 10° N. to 19° S. latitude. They belong to the Natural family *Cinchonaceæ*, and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Trees or tall shrubs; leaves, shortly petioled with plain margins; stipules, ovate or oblong, foliaceous, free deciduous; flowers white or rose-coloured, in terminal corymbose panicles, very fragrant; stamens, included within the tube of the corolla; capsule, ovate, elongated, crowned with the teeth of the calyx, 2-celled, 2-valved, containing many winged seeds.

PREPARATION.—Bark-peeling, as it is termed in South America, is practised by the native Indians; the bark of the entire tree both stem and branches is removed, the trees being in general previously cut down; it is then dried with great care so as to preserve its bright colour, the larger and thicker portions being dried so as to form flat pieces, the smaller being allowed to curl into quills. The epidermis, with the lichens which naturally grow on it, is carefully preserved on the bark, but if it be very coarse or injured it is frequently removed. Bark-peeling occupies the entire of the dry season from May to November, and those employed in it are called *Cascarilleros.*

PHYSICAL PROPERTIES.—It would be quite foreign to the scope of this work to enter into any detailed account of the numerous varieties of cinchona bark which are occasionally met with in commerce. I shall only describe those which most frequently occur, and which are most generally used for medicinal purposes; and in so doing I shall adopt the classification generally followed in the English drug trade, and now adopted in the Pharmacopœia:—namely, *Yellow, Red, and Pale Cinchona barks.*

1st.—YELLOW BARK, *Cinchona flava.* The botanical origin of this bark, the *China regia* of Von Bergen, the *Jaune royal* of Guibourt, is ascribed by Weddell, who investigated the history of Cinchona barks in their native country, to the *Cinchona calisaya.* It is met with in two varieties, *quilled* and *flat.* The *quills* are generally from 9 to 18 inches long, from half an inch to two inches in diameter, and from one to six or seven lines in thickness. They are for the most part singly quilled, and coated with a very rough light-grey epidermis; externally they are marked with longitudinal wrinkles, and traversed with horizontal fissures often extending completely round the quills; and large patches of grayish-white lichens are usually adherent. Internally, they are smooth and of a cinnamon-brown colour. The *flat* pieces are from 8 to 18 inches long, from one to four inches broad, and from one to five lines thick; they are in general freed of their epidermis, but when present it is similar to that of the quilled bark. The colour is reddish-brown externally and cinnamon-brown within. Both sorts break with a fibrous, splintery fracture, and yield an orange-yellow powder. They have a faint aromatic odour, and an aromatic, bitter, somewhat astringent taste. An account of the cryptogamic plants which are found on this and the other sorts of cinchona bark has been given by Fèe and by Zenker, and an attempt made to distinguish the different barks according to the species which predominate on each, but it is much too refined and difficult for practical purposes; and moreover Weddell states that the presence of peculiar varieties of the cryptogamia on the barks depends on the districts in which the trees grow and not on the species of Cinchona. The yellow bark of commerce is imported in serons and chests from Arica, a seaport of Bolivia. The following is the description given of it in the Pharmacopœia.

CHARACTERS.—In flat pieces, uncoated or deprived of the periderm, rarely in coated quills, from six to eighteen inches long, one to three inches wide, and two to four lines thick, compact and heavy; outer surface brown, marked by broad shallow irregular longitudinal depressions; inner surface tawny-yellow, fibrous; transverse fracture shortly and finely fibrous. Powder cinnamon-brown, somewhat aromatic, persistently bitter.

2nd.—RED BARK, *Cinchona rubra.* The species from which this bark, the *China rubra* of Von Bergen, the *Quinquina rouge verruqueux et non-verruqueux* of Guibourt, is obtained, is as yet not certainly ascertained. Guibourt is inclined to ascribe it to *Cinchona nitida* or a variety of that species, but Mr. Elliot Howard, in an interesting memoir published in the 16th volume of the *Pharmaceutical Journal,* is of opinion from observations made by him on specimens received from the place of growth, that it is procured from a variety of the *Cinchona ovata,* and to which he suggests the specific name *erythroderma* originally proposed by Guibourt, should be applied. Weddell has since endorsed this opinion, but M. Guibourt does not agree with it. In the Pharmacopœia it is now ascribed to *Cinchona succirubra.* It occurs in quills and in flat pieces. The *quills* are from 3 to 15 inches long, from two lines to an inch and a quarter in diameter, and from half a line to two lines thick. Externally, they are of a reddish-brown colour,—the smaller quills are grayish-brown; they are usually rough, wrinkled, and furrowed; and have a few scattered patches of grayish-white lichens. The *flat* pieces are from two inches to two feet in length, from one to five inches in breadth, and from a third of an inch to three-quarters of an inch in thickness; they are seldom quite flat, being generally somewhat convex. The epidermis is usually absent, it is of a reddish or chesnut-brown colour, rough, wrinkled, and generally warty. The inner surface of both sorts is fibrous, and of a reddish-yellow or reddish-brown colour, the thickest pieces being the darkest coloured. The transverse fracture is fibrous and splintery, and the powder is pale reddish-brown. Red bark has a feebly aromatic, somewhat earthy odour, and a bitter, strongly astringent taste. It is imported from Guayaquil and Lima in chests, never in serons; good red bark is now scarce in the English market, and does not occur in as large pieces as it formerly did; when met with genuine it is much esteemed and bears a high price. The following is the officinal description.

CHARACTERS.—In flat or curved pieces, less frequently in quills, coated with the periderm, varying in length from a few inches to two feet, from one to three inches wide, and two to six lines thick, compact and heavy; outer surface brown or reddish-brown, rarely white from adherent lichens, rugged or wrinkled longitudinally, frequently warty, and crossed by deep transverse cracks; inner surface redder; fractured surface often approaching to brick-red; transverse fracture finely fibrous; powder red-brown; taste bitter and astringent.

3rd.—PALE BARK. This bark (*Cinchona coronæ*, E., *Crown or Loxa bark*, D., the *China loxa* of Von Bergen, *Quinquina de Loxa* of Guibourt) is the produce of the *Cinchona Condaminea* of Humboldt and Bonplandt. It is always met with in the form of quills, never in flat pieces. These quills are single or double, from six to fifteen inches long, from two lines to an inch in diameter, and from one-fourth of a line to two lines thick. The epidermis is always present, it is furrowed with numerous transverse fissures or cracks; and frequently also with longitudinal splits. Externally the bark is of a pale grayish-brown colour, and covered with a great number of small whitish and ash-coloured lichens. Internally it is smooth and of a pale cinnamon-brown colour; its fracture is fibrous, and it yields a paler coloured powder than either yellow or red bark. The odour and taste are nearly similar to those of red bark. In the Pharmacopœia it is thus described.

CHARACTERS.—From half a line to a line thick, in single or double quills, which are from six to fifteen inches long, two to eight lines in diameter, brittle, easily splitting longitudinally, and breaking with a short transverse fracture; outer surface brown and wrinkled, or grey and speckled with adherent lichens, with or without numerous transverse cracks; inner surface bright orange or cinnamon-brown: powder pale brown, slightly bitter, very astringent.

* CINCHONA MICRANTHA, D. CINCHONA CINEREA, E.—*Gray or*

Huanuco Bark. Silver Bark. This, the fourth variety of bark which was officinal in the last editions of the Dublin and Edinburgh Pharmacopœias, is also a pale bark, and whenever met with, at least in the Dublin market, is sold under that name; it is rather scarce at present, but is a very good bark; it may be readily distinguished from other barks by the edges of the most perfect quills being cut obliquely; it is the produce of *Cinchona micrantha.* Both these varieties of pale bark are imported from Loxa and Lima in chests and in serons, and are often mixed together in the same package. *Cinchona lancifolia,* incidentally alluded to in the Pharmacopœia as one of the sources from which quinia may be procured, and which yields the *orange bark* of Mutis, the *fibrous Carthagena bark, Bogota bark,* and *Coquetta bark* of more modern pharmacologists, is a native of New Granada. Its bark presents a silvery appearance, from the presence of lichens. It may be met with either in quills or flat pieces, but its remarkable features are the splintery nature of its fracture, and its orange colour.

Several other varieties of cinchona bark, although not officinal, are frequently met with in commerce, and are many of them of good quality; a detailed account of them will be found in the works of Pereira, of Christison, of Guibourt, and of Weddell. The so-called *false cinchona barks* will be considered under the head of *adulterations.*

CHEMICAL PROPERTIES.—According to the analyses of various chemists, more especially those of Pelletier and Caventou, cinchona bark appears to consist of five peculiar alkaloids—*quinia, cinchonia, quinidia, cinchonidia,* and *aricina* or *cuzconia,* in combination with three acids—*kinic* or *cinchonic, kinovic* and *tannic,* together with two peculiar colouring matters—*cinchonic red* and *cinchonic yellow,* green fatty matter, kinate of lime, starch, gum, ligneous fibre, and a trace of volatile oil. The proportion of these ingredients, particularly the alkaloids—the last of which has not been used in medicine, and the existence of which is more than problematical, inasmuch as, though announced by Pelletier, subsequent investigators have failed in procuring it, differs remarkably in the various kinds of bark; thus *quinia* predominates in yellow bark, and *cinchonia* in pale bark, while they are contained in nearly equal proportions in red bark: *quinidia* has been found in the brown and gray barks only. In addition to these five alkaloids, Pasteur describes two others, derivatives through the agency of heat, respectively from quinia and cinchonia, which are called *Quinicia* and *Cinchonicia.* The medicinal properties of bark depend principally on the alkaloids quinia, quinidia, cinchonia, and cinchonidia; of these the first is generally considered the most active. A salt of it, the sulphate, is in very general use as a substitute for cinchona bark.

Quinia is most readily obtained by precipitating a solution of the sulphate of quinia with ammonia, when it occurs in the form of a snow-white amorphous powder, which may be readily obtained in the form of delicate silky needles, by dissolving it to saturation in boiling alcohol, and cooling the solution very slowly; it is void of odour, has an extremely bitter taste, and is strongly alkaline. It requires for its solution 200 parts of boiling water, but is very soluble in alcohol and in ether. But the most remarkable characteristic of quinia is the beautiful emerald-green colour which results on treating a solution containing it, or one of its salts, with a fresh solution of chlorine and then with ammonia. *Cinchonia* may be obtained from pale bark by a similar process to that for the preparation of quinia from yellow bark. It crystallizes in colourless prisms, is inodorous, and has a feebly bitter taste. It requires 2500 parts of boiling water to dissolve it, is but slightly soluble in cold ether, and is much less soluble in alcohol than quinia; in other respects it bears much resemblance to that alkaloid, from which, however, it can be readily distinguished by its yielding a *white* precipitate instead of the emerald-green colour when its solution is treated with chlorine and then with ammonia. Its composition is $C_{40}H_{24}N_2O_2$. The existence of a third alkaloid in cinchona possessing the same composition as quinia had been noticed by several analytical chemists, but its distinct nature was first fully proved by in 1848 Van Heijningen, who termed it *β. quinine*, followed in 1850 by Hlasiwetz, who named it *Cinchotin*, and by Leers in 1852. The correctness of the views of those who regarded this substance as a distinct alkaloid is now more than acknowledged, for it has been ascertained to consist of *two* distinct alkaloids, one of which has been named *Quinidia*, and its composition has been stated to be $C_{40}H_{24}N_2O_4$. It has been found in most of the pale barks, being obtained from them by a process similar to that for procuring quinia, but its salts being more soluble than those of quinia they remain in the mother waters. In other respects both the alkaloid and its salts very closely resemble quinia and its salts. The remarkable difference between this alkaloid and all the others is that the solution of its sulphate is precipitated by a solution of iodide of potassium. The fourth alkaloid *Cinchonidia* is isomeric with cinchonia, which it resembles in not striking the green colour with the chlorine and ammonia test, but from which it differs in being more soluble in ether, and in its behaviour with polarized light, *cinchonia* producing deviation to the right, *cinchonidia* to the left. The fifth alkaloid, which was named by its discoverers *Aricina*, was found by Pelletier and Caventou in Arica or Cuzco-bark. The following table will show at a glance the composition and leading characters of these alkaloids. I have excluded *Aricina* from the list, as its existence at all is more than problematical; and *Quinicia* and *Cinchonicia*, inasmuch as they are rather the results of chemical changes than original constituents in bark, contenting myself with remarking that their action on polarized light is to turn the flame feebly to the right.

CHARACTERS.	QUININE.	QUINIDIA.	CINCHONIA.	CINCHONIDIA.
Composition ...	$C_{40}H_{24}N_2O_4$.	$C_{40}H_{24}N_2O_4$.	$C_{40}H_{24}N_2O_2$.	$C_{40}H_{24}N_2O_2$.
Polarization ...	Left.	Right.	Right.	Left.
Solubility in water at 62° F.	In 400 parts.	In 2,580 parts.	Insoluble.	Insoluble.
Solubility in water at 212° F.	In 250 parts.	In 1,358 parts.	In 2,500 parts.	Scarcely soluble
Solubility in Ether	Very soluble	Scarcely soluble	Scarcely soluble	Soluble.
Chlorine and Ammonia test	Splendid emerald-green color.	Green colour.	White precipitate.	Unaltered.
Solution of iodide of potassium	No precipitate.	White precipitate.	No precipitate.	No precipitate.

The other substances of which cinchona bark is composed are unimportant in a medical point of view. Gum is found in the pale barks only.

The active constituents of cinchona bark are extracted by water, alcohol, proof spirit, and the dilute acids. Of these the acids much diluted, and proof spirit are the best solvents. Boiling water dissolves out the active principles more completely than cold water, but continued boiling, as in preparing decoctions and syrups, causes the red colouring matter to form a very insoluble compound with the alkaloids. The action of various re-agents on the infusion of cinchona bark has been proposed as a means for ascertaining the medicinal value of the different varieties; but the results obtained by those who have published their experiments are so dissimilar, that it is unnecessary to give any account of them here.

ADULTERATIONS.—The principal frauds that are practised with reference to cinchona bark are, the substitution of the inferior true barks for the finer sorts; the admixture of bark which has been exhausted by successive macerations and then dried, with good bark; and the substitution of the so-called *spurious* or *false cinchona barks* for the true barks. Of the false barks, three in particular have been described, namely, Piton bark, Caribbean bark, and Pitaya bark. They have all a disagreeable bitter taste, not aromatic: the latter only has been met with in British commerce; it occurs in quills, thin, compact, grayish-yellow externally, blackish-brown internally. A class of barks called on the continent *white cinchonas*, but always looked on in the British market as *spurious* or *false cinchonas*, is often met with mixed with the officinal barks. They are distinguished by the epidermis being whitish or pale-yellowish, micacious, smooth or not cracked, and adherent to the cortical layers. The other adulterations which have been mentioned above are very difficult to discover, as great experience is required to judge of the quality of bark by its physical properties, especially if in powder; when in pieces Weddell conceives that by attentive consideration of its fracture, we can arrive at a proper estimation of the commercial value of a given specimen. Quinia being most largely present in those barks in which the fibres are short and intimately mixed with cells, whilst in those in which the cellular structure predominates cinchonia abounds, therefore the bark the fracture of which is *uniformly short and fibrous* is certain to be richer in quinia, and therefore more energetic as a remedial agent than one the fracture of which is *partly smooth and partly long fibrous*, in which we are more likely to find cinchonia. Of the quality of yellow bark, however, the best characteristic is, the quantity of sulphate of quinia which it yields when treated by the process of the Pharmacopœia; but as this process is difficult of application on the small scale, the following tests have been introduced into the Pharmacopœia.

TEST.—*Of Yellow Bark.* Boil 100 grains of the bark, reduced to very fine powder, for a quarter of an hour in a fluid ounce of distilled water acidulated with ten minims of hydrochloric acid; and allow it to macerate for twenty-four hours. Transfer the whole to a small displacement tube, and after the fluid has ceased to percolate add at intervals about an ounce and a half of similarly acidulated water, or add until the fluid which passes through is free from colour. Add to the percolated fluid solution of subacetate of lead, until the whole of the colouring matter has been removed, taking care that the fluid remains acid in reaction. Filter and wash with a little distilled water. To the filtrate add about thirty-five grains of caustic potash, or as much as will cause the precipitate which is at first formed to be nearly redissolved, and afterwards six fluid drachms of pure ether. Then shake briskly, and, having removed the ether, repeat the process twice with three fluid drachms of ether, or until a drop of the ether employed leaves on evaporation scarcely any perceptible residue. Lastly, evaporate the mixed ethereal solutions in a capsule. The residue, which consists of nearly pure Quinia, when dry should weigh not less than 2 grains, and should be readily soluble in dilute sulphuric acid.—*Of Red Bark.* 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 2 grains of alkaloids.—*Of Pale Bark.* 100 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 2 grains of alkaloids.

EXPLANATION OF TESTS.—By the action of hydrochloric acid upon bark, it is exhausted of its alkaloids, the resulting solution is freed from its colouring matter by the solution of subacetate of lead, which forms with it an insoluble mass, which is removed by filtration; on the addition of caustic potash the hydrochloric acid unites with it, and the alkaloids are precipitated, but are partially redissolved in the excess used, and by the subsequent treatment, in the first *test*, with ether, the quinia is dissolved out, it of all the alkaloids being most soluble in ether; and by evaporation and weighing the product its per-centage can be established. In the second and third *tests* chloroform is used, its solvent action over all the alkaloids generally being greater than that of ether. The Edinburgh College has given the following test by which the greater part of the alkaloid contained may be readily procured in an impure state:—"A filtered decoction of 100 grs. in f℥ij. of distilled water gives, with f℥j. of concentrated solution of carbonate of soda, a precipitate which when heated in the fluid becomes a fused mass, weighing when cold two grains or more, and easily soluble in solution of oxalic acid." Manufacturers of the sulphate of quinia, however, generally employ the test proposed by Guibourt, by which the quantity of lime contained in the specimen is ascertained, for it has been found that those barks which are most rich in quinia also contain most lime; the process is as follows:—"Mix the bark in fine powder with water, so as to form it into a firm paste, place this on paper, filter and add sulphate of soda to the filtered liquor as long as the white sulphate of lime is precipitated." According to Berzelius, the most efficacious barks are those which contain most tannin: consequently, those which in infusion give the largest precipitate with solution of gelatin and with tartar emetic, should be preferred; and this test is applicable to all sorts of cinchona bark. Powdered cinchona bark is often adulterated with *red-saunders wood* in fine powder; the fraud may be easily detected by agitating the suspected specimen either with oil of turpentine or sulphuric ether: if it be thus adulterated, it will communicate a saffron colour to either of these liquids after a few minutes, but the pure bark has no effect on them.

THERAPEUTICAL EFFECTS.—The topical action of cinchona bark is astringent, antiseptic, and somewhat irritant; its general effects on the system, especially if given where debility exists, are eminently tonic; and when administered in certain states of disease it is anti-periodic, that is to say, it possesses the power of checking diseases which recur at regular intervals, as ague, remittent fever, and periodic neuralgia. The cinchona alkaloids, without its astringency, possess in a concentrated degree the other properties of bark, and consequently since their discovery have been substituted to a great extent for the drug itself. Of the alkaloids, it has been a very generally received opinion that quinia is much more active than cinchonia, and consequently the use of the latter has been very restricted; recent experience, however, particularly on the continent, goes far to establish the almost equal activity of cinchonia; indeed, according to some, while equally energetic as a tonic and anti-periodic, it is less irritant; yet some carefully conducted experiments by Bouchardat, Delondre, and Giraud show that while sulphate of cinchonia does not like sulphate of quinia produce ringing in the ears and derangement of vision, it gives rise to intense headache, chiefly affecting the brows and accompanied by a remarkable feeling of compression of the head, and also that its administration causes precordial pains, sighing, and a sensation of fainting. Quinidia appears to be nearly if not quite as active as quinia, at least such was the result arrived at by the late Dr. Pereira in some trials which he made with the sulphate in the City of London Hospital; it has not however been as yet sufficiently tested, and therefore is not in general use. Aricina has not been employed in medicine that I am aware. Most practitioners, however, are of opinion that none of the alkaloids possess the same medical properties as cinchona bark, more especially in the treatment of intermittent diseases; but if reliance can be placed on the statements of those who have employed it, the amorphous quinia of Liebig, presently to be described, is identical in action with the bark itself.

As a topical agent bark has been used in the form of powder or decoction as an application to foul ulcers with excessive discharge, and to mortified parts; but for this purpose it is inferior to many of the vegetable substances contained in the division *Astringents* (see Chapter IV.). As an internal remedy, bark is the most highly esteemed and most generally employed tonic in the whole Materia Medica. Its employment is indicated in all cases of debility unaccompanied by any tendency to inflammation or to active hemorrhage, and provided also the stomach and digestive organs be not in an irritable condition. It is found peculiarly serviceable in those forms of debility with great laxity of the solids, which depend on, or are attended with, profuse discharges from the secreting organs. In the debility attendant on convalescence from acute diseases, cinchona and its alkaloids are also found most efficacious tonics, but they should be administered at first with great caution, as any over-excitement is apt to cause a recurrence of the febrile or inflammatory symptoms.

The principal use, however, of bark (or of the preparations of quinia) is as an *antiperiodic*. In all diseases assuming an intermittent or remittent type, it is found to be the most efficacious remedy which has been as yet discovered; but its *modus operandi* in the cure of these maladies is so obscure, that it is in general said to be *specific*. Bark and the preparations of quinia are best administered during the stage of intermission or remission, and given in as full doses as the stomach can bear, for it is essential to their beneficial influence that vomiting or purging be not produced. If there is irritability of the stomach or any inflammatory tendency present, they should be previously removed by appropriate treatment; and indeed in most cases of intermittent fever, the administration of an emetic and purgative, previously to the employment of cinchona or its alkaloids, will be found serviceable. In neuralgic affections, in rheumatism, headache, amaurosis, spasmodic stricture, &c. recurring at regular intervals, bark is found equally efficacious as in intermittent fever. It is also employed with much benefit in some inflammatory affections, when they assume an asthenic type, or when they occur in the old and debilitated, as in erysipelas, rheumatism, scrofulous ophthalmia, etc.

Sulphate of quinia, given in large doses frequently repeated, has been in many instances found productive of much benefit in the treatment of tetanus; and it has been also much used in France, in doses of from one to three scruples, repeated three or four times a day, as a remedy for acute rheumatism. In all the diseases above enumerated, unless where an astringent effect is required, the cinchona alkaloids may be used, and they are preferred by many to the bark itself. I must however confess that every day's increased experience induces me to prefer the preparations of bark to those of any of its alkaloids when a tonic effect is sought for.

DOSE AND MODE OF ADMINISTRATION.—Cinchona bark is seldom given in the present day in the form of powder; the dose as a tonic is from gr. x. to gr. xl. two or three times a day; as an antiperiodic, from gr. lx. to gr. cxx. every second or third hour; but few stomachs can bear such large doses. Its taste is best concealed by milk, with which, however, it should not be mixed until immediately before it is taken. I have found an old fashioned way of prescribing bark, gr. xv. or xx. of the powder in a wine-glassful of port wine, very effective.

PREPARATIONS.—*Of Yellow Bark.* Quiniæ sulphas, decoctum, extractum liquidum, infusum, tinctura.—*Of Pale Bark.* Tinctura composita.

Decoctum Cinchonæ Flavæ. Decoction of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, one ounce; distilled water, one pint. Boil for ten minutes in a covered vessel. Strain the decoction, when cold, through calico; and add sufficient distilled water through the filter to make up the quantity to sixteen fluid ounces.) Dose, f℥ss. to f℥ij.

Extractum Cinchonæ Flavæ Liquidum. Liquid Extract of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, one pound; distilled water, a sufficient quantity; rectified spirit, one fluid ounce. Macerate the cinchona bark in two pints of the water, for twenty-four hours, stirring frequently; then pack in a percolator, and add more water, until twelve pints have been collected, or a sufficient quantity to exhaust the bark. Evaporate the liquor at a temperature not exceeding 160° to a pint; then filter through paper, and continue the evaporation to three fluid ounces, or until the specific gravity of the liquid is 1·200. When cold, add the spirit gradually, constantly stirring. The specific gravity should be about 1·100.) Introduced as a ready method of preparing the infusion, one fluid drachm representing the amount of bark contained in eight ounces of the infusion. Dose, min. x. to min. xx. Rarely prescribed *per se.*

Infusum Cinchonæ Flavæ. Infusion of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for two hours, and filter through paper.) Dose, f℥j. to f℥ij. In a former edition of the Dublin Pharmacopœia an infusion of bark was prepared with cold water, by maceration for 24 hours; it was a favourite remedy with most practitioners in cases where irritability of the digestive organs contraindicated the use of a more active preparation.

Tinctura Cinchonæ Flavæ. Tincture of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, four ounces; proof spirit, one pint. Macerate the cinchona bark for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, fʒss. to fʒij.

Tinctura Cinchonæ Composita. Compound Tincture of Cinchona. (Take of 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. Macerate the cinchona bark, and the other ingredients, for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) This, a more agreeable but less powerful tonic than the simple tincture, is an excellent preparation when the digestive organs are much debilitated; I have found it especially useful in idiopathic erysipelas. It is commonly known as *Huxham's tincture of bark.* Dose, fʒj. to f℥ss.

* *Syrup of Bark,* CADET. (Any variety of cinchona bark, according to prescription, bruised, ℥iij.; pure sugar, ℔j. ℥iv.; distilled water, Oiij.; boil for half an hour in a covered vessel; remove from the fire, set aside for a quarter of an hour, and then strain with expression; as soon as the liquid is quite cold, filter; evaporate the filtered liquid with a gentle heat to the consistence of a syrup, and finally strain.) This is, in my opinion, the best form for preparing the syrup of bark; I have tried it for some years with excellent results. The dose is from fʒj. to f℥ss.

* *Jelly of Bark and Iceland Moss.* (Iceland moss; carragheen moss, of each, ℥j.; cinchona bark, in coarse powder, ℥ss.; boil slowly for three quarters of an hour in a quart of water; express through fine muslin, and add, tincture of orange peel, fʒij.; and white sugar, ℥ij.) I am indebted to Dr. W. D. Moore of this city for the formula for this preparation; the dose of it is one or two teaspoonfuls three times a day.

QUINIÆ SULPHAS. *Sulphate of Quinia.* (The sulphate of an alkaloid, $C_{40}H_{24}N_2O_4,HO,SO_3 + 7HO$, prepared from yellow-cinchona bark, and from the bark of cinchona lancifolia *Mutis*).

PREPARATION.—"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 sulphuric 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 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.

EXPLANATION OF PROCESS.—On digestion with hydrochloric acid the bark is exhausted of its alkaloids, which on the addition of the soda are precipitated, chloride of sodium remaining in solution. On the addition to the precipitate of sulphuric acid, sulphates of quinia and of cinchonia are formed, and advantage of priority of crystallization is taken in virtue of which the sulphate of quinia is obtained, leaving the sulphate of cinchonia in the mother liquor. The quantity of *sulphate of quinia* obtained from yellow-bark varies with the quality of the bark, the average may be stated to be from 1½ to 3 per cent.

CHARACTERS.—Filiform, silky, snow-white crystals, of a pure intensely bitter taste, sparingly soluble in water, yet imparting to it a peculiar bluish tint. The solution gives with chloride of barium a white precipitate insoluble in nitric acid, and when treated first with solution of chlorine and afterwards with ammonia it becomes of a splendid emerald-green colour.

CHEMICAL PROPERTIES.—It occurs in very fine, needle-like, silky, flexible crystals of a perfectly white colour; they are inodorous, and have a very bitter taste. Exposed to the air they effloresce slightly; by a moderate heat they are fused, and by a red heat are decomposed. Sulphate of quinia requires for its solution 740 parts of cold, but only 30 of boiling water, possessing the peculiar property of giving a blue tinge to the surface of the water; it is soluble in 80 parts of cold alcohol (specific gravity ·850), and in much less of boiling alcohol; it is very soluble in diluted sulphuric acid. This salt is composed of 1 equivalent of quinia ($C_{40}H_{24}N_2O_4$), 1 of sulphuric acid, and 8 of water. As already mentioned, its behaviour with ammonia and chlorine is most characteristic of quinia and its salts.

TESTS.—Dissolves in pure sulphuric acid with a feeble yellowish tint, and undergoes no further change of colour when gently warmed. 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. 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.

ADULTERATIONS.—*Sulphate of Quinia* is very liable to adulteration; the substances which are generally employed for this purpose are, sulphate of lime, gum, sugar or mannite, starch, fatty matters, and sulphate of cinchonia. By the application of the pharmacopœial test the freedom from any of these impurities will be ascertained; on adding ammonia to a solution of sulphate of quinia, we have hydrated quinia precipitated ($C_{40}H_{24}N_2O_4+6HO$): this if pure redissolves in ether, but if cinchonia be present, a crystalline appearance presents itself between the strata of ether and water; the quantity operated upon, and the amount of resulting product, are in strict accordance with their respective chemical equivalents. *Salicin* and *Caffein* are stated to be frequently employed on the continent of late years for the adulteration of sulphate of quinia, the latter is too dear in this country to be used for that purpose; the presence of the former may be discovered by the addition of a few drops of sulphuric acid; if salicin be present it will be changed to a bright-red colour, but no effect is produced on pure sulphate of quinia.

DOSE AND MODE OF ADMINISTRATION.—Dose, gr. j. to gr. v. three or four times a day. As an antiperiodic, it is given in ague during the intermission, in divided doses, so regulated that from gr. xv. to gr. xl. according to circumstances, shall be taken in all. It may be administered in the form of pill, made with confection of roses or mucilage, or dissolved in some aqueous vehicle with the aid of dilute sulphuric acid; it should not be prescribed, as is frequently done in the infusion of roses, as most of it is precipitated in the form of an insoluble *tannate of quinia* by the tannic acid contained in that preparation. Sulphate of quinia may be administered in the form of enema, where there is very great irritability of the stomach; three times the ordinary dose or even more may be mixed with an ordinary starch enema, and administered about an hour before the paroxysm. Or it may be introduced into the system by the endermic method, the ordinary dose being sprinkled over the surface of the skin, denuded of the epidermis by means of a blister. In intermittent headache, gr. j. of the sulphate, mixed with gr. iij. of starch, may be snuffed up the nostrils occasionally.

Tinctura Quiniæ Composita. Compound Tincture of Quinia. (Take of sulphate of quinia, one hundred and sixty grains; tincture of orange peel, one pint. Digest for seven days, and strain.) Each fluid drachm contains one grain of the salt. Dose, f℥j. to f℥ss.

* *Pilulæ Quiniæ Sulphatis*, UNITED STATES PHARMACOPŒIA. (Sulphate of quinia, ℥j,; gum arabic, in powder, gr. cxx.; honey, a sufficient quantity; mix the sulphate of quinia and the gum, then beat them with the honey so as to form a mass to be divided into 430 pills.) Each pill contains gr. j. of the sulphate of quinia.

* *Vinum Quiniæ*, COLLIER. (Sulphate of quinia, gr. xxiv.; citric acid, in crystals, gr. xv.; rub together, and dissolve in orange wine, f℥xxiv.) An elegant formula: Dose, f℥ss. to f℥ij.

* *Quiniæ Arsenias. Arseniate of Quinia.* This salt has been

recently employed in France with much success in the treatment of intermittent fevers. It is prepared by boiling for a short time in a glass flask, a mixture of gr. ccx. of pure quinia, gr. lx. of arsenious acid, and f℥iv. of distilled water, allowing the crystals to be deposited by cooling, separating them by filtration, and purifying by re-crystallization in distilled water. When well prepared, it is in the form of minute, feathery, white crystals. It is soluble in boiling water, from which the greater portion is deposited as the solution cools; is slightly soluble in proof spirit, but very sparingly so in alcohol; and is insoluble in ether. The dose of it is from a tenth to a fourth of a grain dissolved in a large quantity of water; or, better still, in the form of pill, made up with extract of gentian.

* *Quiniæ Murias. Muriate of Quinia.* (Take of sulphate of quinia, ℥j.; chloride of barium, gr. cxxiij.; distilled water, f℥xxxij.; dissolve the chloride of barium in two ounces of the water, and the sulphate of quinia in the remainder, raised to the temperature of ebullition. Mix the two solutions, evaporate to one-half, filter, and continue the evaporation by means of a steam or water heat, until crystalline spiculæ begin to appear. The solution is now to be permitted to cool, and the crystals which separate to be dried on blotting paper. The liquor decanted off the crystals will, by further concentration and cooling, yield an additional product.) The muriate of quinia is preferred by many practitioners to the sulphate, but it is much more expensive; the dose is the same.

* *Quiniæ Valerianas. Valerianate of Quinine.* (Already described, see p. 65.)

* *Acetate, Antimoniate, Citrate, Nitrate, Phosphate, Tartrate, and Tannate of Quinia* have been also used in medicine: they are all expensive preparations, and do not appear to me to be superior in any respect to the sulphate. They may be readily prepared by dissolving pure quinia or *amorphous quinia* to saturation, in the respective acids previously diluted with water, evaporating and crystallizing; their doses are the same as those of the sulphate.

In addition to these salts of quinine, a *wine of oranges and of quinine* is found in our shops; it may be prepared by digesting a quarter of an ounce of bitter orange peel in a pint of sherry, and adding one grain of sulphate of quinia to each ounce. Dose, f℥ss. to f℥ij.; it makes a most agreeable formulary.

The salts of *Cinchonia* are prepared in a similar manner to those of quinia; their doses are the same.

* *Quinia* and *Cinchonia* are but seldom employed in the uncombined state, in consequence of their insolubility; nevertheless they are preferred by some continental practitioners to any of their salts. The dose of either is from gr. iij. to gr. v. frequently repeated. *Quinidia* and *Cinchonidia* may be given in the same dose.

In the preparation of sulphate of quinia the mother liquor that is left has a strongly bitter taste, and on the addition of an alkaline carbonate deposits a yellowish-white or brownish precipitate, which on being washed with water and gently heated agglutinates into a resinous looking mass. This resinous substance was named by Sertuërner, who first discovered it, *Quinoidine*, and was found by him as well as by others, who employed it in medicine, to possess properties but little inferior to sulphate of quinia. Liebig has more recently investigated this matter, and has found that the so-called *quinoidine*, is uncrystallizable or *amorphous* quinia combined with various inert substances. From these the *amorphous quinia* has been separated; it is identical in chemical composition with, and has the same atomic weight as quinia, from which it appears to differ only in form—that is to say, it cannot be made to assume a crystalline shape. Roder believes it to be quinia combined with a resin, while Van Heijningen states that he has resolved it into ordinary quinia, cinchonia, quinidia, and a resinous substance. *Amorphous quinia* is completely soluble in dilute sulphuric acid and in alcohol, and combines with the various acids to form salts.

The preparation of *amorphous quinia* has been made the subject of a patent in England, nevertheless, from observations which have been made on it, most of what has been hitherto offered for sale does not appear to be of very good quality. Liebig gives the following simple test for ascertaining its purity:—"Completely soluble in dilute sulphuric acid and in alcohol; the solution in a dilute acid yields upon precipitation by means of ammonia exactly the same amount of precipitate as the weight of the substance originally dissolved in the acid." An *unbleached sulphate of quinia* has been also recently introduced into the English market; it is a cheap and good preparation.

* *Amorphous* and *unbleached quinia* are administered in the same doses as the sulphate; they may be given dissolved in water by means of a few drops of any dilute acid.

INCOMPATIBLES.—*With the preparations of Cinchona bark.*—Ammonia; lime water; carbonate of potash; tartar emetic; the sesqui-salts of iron; the acetates of lead; corrosive sublimate; nitrate of silver; tincture of galls; and gelatin. *With sulphate of quinia.*—The alkalies, and their carbonates; lime-water; tartaric acid; the soluble tartrates; and all vegetable tinctures, infusions, and decoctions containing tannin.

* CUPRI AMMONIO-SULPHAS. *Ammonio-sulphate of Copper.* (Syn.: *Cuprum Ammoniatum. Ammoniated Copper.*) ($CuO,SO_3 + 2NH_3,HO$)$=122\cdot75$.

PREPARATION.—"Take of sulphate of copper, ℥ij.; commercial sesqui-carbonate of ammonia, ℥iij.; rub them together in a porcelain mortar until effervescence has ceased, then roll up the residue in bibulous paper, and place it on a porous brick. When dry let it be enclosed in a bottle furnished with a well-fitted stopper."

EXPLANATION OF PROCESS.—On rubbing together these two salts, after a time they become moist, due to the water of crystallization of the sulphate of copper being set free; the colour changes, becoming of a splendid royal blue; and effervescence is observed, due to the escape of the carbonic acid of the sesquicarbonate of ammonia. This equation accounts for these reactions, $CuOSO_3 5HO + 2NH_4O,3CO_2 = (CuOSO_3 + 2NH_3,HO) + 3CO_2 + 6HO$.

PHYSICAL PROPERTIES.—As usually met with, this preparation is of a fine azure-blue colour, with an ammoniacal odour, and a styptic metallic taste. It is in the form of powder, but may be crystallized in large right rhombic prisms.

CHEMICAL PROPERTIES.—The exact composition of the salt, as prepared for use in medicine, is doubtful; but according to Wittstein its formula is $(NH_4O + SO_3 + NH_3 + CuO)$. Exposed to the air ammonia is given off, and a green powder left. It is completely soluble in $1\frac{1}{2}$ parts of cold water; but in a large quantity of water is decomposed, a pale blue powder, which contains less ammonia, being precipitated; the solution has an alkaline reaction.

ADULTERATIONS.—This compound is scarcely liable to adulteration; the following are the characteristics and tests given for it in the last edition of the London Pharmacopœia:—"Pulverulent, of an azure colour, converted by a strong heat into oxide of copper, sesqui-carbonate first and afterwards sulphate of ammonia being driven off; soluble in water: the solution turns turmeric brown, and is changed to a green colour on the addition of arsenious acid."

THERAPEUTICAL EFFECTS.—Ammonio-sulphate of copper is employed in medicine as a tonic, and in consequence of its powers as such, as an antispasmodic also. It has been principally used in the treatment of epilepsy, for the treatment of which disease it was originally suggested by Cullen; in chorea, and other spasmodic affections; and is frequently productive of great benefit when these diseases occur in debilitated constitutions about the period of puberty, and are unassociated with organic disease. It is not, however, as much employed at present as it was formerly.

DOSE AND MODE OF ADMINISTRATION.—Gr. ss. gradually increased to gr. v. twice or three times daily; it may be given in the form of pill made with bread crumb or confection of roses. The following solution is officinal, being introduced as a test into Appendix B of the Pharmacopœia.

Solution of Ammonio-sulphate of Copper. (Take of sulphate of copper, in crystals, half an ounce; solution of ammonia, a sufficiency; distilled water, a sufficiency. Dissolve the sulphate of copper in eight fluid ounces of the water, and to the solution add the ammonia until the precipitate first formed is nearly dissolved. Clear the solution by filtration, and then add distilled water, so that the bulk may be ten fluid ounces.) This solution is not employed in medicine; it is introduced into the Pharmacopœia with the intention of being used as a test for arsenious acid (see page 211).

INCOMPATIBLES.—Acids; potash; soda; and lime water.

In poisoning with this salt, the treatment is the same as in poisoning with sulphate of copper (see page 87).

CUPRI SULPHAS.—*Sulphate of Copper* (described in the division *Astringents*) has been employed as a tonic in chorea and epilepsy, but the ammonio-sulphate is more generally preferred in these diseases. The dose and mode of administration have been described in the division *Astringents* (see page 86).

CUSPARIA. *Cusparia Bark.* (Syn.: *Angostura Bark.*) Galipea Cusparia, *DC.* Plate 149, *Steph. and Church. Med. Bot.* *(Bonplandia trifoliata).* *(Galipea officinalis ?)* The bark; from tropical South America. The bark is probably obtained from both species of *Galipea* mentioned above. They are natives of the warmer regions of South America, and belong to the Natural family *Rutaceæ*, and to the Linnæan class and order *Diandria Monogynia.*

BOTANICAL CHARACTERS.—*Galipea cusparia* (St. Hilaire) is a lofty tree, 60–80 feet high; leaves, trifoliate, about 2 feet long, agreeably fragrant; flowers, white, with fascicles of hairs seated on glandular bodies on the outside, in stalked, almost terminal racemes. *Galipea officinalis* (Hancock) attains a height of only from 15 to 20 feet: leaves, trifoliate, from 6 to 10 inches long, having the odour of tobacco; flowers, white, hairy, in stalked, axillary, terminal racemes.

CHARACTERS.—In straight pieces more or less incurved at the sides, from half a line to a line in thickness, pared away at the edges; epidermis mottled, brown or yellowish-grey; inner surface yellowish-brown, flaky; breaks with a short fracture; bitter and slightly aromatic. The cut surface examined with a lens usually exhibits numerous white points or minute lines.

CHEMICAL PROPERTIES.—According to the analysis of Fischer, this bark consists of 3·7 per cent. of a peculiar bitter principle (which has been named *Cusparin* by Saladin, who obtained it in a crystalline state by submitting an alcholic tincture of the bark, prepared by percolation, to spontaneous evaporation), 1·7 of bitter hard resin, 1·9 of balsamic soft resin, 0·3 of volatile oil, gum, lignin, &c. The active properties of the bark are extracted by water and alcohol; it is probable that they depend on the neutral principle Cusparin, and on the bitter resin.

TEST.—The inner surface touched with nitric acid does not become blood-red.

ADULTERATIONS.—About the commencement of this century, the substitution of a highly poisonous bark, which was brought from the East Indies, for true angostura bark, was very common in the British Isles and in various parts of the continent; but since then, so far as I am aware, it had not been met with until some years since, when a specimen of the false bark was sent to me from a druggist's in this city, labelled *Angostura bark.* Upon inquiry, I found that a chest containing about two cwt. of the bark had lain in their store-house for upwards of forty years, but had never been before dispensed.

Within this year (1864) I found, in the shop of one of our large public institutions, this false bark labelled as true Angostura bark. False Angostura bark may be readily distinguished from the true bark by its physical as well as chemical properties. It is generally in more perfectly quilled pieces, always much thicker and heavier; the epidermis is thickly mottled with grayish spots, or covered with a rusty efflorescence; the taste is intensely bitter, very permanent, but it has no odour. The best chemical test is the application of nitric acid to a transverse fracture: it produces a bright red colour with the false bark, but merely deepens the colour of the true bark. The rusty efflorescence on false angostura bark is stained greenish-black by the same acid. This false bark was for a long time referred to the *Brucea antidysenterica*, a native of Africa; but the investigations of Christison, O'Shaughnessy, and others, have proved that it is the bark of *Strychnos nux-vomica* (see page 568).

THERAPEUTICAL EFFECTS.—Angostura bark is an excellent tonic, devoid of all astringency. It bears much resemblance to cinchona bark, than which it is generally held in much higher estimation as a febrifuge in South America,—being adapted for the worst and most malignant bilious fevers of the marshy districts, while the fevers in which cinchona bark is employed there, are simple intermittents, for the most part unattended with danger. It has never come into general use in Europe, in consequence of the serious accidents which resulted from the fraud above noticed, and it was omitted from the last edition of the Dublin Pharmacopœia; nevertheless, it will be found very serviceable in atonic dyspepsia, in convalescence from acute diseases, and in the advanced stages of diarrhœa and dysentery.

DOSE AND MODE OF ADMINISTRATION.—In powder gr. x. to gr. xxx.

Infusum Cuspariæ. Iufusion of Cusparia. (Take of cusparia, in coarse powder, half an ounce; distilled water at 120°, ten fluid ounces. Infuse in a covered vessel for two hours and strain.) Dose, f℥ss. to f℥ij.

INCOMPATIBLES.—The mineral acids; sesqui-salts of iron; nitrate of silver; and the acetates of lead.

FEL BOVINUM. *Ox Bile. Ox Gall. (The fluid contents of the gall bladder of the ox, inspissated by heat.)*

FEL BOVINUM PURIFICATUM. *Purified Ox Bile.*

PREPARATION.—Take of fresh ox bile, one pint; rectified spirit, two pints. Mix the bile and the spirit by agitation in a bottle, and set aside for twelve hours until the sediment subsides. Decant the clear solution, and evaporate in a porcelain capsule on a water bath, until the residue acquires the consistence of a vegetable extract.

CHARACTERS.—A yellowish-green substance of pilular consistence, having a taste partly sweet and partly bitter, soluble in water and in spirit. A solution of one or two grains of it, in about a fluid drachm of water, when treated, first with a drop of freshly made syrup consisting of one part of sugar and four of water, and then with sulphuric acid cautiously added until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple, and violet.

TEST.—Its watery solution gives no precipitate on the addition of rectified spirit.

CHEMICAL PROPERTIES.—According to the analysis of Berzelius ox-gall consists of *bilin; cholepyrrhin* (the source of its colour); *mucus; cholesterin; oleate, margarate, and stearate of soda; chloride of sodium; sulphate, phosphate, and lactate of soda; phosphate of lime, &c.*; of these *bilin* is the most important. *Strecker's* analysis differs from that of Berzelius, this chemist stating that ox-gall consists, in addition to the salts and mucus enumerated, of two acids in combination with soda, *cholic* and *choleic* acids; both of these acids contain nitrogen, and the latter also contains sulphur. By the agency of the alkalies and of heat both acids are resolved into *cholalic acid*, and, in the case of cholic acid, into *glycocine*, in that of choleic acid into *taurine*, hence these two acids are now termed *glyco-cholic acid* ($HO,C_{52}H_{42}NO_{11}$), and tauro-cholic acid ($HO,C_{52}H_{44}NO_{13}S_2$).

THERAPEUTICAL USES.—Ox-gall, although at one time much employed in medicine, had fallen completely into disuse until lately, when it has been again brought under the notice of the profession as an excellent tonic in various forms of dyspepsia. From my own experience of its effects in numerous cases in which I employed it, I can speak most highly of its remedial powers, particularly in that morbid irritability of the stomach accompanied by vomiting soon after the meals have been taken, and which does not depend on organic disease; it appears also to act as a gentle laxative when there is a deficient secretion of bile, seeming to supply its place in the animal economy.

DOSE AND MODE OF ADMINISTRATION.—Gr. ij. to gr. x. in pill, generally combined with some of the aperient pill masses.

FERRUM. Iron wire. Annealed iron wire, binding wire. (Fe=28.)

FERRUM REDACTUM. *Reduced Iron.* (Syn.: *Ferri Pulvis*, Dub. Fer réduit.) (Metallic iron, with a variable amount of magnetic oxide of iron.)

Iron is said to be met with in the metallic state in Russia and America, but is very rare; it is usually found combined with other minerals in the state of oxide, sulphuret, carbonate, &c. Metallic iron in the form of iron wire is an article of the Materia Medica in the British Pharmacopœia. Metallic iron, as a commercial article, is most generally obtained from the native black oxide—*magnetic iron ore*, and from the native carbonate of the protoxide—*clay iron stone*, by smelting in blast furnaces. The ore mixed with coke and lime stone is exposed to intense heat, and the melted mass is permitted to run into moulds of sand, when on cooling it constitutes *cast* or *pig iron*, which is refined by a process termed *puddling*, in which the melted metal is exposed to the action of the air in a reverberatory furnace, by which much of its impurities are got rid of, and after a time it becomes pulverulent, it is then heated until it again agglutinates, when it is made up into globular masses intensely heated, subjected to powerful pressure, and rolled into bars, when it constitutes *wrought* or *malleable* iron. This drawn into wire is the form in which iron is directed to be used in the preparation of the various salts in the Pharmacopœia.

PROPERTIES.—Pure metallic iron is of a silver-white colour, but as ordinarily met with, is grayish-white, very brilliant, hard, and ductile. It is very malleable, particularly when heated; has a peculiar taste, and emits an odour when rubbed. At an intense heat iron fuses, but before it arrives at the point of fusion, it becomes soft, and in this state possesses a remarkable property, that of being *welded*. Iron is attracted by the magnet, and becomes itself magnetic by induction, but if pure, immediately loses its polarity when withdrawn from the magnet. Its specific gravity is 7·8, and its atomic weight 28.

THERAPEUTICAL EFFECTS.—The general effects of the ferruginous preparations, when their use has been continued for some time, are tonic and astringent; but when they have been given in too large doses, or persisted in for too long a period, they generally produce a state of over-excitement, characterised by a feeling of determination of blood to the head, of general fulness, and by other uneasy sensations. The morbid state of the system in which the preparations of iron are found most useful, is that which has been denominated *anemia*, in which the blood is deficient, in respect both of quantity and of the relative proportion of red particles. The diseases, therefore, in which they have been employed, are chiefly those of debility, accompanied by or dependent on anemia, as in chlorosis, amenorrhœa, menorrhagia, diseases of the urinary organs, scrofulous affections, passive hemorrhages, certain diseases of the digestive organs, neuralgia, &c. They have been also used with benefit in diseases of an intermittent or remittent type, in dropsical affections, in chronic enlargements of the liver or spleen, in cancer, in albuminuria—even in acute diseases, in the advanced stages of Bright's disease of the kidney, in valvular diseases of the heart when a tonic is indicated, in chronic cutaneous affections, &c. The employment of the ferruginous preparations is contra-indicated when there is any tendency to inflammation or active hemorrhage in the system, when there is irritability of the digestive organs in persons of a full habit of body, and in those prone to a determination of blood to the head.

Iron, like other metals, does not exert any influence on the human system while it retains the metallic state; but as it is very readily oxidized and converted into salts, this change takes place in the stomach soon after it is swallowed, and then the effects of a tonic are produced. *Iron filings* were at one time much used in medicine, but in the present day they are scarcely ever employed in regular practice; the dose of them was from gr. x. to gr. xxx. administered in the form of electuary or bolus made with treacle or honey. More recently the employment of metallic iron reduced to a state of minute division by means of hydrogen gas, as in the following formula of the Pharmacopœia (*fer réduit* of the French), has been employed on the continent, its use having been first introduced by M. M. Quevenne and Miquelard. *Reduced iron* is thus prepared.

PREPARATION.—"Take of peroxide of iron, one ounce; zinc, granulated, a sufficiency; sulphuric acid of commerce, a sufficiency; chloride of calcium, a sufficiency. Introduce the peroxide of iron into a gun-barrel, confining it to the middle part of the tube by plugs of asbestos. Pass the gun-barrel through a furnace, and when it has been raised to a strong red heat, cause it to be traversed by a stream of hydrogen gas developed by the action on the zinc of some of the sulphuric acid diluted with eight times its volume of water. The gas before entering the gun-barrel must be rendered quite dry by being made to pass first through the remainder of the sulphuric acid, and then through a tube eighteen inches long, packed with minute fragments of the chloride of calcium. The farther end of the gun-barrel is to be connected by a cork with a bent tube dipping under water; and when the hydrogen is observed to pass through the water at the same rate that it bubbles through the sulphuric acid, the furnace is to be allowed to cool down to the temperature of the atmosphere, the current of hydrogen being still continued. The reduced iron is then to be withdrawn, and enclosed in a dry stoppered bottle."

EXPLANATION OF PROCESS.—Matters being arranged as described in the Pharmacopœia, the stream of hydrogen gas, passing through the peroxide of iron, unites with its oxygen to form water, leaving the iron in the metallic form, thus, $Fe_2O_3+3H=3HO+2Fe$. We are directed to permit the furnace to cool down to the temperature of the air, as, were it removed sooner, it would rapidly abstract oxygen from the air, with the development at the same time of such an amount of heat as spontaneously to ignite and to set fire to paper or other combustible material placed in contact with it, constituting an example of that curious class of substances known to chemists as *pyrophori*. Another important circumstance to be attended to during the operation of preparing it is the state of the temperature. If it be not sufficiently high, the reduction does not take place; and if it be too high, the iron is reduced, but is agglutinated into ductile plates.

CHARACTERS.—*Of Reduced Iron*. A fine greyish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar. It dissolves in hydrochloric acid with the evolution of hydrogen, and the solution gives a light-blue precipitate with the ferridcyanide of potassium.

TEST.—Ten grains added to an aqueous solution of fifty grains of iodine and fifty grains of iodide of potassium, and digested with them in a small flask at a gentle heat, leave not more than five grains undissolved, which should be entirely soluble in hydrochloric acid.

ADULTERATIONS.—Since the introduction of the *pulvis ferri* into practice, the demand for it has steadily increased, and consequently its preparation being difficult, troublesome, and expensive, it could scarcely be expected to escape adulteration; it is, however, rather a sophistication than an adulteration which has been practised with respect to this preparation. The fraud, which for some time attracted much notice, in consequence of a dispute to which it had given rise between two rival wholesale chemists in London, consists in the substitution of the magnetic black oxide of iron for the powder of iron. The taste is at once sufficient to detect this, the latter being perfectly tasteless when placed on the tongue, while the former has the peculiar inky taste of the ferruginous preparations. Chemically they may be distinguished by the powder of iron being completely soluble in dilute sulphuric acid with copious effervescence, while the magnetic oxide effervesces not at all, or but slightly, owing to the presence of some sulphuret of iron: the former solution also gives a green precipitate; the latter a black one with an alkali. The pharmacopœial test allows for the presence of fifty per cent. of magnetic oxide of iron. When well prepared it is in the form of a fine light powder, of a bright grayish slate colour, occasionally darker, in very minute division, and free from any trace of sulphur.

THERAPEUTICAL EFFECTS.—The advantages which this preparation possesses are, first, that it is readily acted on by the weak acids—the lactic and muriatic, which are ordinarily present in the gastric juice during digestion; and secondly, that it is free from the inky taste, which the preparations of iron possess in a degree proportioned to their solubility; a property rendering it peculiarly applicable for children. I have used the *pulvis ferri* very extensively since the two last editions of this book were published, and with the best results; indeed I consider it superior in most cases to any other ferruginous preparation, being especially adapted for persons in whom the digestive organs are in a feeble or debilitated state, as is so frequently the case when indications exist for the administration of iron. The dose is from gr. j. to gr. x.; it may be given in powder, pill, or bolus.

It has been lately proposed in France to administer manganese in combination with iron, from a fancied notion that it would be thus rendered more readily assimilable by the system, a notion, in my opinion, resting on no good foundation. Nevertheless the compounds of iron and manganese for a time acquired a sort of fashion, and various formulæ were proposed for preparations containing them; of these probably the best is that by Dr. Speer of Cheltenham for a *saccharated carbonate of iron and manganese* prepared as follows: —"Finely powdered sulphate of iron, ℥iij. gr lx.; carbonate of soda, ℥v.; sulphate of manganese, ℥j. gr. xx.; white sugar, ℥iiss.; dissolve each of the three first-mentioned ingredients in a pint and a half of water, add the solutions, and mix them well; collect the precipitate on a cloth, filter, and immediately wash it with cold water; squeeze out as much of the water as possible, and without delay triturate the pulp with the sugar, previously reduced to a fine powder. Dry it at a temperature of about 120° F."

The compound thus prepared is a powder of a reddish-brown colour, and devoid of all taste, save that imparted by the sugar, with which the salts of the two metals are conjoined. The dose is five grains, gradually increased up to gr. xx., three times a day; it should be given with the meals, or at least immediately after.

* FERRI ACETATIS TINCTURA.—*Tincture of the Acetate of Iron.*

PREPARATION.—Take of sulphate of iron, ℥viij.; distilled water, Oss.; pure sulphuric acid, f℥vj.; pure nitric acid, f℥ss.; acetate of potash, ℥viij.; rectified spirit, cong. ss. To nine ounces of the water add the sulphuric acid, and in the mixture, with the aid of heat, dissolve the sulphate of iron. Add next the nitric acid, first diluted with the remaining ounce of water, and evaporate the resulting solution to the consistence of a thick syrup. Dissolve this in one quart, and the acetate of potash in the remainder of the spirit, and, having mixed the solutions, and shaken the mixture repeatedly in a large bottle, let the whole be thrown upon a calico filter. When any further liquid ceases to trickle through, subject the filter, with its contents, to expression, and, having cleared the turbid tincture thus procured by filtration through paper, let it be added to that already obtained. The specific gravity of this tincture is ·891.

EXPLANATION OF PROCESS.—This process consists of two stages, in the first of which, by the action of the nitric and sulphuric acids employed, the proto- is converted into persulphate of iron; six equivalents of protosulphate of iron requiring three equivalents of sulphuric acid, and one of nitric acid to form three equivalents of persulphate of iron, and one of nitric oxide gas; the nitric acid supplying three equivalents of oxygen to the six protoxides to convert them into three peroxides, which, with the six original and three additional equivalents of sulphuric acid, combine to form three equivalents of persulphate of iron, whilst the nitric oxide gas, so generated, escapes, thus, $6FeOSO_3+3SO_3+NO_5=3(Fe_2O_33SO_3)+NO_2$. In the second stage of the process, this salt is decomposed by the acetate of potash, three equivalents reacting upon one equivalent of persulphate of iron, the three sulphuric acids of which unite with the three atoms of potash to form three sulphates of potash, and the three equivalents of acetic acid unite with the sesquioxide of iron to form the sesquiacetate of iron, which is held in solution by the spirit, whilst the sulphate of potash is precipitated, thus, $Fe_2O_33SO_3+3KO\bar{A}=Fe_2O_33\bar{A}+3KOSO_3$.

PROPERTIES.—Tincture of the acetate of iron is a reddish-brown transparent liquid, with an ethereal odour, and an acid chalybeate taste. It is a solution of the acetate of the sesquioxide of iron ($Fe_2O_33\bar{A}$) in rectified spirit.

THERAPEUTICAL EFFECTS.—Acetate of iron possesses the properties of the ferruginous preparations generally; but as its composition is rather uncertain, it is not so much used at present as formerly. The tincture was originally introduced into the Pharmacopœia on the authority of Dr. Percival, who thought most highly of the chalybeate powers of this salt of iron. I have employed it extensively in the treatment of phthisis, of chlorosis, and of chronic diseases of the heart, and am inclined to think most favourably of its remedial powers, an opinion strengthened by every day's experience.

DOSE AND MODE OF ADMINISTRATION.—The dose is from min. xxx.

to f℥j. Dr. Percival was in the habit of administering it in asses' milk; it may be given thus or dropped in water or in cod-liver oil.

* FERRI AMMONIO-CHLORIDUM. *Ammonio-chloride of Iron.*

PREPARATION.—Sesquioxide of iron, ℥iij.; hydrochloric acid, Oss.; hydrochlorate of ammonia, ℔iiss.; distilled water, Oiij.; mix the sesquioxide of iron with the acid, and digest in a sand bath, frequently shaking until it is dissolved; afterwards add the hydrochlorate of ammonia first dissolved in the water; strain and evaporate until the salt is dry; then rub to powder.

PROPERTIES.—This preparation is commonly met with in the form of an orange-yellow, semi-crystalline powder, which attracts moisture when exposed to the air. It emits a feeble odour if moistened, has a saline metallic taste, and is readily dissolved by water and by weak spirit. According to Phillips it is a mechanical mixture of 15 parts of sesquichloride of iron, and 85 parts of hydrochlorate of ammonia. Wittstein gives the following formula for it, $NH_4Cl+10Fe_2Cl_3$.

ADULTERATIONS.—Ammonio-chloride of iron is not liable to adulteration, but as it keeps badly is sometimes unfit for use in medicine as met with in the shops. The following were the characteristics and tests given for it in the last edition of the London Pharmacopœia:—"Pulverulent, of an orange-colour, soluble in proof spirit, and in water; either solution emits ammonia on the addition of potash; which also precipitates about seven grains of sesquioxide of iron from 100 grains of this salt."

THERAPEUTICAL EFFECTS.—This preparation, the *Flores martiales* of the older pharmacologists, was at one time highly esteemed as a tonic and deobstruent in scrofulous affections; but, in consequence of its liability to become decomposed by keeping, and the variable quantity of iron which it contains, is not often prescribed in the present day, and consequently has been very properly omitted from the Pharmacopœia. The principal portion of any therapeutical value it possesses must, in consequence of the great amount of it present in the salt, be ascribed to the hydrochlorate of ammonia.

DOSE AND MODE OF ADMINISTRATION.—In the solid state, gr. v. to gr. xv.

* *Tinctura Ferri Ammonio-chloridi. Tincture of Ammonia. Chloride of Iron.* (Ammonio-chloride of iron, ℥iv.; proof spirit; distilled water, of each, Oss.; dissolve the salt in the spirit and strain.) A fluid ounce of this tincture should throw down 5·8 grains of sesquioxide of iron on the addition of potash. Dose, min. xij. to min. xl.

INCOMPATIBLES.—Alkalies and their carbonates; lime water; and all astringent vegetable preparations.

FERRI ARSENIAS. *Arseniate of Iron.* Arseniate of Iron, $3FeO,AsO_5(=223)$, partially oxidated

PREPARATION.—"Take of sulphate of iron, nine ounces; arseniate of soda, dried at 300°, four ounces; acetate of soda, three ounces; boiling distilled water, a sufficiency. Dissolve the arseniate and acetate of soda in two pints, and the sulphate of iron in three pints of the water, mix the two solutions, collect the white precipitate which forms, on a calico filter, and wash until the washings cease to be affected by a dilute solution of chloride of barium. Squeeze the washed precipitate between folds of strong linen in a screw press, and dry it on porous bricks in a warm air chamber whose temperature shall not exceed 100°."

EXPLANATION OF PROCESS.—To understand this process it must be borne in mind that arsenic acid, like phosphoric acid, (see p. 587) is a tribasic acid, but that in the case of the arseniate of soda one of its atoms of base is water, the salt consisting of two atoms of soda, one of water, and one of arsenic acid ($2NaO,HO,AsO_5$); arseniate of iron consists of three equivalents of protoxide of iron and one of arsenic acid. To furnish a sufficient number of equivalents of oxide of iron to form the arseniate of iron three equivalents of sulphate of iron must be decomposed, but the arseniate of soda only contains a quantity of soda sufficient to saturate two out of the three equivalents of the resulting sulphuric acid, which would be objectionable, inasmuch as were the sulphuric acid left free in the solution, it would exert a solvent action over the arseniate of iron, and thus be a source of loss; this action is not exerted by acetic acid, hence it is that the acetate of soda is used. One atom of acetate of soda together with one equivalent of arseniate of soda, supply three atoms of soda to the three atoms of sulphuric acid to make three equivalents of sulphate of soda; the three oxides of iron unite with the one arsenic acid to form arseniate of iron; and water and acetic acid are set free, thus, $2NaO, HO, AsO_5 + 3FeOSO_3 + NaO\bar{A} = 3NaOSO_3 + 3FeO,AsO_5 + HO + \bar{A}$. By the washing directed the acetic acid and sulphate of soda are gotten rid of. So long as sulphate of soda is present the washings will of course precipitate on the addition of chloride of barium.

CHARACTERS.—A tasteless amorphous powder of a green colour, insoluble in water, but readily dissolved by hydrochloric acid. This solution gives a copious light-blue precipitate with the ferridcyanide of potassium, and a still more abundant one of a deeper colour with the ferrocyanide of potassium. 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.

CHEMICAL PROPERTIES.—When first precipitated it is of a white colour, and is an arseniate of the protoxide of iron, but on exposure to the air even in the act of drying it rapidly alters, acquiring a pale greenish hue, and is converted into a mixture of arseniate of the protoxide and arseniate of the sesquioxide of iron, and consequently precipitates with the solutions both of the ferrid- and ferro-cyanide of potassium. The arseniate of iron met with in the shops is a greenish-coloured powder, perfectly insoluble; hydrochloric acid dropped on it changes it to a golden-yellow hue, and if thrown on live coals it emits the alliaceous odour of arsenic: the brick red precipitate produced on the addition of nitrate of silver as directed in the *characters*, is arseniate of silver ($3AgO,AsO_5$).

TESTS.—The solution in hydrochloric acid when diluted gives no precipitate with chloride of barium. Twenty grains dissolved in an excess of hydrochloric acid diluted with water continue to give a blue precipitate with the ferridcyanide of potassium, until at least seventeen measures of the volumetric solution of bichromate of potash have been added.

ADULTERATIONS.—This preparation is not liable to any other impurities than those arising from careless preparation. If not sufficiently washed it will contain sulphate of soda, detected by chloride of barium yielding a precipitate (sulphate of barytes). It may also be deficient in the amount of protosalt; this will be evidenced by the volumetric test in which the arseniate of iron is converted by the hydrochloric acid employed into protochloride of iron; water and arsenic acid being set free, thus, $3FeO,AsO_5+3HCl=3FeCl+3HO+AsO_5$. On the addition of the solution of bichromate of potash, in virtue of the reaction upon it of the excess of hydrochloric acid employed, chlorine is set free, which converts the protochloride into perchloride of iron, when it will cease to strike the blue colour with ferridcyanide of potassium. To explain the action of the hydrochloric acid upon the bichromate of potash we will require one atom of bichromate of potash and seven of hydrochloric acid, the hydrogen of the acid unites with the oxygen of the salt to form water, one atom of chlorine unites with one of potassium to form chloride of potassium, three atoms of chlorine unite with two of chromium to form sesquichloride of chromium, and three chlorines are set free, thus, $KO2CrO_3+7HCl=KCl+Cr_2Cl_3+7HO+3Cl$. The volumetric solution is so constructed that it can convert one-tenth of six equivalents of iron from the state of proto- to that of per-salt; but each equivalent of arseniate of iron contains *three* equivalents of iron, therefore the volumetric solution corresponds to one-tenth of *two* equivalents of arseniate of iron, so an easy calculation will now show that the test indicates the presence in the quantity operated upon of 2·85 grains of iron, or 7·582 grains, corresponding to 37·76 per cent. of arseniate of iron.

THERAPEUTICAL USES.—Arseniate of iron is a useful and active preparation, being more decidedly tonic than the other arsenical preparations; and is therefore especially adapted for the treatment of cutaneous diseases occurring in anemic persons. Carmichael used it as a local application diluted with four times its weight of phosphate of iron, as a caustic in cancerous affections; and more recently M. Duchesne Duparc has used it internally with success in obstinate herpetic and scaly eruptions.

DOSE AND MODE OF ADMINISTRATION.—Internally it may be given in pill in doses of 1-12th of a grain gradually increased to 1-8th of a grain three times daily. Externally it may be employed as a caustic, diluted with ten or twelve parts of simple ointment.

* FERRI BROMIDUM.—*Bromide of Iron.* (FeBr.=108.)

PREPARATION.—"Bromine; and clean iron filings, of each, equal parts; heat together under water till the fluid becomes of a greenish colour; filter and evaporate to dryness."—MAGENDIE.

EXPLANATION OF PROCESS.—A simple case of direct union of the bromine with the iron.

PHYSICAL PROPERTIES.—Bromide of iron is of a brick-red colour, and has a disagreeable, styptic, metallic taste. It deliquesces rapidly when exposed to the air, and is very soluble in water.

CHEMICAL PROPERTIES.—As a salt of iron it will be recognized by the usual tests for that metal; as one of bromine it is characterized by the yellow colour which its solution acquires on being treated with chlorine, when the bromine is set free, and can be recovered by digestion either with ether or chloroform.

THERAPEUTICAL EFFECTS.—It has been used on the continent, it is stated with much success, in hypertrophy of the uterus, and in glandular enlargements; more recently it has been employed as a substitute for the iodide of iron, being used in erysipelas, amenorrhœa, strumous epididymitis, &c. It has been also employed externally in the form of ointment, prepared by rubbing together one part of the bromide and fifteen of prepared lard.

DOSE AND MODE OF ADMINISTRATION.—It may be administered either dissolved in distilled water, protected by the addition of syrup, or in the form of pill, in doses of from one to five grains.

* *Pilulæ Ferri Bromidi*, WERNECK. (Bromide of iron, gr. lx.; extract of liquorice, a sufficiency; mix and divide into 60 pills.) One or two, morning and evening.

FERRI CARBONAS SACCHARATA. *Saccharated Carbonate of Iron.*

(Carbonate of iron, FeO,CO_2 (=58), mixed with peroxide of iron, and sugar, and forming at least fifty-seven per cent. of the mixture.)

PREPARATION.—Take of sulphate of iron, two ounces; carbonate of soda, two ounces and a half; boiling distilled water, two gallons; refined sugar, one ounce. Dissolve the sulphate of iron and the carbonate of soda each in half a gallon of water, and mix the two solutions with brisk stirring in a deep cylindrical vessel, which is then to be covered as accurately as possible. Set the mixture by for twenty-four hours, and from the precipitate, which has subsided, separate the supernatant solution by a siphon. Pour on the remainder of the water, stir well, and, after subsidence, again remove the clear solution. Collect the resulting carbonate on a calico filter, and, having first subjected it to expression, rub it with the sugar in a porcelain mortar. Finally dry the mixture at a temperature not exceeding 212°.

EXPLANATION OF PROCESS.—A simple case of double decomposition, the carbonic acid of the carbonate of soda going to the oxide of iron to form carbonate of iron, which is precipitated, and the sulphuric acid to the soda to form sulphate of soda, which remains in solution, thus, $FeOSO_3 + NaOCO_2 = FeOCO_2 + NaOSO_3$. The sugar is used with the view of preventing the carbonate of iron becoming converted into sesquioxide of iron; this it does mechanically by investing it, and so in a great measure debarring the access of atmospheric air.

CHARACTERS.—Small coherent lumps of a grey-brown colour, with a sweet very feeble chalybeate taste. Dissolves with effervescence in warm hydrochloric acid diluted with half its volume of water, and the solution is but slightly affected by the ferrocyanide, but gives a copious blue precipitate with the ferridcyanide of potassium.

TESTS.—Its solution in hydrochloric acid gives but a very slight precipitate with chloride of barium. 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 thirty-three measures of the volumetric solution of bichromate of potash have been added.

ADULTERATIONS.—This preparation is not liable to the presence of any other impurity than that arising from faulty or too long keeping. On being long kept it gradually abstracts oxygen from the air, its carbonic acid at the same time escaping; two equivalents of carbonate of iron with one atom of oxygen resulting in the formation of one equivalent of sesquioxide of iron and two of carbonic acid, thus, $2FeOCO_2+O=Fe_2O_3+2CO_2$. So that an estimate of its value may be obtained from the amount of carbonic acid that a given weight of it will yield, Dr. Christison stating that when decomposed by an acid, fifty grains ought to yield 7·5 cubic inches of gas. The volumetric test of the Pharmacopœia depends upon the amount of bichromate of potash required to furnish a sufficiency of chlorine to a given amount of it, to convert all the proto- into a sesqui-chloride of iron (see p. 639). The amount of the solution used would indicate the presence of 5·544 grains of metallic iron in the quantity operated upon, equivalent to 57·40 *per cent.* of carbonate of iron.

THERAPEUTICAL EFFECTS.—Carbonate of the protoxide of iron is one of the best and most active of the ferruginous salts, and the permanency of its composition in the form now described renders this preparation a valuable addition to the Materia Medica. It is peculiarly adapted for children and delicate females, when the employment of a chalybeate tonic is indicated. In the treatment of neuralgia I have found it, in large doses, the most certain of all the ferruginous preparations. Carbonate of iron held in solution by an excess of carbonic acid is the active principle of many chalybeate mineral waters.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xxx. in the form of powder, or made into an electuary with syrup or honey.

Mistura Ferri Composita. Compound Mixture of Iron. (Take of sulphate of iron, thirty grains; carbonate of potash, twenty-five grains; myrrh, in powder, sixty grains; sugar, sixty grains; spirit of nutmeg, one fluid drachm; rose water, eight fluid ounces. Triturate the myrrh and carbonate of potash with the sugar, the spirit of nutmeg, and seven ounces of the rose water, the latter being gradually added, until a uniform mixture is obtained. To this add the sulphate of iron, previously dissolved in the remaining ounce of rose water, and enclose the mixture at once in a bottle which should be tightly corked.) This mixture, which was introduced into the pharmacopœias as a substitute for *Dr. Griffith's tonic mixture*, and by which name it is commonly known, is one of the best and most generally employed of the pharmaceutical preparations of iron. In its preparation a mutual reaction takes place between the sulphate of iron and carbonate of potash, identical in every respect with that already described in the case of the sulphate of iron and carbonate of soda. A greater amount of carbonate of potash, however, is employed than is actually required for the decomposition of the sulphate of iron; this forms with the myrrh a species of soap which assists in suspending the carbonate of iron. The use of the sugar is to preserve the iron in a state of protosalt. When first prepared, it is of a green colour, which colour, however, on keeping, it rapidly loses, becoming reddish-brown, the iron now having passed to the condition of sesquioxide, when it is no longer fit for use. Its operation is stimulant as well as tonic, and consequently it should not be administered in cases where there is any tendency to inflammatory action in the digestive organs; the dose is f℥j. to f℥ij. two or three times a day. As it does not keep, it should be only prepared when wanted for use.

Pilula Ferri Carbonatis. Pill of Carbonate of Iron. (Take of saccharated carbonate of iron, one ounce; confection of roses, a quarter of an ounce. Beat them into a uniform mass.) Dose, gr. v. three times a day.

INCOMPATIBLES.—Acids, and acidulous salts; and all astringent vegetable preparations.

FERRI ET AMMONIÆ CITRAS. *Citrate of Iron and Ammonia.* ($Fe_2O_3,NH_4O,HO,C_{12}H_5O_{11}+2HO$)? (=298). (Syn.: *Ferri Ammonio-Citras. Ammonio-Citrate of Iron. Ferro-Citrate of Ammonia.*

PREPARATION.—"Take of solution of persulphate of iron, eight fluid ounces; solution of ammonia, fourteen fluid ounces, or a sufficiency; citric acid, in crystals, five ounces; distilled water half a gallon. Add the persulphate of iron to two pints of the distilled water, and gradually pour the dilute solution into the solution of ammonia, stirring well for a few minutes; collect on a calico filter the hydrated peroxide of iron which precipitates, and wash it with distilled water until the filtrate ceases to become turbid on the addition of chloride of barium. Dissolve the citric acid in the remainder of the water, and digest the solution at a boiling heat on the oxide of iron. Make the liquid neutral by the addition of solution of ammonia, and evaporate it to dryness in thin layers, on flat porcelain or glass plates. Remove the dry salt in flakes, and keep it in stoppered bottles."

EXPLANATION OF PROCESS.—The first step in this preparation is to decompose the persulphate of iron by the agency of ammonia, in virtue of which we have sesquioxide of iron precipitated and sulphate of ammonia held in solution, thus, $Fe_2O_33SO_3+3NH_4O=Fe_2O_3+3NH_4OSO_3$. This latter salt is to be carefully washed away, a point which will be ascertained when the washings cease to yield a precipitate *(Sulphate of Barytes)* on the addition of chloride of barium. On referring to the article upon citric acid (p. 389) it will be seen to be a tribasic acid, composed of three atoms of *basic* water and one of anhydrous acid; on digesting it upon the oxide of iron one of its atoms of basic water is replaced by the oxide, thus, $3HO,\bar{C}+Fe_2O_3=Fe_2O_32HO\bar{C}+HO$; and on the subsequent addition of the solution of ammonia, one of the two remaining equivalents of basic water is replaced by ammonia, thus, $Fe_2O_32HO\bar{C}+NH_4O=Fe_2O_3NH_4O\bar{C}+HO$. The subsequent steps of the process require no comment.

PHYSICAL PROPERTIES.—The ammonio-citrate of iron occurs in the form of semitransparent shining scales, of a garnet-red colour, inodorous, with a mildly styptic metallic taste.

CHARACTERS.—In thin transparent scales of a hyacinth-red colour with tinge of olive-green, slightly sweetish and astringent in taste; feebly reddens litmus paper; is soluble in water, almost insoluble in rectified spirit. Heated with solution of soda it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with hydrochloric acid, give any crystalline deposit.

CHEMICAL PROPERTIES.—The ammonio-citrate is a slightly deliquescent salt; it dissolves readily in cold or boiling water, and the solution should be all but neutral to test paper. The composition of this preparation has been variously stated, but all chemists agree that the iron exists in it in the state of sesquioxide. The following is the formula for it given by Wittstein $(5NH_4O+2\bar{C}+6HO)+(4Fe_2O_3+\bar{C}+3HO.)$

TESTS.—Its solution in water, when acidulated with hydrochloric acid, gives a copious blue precipitate with the ferrocyanide of potassium, but none with the ferridcyanide. When incinerated with exposure to air it leaves 26·5 per cent. of peroxide of iron.

ADULTERATIONS.—Not liable to adulteration; its not precipitating with ferridcyanide of potassium indicates the absence of a protosalt, whilst the amount of peroxide left on incineration is strictly in accordance with its presumed chemical equivalent.

THERAPEUTICAL EFFECTS.—The ammonio-citrate of iron resembles much the tartrate to be next described, and is adapted for the same cases. Both these preparations are much milder in their effects than the mineral acid salts of the metal; they are consequently better adapted for delicate persons, and especially for cases in which the digestive organs are in an irritable state, being devoid of astringency; but they are not so useful in anemic diseases, inasmuch as good reason exists for believing that the iron enters into the electro-negative (acid) portion of the salt; such compounds possessing inferior hematinic properties.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. viij. in solution; it may be prescribed in combination with the alkaline carbonates.

* *Ferri et Magnesiæ Citras.* This preparation, which possesses the advantage over the ammonio-citrate of not being deliquescent, has been recently much used on the continent. It is prepared by dissolving two parts by weight of recently precipitated hydrated sesquioxide of iron in a solution of three parts of citric acid, then saturating with carbonate of magnesia and evaporating to dryness. It is thus obtained in the form of shining brown scales; and may be given in powder or pill in doses of from gr. ij. to gr. x. three times a day. It may be also given in solution sweetened with syrup.

* *Aqua Chalybeata.* Under this name, a solution of citrate of iron in water charged with carbonic acid and flavoured with syrup and oil of the bitter orange, has been introduced to the notice of the profession by Messrs. Bewley and Evans of this city. The exact formula for its preparation has not been made public: every f℥vj. hold in solution grains xiij. of citrate of iron, it may be therefore given in doses of f℥j. to f℥ij. two or three times a day. It is the most agreeable form perhaps in which a ferruginous preparation can be administered, and I have derived the most excellent results from its employment, the only objection to its use being that in some persons it is apt to cause unpleasant eructations shortly after it has been taken; this may be, however, to a great extent prevented by its not being drunk until the effervescence has nearly ceased. It is very generally employed, being found an efficacious preparation of iron.

* *Tinctura Ferri Aurantiacea,* WIRTEMBERG. (Iron filings, ℥iv.; Seville oranges, 4. Remove the peel, the white, and the seeds; beat the pulp with the filings in a stone mortar, and let the paste remain at rest for two days; then pour upon it, Madeira wine, f℥x., and tincture of orange peel, f℥ij.; digest for seven days, express and filter.) A very agreeable preparation; Dose, f℥j. to f℥iv.

INCOMPATIBLES.—The mineral acids; and all astringent vegetable preparations.

* FERRI ET AMMONIÆ TARTRAS. *Tartrate of Iron and Ammonia.* (Syn.: *Ammonio-tartrate of Iron.*) ($Fe_2O_3NH_4O,C_8H_4O_{10} + 4HO$?) (=248).

PREPARATION.—"Tartaric acid, 100 drachms; sesquicarbonate of ammonia, crystalline, 39½ drachms; sesqui-(*per*)-oxide of iron, 53½ drachms; muriatic acid, 180 drachms; solution of ammonia, and water, of each a sufficiency; dissolve the tartaric acid in cong. j. of water, and add the sesquicarbonate of ammonia gradually. Dissolve the sesquioxide of iron in the muriatic acid by means of a gentle heat; dilute the solution with Ovj. of water, and add a sufficient quantity of solution of ammonia to precipitate the oxide. Separate this on a flannel filter, wash it with water, until the washings pass tasteless; and add it to the solution containing the bitartrate of ammonia, then apply a gentle heat, by means of a water-bath, until the whole of the sesquioxide of iron is dissolved, and a deep reddish-brown solution results. Lastly, evaporate this solution by means of a water-bath, to dryness."—Mr. PROCTER, in the *American Journal of Pharmacy.*

EXPLANATION OF PROCESS.—In this process we have formed an acid tartrate of ammonia similar in composition to that of potash (see p. 167); the basic water of this salt is replaced by the sesquioxide of iron precipitated by the action of the solution of ammonia upon the sesquichloride of iron, resulting from the action of the muriatic acid upon the sesquioxide of iron. The reaction in virtue of which this salt is produced is thus expressed, $Fe_2O_3+NH_4O,HO,\bar{T}+3HO=Fe_2O_3,NH_4O,\bar{T}+4HO$.

PROPERTIES.—This preparation (which has been recently introduced into the practice of medicine, and is not contained in the Pharmacopœia) is met with in the form of brilliant scales, semitransparent, of a beautiful reddish-brown colour. It is odourless, has a sweetish, slightly chalybeate taste; is soluble in about its own weight of water at 60°, and in a much less quantity of boiling water. It is insoluble in absolute alcohol and in ether. Ammonio-tartrate of iron is composed of one equivalent of basic tartrate of sesquioxide of iron, one of tartrate of ammonia, and four of water.

THERAPEUTICAL EFFECTS.—This is an excellent preparation of iron, void of all astringency. It is peculiarly suited as a tonic for those derangements of the uterine organs in which the ferruginous salts are indicated. Its not disagreeable taste, its solubility in water, its compatibility with the alkaline carbonates, and the permanency of its composition, give it an advantage over most of the other preparations of iron; the observations made under the head of the ammonio-citrate of iron apply equally to this preparation, a close resemblance existing between these two salts.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. viij. in the form of powder, pill, or solution; or made into a bolus with honey.

INCOMPATIBLES.—The mineral acids; and all astringent vegetable preparations.

FERRI ET QUINIÆ CITRAS. *Citrate of Iron and Quinia.* (Citric acid combined with peroxide of iron, protoxide of iron and quinia.)

PREPARATION.—"Take of solution of persulphate of iron, three fluid ounces; sulphate of iron, one ounce; distilled water a sufficiency; solution of soda, thirty-six fluid ounces; citric acid, in crystals, two ounces and a quarter; sulphate of quinia, three hundred and eighty grains; dilute hydrochloric acid, a sufficiency; solution of chloride of barium, a sufficiency; solution of ammonia, a sufficiency. Add the solution of persulphate of iron to the sulphate of iron dissolved in ten fluid ounces of the water; mix well, and pour the mixture into the solution with constant stirring. Collect the precipitate on a calico filter, and wash with distilled water, until the liquid which passes through ceases to give a precipitate with chloride of barium.

Dissolve the citric acid in twenty fluid ounces of the distilled water, and having then added the washed precipitate, digest the mixture on a water bath, with repeated stirring, until a solution is obtained.

In eight fluid ounces of the water acidulated with a little of the dilute hydrochloric acid dissolve the sulphate of quinia, add sufficient of the solution of chloride of barium to precipitate the sulphuric acid, and filter, and having treated the solution with a slight excess of ammonia, collect the precipitate on a paper filter, and wash it with distilled water, until chloride of barium dropped into the filtrate gives but a very slight precipitate.

Transfer the washed quinia to the capsule containing the citrate of iron, and digest on a water bath, until the alkaloid is dissolved. Lastly, let this solution be evaporated in thin layers, on flat porcelain or glass plates, at a temperature below 212°, and let the residue be removed in flakes, and preserved in stoppered bottles."

EXPLANATION OF PROCESS.—On mixing the solutions of proto- and persulphate of iron with that of soda we have sulphate of soda formed, and proto- and peroxide of iron precipitated; these two oxides are treated with citric acid, when two salts are formed, one a citrate of the protoxide, the other a citrate of the peroxide of iron, these mixed with quinia form the *Ferri et Quiniæ Citras*. The quinia itself is obtained by first decomposing the sulphate of quinia with chloride of barium, when we have muriate of quinia held in solution, and sulphate of barytes precipitated, the muriate of quinia is decomposed by the solution of ammonia, chloride of ammonium being held in solution and quinia precipitated.

CHARACTERS.—Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very 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.

CHEMICAL PROPERTIES.—The chemical properties of this salt can be readily inferred from its composition. The solution of soda precipitates the iron in the state of proto- and sesquioxide of iron; the solution of ammonia precipitates the quinia. In virtue of the citrate of the protoxide of iron present in it, it yields a blue precipitate with the solution of the ferridcyanide of potassium (see p. 92), and in consequence of its also containing citrate of the peroxide of iron, it strikes a blue colour with the solution of ferrocyanide of potassium (see p. 90).

TESTS.—Taste bitter as well as chalybeate. When burned with exposure to air, it leaves a residue which yields nothing to water. Fifty grains dissolved in a fluid ounce of water and treated with a slight excess of ammonia give a white precipitate, which, when collected on a filter and dried, weighs eight grains. The precipitate is entirely soluble in pure ether, when burned leaves no residue, and when dissolved by the aid of an acid, forms a solution which, decolorized by a little purified animal charcoal, turns the plane of polarization strongly to the left.

ADULTERATIONS.—The principal sophistication to which this salt is liable is a deficiency in the amount of quinia which it should contain, occasionally amounting to its complete absence; or the substitution for it of cinchonia. The pharmacopœial test will demonstrate in it the presence of sixteen per cent. of quinia, and the character of its polarization serves to distinguish it from cinchonia (see p. 619).

THERAPEUTICAL USES.—This salt possesses the combined properties of a tonic and chalybeate, but this latter only in a minor degree. It is by no means an active hæmatinic, its tonic properties being those which are best marked. It is not so markedly astringent as the majority of the iron preparations, possessing indeed this property in but a trifling degree—a great advantage where its protracted exhibition is called for. It is used with advantage in cases of anæmia attended with loss of appetite. It is peculiarly suited for such cases as require a mild chalybeate and tonic plan of treatment combined.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. x. in pill, or dissolved in water, or in the infusion of calumba.

INCOMPATIBLES.—All substances incompatible with the salts of iron.

FERRI IODIDUM. *Iodide of Iron.* $FeI+4HO(=191)$.

PREPARATION.—Take of fine iron wire, one ounce and a half; iodine, three ounces; distilled water, fifteen fluid ounces. Introduce the iodine, iron, and twelve ounces of the water into a flask, and having heated the mixture gently for about ten minutes, raise the heat and boil until the solution loses its red colour. Pass the solution through a small paper filter into a dish of polished iron, washing the filter with the remainder of the water, and boil down until a drop of the solution taken out on the end of an iron wire solidifies on cooling. The liquid should now be poured out on a porcelain dish, and, as soon as it has solidified, should be broken into fragments, and enclosed in a stoppered bottle."

EXPLANATION OF PROCESS.—A simple case of union of the iron with the iodine, resulting in the production of the salt, thus, $Fe+I=FeI$. The following simple process for preparing iodide of iron has been recently proposed by M. Cap:—Bruise together in a large mortar 4 parts of iodine and 2 parts of water; then add quickly 1 part of iron filings. Sufficient heat is produced to drive off 1 part of iodine in the state of vapour, when the mixture becomes liquid; to remove the excess of iron, it is to be dissolved in water and filtered. The filtered liquor is a solution of the iodide of iron free from oxide or per-oxide. This solution may be readily preserved by adding a sufficiency of pure sugar to it, to convert it into a syrup.

CHARACTERS.—Crystalline, green with a tinge of brown, inodorous, deliquescent, soluble in water, forming a slightly green solution which gradually deposits a rust-coloured sediment, and acquires a red colour. It gives a copious blue precipitate with the ferridcyanide of potassium, and one of a similar colour with mucilage of starch, on the addition of a minute quantity of chlorine.

CHEMICAL PROPERTIES.—When recently prepared it consists of one equivalent of iodine and one of iron; it dissolves readily in water and alcohol, but the solution when left exposed to the air is rapidly decomposed, and sesqui-oxide of iron deposited; which change is, however, prevented if a sufficient quantity of sugar be present. The first step in this change is, that water is decomposed, its oxygen goes to the iron to form protoxide of iron, two equivalents of which abstract one other equivalent of oxygen from the air, and sesquioxide of iron is consequently precipitated; the hydrogen uniting with the iodine forms hydriodic acid, which abstracting oxygen from the air is also decomposed into water and free iodine. Exposed to heat, it fuses, and at a temperature above 350° F. is decomposed, the iodine being volatilized and the iron left in the state of peroxide. The The formula of the Pharmacopœia yields an excellent preparation; it is that originally proposed by Messrs. Smith, of Edinburgh.

TEST.—It dissolves almost entirely in water, leaving but a very small quantity of red sediment.

ADULTERATIONS.—That iodide of iron has been well prepared and properly preserved may be readily known by its being entirely soluble in distilled water. Owing to the difficulty of preserving this salt, the London College directed the syrup alone to be prepared for use in medicine, but as many persons can take it only in the solid state, this was a defect in the last edition of the London Pharmacopœia, the more especially as the iodide may be preserved in well stoppered bottles for an almost indefinite period, provided it be kept covered with a layer of the *Pulvis Ferri*.

THERAPEUTICAL EFFECTS.—Iodide of iron was first employed in the practice of medicine by the late Dr. A. T. Thomson. In its operation on the system it is more nearly allied to the preparations of iodine than to those of iron, the iron in the salt being to the iodine but as 1 is to 4·5; to a certain extent, however, it possesses the combined properties of both elements. Thus, as a tonic it is especially useful in scrofulous debility, and under its use strumous enlargements of the glandular system are quickly dissipated. It may be also administered with much benefit in chlorosis and amenorrhœa, when the ferruginous preparations are indicated, and it is probably one of the most useful remedies that can be employed in the treatment of secondary syphilitic affections, occurring in scrofulous or weak constitutions. I have found it very beneficial in several forms of cutaneous disease occurring in debilitated habits, and in many cases of phthisis, in either of which the syrup may be combined with cod-liver oil. In large doses iodide of iron sometimes purges.

DOSE AND MODE OF ADMINISTRATION.—The dose of iodide of iron is gr. ij. to gr. v. gradually increased. It is so deliquescent a substance, and when dissolved decomposes so rapidly, that many methods have been proposed for preserving its solution unchanged; of these the only two that deserve notice are, keeping in the bottle in which it is contained a piece of iron wire, as first proposed by Mr. Squire of London, or forming it into a strong syrup, as recommended by Dr. A. T. Thomson. The former method has been found very effectual, but it entails the necessity of filtering the solution every time it is to be used, inasmuch as peroxide of iron is formed and precipitated, as previously described, but the nascent hydriodic acid meeting with the iron unites with it again to form iodide of iron; while in the latter it is not only preserved for a length of time unaltered, but it is also an elegant form for the administration of the medicine.

Pilula Ferri Iodidi. Pill of Iodide of Iron. (Take of 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 the 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.) The above formula is a modification of that originally communicated by Mr. Leslie of Glasgow, which has been in general use for several years; but I have found that when kept for some time the pills become very soft and lose all trace of iodine. I have therefore tried the following, which makes an excellent pill, not nearly so large as the above, and by means of which any desired number of pills may be prepared in a few minutes, thereby rendering their being too long kept unnecessary:—Pulvis ferri, gr. vj.; sugar of milk, gr. vj.; iodide of iron, gr. xij.; confection of the dog rose, gr. xij.; make into a mass and divide into 12 pills. Each of these pills contains one grain of the iodide of iron and half a grain of the powder of iron. This formulary is an imitation of *Blancard's pills*, which, however, have the advantage in being varnished with a coating of balsam of tolu, and thus protected from the action of the atmosphere; either of these preparations are to be preferred to the pharmacopœial mass.

Syrupus Ferri Iodidi. Syrup of Iodide of Iron. (Take of fine iron wire, one ounce; iodine, two ounces; refined sugar, twenty-eight ounces; distilled water, thirteen fluid ounces. Prepare a syrup by dissolving the sugar in ten ounces of the water with the aid of heat. Digest the iodine and the iron wire in a flask, at a gentle heat, with the remaining three ounces of the water, till the froth becomes white; then filter the liquid while still hot into the syrup, and mix. The product should weigh two pounds eleven ounces, and should have the specific gravity 1·385.) This is the most certain form for the administration of the iodide of iron, each fluid drachm contains about five grains. Dose, min. xx. to f℥j.

INCOMPATIBLES.—Acids, and acidulous salts; and all substances incompatible with sulphate of iron (see page 94).

* FERRI LACTAS.—*Lactate of Iron. Proto-lactate of Iron.*

PREPARATION.—"Take any quantity of sour whey; evaporate it to a third or fourth of its volume; decant, filter, and saturate with milk of lime. Separate the precipitated lactate of lime on a filter; treat it with solution of oxalic acid to precipitate the oxalate of lime. Add to the liquor, again filtered (which is now a solution of lactic acid) clean iron filings; boil for a short time, filter, evaporate to the consistence of a syrup and crystallize by cooling."—LOURADOUR.

PHYSICAL PROPERTIES.—Lactate of iron occurs in the form of small greenish-yellow acicular prisms, or in powder of a dull, pale green colour, having a feeble chalybeate, not disagreeable taste, but no odour.

CHEMICAL PROPERTIES.—It is composed of 1 equivalent of protoxide of iron and 1 of lactic acid, combined in the crystalline state with 3 of water. It is but slightly soluble in water, and during solution the iron passes to a higher state of oxidation; when pure, the solution in distilled water is not affected by solution of nitrate of baryta or of oxalate of ammonia. Proto-lactate of iron has an acid reaction on vegetable colours.

THERAPEUTICAL EFFECTS.—Lactate of iron has been administered in the same cases as the other mild preparations of this metal. It has been principally used in the treatment of chlorosis and atonic amenorrhœa, in which it has been found very successful. In consequence, however, of its high price, it has been hitherto but little employed in this country.

DOSE AND MODE OF ADMINISTRATION.—Gr. vj. to gr. xij. in the 24 hours. It is best given in the form of lozenge or of syrup.

* *Trochisci Ferri Lactatis*, CAP. (Lactate of iron, ʒvij.; gr. lxxii.; pure sugar, ℥xiss.; mucilage, a sufficiency; make into lozenges, each weighing gr. x.) Each lozenge contains gr. $\frac{3}{4}$ of the salt.

* *Syrupus Ferri Lactatis*, CAP. (Lactate of iron, gr. lx.; boiling distilled water, fʒviss.; pure sugar, ʒxiij.; make into a syrup.) Dose, fʒij. to fʒss.

INCOMPATIBLES.—Same as for the ammonio-citrate of iron.

* FERRI MISTURA AROMATICA. *Aromatic Mixture of Iron.*

PREPARATION.—Take of Peruvian bark (crown or pale), in powder, ℥j.; calumbo root, in coarse powder, gr. clxxx.; cloves, bruised, gr. cxx.; filings of iron, separated by a magnet, ʒss.; digest for three days, with occasional agitation, in a covered vessel, with as much peppermint water as will give twelve ounces of a filtered product, and then add of compound tincture of cardamoms, three fluid ounces; tincture of orange peel, three fluid drachms. This mixture should be kept in a well-stopped bottle.

This mixture is a combination of aromatic tonics holding in solution some tannate of iron; in consequence of its black colour and of its having been originally recommended by that distinguished physician, it is commonly known as *Heberden's ink*. Notwithstanding its being an unchemical compound, and having been omitted from the Pharmacopœia, it is a most excellent tonic, and so highly thought of as to have been retained in the last edition of the Dublin Pharmacopœia; it is in very general use in this city, in the various states of debility attended with anemia. Dose, fʒj. to fʒij. two or three times a day. It may be conveniently and advantageously prescribed in combination with the compound iron mixture, equal proportions of each being used.

FERRI OXIDUM MAGNETICUM. *Magnetic Oxide of Iron.* (Syn.: *Ferri Oxidum Nigrum*, Ed., *Ferroso Ferric-oxide of Iron.)* Peroxide of iron, Fe_2O_3, with about nine per cent. of protoxide of iron, FeO, and twenty-two of water.

PREPARATION.—"Take of sulphate of iron, six ounces; sulphuric acid, three fluid drachms; nitric acid, two fluid drachms; solution of soda, fifty-eight fluid ounces, or a sufficiency; distilled water, a sufficiency. Add the sulphuric acid to five fluid ounces of the water, and with the aid of heat dissolve in the mixture four ounces of the sulphate of iron. Mix the nitric acid with two fluid ounces of the water, and, having added the dilute acid to the solution of sulphate of iron, concentrate by boiling until, on the sudden disengagement of ruddy vapours, the liquid passes from a dark to a red colour. To the solution thus obtained add the two remaining ounces of sulphate of iron, first dissolved in half a pint of distilled water. Mix well, add to the liquid the solution of soda, and having boiled for five minutes in an iron vessel, collect the precipitate on a calico filter, and wash it with boiling distilled water, until the liquid which passes through ceases to give a precipitate when allowed to drop into a solution of chloride of barium. Lastly, dry the precipitate without heat in a confined portion of air over a capsule containing sulphuric acid, and enclose it in a stoppered bottle."

EXPLANATION OF PROCESS.—On treating a solution of sulphate of iron with sulphuric and nitric acids we find that it is converted from the state of proto- to that of per-sulphate of iron with the evolution of nitric oxide gas; to explain the reaction we will require six equivalents of sulphate of iron, three of sulphuric, and one of nitric acids. The six protoxides of iron of the protosulphate receive three atoms of oxygen from the nitric acid, and are thereby converted into three equivalents of sesquioxide of iron; with these the six atoms of sulphuric acid of the protosulphate of iron, together with the three additional equivalents of sulphuric acid employed, unite, and we have three equivalents of persulphate of iron formed, thus, $6FeOSO_3+3SO_3+NO_5=3Fe_2O_33SO_3+NO_2$. The nitric oxide gas does not escape as it is developed, but is absorbed by whatever protosulphate of iron has as yet escaped this action, and gives with it the dark characteristic colour alluded to; but when at last all the protosulphate is converted into persulphate of iron, the accumulated gas escapes with some violence, and, meeting with the oxygen of the atmospheric air, unites with it, and is converted from the colourless nitric oxide gas into the orange-coloured hyponitric acid gas, thus, $NO_2+2O=NO_4$. To the solution of persulphate of iron thus obtained a solution of sulphate of iron is added, and into the mixed solutions the solution of soda is poured; the soda removes the sulphuric acids of the salts, forming with them sulphate of soda, which remains in solution, whilst from the sulphate of iron protoxide of iron is precipitated, thus, $FeOSO_3+NaO=NaOSO_3+FeO$; and from the persulphate of iron sesquioxide of iron, thus, $Fe_2O_33SO_3+3NaO=3NaOSO_3+Fe_2O_3$. The mixture of these two oxides in the proportions stated, in combination with water, constitutes the pharmacopœial preparation.

PHYSICAL PROPERTIES.—This compound is met with native, when it constitutes *magnetic* iron ore. Prepared according to the directions of the Pharmacopœia, it is a brownish black powder with a velvety smoothness. It is strongly magnetic.

CHARACTERS.—Brownish-black, destitute of taste, strongly magnetic. It dissolves without effervescence in hydrochloric acid diluted with half its bulk of water, and the solution thus obtained gives blue precipitates with the ferrocyanide, and with the ferridcyanide of potassium.

CHEMICAL PROPERTIES.—Magnetic oxide of iron is a compound of the protoxide and of the sesquioxide of iron. Exposed to heat in close vessels it undergoes no alteration, but when heated in the open air it absorbs oxygen, and passes into the state of sesquioxide. It dissolves readily in hydrochloric acid without effervescence, and the solution yields a precipitate both with ferrid- and ferrocyanide of iron, indicating the presence respectively of the proto- and perchloride of iron.

TESTS.—Twenty grains moistened with nitric acid, and calcined at a low red heat, leave 15·8 grains of the peroxide of iron. Twenty grains dissolved in hydrochloric acid continue to give a blue precipitate with the ferridcyanide of potassium until 8·3 measures of the volumetric solution of bichromate of potash have been added.

ADULTERATIONS.—Prepared as directed in the Pharmacopœia, this preparation is unlikely to contain any impurity; it may contain metallic iron, the presence of which will be indicated by the escape of hydrogen gas, when treated with hydrochloric acid. The amount of peroxide of iron resulting on the treatment directed in the *tests* corresponds with its composition, as stated in the Pharmacopœia, whilst the amount of blue precipitate yielded with the volumetric solution of bichromate of potash represents gr. 8·75 per cent. of protoxide of iron, closely approximating the per centage stated in the Pharmacopœia.

THERAPEUTICAL EFFECTS.—This preparation of iron is not much used in the present day, but formerly under the name of *Æthiops martis* it bore a high reputation as a chalybeate tonic.

DOSE AND MODE OF ADMINISTRATION.—The dose of it is from gr. v. to gr. xx. two or three times a day, made into an electuary with honey or treacle.

* *Ferruginous pills*, SCHNEIDER. (Magnetic oxide of iron, in fine powder, 15 parts; calumbo and canella, of each, in fine powder, 4 parts; cayenne pepper, 1 part; extract of chamomile, a sufficiency; make into a pill mass and divide into four grain pills.) Dose, 3 to 5 daily. An excellent combination in chlorosis.

FERRI PEROXIDUM. *Peroxide of Iron.* $Fe_2O_3,HO(=89)$.

* FERRI CARBONAS.—*Carbonate of Iron.* As most of the carbonic acid is driven off during the drying of the carbonate, as formerly directed by the Dublin College, and as the small quantity it retains escapes soon after it has been prepared, no matter how carefully it may be preserved—the resulting powder being the sesquioxide—I have thought it better to describe the so-called carbonate of iron along with the sesquioxide of iron, especially as even still some confusion exists in the minds of practitioners with respect to these two preparations.

FERRI PEROXIDUM.—PREPARATION.—"Take of hydrated peroxide of iron, four ounces. Place the peroxide of iron in a stove or oven until it becomes dry to the touch; and then expose it to a heat of 212° until it ceases to lose weight. Lastly, reduce it to a fine powder, and preserve it in a bottle."

EXPLANATION OF PROCESS.—In this process the hydrated peroxide of iron is simply deprived of all its equivalents, save one of water, by the heat employed.

* FERRI CARBONAS.—PREPARATION.—"Take of sulphate of iron, ℥viij.; crystallized carbonate of soda of commerce, ℥x.; distilled water, cong. ij: dissolve each salt in one half of the water, and both solutions being raised to the boiling temperature, mix them, and set the whole to rest in a covered vessel for six hours. The supernatant solution having been drawn off with a syphon, the precipitate is to be drained on a calico filter, and then subjected to strong expression. Finally let it be dried at a temperature not exceeding 212°, pulverized, and preserved in a well-stopped bottle.

EXPLANATION OF PROCESS.—A case of double decomposition, the carbonic acid of the carbonate of soda going to the oxide of iron to form carbonate of iron, and sulphuric acid of the sulphate of iron to the soda to form sulphate of soda, thus, $NaOCO_2+FeOSO_3=FeOCO_2+NaOSO_3$. Such at all events is what might be inferred from theory, but practice teaches us that no sooner is the protocarbonate of iron formed than it commences to abstract oxygen from the air, in consequence of which sesquioxide of iron is formed, which having no affinity for carbonic acid permits its escape, and the sesquioxide of iron is precipitated, thus, $2FeOCO_2+O=Fe_2O_3+2CO_2$. Consequently the following observations are equally applicable to these two preparations.

CHARACTERS.—A powder of a dark brown colour, and destitute of taste; dissolves completely, though slowly, with the aid of heat in hydrochloric acid diluted with half its volume of water, forming a solution which gives a copious blue precipitate with the ferrocyanide of potassium.

CHEMICAL PROPERTIES.—Sesquioxide of iron is composed of 2 equivalents of iron, and 3 of oxygen (Fe_2O_3). It is insoluble in water, but is dissolved by hydrochloric acid, in which it dissolves slowly, but, if free from carbonic acid, without effervescence.

TESTS.—It dissolves completely in hydrochloric acid, and the solution gives no precipitate with chloride of barium, or with the ferridcyanide of potassium.

ADULTERATIONS.—If it contain any earthy impurity, as brick dust, it will not be completely soluble in hydrochloric acid; if free from a sulphate it will yield no precipitate with chloride of barium; if no protoxide be present, it will not precipitate with ferridcyanide of potassium.

THERAPEUTICAL EFFECTS.—Sesquioxide of iron may be used as a chalybeate tonic in the same cases as the other ferruginous preparations. Its principal use, however, is in the treatment of neuralgic affections, particularly tic-douloureux, as a remedy for which it was first proposed under the old name of *Carbonate*, by Mr. Hutchinson. In many instances it will be found to give complete relief, but it frequently fails to prove of the least service. The late

Mr. Carmichael of this city highly recommended this preparation as a useful palliative in cancerous diseases.

DOSE AND MODE OF ADMINISTRATION.—The sesquioxide of iron is administered in doses of from gr. xxv. to ℥ss. three or four times a day. It may be given in the form of electuary made with honey, and some aromatic powder combined with it. Combined in these properties with sulphur confection, I have found it of great value in neuralgic affections.

Emplastrum Ferri. Chalybeate Plaster. (Take of peroxide of iron, in fine powder, one ounce; Burgundy pitch, two ounces; litharge plaster, eight ounces. Add the peroxide of iron to the Burgundy pitch and litharge plaster, previously melted together, and stir the mixture constantly till it stiffens on cooling.) This plaster is employed with good effect to give mechanical support in muscular relaxations and weakness of the joints, over the stomach in flatulent dyspepsia, and over the region of the heart in nervous palpitation.

INCOMPATIBLES.—The mineral acids; and acidulous salts.

FERRI PEROXIDUM HYDRATUM. *Hydrated Peroxide of Iron.* (Hydrated peroxide of iron, $2Fe_2O_3,3HO(=131)$, with a variable amount of uncombined water.)

PREPARATION.—"Take of solution of persulphate of iron, four fluid ounces; solution of soda, thirty-three fluid ounces, or a sufficiency; distilled water, one pint. Add the persulphate of iron to the distilled water, and gradually pour the dilute solution into the solution of soda, stirring well for a few minutes; collect the precipitate on a calico filter, and wash it with distilled water, until the filtrate ceases to give a precipitate with chloride of barium. Lastly, enclose the precipitate, without drying it, in a porcelain pot whose lid is made tight by a luting of lard. This preparation should be recently made."

EXPLANATION OF PROCESS.—On adding the solution of persulphate of iron to that of soda, its sulphuric acid unites with the soda, forming sulphate of soda, which is held in solution, whilst the peroxide of iron is precipitated, thus, $Fe_2O_33SO_3+3NaO=3NaOSO_3+Fe_2O_3$.

CHARACTERS.—A soft moist pasty mass, of a reddish-brown colour. Dissolves readily in dilute hydrochloric acid without the aid of heat, forming a solution which gives a copious blue precipitate with the ferrocyanide of potassium. A little of it dried at 212° gives off moisture when further heated in a test tube.

TESTS.—Free from grittiness; leaves on calcination about twelve per cent. of peroxide of iron.

PROPERTIES.—The hydrated sesquioxide of iron is in the form of a yellowish-brown powder, inodorous and tasteless. It is composed of 2 equivalents of peroxide of iron and 3 of water. It is insoluble in water, but dissolves readily in dilute acids; heated it gives off water, and the red peroxide of iron is left. If in the moist state the hydrated peroxide of iron in considerable excess (*at least 12 parts of oxide to 1 part of arsenic,* Dr. Maclagan), be agitated with a solution containing arsenious acid, a very insoluble compound (*arseniate of protoxide of iron*, Graham) is formed, and the filtered liquid gives no trace of arsenious acid, the arsenious acid and peroxide of iron mutually reacting upon each other, in consequence of which the peroxide is reduced to protoxide of iron, and the arsenious acid is converted into arsenic acid, thus, $2Fe_2O_3+AsO_3=4FeO,AsO_5$. According to Dr. A. Taylor, this reaction, however, will not occur unless with arsenious acid *in solution*.

THERAPEUTICAL EFFECTS.—In its medicinal properties this preparation is precisely similar to the dry peroxide. It has been advisedly introduced into the Pharmacopœia as being the most certain antidote for poisoning with arsenic which has been yet discovered. Its antidotal powers are now well established by the result of numerous cases in which it has proved successful within the last twenty years, both in this country and on the continent; from Dr. Taylor's experiments much of its value in those cases must be ascribed to its *mechanically* enveloping the arsenic, and so protecting the coats of the stomach from the corrosive action of the mineral. The quantity required to neutralize the poisonous property of arsenic, as above remarked, is at least 12 parts to 1 of the poison, but it should be always given in as large doses as the stomach will bear. Thus, a tablespoonful may be mixed with water, and this quantity administered every five or ten minutes. Hydrated sesquioxide of iron does not prove nearly so efficacious an antidote when dried, as when kept in the form of a moist magma, hence the pharmacopœial directions to preserve it in an air-tight vessel. According to Maclagan, the sesquioxide precipitated from the ferruginous solution by ammonia is to be preferred to that yielded by the other alkalies, but for my own part I cannot well understand how this should be. In a case of arsenical poisoning time is all important, and a ready way of obtaining extemporaneously this preparation may prove acceptable. This can be done by throwing the tincture of sesquichloride of iron into either liquor ammoniæ or potassæ, filtering through flannel, and washing the precipitate with water. All these materials are to be found in the poorest dispensary or apothecary's shop, and the process can be conducted whilst steps are being taken to empty the stomach by the pump or emetics as the case may be—a preliminary that under no circumstances should be neglected.

* FERRI PERCYANIDUM.—*Percyanide of Iron. Prussian Blue.* $Fe_4 3FeCy_3 (=430)$.

This substance was formerly introduced into the Materia Medica list of the London Pharmacopœia, from the last edition of which, however, it was omitted, as being solely used for preparing bicyanide of mercury. It has been, however, employed in America in the treatment of intermittent and remittent fevers, and in dysentery; for which it is stated to have proved a very effectual remedy. It has been also used in Germany, it is said with success, in some cases of old standing epilepsy. But according to more recent observations, it appears to possess very little, if any, therapeutical power. The dose in which Prussian blue has been administered is from gr. iij. to gr. vj. three or four times a day.

FERRI PHOSPHAS. *Phosphate of Iron.* Phosphate of iron, $3FeO,PO_5(=179)$, partially oxidated.

PREPARATION.—"Take of sulphate of iron, three ounces; phosphate of soda, two ounces and a half; acetate of soda, one ounce; boiling distilled water, four pints. Dissolve the sulphate of iron in one half of the water, and the phosphate and acetate of soda in the remaining half. Mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with hot distilled water, till the filtrate ceases to give a precipitate with chloride of barium. Finally dry on porous bricks in a stove whose temperature does not exceed 100°. Preserve the dried salt in a stoppered bottle."

EXPLANATION OF PROCESS.—Phosphate of soda consists of one equivalent of phosphoric acid in combination with two of soda and one of *basic* water (see p. 186). Phosphate of iron consists of three atoms of oxide of iron united with one of phosphoric acid; to furnish these three atoms of oxide of iron, three equivalents of sulphate of iron will be required; but phosphate of soda only contains enough of base to saturate two out of the three equivalents of the resulting sulphuric acid, which would be objectionable inasmuch as the free sulphuric acid, exercising a solvent action over the phosphate of iron, would be a source of loss in the process; an action not possessed by acetic acid: hence the necessity of employing the acetate of soda, one equivalent of which, with one of phosphate of soda, containing between them three equivalents of soda, saturate the three equivalents of sulphuric acid, forming three equivalents of sulphate of soda, which, with the acetic acid set free, are held in solution, whilst the three oxides of iron unite with the one phosphoric acid, forming the phosphate of iron, which is precipitated, thus, $2NaO,HOPO_5 + NaO\bar{A} + 3FeOSO_3 = 3NaOSO_3 + \bar{A} + HO + 3FeO,PO_5$. The precipitate is to be washed so long as the washings yield any precipitate with chloride of barium; in other words, until freed from sulphate of soda.

CHARACTERS.—A slate-blue amorphous powder, insoluble in water, soluble in hydrochloric acid. The solution yields a precipitate with both the ferrocyanide and the ferridcyanide of potassium, that afforded by the latter being the more abundant; and when treated with tartaric acid and an excess of ammonia, and subsequently with the solution of ammonio-sulphate of magnesia, lets fall a crystalline precipitate.

TEST.—If it is digested in hydrochloric acid with a lamina of pure copper, a dark deposit does not form on the metal.

PROPERTIES.—Phosphate of iron is in the form of a fine bluish or greenish powder. It has a ferruginous taste, but no odour. According to Berzelius, it is a compound of the phosphates of the proto-and sesqui-oxides of iron, and hence it yields a precipitate with both the ferro- and ferridcyanide of potassium; the crystalline precipitate alluded to in the characters is the ammoniaco-magnesian phosphate (see p. 522). Did it darken the lamina of copper, when treated as described in the test, it would indicate the presence of arsenic (see p. 212). It is insoluble in water.

THERAPEUTICAL EFFECTS.—Phosphate of iron possesses the tonic properties of the other ferruginous preparations; but is rarely used, however, in the present day. It appears to me to be peculiarly adapted for those scrofulous affections of children in which there is softening of the osseous system, and for rickets. It was a favourite remedy with the late Dr. Prout in diabetes. In America it is employed in amenorrhœa and in some forms of dyspepsia.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. x. in powder or made into pill with extract of liquorice, or in the following form.

Syrupus Ferri Phosphatis. Syrup of Phosphate of Iron. (Take of granulated sulphate of iron, two hundred and twenty-four grains; phosphate of soda, two hundred grains; acetate of soda, seventy-four grains; dilute phosphoric acid, five fluid ounces and a half; refined sugar, eight ounces; distilled water, eight fluid ounces. Dissolve the sulphate of iron in four ounces of the water, and the phosphate and acetate of soda in the remainder; mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with distilled water, till the filtrate ceases to be affected by chloride of barium. Then press the precipitate strongly between folds of bibulous paper, and add to it the dilute phosphoric acid. As soon as the precipitate is dissolved, filter the solution, add the sugar, and dissolve without heat. The product should measure exactly twelve fluid ounces.) This preparation will be understood on reference to what has been already written on the phosphate of iron. Each drachm of this syrup contains gr. j. of phosphate of iron. Dose, f℥j. to f℥ij. twice or three times a day.

FERRI SULPHAS.—*Sulphate of Iron* (described in the division *Astringents*) is an excellent tonic, and is employed with much benefit in the same cases as the other ferruginous compounds, provided its astringent property does not contra-indicate its use. I have found the dried sulphate (see page 72), combined with the pill of aloes and myrrh, productive of excellent effects in the treatment of chlorosis.

FERRI SULPHAS GRANULATA. *Granulated Sulphate of Iron.* FeO,SO_3+7HO (=139).

PREPARATION.—(The mode of preparing this salt and the explanation of the process will be found at page 93.)

CHARACTERS.—In small granular crystals of a pale-green colour, and mildly styptic taste, soluble in water, insoluble in rectified spirit.

TESTS.—Free from opaque rust-coloured spots, and dissolving in water without leaving any ochry residue. The aqueous solution gives no precipitate with sulphuretted hydrogen, and one nearly white with ferrocyanide of potassium.

CHEMICAL PROPERTIES.—This is a pure protosalt of iron. It is characterised by the white precipitate it yields with ferrocyanide of potassium, a precipitate which on exposure to air, by absorption of oxygen, becomes rapidly blue. The composition of this white precipitate is one atom of potassium, one of iron, and one of ferrocyanogen ($KFe+FeCy_3$).

THERAPEUTICAL USES.—This is one of the most valuable of our chalybeate preparations. For its dose and mode of administration see p. 93.

FERRUM TARTARATUM. *Tartarated Iron.* (Tartrate of iron and potash, $Fe_2O_3,KO,C_8H_4O_{10}+HO$) (=268). (Syn.: *Ferri Potassio-tartras,* Lond.

PREPARATION.—Take of solution of persulphate of iron, four fluid ounces; solution of soda, two pints, or a sufficiency; acid tartrate of potash, in powder, two ounces; distilled water, a sufficiency. Add the persulphate of iron to a pint of distilled water, and gradually pour the dilute solution into the solution of soda, stirring well for a few minutes; then collect the precipitate on a calico filter, and wash it with distilled water until the filtrate ceases to become turbid on the addition of chloride of barium. To the acid tartrate of potash and thirty ounces of distilled water placed in a capsule add the precipitate, and digest the mixture with repeated stirring for six hours, at a heat which must be carefully prevented from rising above 140°. After the solution has cooled down to the temperature of the atmosphere, decant it off any undissolved precipitate, and, having poured it in a thin layer on flat porcelain or glass plates, evaporate it to dryness at a temperature not exceeding 140°. Lastly, remove the dried salt in flakes, and preserve it in stoppered bottles."

EXPLANATION OF PROCESS.—On reference to what has been written on tartaric acid, page 393, it will be seen to be a bibasic acid, and it will be also seen that the composition of the acid tartrate of potash is one atom of potash, one of basic water, and one of tartaric acid ($KO,HO,\bar{T}$), the water in this case discharging the duties of a base. The first step taken in the present process is to precipitate sesquioxide of iron from the persulphate of iron by the action of the solution of soda; this is accomplished by the soda uniting with the sulphuric acid of the persulphate of iron forming sulphate of soda, which remains in solution and sesquioxide of iron which is precipitated, thus, $Fe_2O_33SO_3+3NaO=3NaOSO_3+Fe_2O_3$ The precipitate is washed so long as ever it precipitates the solution of chloride of barium, in other words, so long as any sulphate of soda remains; the sesquioxide of iron is now treated with the acid tartrate of potash, and eventually takes the place of the basic water in that salt, forming the ferrum tartaratum, thus, $Fe_2O_3+KOHO\bar{T}=(Fe_2O_3KO\bar{T}+HO)$.

CHARACTERS.—Thin transparent scales of a deep garnet colour, slightly deliquescent, somewhat sweet, and rather astringent, soluble in water and sparingly soluble in spirit. The aqueous solution, when acidulated with hydrochloric acid, gives a copious blue precipitate with the ferrocyanide of potassium, but no precipitate with the ferridcyanide. When the salt is boiled with solution of soda, peroxide of iron separates, but no ammonia is evolved, and the filtered solution when slightly acidulated by hydrochloric acid gives, as it cools, a crystalline deposit.

CHEMICAL PROPERTIES.—The tartrate of iron and potash when prepared, as in the formula of the British Pharmacopœia, with the sesquioxide of iron, is according to Wittstein, a compound of 4 equivalents of tartrate of potash, 1 of the tartrate of the protoxide of iron, 3 of the sesquioxide of iron, and 1 of tartaric acid, ($4KO\bar{T} + FeO\bar{T} + 3Fe_2O_3 + \bar{T}$); or according to Phillips, of 1 equivalent of neutral tartrate of potash, and 1 equivalent of basic tartrate of sesquioxide of iron. It attracts water in damp air, but does not deliquesce; is soluble in water, requiring about 4 parts of cold water for its solution; and is slightly soluble in weak spirit. The solution is of a greenish yellow colour; is not decomposed by the alkalies or alkaline carbonates, unless with the aid of heat; and retains its composition unchanged for a considerable time. The blue precipitate yielded with ferrocyanide of potassium is characteristic of its being a persalt of iron, whilst the non-production of one with the ferridcyanide of potassium demonstrates the absence of a protosalt; its not evolving ammonia on being treated with soda, serves to distinguish it from the ammonio-tartrate of iron; the crystalline precipitate thrown down on the addition of hydrochloric acid is cream of tartar.

TESTS.—By incinerating fifty grains of this preparation at a red heat, and acting on the residue with hydrochloric acid, a solution is obtained which, when digested with a little nitric acid, and afterwards diluted with four fluid ounces of water, and supersaturated with ammonia, yields a precipitate of peroxide of iron weighing 14·92 grains.

ADULTERATIONS.—As met with in the shops, tartrate of iron and potash is often imperfectly prepared, the oxide of iron not being chemically combined with the bitartrate of potash. I have in several instances met with specimens of this salt which contained carbonate of potash; they were exceedingly deliquescent, and effervesced with dilute acids. The pharmacopœial test is directed to ascertaining the amount of peroxide of iron in the salt, the per-centage stated being that which would be inferred from its chemical equivalents.

THERAPEUTICAL EFFECTS.—This is a mild chalybeate tonic, and may be used in all cases where the milder preparations of iron are indicated; indeed by many practitioners it is preferred to any other, from a belief that it is more readily assimilable by the digestive organs. In consequence of its taste, the potassio-tartrate of iron is well adapted for children.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx. three or four times a day, made into a bolus with honey or treacle, or dissolved in some aromatic water.

Vinum Ferri. Wine of Iron. (Take of tartarated iron, one hundred and sixty grains; sherry, one pint. Dissolve.) This wine is presumed to contain one grain of tartarated iron in each drachm, but according to Mr. Squire the sherry is already so charged with bitartrate of potash as to be unable to dissolve the salt. It is intended as a substitute for the Vinum Ferri, Lond., which is preferred by Mr. Squire to the present preparation, and is thus prepared.

* *Vinum Ferri.* (Iron wire, ℥j.; sherry wine, Oij.; digest for thirty days and filter.) The following formula by M. Soubeiran yields a much more elegant preparation :—"Tartrate of protoxide of iron, 1 part; tartaric acid, 1 part; white wine, 1000 parts. Rub the tartrate of iron and tartaric acid together in a porcelain or glass mortar; then add the white wine, and filter the solution if necessary. Tartrate of protoxide of iron is readily prepared by decomposing an equivalent of proto-sulphate of iron with an equivalent of neutral tartrate of potash, instantly washing the precipitate with water, collecting it on a strainer, pressing it strongly, and drying over a water bath." The dose of iron wine is from f℥j. to f℥ss. Both preparations contain the iron in the state of tartrate, with traces of the malate and probably the acetate.*

INCOMPATIBLES.—The mineral acids; lime water; and all astringent vegetable preparations.

GENTIANA. *Gentian.* Gentiana lutea, *Linn.* Plate 132, *Steph. and Church. Med. Bot.* (The root dried; collected in the Alps, Apennines, and other mountainous districts of Europe.) A native of the mountainous regions of central Europe; belonging to the Natural family *Gentianaceæ*, and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—Root, perennial; stem, annual, simple, erect, 3–4 feet high, roundish, hollow; leaves, opposite, broad, ovate, 5–7 nerved, plaited; flowers, yellow, whorled, numerous, on smooth peduncles; fruit, a conical capsule, 2-valved, many-seeded.

PHYSICAL PROPERTIES.—Gentian root is imported in bales from Switzerland, by way of Havre, Marseilles, &c. It is in pieces varying in length from two or three to eight or ten inches, and from half an inch to one or two inches in thickness, usually contorted and much branched; the epidermis is wrinkled and somewhat annulated, of a brownish-yellow colour; internally the root is of a bright yellow

* In addition to these several preparations of iron must be noted a very elegant form of administering the various ferruginous preparations, although not officinal in the Pharmacopœia; I allude to the *granular effervescing* citrate of iron, carbonate of iron, citrate of iron and quinine, ammonio-citrate of iron, &c. These various compounds are now found in all our shops, arranged so that a tea-spoonful in half a tumblerful of water will be the dose for an adult; they produce a most agreeable effervescing drink; they are suited for all such cases as are likely to be benefitted by mild chalybeates and tonics, and from their agreeable taste are admirably adapted for exhibition to children.

colour, and has a spongy texture. It has a faint aromatic odour, which in the fresh state is said to be strong and disagreeable, and an intensely bitter taste, void of all astringency.

CHARACTERS.—From half an inch to one inch in thickness, several inches in length, often twisted, much wrinkled, or marked with close transverse rings, brown externally, yellow within, tough and spongy; taste at first sweetish, afterwards very bitter.

CHEMICAL PROPERTIES.—Gentian consists of odorous volatile oil, a yellow crystallizable bitter neutral principle (*gentianin* of M. M. Henry and Caventou, but which, according to Leconte and Trommsdorff, is a compound of simple colouring matter not bitter,—*gentisin*, a bitter principle—*gentianite*, and a fatty matter), a substance identical with bird-lime (a compound of wax, oil, and caoutchouc, *Leconte*), a green fixed oil, a free organic acid, uncrystallizable sugar, gum, yellow colouring matter, and lignin. Gentian imparts its active principles readily to cold or boiling water, alcohol, and ether. The caustic alkalies deepen the colour of its infusion, which becomes olive-brown on the addition of sesquichloride of iron. With a solution of acetate or subacetate of lead the infusion yields a gelatinous precipitate, attributable to *pectic acid*, first discovered in it by Denis.

ADULTERATIONS.—The roots of other species of gentian are frequently mixed with those of *Gentiana lutea*, an adulteration of little importance, as for the most part they possess analogous properties. A more serious fraud has been, however, sometimes practised, that of mixing the roots of belladonna, monkshood, or white hellebore with gentian; that may be readily detected, as they do not possess either the intense bitter taste or the bright yellow colour internally of gentian root. In France powdered gentian root is very commonly adulterated with yellow ochre, as much as 50 per cent. being often mixed with it. The fraud may be detected by boiling a small quantity of a suspected specimen for a few minutes with very dilute sulphuric acid, filtering, and testing the filtered liquor with tincture of galls; if any ochre had been present, a blackish precipitate will be produced.

THERAPEUTICAL EFFECTS.—Gentian is an excellent pure bitter tonic, and is one of the most commonly employed of this class of medicines. In large doses it often causes vomiting, and it has a tendency to relax the bowels. The diseases in which gentian is employed with most benefit are those forms of dyspepsia attended with torpid digestion and secretion of acid, but unaccompanied by any tendency to irritability or inflammation of the stomach. It is also a useful tonic in the debility attendant on chronic diseases; and in consequence of its bitterness it proves anthelmintic.

DOSE AND MODE OF ADMINISTRATION.—In powder, seldom used, gr. x. to gr. xxx.; as gentian possesses little if any aroma, aromatics are usually prescribed in combination with it.

Extractum Gentianæ. Extract of Gentian. (Take of gentian, sliced, one pound; boiling distilled water, one gallon. Macerate the gentian in the water for two hours; boil for fifteen minutes; pour off, press, and strain. Then evaporate by a water bath to a proper consistence.) An excellent tonic extract. Dose, gr. x. to gr. xxx. two or three times a day, in the form of pill; in this state it may be prescribed with the preparations of iron. It forms an admirable excipient for other more active medicines.

Infusum Gentianæ Compositum. Compound Infusion of Gentian. (Take of gentian, sliced, a quarter of an ounce; bitter orange peel, bruised, thirty grains; coriander, thirty grains; proof spirit, ten fluid ounces; cold distilled water, eight fluid ounces. Pour the spirit upon the dry ingredients, in a covered vessel, in two hours add the water, and in two hours more strain through calico.) The quantity of proof spirit contained in this formulary may render its exhibition under certain cases inadmissible, constituting as it does one-fifth of the entire amount, and in every instance must be borne in mind by the prescriber, lest he should be too liberal in adding to it tinctures. One advantage attends upon the quantity of spirit it contains, that it will make the infusion keep better; the following infusion is that with which practitioners hitherto have been most familiar, it is that which was officinal in the last edition of the London Pharmacopœia under the name of *Infusum Gentianæ Compositum*; for the purpose, however, of distinguishing it from the present officinal formulary, I have dropped the adjective.

* *Infusum Gentianæ. Infusion of Gentian.* (Gentian, sliced; orange peel, dried, of each, ʒij.; lemon peel, ʒiv.; boiling distilled water, Oj.; macerate for an hour in a covered vessel and strain.) This is an agreeably tasted infusion, but as it does not keep should be prepared as required for use. Dose, of either infusion, f℥j. to f℥ij.

Tinctura Gentianæ Composita. Compound Tincture of Gentian. (Take of gentian, bruised, one ounce and a half; bitter orange peel, cut small and bruised, three-quarters of an ounce; cardamoms, bruised, a quarter of an ounce; proof spirit, one pint. Macerate the gentian and the other ingredients for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, fʒss. to fʒij.

INCOMPATIBLES.—Solution of subacetate of lead; nitrate of silver; sulphate of iron; and analogous salts.

MYRRHA. *Myrrh.* Balsamodendron Myrrha, *Ehrenb.* Plate 357, *Nees, Plant. Med.* (A gum-resinous exudation from the stem; collected in Arabia Felix and Abyssinia.) A native of Gison on the borders of Arabia Felix and of Southern Abyssinia; belonging to the Natural family *Amyridaceæ*, and to the Linnæan class and order *Octandria Monogynia*.

BOTANICAL CHARACTERS.—An arborescent shrub, with a pale ash-gray bark, and spinescent branches; leaves, ternate, on short footstalks; flowers, unknown; fruit, somewhat larger than a pea, ovate, acuminate, brown.

PREPARATION.—Myrrh exudes from the tree like cherry-tree gum, issuing from natural fissures in the bark and from bruises made with stones; it is at first of the consistence of oil, but soon becomes hard and dark coloured. It is imported into Britain by way of the East Indies.

CHARACTERS.—In irregular-shaped tears or masses varying much in size, somewhat translucent, of a reddish-yellow, or reddish-brown colour, fractured surface irregular and somewhat oily; odour agreeable and aromatic, taste acrid and bitter.

PHYSICAL PROPERTIES.—Myrrh, like the other gums, is met with in commerce of different qualities. The finest, *Turkey Myrrh*, (so called because it was formerly imported by way of Turkey) is in irregular shaped tears or masses, varying in size from that of a pea to that of a chesnut, but pieces are often met with more than twice that size; they are semi-transparent, of a reddish-yellow or reddish-brown colour, the larger pieces being the darker coloured; their fracture is shining, somewhat fatty, presenting often small white striæ in the centre, particularly of the largest masses. The taste of myrrh is acrid and bitter, the odour agreeable and aromatic; the finer pieces of Turkey myrrh are often selected and sold under the name of picked myrrh. The inferior sorts, *East Indian Myrrh*, are on an average in much smaller tears than Turkey myrrh; some of the tears are almost transparent and of a very pale colour, others are dark brown; they are generally mixed with other gums.

CHEMICAL PROPERTIES.—Myrrh has been carefully analysed by Ruickoldt. Its specific gravity varies from 1·120 to 1·180. It is composed of 2·183 per cent. of volatile oil *(Myrrhol)*, 44·760 of resin *(Myrrhin)*, 40·818 of gum *(Arabin)*, carbonates of lime and magnesia, and a trace of gypsum and oxide of iron. Its medicinal properties depend on the volatile oil and the resin, both of which are dissolved out completely by rectified spirit, partially by proof spirit, and very slightly by water; the latter menstruum dissolves all the soluble gum, and forms with it a thicker mucilage than with gum acacia. By heat myrrh is softened, but does not melt; it is inflammable.

ADULTERATIONS.—Myrrh is frequently adulterated with the inferior sorts, and with other gum resins. The finer pieces of Turkey myrrh should be alone employed in medicine. Righini has proposed the following method for ascertaining the purity of myrrh:—"Reduce to very fine powder 4 parts each of myrrh and of muriate of ammonia, and triturate them together for about a quarter of an hour; then add gradually and with constant agitation from 60 to 100 parts of water." If the myrrh be pure and does not contain any foreign bodies, the mixture dissolves readily.

THERAPEUTICAL EFFECTS.—Myrrh is a stimulating aromatic tonic, and is consequently inadmissible in cases where there is any tendency to inflammatory action. It is principally used in debilitated states of the digestive organs, or in diseases attended with excessive secretion from the mucous membranes. Myrrh is an excellent addition to alteratives and astringents in the protracted diarrhœas of infancy and childhood. It was formerly in high esteem as an emmenagogue, but has completely lost its repute as such.

DOSE AND MODE OF ADMINISTRATION.—Gr. x. to gr. xxx. in powder or made into an emulsion with water, but is rarely employed *per se*. It enters into the composition of several other preparations as a secondary agent, such as decoctum aloes compositum, mistura ferri composita, pilula aloes et myrrhæ, pilula rhei composita, &c.

Tinctura Myrrhæ. Tincture of Myrrh. (Take of myrrh, in coarse powder, two ounces and a half; rectified spirit, one pint. Macerate the myrrh for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.) The dose of this tincture for internal use is from f℥j. to f℥ij. It is most generally employed diluted with water as a lotion in sponginess or ulceration of the gums; it is also used as a stimulant application to foul ulcers. When mixed with water, in consequence of the precipitation of the resin, a milky solution is formed.

NECTANDRA. *Bebeeru Bark.* (Nectandra Rodiæi, *Schomburgh*, in *Hooker's Journ. of Bot.*, 2nd ser. The Greenheart tree. The bark imported from British Guiana.) The Nectandra Rodiæi, the Greenheart tree of Demerara and of British Guiana, belongs to the Natural family *Lauraceæ*, and to the Linnæan class and order *Dodecandria Monogynia.* The name Rodiæi was given it by Schomburgh in honour of Dr. Rodie, by whom it was originally described, and who urged its introduction as a remedial agent in 1834. The fruit, about the size of a small apple, is obovate, brownish in colour, composed of an external brittle shell and an internal fleshy kernel, intensely bitter.

CHARACTERS.—*Of the Bark.* In large flat heavy pieces from one to two feet long, from two to six inches broad, and about a quarter of an inch thick. External colour greyish-brown, internal dark cinnamon-brown. Taste strongly and persistently bitter, with considerable astringency.

PROPERTIES.—Bebeeru bark contains two alkaloids, *beberia* and *siperia*, described by Dr. Rodie, soft resin, vegetable albumen, gum, &c. The bark itself is not employed medicinally and has only been introduced into the Pharmacopœia with the object of furnishing the sulphate of beberia.

Beberiæ Sulphas. Sulphate of Beberia. (The sulphate of an alkaloid, $C_{38}H_{21}NO_6,HO,SO_3$, prepared from bebeeru bark.)

PREPARATION.—"Take of bebeeru bark, in coarse powder, one pound; sulphuric acid, half a fluid ounce; slaked lime, three-quarters of an ounce, or a sufficiency; solution of ammonia, a sufficiency; rectified spirit, sixteen fluid ounces or a sufficiency; dilute sulphuric acid, a sufficiency; water, one gallon; distilled water, a sufficiency. Add the sulphuric acid to the water; pour upon the bebeeru bark enough of this mixture to moisten it thoroughly; let it macerate for twenty-four hours; place it in a percolator, and pass through it the remainder of the acidulated water. Concentrate the acid liquor to the bulk of one pint, cool, and add gradually the lime in the form of milk of lime, agitating well, and taking care that the fluid still retains a distinct acid reaction. Let it rest for two hours; filter through calico; wash the precipitate with a little cold distilled water, and add to the filtrate solution of ammonia until the fluid has a faint ammoniacal odour. Collect the precipitate on a cloth, wash it twice with ten ounces of cold water, squeeze it gently with the hand, and dry it on the vapour bath. Pulverize the dry precipitate, put it into a flask with six ounces of the rectified spirit, boil, let it rest for a few minutes, and pour off the spirit. Treat the undissolved portion in a similar manner with fresh spirit until it is exhausted. Unite the spirituous solutions, add to them four ounces of distilled water, and distil so as to recover the greater part of the spirit. To the residue of the distillation, add by degrees, and with constant stirring, dilute sulphuric acid till the fluid has a slight acid reaction. Evaporate the whole to complete dryness on the water bath, pulverize the dry product, pour on it gradually one pint of cold distilled water, stirring diligently, filter through paper, evaporate the filtrate to the consistence of syrup, spread it in thin layers on flat porcelain or glass plates, and dry it at a heat not exceeding 140°. Preserve the product in stoppered bottles."

EXPLANATION OF PROCESS.—In this process the bark is exhausted of its alkaloid by the agency of sulphuric acid, and to the concentrated liquor milk of lime is added with the view of precipitating the colouring and other vegetable matter, taking care not to make the liquor alkaline, as in that case the alkaloid would also be precipitated. On the addition of solution of ammonia, the sulphuric acid unites with it, and beberia in an impure condition precipitates, and is dissolved out by the spirit, which is recovered by distillation, and by the second addition of sulphuric acid, sulphate of beberia is formed; after it has been evaporated to dryness and reduced to powder, advantage is taken of its solubility in water to make a solution, which when spread in thin layers on a flat dish, forms scales, having the following properties.

CHARACTERS.—In dark-brown, thin, translucent scales, yellow when in powder, 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.

TESTS.—Entirely destructible by heat. Water forms with it a clear brown solution.

According to Dr. Douglas Maclagan's analysis of the commercial salt, it is a basic sulphate, being composed of 90·83 of the base and 9·17 of sulphuric acid. It is soluble in water, but, like sulphate of quinia, requires the addition of a few drops of dilute sulphuric acid for its complete solution. Beberia is an alkaloid, and combines with acids to form salts; the sulphate only has been as yet used in medicine.

THERAPEUTICAL EFFECTS.—The introduction of this new medicine into the Materia Medica is altogether due to the researches of my friend Dr. Douglas Maclagan of Edinburgh. It is unquestionably a *tonic* of much power, and as an *antiperiodic* its effects are but little if at all inferior to those of sulphate of quinia. From a report of numerous cases in which it has been employed, and which have been published by Dr. Maclagan in the 63rd vol. of the *Edinburgh Medical and Surgical Journal*, it appears to differ from that remedy "in not being so liable to excite the circulation or affect the nervous system;" and this conclusion is fully borne out by my own experience of its effects in some cases in which I have employed it.*

DOSE AND MODE OF ADMINISTRATION.—Gr. j. to gr. v. three or four times a day, made into pill with conserve of roses, or dissolved in water by means of a few drops of dilute sulphuric acid; gr. lx. may be given as a febrifuge.

INCOMPATIBLES.—The alkalies, and their carbonates; lime water; tartaric acid; the soluble tartrates; and all vegetable tinctures, infusions, and decoctions containing tannin.

QUASSIA. *Quassia.* Picræna excelsa, *Lindl.* Plate 173, *Steph. and Church. Med. Bot. (Quassia excelsa).* (The wood; from Jamaica.) The *Quassia* or *Picræna excelsa* is a native of Jamaica; belonging to the Natural family *Simarubaceæ,* and to the Linnæan class and order *Decandria Monogynia.* The *Quassia amara* or true quassia tree yields none of the quassia at present met with in British commerce; it is a native of the continent of South America and of many of the West Indian Islands.

BOTANICAL CHARACTERS.—*Picræna excelsa* is a tall handsome tree, often attaining a height of 100 feet; leaves, pinnated; flowers, small, yellowish-green, in axillary, very compound racemes.

CHARACTERS.—Billets varying in size, seldom thicker than the thigh. Wood, dense, tough, yellowish-white, intensely and purely bitter. Also chips of the same.

PHYSICAL PROPERTIES.—Quassia wood is imported in billets from two to nine inches in diameter, covered with a brittle, reticulated, dark-brown bark. The wood is close, but light, of a pale-yellow colour, odourless, with an intensely bitter taste. The billets are cut into chips for medical use.

CHEMICAL PROPERTIES.—It is composed of lignin, gummy matter, some salts of lime, a minute trace of volatile oil, and a peculiar neutral bitter principle which has been named *quassin* or *quassite.* It yields its bitterness to boiling water and to alcohol.

ADULTERATIONS.—Quassia wood being scarce, other woods which resemble it in appearance are frequently substituted for it. They

* See *Dublin Quarterly Journal of Medical Science*, vol. xvi. p. 202.

may be at once detected by their wanting the pure bitter taste of quassia; the infusion also of most of the spurious quassias is coloured blackish by the sesqui-salts of iron, but no effect is produced on the infusion of the true wood.

THERAPEUTICAL EFFECTS.—Quassia is amongst the most powerful of the pure bitters, and consequently is essentially tonic; according to some it possesses narcotic properties also, and it undoubtedly acts as a narcotic poison on insects and some of the lower animals. In medicine it is chiefly used in dyspepsia resulting from atony of the digestive organs, and it is found particularly useful in that form which results from dissipation. The infusion forms an excellent vehicle for alkaline remedies in the acidity of the stomach of gouty and rheumatic habits, and for saline purgatives in the constipation of atonic dyspepsia. Owing to its intense bitterness, quassia is also a good anthelmintic.

DOSE AND MODE OF ADMINISTRATION.—In consequence of the difficulty of reducing it to powder, quassia is not given in substance; the dose of it would be from gr. xv. to gr. xxx.

Extractum Quassiæ. Extract of Quassia. (Take of quassia, in moderately fine powder, one pound; distilled water, a sufficiency. Macerate the quassia in eight fluid ounces of the water for twelve hours; then pack in a percolator, and add distilled water, until the quassia is exhausted. Evaporate the liquor; filter before it becomes too thick; and again evaporate by a water bath to a proper consistence.) Dose, gr. x. to gr. xxx.

Infusum Quassiæ. Infusion of Quassia. (Take of quassia, in chips, sixty grains; cold distilled water, ten fluid ounces. Infuse in a covered vessel, for half an hour, and strain.) Dose, f℥j. to f℥ij. If given in too large doses it is apt to occasion vomiting. The chalybeate preparations do not alter the colour of infusion of quassia, it may be therefore employed as a vehicle for their administration.

* SALIX.—*Willow-bark. Bark of Salix caprea.* The genus salix is placed in the Natural family *Salicaceæ*, and in the Linnæan class and order *Diœcia Diandria.* There are no less than 64 species of Salix indigenous to the British islands; any of the species which possess a bitter tasting bark may be used in medicine.

BOTANICAL CHARACTERS.—Shrubs or trees. *Barren flowers;* scales of the catkin, single flowered, imbricated, with a nectariferous gland; perianth, none; stamens, 1–5. *Fertile flowers;* scales of the catkin, single-flowered, imbricated, with a nectariferous gland; perianth, none; stigmas, 2, often cleft; capsule, 1-celled, 2-valved, many-seeded; seeds, comose. HOOKER.

PHYSICAL PROPERTIES.—Dried willow-bark is met with in partially quilled pieces of from 6 to 8 inches in length; the epidermis is smooth and of a silver-gray colour. It is odourless, but has a very bitter, somewhat astringent taste.

CHEMICAL PROPERTIES.—Willow-bark yields its properties to boiling water and to alcohol. Its constituents are tannin, resinous extractive, gummy matter, chlorophyll, yellow colouring matter, an organic salt of magnesia, and a peculiar principle named *Salicin*, on which the febrifuge and tonic properties of the bark depend. The best process for preparing *Salicin* is that of Erdmann; it is as follows:—"Take of the bark of Salix pentandra (or of any other of the species, the bark of which tastes bitter), ℔j.; macerate for 24 hours in milk of lime consisting of ℥ij. of recently burned lime in Oviij. of water; then boil for half an hour. Pour off the liquor and repeat the process twice with the residuum. Mix all the decoctions; allow the mixture to settle, and pour off the clear liquor, concentrate to Oij.; digest with ℥viij. of animal charcoal, filter and evaporate to dryness. Exhaust with spirit containing 28 per cent. of alcohol, distil off the spirit, and purify the crystals which form, by boiling with animal charcoal and recrystallizing. Thus treated, ℔j. of bark yields ℨv. of salicin." Salicin crystallizes in delicate, colourless, silky needles, which have an intensely bitter taste, but no odour; they are neutral. It is permanent in the air, is not altered at a temperature of 212°, fuses at 248°, and is decomposed at a higher temperature. It is reddened by sulphuric acid, and is soluble in eighteen parts of cold, and in one of boiling water; is very soluble in alcohol, but insoluble in ether and oil of turpentine. Its composition in the crystalline state is $C_{26}H_{18}O_{14}$ (PIRIA.) The presence of salicin in large quantity in willow-bark is indicated by sulphuric acid reddening a strong decoction.

THERAPEUTICAL EFFECTS.—Willow-bark is an excellent tonic and has been used successfully as a febrifuge. It may be employed in the same cases as cinchona bark, for which it forms an admirable indigenous substitute. Salicin resembles in its properties sulphate of quinia, over which it possesses the advantage of not being so liable to irritate the stomach. I have used it very extensively as a tonic in the debility following acute diseases, particularly in cases accompanied by irritability of the digestive organs, and consider its powers to be fully equal to those of sulphate of quinia.

DOSE AND MODE OF ADMINISTRATION.—Of the powdered bark, gr. xxx. to gr. lx.

**Salicin*. Dose, as a tonic, gr. ij. three or four times a day; as a febrifuge, gr. xx. to gr. xl. in divided doses during the intermission. It may be given in powder combined with sugar or some aromatic powder; or dissolved in water sweetened with some agreeable syrup, as syrup of orange-peel or syrup of *Hemidesmus indicus*.

INCOMPATIBLES.—Ammonia and its carbonates; lime water; carbonate of potash; the sesqui-salts of iron; acetate of lead; corrosive sublimate; and sulphate of zinc.

* SIMARUBA AMARA, RADICIS CORTEX.—*Simaruba. Bark of*

the root. This tree is a native of Jamaica and Guiana, and belongs to the Natural family *Simarubaceæ*, and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A tall tree, with long creeping roots; leaves, alternate, pinnate; flowers, small, whitish, diœcious, in panicles; fruit, 5, ovate, smooth, black capsules, placed on a fleshy disk.

PHYSICAL PROPERTIES.—The bark of the root is alone made use of; it is imported from Jamaica, and is in long pieces folded flat, covered with a reddish-yellow epidermis, wrinkled and warty: the inner surface of the bark is yellowish-brown. It has a bitter, persistent taste, but no odour.

CHEMICAL PROPERTIES.—Simaruba bark contains a trace of volatile oil, resinous matter, *ulmin* (a bitter principle analogous to *quassin*), lignin, and some salts. It yields its properties readily to water and to alcohol.

THERAPEUTICAL EFFECTS.—Simaruba is a bitter tonic, not much prescribed in the present day, and has been therefore omitted from the Pharmacopœia: in large doses it produces vomiting and purging. It has been highly praised for its remedial powers in chronic diarrhœa and dysentery, by many practitioners both on the continent and in this country. As a bitter tonic it is, however, much inferior to many remedies of this class.

DOSE AND MODE OF ADMINISTRATION.—It is not given in powder; the following is the only preparation used.

* *Infusum Simarubæ.* (Take of Simaruba root-bark, bruised, gr. cxxx.; boiling water, f℥ix.: infuse for one hour, in a covered vessel, and strain. The product should measure about eight ounces.) Dose, f℥j. to f℥ij.

INCOMPATIBLES.—Lime water; alkaline carbonates; the salts of lead, mercury, and silver; and astringent vegetable infusions or decoctions.

SODÆ ARSENIAS. *Arseniate of Soda.* $2NaO,HO,AsO_5+14HO$ (=312).

PREPARATION.—"Take of arsenious acid, ten ounces; nitrate of soda, eight ounces and a half; dried carbonate of soda, five ounces and a half; boiling distilled water, thirty-five fluid ounces. Reduce the dry ingredients separately to fine powder, and mix them thoroughly in a porcelain mortar. Put the mixture into a large clay crucible, and cover it with the lid. Expose to a full red heat, till all effervescence has ceased, and complete fusion has taken place. Pour out the fused salt on a clean flagstone, and as soon as it has solidified, and while it is still warm, put it into the boiling water, stirring diligently. When the salt has dissolved, filter the solution through paper and set it aside to crystallize. Drain the crystals, and, having dried them rapidly on filtering paper, enclose them in stoppered bottles."

EXPLANATION OF PROCESS.—The first step in this process is to convert the arsenious into arsenic acid. This latter is a tribasic acid, but, like phosphoric acid, water can discharge the duties of a base. When treated as described in the process, with nitrate of soda, the nitric acid of this latter salt parts with some of its oxygen to convert the arsenious into arsenic acid; to explain the reaction we will require three atoms of arsenious acid, two of nitrate of soda, four of carbonate of soda, and forty-five of water: the three arsenious acids reacting upon the two nitric acids of the soda, form three equivalents of arsenic acid and two of nitric oxide gas, thus, $3AsO_3+2NO_5=3AsO_5+2NO_2$. The two sodas, with the four sodas of the carbonate of soda and the forty-five equivalents of water, form three atoms of the arseniate of soda, whilst the four carbonic acids escape, giving rise, with the nitric oxide gas, to the effervescence alluded to, thus, $3AsO_3+2NaONO_5+4NaOCO_2+45HO=3(2NaO,HO,AsO_5+14HO)+4CO_2+2NO_2$. The rest of the process requires no explanation.

PHYSICAL PROPERTIES.—This salt crystallizes in beautiful regular hexahedral prisms, transparent and colourless; odourless, with a strongly acrid taste.

CHARACTERS.—In colourless transparent prisms, soluble in water; the solution alkaline, giving white precipitates with chloride of barium, chloride of calcium, and sulphate of zinc, and a brick-red precipitate with nitrate of silver, all of which are soluble in nitric acid.

CHEMICAL PROPERTIES.—As stated in the characters, it yields white precipitates with chloride of barium, chloride of calcium, and sulphate of lime, and a brick-red one with nitrate of silver; arseniates of the respective bases.

TESTS.—Heated to 300° it loses 40·38 per cent. of its weight. A watery solution of ten grains of the residue, treated with 5·3 measures of the volumetric solution of soda, continues to give a precipitate with the volumetric solution of nitrate of silver until 161·3 measures of the latter have been added.

ADULTERATIONS.—So far as my experience goes, this salt is not sophisticated. The loss stated in the *tests* to occur on heating to 300° is due to the escape of its water of crystallization, and is in strict accordance with its chemical equivalent. To understand the volumetric test, it must be remembered that arsenic acid is tribasic, and that consequently the precipitate it forms with silver has this composition $3AgO,AsO_5$. The atomic weight of arseniate of silver, deprived of its water of crystallization, as occurs on heating it to 300°, is 186. Now each equivalent of arseniate of soda will require three equivalents of nitrate of silver ($AgONO_5=170$) to furnish three oxides of silver to form the arseniate of silver; so that each 186 grains of arseniate of soda will require 510 grains of nitrate of silver to form the salt; but if 186 grains require 510 grains, 10 grains will require 27·42 grains. The volumetric solution of nitrate of silver is so constructed that each 100 measures of it will contain $\frac{1}{10}$ of an equivalent of nitrate of silver, *i. e.* 17 grains; but if 17 grains are furnished by 100 measures, to obtain 27·42 grains we will require 161·3 measures, the quantity indicated in the tests; did it cease to precipitate before the entire of that number of measures was consumed, it would give conclusive evidence that the proper amount of arsenic acid was not present; hence it is that by the volumetric test is ascertained the absolute purity of the salt. The ten grains of arseniate of soda operated upon represent 6·18, equivalent to 61·8 per cent. of arsenic acid.

THERAPEUTICAL PROPERTIES.—This preparation, though perhaps the most generally used salt of arsenic on the continent, has not been much employed in this country. My experience leads me to place much reliance on it, especially in cases in which the arsenite of potash disagrees with the stomach; it is used in the same diseases as that preparation (see page 597).

DOSE AND MODE OF ADMINISTRATION.—It may be given in pill in doses of from 1-12th to 1-8th of a grain; but it is more safely administered in solution; one of the following strength under the name of *Pearson's Solution* is in very general use in France:—Arseniate of soda, in crystals, gr. j.; distilled water, f℥x.; dissolve. Dose, min. xx. very gradually increased to f℥ij. three times daily. It must be borne in mind that arsenic acid is as deadly a poison, if not more so, as arsenious acid. Paper impregnated with a solution of arseniate of soda sweetened with sugar is commonly sold as a poison for flies, under the name *papier Moure.*

Liquor Sodæ Arseniatis. Solution of Arseniate of Soda. (Take of arseniate of soda (rendered anhydrous by a heat not exceeding 300°), four grains; distilled water, one fluid ounce. Dissolve.) Dose, min. iij. to min. x. Each fluid drachm contains half a grain of anhydrous salt.

TARAXACUM. *Dandelion Root.* Taraxacum Dens Leonis *DC.* Plate 3, *Woodv. Med. Bot.* (The fresh roots; gathered between September and February, from meadows and pastures in Britain.) Indigenous; belonging to the Natural family *Compositæ (Asteraceæ,* Lindley), and to the Linnæan class and order *Syngenesia Æqualis.*

BOTANICAL CHARACTERS.—Root, perennial, spindled-shaped; leaves, all radical, runcinate, glabrous, toothed; scape, with a single, large, yellow flower.

CHARACTERS.—Tap-shaped roots, smooth and dark-brown externally, white within, easily broken, and giving out an inodorous bitter milky juice, which becomes pale-brown by exposure.

PHYSICAL PROPERTIES.—The whole of the dandelion plant abounds in a milky juice, which is most abundant in the months of August and September, at which season it should be gathered for medical use. The juice has a bitter taste but no odour.

CHEMICAL PROPERTIES.—Dandelion juice contains mannite, resin, sugar, gum, caoutchouc, various salts, and a peculiar bitter extractive, which has been obtained by M. Polex in a crystalline state and named by him *Taraxacine;* the latter is probably the active principle of the plant. Dandelion root and herb yield their properties to boiling water.

TEST.—Not wrinkled or pale-coloured externally; juice not watery; any adherent leaves runcinate and quite smooth.

ADULTERATIONS.—Herb collectors often substitute various other roots for dandelion; the best way for the druggist to prevent the substitution is to require that some of the leaves be attached to the roots, as they are highly characteristic.

THERAPEUTICAL EFFECTS.—Dandelion is a useful tonic in chronic diseases of the liver, and in other affections accompanied by derangement of the biliary organs, as in some forms of dyspepsia and of cutaneous disease. It is also held by many to be diuretic and aperient, but these effects are not produced unless it be given in very large doses.

DOSE AND MODE OF ADMINISTRATION.—Only as follows:—

Extractum Taraxaci. Extract of Taraxacum. (Take of fresh dandelion root, four pounds. Crush the root; press out the juice, and allow it to deposit; heat the clear liquor to 212°, and maintain the temperature for ten minutes; then strain, and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence.) Dose, gr. x. to gr. xxx.

Decoctum Taraxaci. Decoction of Taraxacum. (Take of dried dandelion root, sliced and bruised, one ounce; distilled water, one pint and a half. Boil for ten minutes and strain. The product should measure one pint.) Dose, f℥j. to f℥iv.

Succus Taraxaci. Juice of Taraxacum. (Take of dandelion root, seven pounds; rectified spirit, a sufficiency. Bruise the dandelion root in a stone mortar; press out the juice; and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place.) When properly prepared this liquid resembles sherry in colour; although not so directed in the Pharmacopœia, it should be prepared from the *fresh* root; it is the best preparation of dandelion. The dose of it is from min x. to f℥ij.

INCOMPATIBLES.—Acetate of lead; the sesqui-salts of iron; corrosive sublimate; nitrate of silver; and infusion of galls.

ULMUS. *Elm Bark.* Ulmus campestris, *Linn.* Broad-leaved Elm. Plate 197, *Woodv. Med. Bot.* (The dried inner bark, deprived of its outer layers; from trees indigenous to and cultivated in Britain.) Indigenous; belonging to the Natural family *Cupuliferæ (Ulmaceæ*, Lindley,) and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—A large tree, with rugged bark; leaves rhomboid-ovate, acuminate, wedged-shaped, and oblique at the base; flowers, in dense heads, each subtended by a small scale.

CHARACTERS.—A tough brownish-yellow bark, about half a line thick, without smell; taste mucilaginous, slightly bitter, and astringent. Its decoction is turned green by perchloride of iron, and precipitates with a solution of gelatine.

PROPERTIES.—The inner bark alone of the elm should be used in medicine; it is of a whitish colour, inodorous, with a bitter, somewhat astringent taste. It contains resin, gum, tannin, mucous-extractive, and some salts. Its active principles are extracted by boiling water.

THERAPEUTICAL EFFECTS.—Elm bark, though at present but little employed in medicine, is a most useful tonic; the decoction and syrup if taken in large quantity determine to the skin, and consequently are of much service in the treatment of cutaneous affections, especially when occurring in debilitated habits; in such cases I am in the habit of employing them very extensively and with much benefit.

DOSE AND MODE OF ADMINISTRATION.—Used only in the form of decoction and syrup.

**Decoctum Ulmi.* (Elm bark, bruised, ℥iiss.; distilled water, Oij.; boil down to Oj., and strain.) Dose, f℥iv. to f℥vj. three or four times a day. The fresh inner bark should be always used in preparing this decoction. In the large edition of the Pharmacopœia this is stated in the list of the Materia Medica to be one of the preparations of the bark, although in the body of the work no formulary is given for its preparation; this, however, will be found a suitable form for its exhibition.

**Syrupus Ulmi.* (Fresh elm bark, ℥iv.; water, Oij.; boil down to Oiss, strain, and with the aid of steam or water-heat, dissolve in it ℔iv. of sugar.) Dose, f℥ij. to f℥ss. An excellent addition to mixtures in the treatment of diseases of the skin.

INCOMPATIBLES.—Sulphate of iron; acetate of lead; nitrate of silver; and gelatine.

ZINCI OXYDUM.—*Oxide of zinc* (described in the division *Astringents)* is employed internally as a tonic in some forms of convulsive and spasmodic diseases, particularly epilepsy, in which it proves in many instances highly beneficial, but its use must be persevered in for a considerable period. It may be given in powder or in pill, in doses of gr. j. to gr. ij. gradually increased to gr. x. twice daily. M. Herpin, in his essay on epilepsy, lauds in the highest terms the efficacy of the oxide of zinc in the treatment of this disease: out of forty-two cases in which he administered it, twenty-eight, he states, were cured. He commenced it with adults in doses of from six to eight grains daily, given in divided quantities one hour after each meal; the dose was augmented every week by two grains daily, until forty-five grains were taken during the day, and it was then continued in this quantity for three months. I do not, however, think there is any advantage to be derived from giving oxide of zinc in such enormous quantities, as in my own practice I have found it more successful than any other remedy in the treatment of epilepsy when administered in the doses first stated above, provided only its use be long enough continued.

ZINCI SULPHAS.—*Sulphate of zinc* (described in the division *Astringents*) has been also administered as a tonic in spasmodic diseases, and in such cases its exhibition has been attended with decided benefit. I have found it of signal service in some cases of nervous palsy in which I employed it; and of all the tonics which I have ever used, I have found it the most valuable in cases of nervous exhaustion attendant upon sexual excesses. In the so-called cases of *spermatorrhœa* its use has been attended in my hands with the happiest results.

CHAPTER XXI.

SUPPLEMENTARY AGENTS.

In this chapter are described those different articles which though rarely, if ever, employed in medicine for their strictly so-called remedial powers, still are made use of as *adjuvants*, *colouring agents*, *perfumes*, *tests*, and *pharmaceutical agents*.

Acetate of Soda. (Described, page 267.)

Alcohol. (Described, page 454.)

Aqua. *Water.* Natural water, HO(=9), the purest that can be obtained, cleared if necessary, by filtration.

TESTS.—Free from odour, taste, and visible impurity.

In nature we find many varieties of fresh water, such as rain, spring, river, lake, and pump waters. The purest variety of all these is rain water collected at a distance from inhabited places in clean vessels. Water when absolutely pure is composed of one atom of hydrogen and one of oxygen. At 212° F. it boils, and above 32° F. *ice melts.* This point on the thermometric scale is that at which, in general language, water is said to freeze, but it can be reduced, with certain precautions, many degrees below that and still maintain the condition of fluidity. The impurities found in water may be divided into two classes, viz., those derivable from the organic and the inorganic kingdom. The impurities furnished by the organic kingdom are varied indeed in their qualities, being of a mixed vegetable and animal character, and it is to their presence to any extent is due the disagreeable odours emitted by some waters on keeping. The inorganic impurities are of a saline nature, the most important of which are the salts of the alkaline earths. Fresh waters have been divided into hard and soft; hard waters owing their properties to the presence in them of salts of the alkaline earths, such as sulphate or carbonate of lime held in solution by an excess of carbonic acid, the amount of course varying with the degree of hardness of the water. It may be accepted as a general rule, that independent of their effects upon the general health, hard waters are objectionable in an economical point of view, inasmuch as they possess inferior solvent action over vegetable matters, and are consequently not so well suited for making infusions, extracts, &c., as waters of a soft character, a fact well recognized by the thrifty housekeeper. The amount of hardness in a water is ascertained by what is termed the *soap test;* every one knows the difficulty experienced in washing the hands with a hard water, how impossible it is to get up what is familiarly known as a *lather;* this is accounted for by the earthy bases in the hard water usurping the place of the alkaline bases in the soap, and so forming a kind of soap, to be sure, but one insoluble in water. Upon this is founded the soap test; a hard water is prepared of known strength by dissolving in hydrochloric acid 16 grains of pure carbonate of lime, evaporating to dryness, and dissolving the resulting chloride of calcium in a gallon of distilled water; a solution of soap in proof spirit is next prepared of such a strength as that a quantity of it which will fill 32 measures of a volumetric tube, each measure of which contains ten grains, will be able exactly to convert 1000 grains' measure of the standard solution of hard water into the earthy soap described. This point is thus ascertained; the hard water is introduced into a bottle, and the soap solution added to it by degrees, the bottle being shaken after each addition, when a bubble will form, which rapidly disappears so long as the lime is present, but when at last it is all used up the viscid bubble remains. If now a given sample of water be examined, and this point is reached at the expense of the entire 32 measures, it is a water of 16 degrees of hardness. Now, perfectly soft water will consume two measures of the soap solution before permanent bubbles are formed, so that a water of 16 degrees of hardness in reality only has consumed 30 measures of the soap solution; consequently each degree of hardness in a water corresponds to 16 divided by 30 of the soap test, but $\frac{16}{30}=0{\cdot}53$, hence if any given measures of the soap test be used in estimating the hardness of a water, we must first subtract 2 from the amount and then multiply by 0·53, and the result will give us its degree of hardness. For instance, let a given sample require 29 measures of the soap test, from this we must first deduct 2, and we will find its degree of hardness to be 14·31, for $(29-2)+0{\cdot}53 = 14{\cdot}31$.

Independent of its pharmaceutical uses, water, though scarcely to be called a medicine, is frequently pressed into the service of both the physician and surgeon. We use it in its liquid state; in its gaseous form, as in steam; and in its solid condition, as ice. No drink is more acceptable to the patient, parched with the thirst of fever, than cold water; none more useful; and yet, under mistaken notions of its noxious qualities in these conditions of the system, none more frequently nor more cruelly denied. In cynanche, in hemorrhoids, &c. steaming the part with vapour of warm water is frequently attended with the happiest results; and no remedy in the Pharmacopœia is more potent in controlling vomiting, or more useful in gastritis, than small lumps of *ice* allowed to dissolve slowly in the mouth: independent of which, externally applied, ice is found to produce marked anæsthetic effects, if kept sufficiently long applied to the parts about to be operated upon; and is of vast antiphlogistic value when applied to parts in a state of congestion: the ice cap in fever is of too acknowledged repute to require comment here; it can be readily applied by pounding the ice, putting it loosely into a pig's bladder, fastening the orifice with a string, and placing it under the patient's head.

The external uses of water are too numerous to be more than alluded to here; to Macartney we are indebted for the treatment of ulcers by pledgets of lint steeped in water, the too rapid evaporation of which can be prevented by covering the lint with oiled silk. The cold water dressing of fresh wounds must be by this time too generally known to require more particular notice here. I shall content myself with remarking that rarely indeed do we see the dirty sticking plaster employed, its place being all but exclusively occupied, at least in my practice, with slips of lint steeped in water. The value of wet bandaging in many injuries, such as sprains of the extremities, can not be overrated. The common roller, well wet, is applied as in the ordinary manner; the only difficulty is, to keep it constantly wet; this can be done by filling a common pickle bottle with water, fastening it to the bed-post, on a plane higher than the limb, and putting into it a coil of pretty thick chandler's wick, and applying two or three turns of this round the affected part; by capillary attraction a constant supply of water is kept up, and the bandage remains wet.

Baths have become so all important an element in the treatment of injuries that a few words must be said about them here. We have the cold, tepid, warm, and hot bath, all capable of being variously applied, either in the form of sponge, sitz, shower, foot, hip, or reclining bath (I advisedly omit here for the present mention of the plunge bath). The temperature of the two first of these must always vary, in accordance with the period of the year and the temperature of the climate. A bath which would be cold in summer, being evidently capable of being looked upon as tepid in winter, and vice versâ as a general rule. Water at the temperature of the day upon which it is used may be looked upon as a cold bath; a temperature some few degrees above that may be looked upon as that of a tepid bath: the temperature of a warm bath varies from 90° F. to 98° F., whilst that of a hot bath ranges from 100° F. to 112° F. The difference in the effects produced by these baths on the system is marked indeed. When properly used, the first three may be looked upon as tonic, and may be used as auxiliary to the more active remedies of this class. The hot bath is decidedly relaxing and depressing, and is used wherever we would wish to produce a powerful impression on the system, as in severe luxations, strangulated hernias, &c. In placing a patient in this bath, it must be borne in mind that the temperature at first should not exceed 98°, subsequently to be raised to the desired point.

The length of time also which a patient should remain in such a bath is of some importance, fifteen to twenty minutes for the warm, ten to fifteen for the hot bath, in the case of adults, being generally considered quite sufficient. In the case of infants the *hot* bath is inadmissible, and they should only remain in the warm bath for about five minutes. The temperature of this latter is best estimated by that of the nurse's hand; what *feels* pleasantly warm being about the right temperature. The various forms in which baths may be applied are sufficiently characterized by their names, merely particularizing the *Russian bath,* which may be thus imitated. Two large basins are to be provided, one filled with cold, the other with hot water (98° F.); in each basin a large sponge is to be placed. The patient is to be seated in a large slipper bath, and each sponge applied to the nape of the neck is alternately to be squeezed out along the course of the spine; thus a succession of shocks is produced, and highly tonic effects are the result. In many cases of hysteria, of spinal debility, of amenorrhœa, of uterine weaknesses, &c., this form of bath is found highly beneficial.

To avail ourselves of the plunge bath, we have recourse either to lake or river waters, or the open sea. In cases suited for the plunge bath its action is eminently tonic; the first effect of the immersion being to drive the blood from the surface back upon the internal organs; from whence, if the immersion be not too long continued, it returns with increased vigour to the surface, producing that glow so familiar to all who have enjoyed it. The plunge bath is not suited for every constitution; for instance, it is unsuited for very stout persons, or those suffering from cardiac disease, or a tendency of blood to the head or lungs. In some persons also, the shock proves greater than the reaction, and they emerge, cold, with blue lips, blanched surface, and shrivelled fingers. Consequently it must be perceived that the too general idea that sea bathing must be eminently safe and wholesome is founded on error, and that before adopting a remedy so potent for good or evil, medical advice on the point should be sought. In all cases the plunge bath should only be entered when the circulation is in a state of moderate activity, as after a few minutes' brisk walk; and on emerging from it the surface should be thoroughly dried, and well rubbed with a rather coarse towel. In no case should we have recourse to a plunge bath when the stomach is full, as after meals; nor yet should we enter it when exhausted by too long fasting.

For all these uses any form of water may be employed, but in chemistry and pharmacy it becomes necessary to free the so-called natural waters from their several impurities. This can only be done by distillation, and the following is the pharmacopœial process.

Aqua Destillata. Distilled Water. (Take of water, free from taste and odour, ten gallons. Distil from a copper still, connected with a block-tin worm; reject the first half gallon, and preserve the next eight gallons.)

TESTS.—A fluid ounce of it evaporated in a clean glass capsule leaves no visible residue. It is not affected by sulphuretted hydrogen, oxalate of ammonia, nitrate of silver, chloride of barium, or solution of lime.

In this process the first portion is rejected, by which all volatile impurities, such as oxygen, carbonic acid, &c., are gotten rid of. If it were affected by sulphuretted hydrogen, it would indicate the presence of metallic impurities, notably that of lead (see page 110); if with oxalate of ammonia, the presence of calcareous salts; if with nitrate of silver, of chlorides; if with chloride of barium, of sulphates; if with lime, carbonic acid would be indicated. The purest variety of distilled water, on keeping, will not stand this last test, as it slowly abstracts carbonic acid from the air, from which, however, it may be purified by simply boiling it.

ARSENIOUS ACID OF COMMERCE. *White Arsenic.* (Aready de scribed, page 209.)

BICHROMATE OF POTASH. $KO,2CrO_3$. (Already described, page 218.)

BISMUTH.

BLACK OXIDE OF MANGANESE. *Binoxide of Manganese.* MnO_2 ($=43\cdot5$). Found native in some parts of England and Scotland; it is known to mineralogists under the name of *Pyrolusite*.

It is only used as a pharmaceutical agent, at least in this country, being employed in the preparation of oxygen, chlorine, and iodine.

TESTS.—Gives off oxygen when heated to redness, and is almost entirely soluble in hydrochloric acid with the evolution of chlorine.

BONE ASH. (The residue of Ox and Sheep bones, which have been burned white in contact with air, reduced to powder; consisting principally of phosphate of lime and a little carbonate of lime.)

BONE BLACK. *Animal Charcoal. Ivory Black.* (The residue of Ox and Sheep bones, which have been exposed to a red heat without the access of air, reduced to powder.)

BORACIC ACID. $BO_3+3HO(=62)$.

TESTS.—Soluble in alcohol. The solution burns with a green flame.

Used as a test for rhubarb.

BREAD. Bread made with wheaten flour.

BROMINE. (Already described, page 528.)

CALX. *Lime.* $CaO(=28)$. *Quicklime*, as it is generally termed, is prepared by exposing the common limestone to a high heat in a lime-kiln, by which its carbonic acid is driven off, and the lime left behind. Its properties have been already described (see p. 8).

CHARACTERS.—In light lumps, externally of a dirty white colour, white within. When two-thirds of its weight of water are poured upon it, it slakes rapidly, with the development of much heat, and is converted into a snow-white and very bulky powder. This, when agitated with distilled water, gives after filtration a clear solution, which has an alkaline reaction, and yields a white precipitate with oxalate of ammonia.

TESTS.—If previously slaked it dissolves without effervescence in dilute hydrochloric acid, 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.

PREPARATIONS.—Hydras, linimentum, liquor, liquor saccharatus.

CALCIS HYDRAS. *Slaked Lime.* (Take of lime, recently burned, two pounds; distilled water, one pint. Place the lime in a metal pot, pour the water upon it, and when vapour ceases to be disengaged cover the pot with its lid, and set it aside to cool. When its temperature has fallen to that of the atmosphere, remove its contents, pass the powder through an iron-wire sieve, and put it into a wide-mouthed bottle, which should be accurately closed by a well-fitted cork. Slaked lime should be recently prepared.) In this process the lime enters into a definite combination with the water, and in consequence of this chemical union, a marked degree of heat is evolved, sufficient to considerably raise the temperature of the water, and drive off a portion of it in the form of steam—the vapour alluded to in the process.

CALCIS PHOSPHAS PRÆCIPITATA. *Precipitated Phosphate of Lime.* $3CaO,PO_5(=155)$.

PREPARATION.—"Take of bone ash, four ounces; hydrochloric acid, six fluid ounces; distilled water, two pints; solution of ammonia, twelve fluid ounces, or a sufficiency. Digest the bone ash in the hydrochloric acid, diluted with a pint of water, until it is dissolved. Filter the solution, if necessary; add the remainder of the water, and afterwards the solution of ammonia, until the mixture acquires an alkaline reaction; and, having collected the precipitate on a calico filter, wash it with boiling distilled water as long as the liquid which passes through occasions a precipitate when dropped into the solution of nitrate of silver acidulated with nitric acid. Dry the washed product at a temperature not exceeding 212°."

EXPLANATION OF PROCESS.—It will be convenient to divide the consideration of this process into two stages, in the first of which the insoluble phosphate of lime ($3CaO,PO_5$), existing in bone ash, is converted by the muriatic acid into soluble phosphate of lime ($2HO,CaO,PO_5$) and chloride of calcium. This is effected by two atoms of acid being resolved into their elements, the two chlorines uniting with two of the calciums in the insoluble phosphate to form two chlorides of calcium, whilst the two hydrogens unite with the two oxygens to form two atoms of water, which, taking the place of two of the equivalents of lime in the salt, form one equivalent of the soluble phosphate of lime, thus, $(3CaO,PO_5) + 2HCl = 2CaCl + (2HO,CaO,PO_5)$. In the second stage of this process, on the addition of the solution of ammonia, the two chlorides of calcium are decomposed, the two chlorines uniting with the two ammoniums to form two equivalents of sal ammoniac, which remain in solution, whilst the two oxygens of the ammonia unite with the two calciums to form two atoms of lime, which, displacing the two equivalents of water in the soluble phosphate, reconvert it into the insoluble phosphate, which is of course precipitated, thus, $(2HO,CaO,PO_5) + 2CaCl + 2NH_4O = 2NH_4Cl + (3CaO,PO_5) + 2HO$.

CHARACTERS.—A light, white, amorphous 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 both of a little oxalate of ammonia, and of perchloride of iron.

TESTS.—Ten grains dissolve perfectly and without effervescence in dilute hydrochloric acid. The solution yields with ammonia a white precipitate, which is insoluble in boiling solution of potash, and when washed and dried weighs ten grains.

It was formerly employed in medicine in the treatment of rickets and of mollities ossium, on the theoretical idea of supplying bone earth to the system; but the fallacy of this doctrine is universally admitted now-a-days, and at present it is only used in pharmacy, being introduced into the Pharmacopœia for the purpose of preparing the *pulvis antimonialis*.

CARBO ANIMALIS PURIFICATUS. *Purified Animal Charcoal.* (Bone black deprived of its earthy salts) Animal charcoal is usually prepared by calcining the bones of animals in close vessels; thus obtained, it contains phosphate and carbonate of lime, which would unfit it for the purposes to which it is applied in pharmacy, namely, that of acting as a decolorizing agent in the preparation of the vegetable alkaloids; a process is consequently given in the Pharmacopœia for purifying the commercial article.

PREPARATION.—"Take of bone black, sixteen ounces; hydrochloric acid, ten fluid ounces; distilled water, a sufficiency. Mix the hydrochloric acid with a pint of the water, and add the bone black, stirring occasionally. Digest at a moderate heat for two days, agitating from time to time; collect the undissolved charcoal on a calico filter, and wash with distilled water till what passes through gives scarcely any precipitate with nitrate of silver. Dry the charcoal, and then heat it to redness in a covered crucible."

EXPLANATION OF PROCESS.—The salts contained in the bone-black are dissolved out by the acid and pure charcoal remains.

CHARACTERS.—A black pulverulent substance. If it is perfectly dry, the tincture of litmus diluted with twenty times its bulk of water, agitated with it and thrown upon a filter, passes through colourless.

TEST.—When burned at a high temperature with free access of air, it leaves scarcely any residue.

After animal charcoal has been employed as a decolorizing agent, it loses its powers as such; which, however, may be again restored to it by drying and heating to redness.

CARBO LIGNI. *Wood Charcoal.* (Wood charred by exposure to a red heat without access of air.)

CHARACTERS.—In black, brittle, porous masses, without taste or smell, very light, and retaining the shape and texture of the wood from which it was obtained; insoluble in water, and in close vessels neither melted nor volatilized by the most intense heat.

TEST.—When burned at a high temperature with a free access of air, it leaves not more than two per cent. of ash.

Wood-charcoal is obtained by burning billets of wood, the access of air being prevented. It is an article of the Materia Medica in the Pharmacopœia, being prepared on the large scale for various uses in the arts, particularly for the manufacture of gunpowder. In medicine it is at present rarely used except to destroy fetor; for which purpose it is applied in the form of powder or poultice to gangrenous sores, phagedenic ulcers, &c.; it is also used as a dentifrice, for which it is very generally employed, as by its mechanical action it removes encrustations from the teeth, and by its antiseptic powers corrects fetor of the breath. Charcoal has been administered in the treatment of various diseases, but the only one, until lately, in which it was employed in this country was dysentery, and in it merely to correct the fetor of the evacuations, for which purpose it is given in doses of gr. xx. frequently repeated. More recently it has been used in Paris and elsewhere in large doses, four or five teaspoonfuls before and after meals, in the treatment of painful affections of the digestive organs accompanied with the evolution of much flatus; its effects occasionally are most beneficial: for this purpose it is directed to be prepared from the wood of the poplar and to be very finely powdered. *Belloc's Charcoal* is a favorite form for its exhibition. Charcoal lozenges also are much used, but they scarcely contain a sufficiency of charcoal to produce a decided effect.

Cataplasma Carbonis. Charcoal Poultice. (Take of wood charcoal, in powder, half an ounce; bread, two ounces; linseed meal, one ounce and a half; boiling water, ten fluid ounces. Macerate the bread in the water for a short time near the fire, then mix, and add the linseed meal gradually, stirring the ingredients, that a soft poultice may be formed. Mix with this half the charcoal, and sprinkle the remainder on the surface of the poultice.) Used for the purposes stated above.

CARBONATE OF BARYTA. This substance is found native in many parts of England, and is known to mineralogists by the name of *Witherite.* It is employed for the preparation of chloride of barium. It acts as a narcotico-acrid poison on animals and on man.

CHALK. (Soft, white, amorphous, native Carbonate of Lime.)

CHLORIDE of BARIUM. (Described, p. 600.)

CHLORIDE OF CALCIUM. (Chloride of Calcium dried at a dull red heat, CaCl (=55·5). It should be kept in a well-closed bottle.

TESTS.—Dry, but very deliquescent, and entirely soluble in twice its weight of water. The solution is not precipitated by lime.

COCCUS. *Cochineal.* Coccus Cacti, *Linn.* (The female insect, dried; reared in Mexico and Teneriffe.) A native of Mexico; belonging to the natural class *Insecta,* order *Hemiptera.* The cochineal insect and the plant on which it feeds have been recently introduced into Algeria; and France is now to a great extent supplied with cochineal from that colony.

The cochineal insect feeds chiefly on the Nopal plant (*Opuntia cochinilliferæ),* large plantations of which are cultivated for its nourishment in Mexico. The insects are collected three times a year, killed by immersion in boiling water, and dried with stove-heat; the first gathering is the best, consisting entirely of impregnated females, when they are of the largest size, and afford more colouring matter. As met with in commerce, cochineal is in the form of small roundish grains (each grain being a separate insect); they are wrinkled, from one to two lines long, and of a silvery purplish colour. They are inodorous, but have a rather bitter taste. Cochineal consists of some peculiar fatty substance, and a brilliant purplish-red colouring matter which has been named *cochinillin;* and which is a principal constituent in the pigment technically known as *carmine.*

Cochineal was at one time supposed to possess anodyne properties, and was employed in medicine in the treatment of hooping-cough and neuralgia: as a remedy for the former disease, its use has been again resorted to latterly in many parts of the continent, particularly in Germany. The tincture has been introduced into the Pharmacopœia.

CHARACTERS.— Ovate, plano-convex, about two lines long, wrinkled, black or greyish-white; yields, when crushed, a puce-coloured powder. The greyish-white insect quickly becomes black when warmed before the fire.

Tinctura Cocci. Tincture of Cochineal. (Take of cochineal, in powder, two ounces and a half; proof spirit, one pint. Macerate for seven days, strain, express, filter, and add sufficient proof spirit to make one pint.) Dose, ʒss. to ʒij.

COPPER FOIL. (Pure Metallic Copper, thin and bright.) Used as a test for arsenic (see p. 211).

COTTON. Cotton Wool. (The Hairs of the seed of various species of Gossypium, *Linn.* carded.) (Described p. 305.)

ETHER, PURE. (Described p. 453.)

FERRIDCYANIDE OF POTASSIUM. (*Red Prussiate of Potash.* K_3, Fe_2Cy_6.) (Cyanogen, $Cy{=}C_2N$.)

TEST.—Its solution in water gives no precipitate with persulphate of iron.

FERROCYANIDE OF POTASSIUM. *Yellow Prussiate of Potash.* $K_2,FeCy_3+3HO$. (Cyanogen, $Cy{=}C_2N$.) This salt has been used by some physicians in America as a sedative, but the results obtained have been very uncertain, and it would appear to be rather an inert substance. It has been introduced into the Pharmacopœia as being a cheap material for preparing hydrocyanic acid (see page 404).

FLOUR. *Wheat Flour.* (The grains of Wheat, Triticum Vulgare, *Villars*, ground and sifted.)

FOUSEL OIL. *Amylic Alcohol.* (Hydrate of Oxide of Amyl, $C_{10}H_{11}O,HO$.) This oily fluid has been referred to at page 61; it has been introduced into the Pharmacopœia, as valerianic acid is directed to be prepared from it.

PREPARATION.—Take of the light liquid, which may be obtained at any large distillery by continuing the distillation for some after the pure spirit has been all drawn off, any convenient quantity. Introduce it into a small still or retort connected with a condenser, and apply heat, so as to cause distillation. As soon as the oil begins to come over unmixed with water, the receiver should be changed, and the distillation being resumed and carried nearly to dryness, the desired product will be obtained.

The liquid drawn over during the first part of the distillation will consist of an aqueous fluid, surmounted by a stratum of fousel oil. This latter, though impregnated with a minute quantity of water, should be separated and preserved, as being sufficiently pure for use.

TESTS.—Specific gravity 0·818; boiling point 270°.

GOLD, FINE. (Gold, free from metallic impurities.) (Described p. 526.)

HIRUDO. *The Leech.* (1. Sanguisuga officinalis, *Savigny*, the speckled leech; and 2. S. medicinalis *Sav.*, the green leech, imported chiefly from Hamburg.)

CHARACTERS.—Body elongated, two or three inches long, tapering to each end, plano-convex, wrinkled transversely; back olive-green with six rusty-red longitudinal stripes. 1. Belly greenish-yellow, spotted with black; 2. Belly olive-green, not spotted.

Leeches are favourite means for the local abstraction of blood. They are applied to almost every available portion of the body. Formerly their application to mucous surfaces was looked upon as inadmissible, but Crampton in the year 1822 (*Dublin Hospital Reports*, vol. iii, p. 223) first pointed out their great value in the treatment of ophthalmic inflammations when applied directly to the conjunctiva, and since then they have been employed on every available portion of the body, as already stated, except the cornea. Some little dexterity is required in their application, and to be successful we must treat them with the greatest gentleness, and allow nothing dirty or greasy to approach them. The part to which they are to be applied should first be carefully washed with soap and water to remove all grease, then thoroughly with lukewarm water so as to remove all trace of soap, a drop of cream or milk should next be applied, and the leech, taken out of fresh cold water, should be grasped in a clean towel and directed towards the spot where we wish it to bite. It will be known that the animal has fastened when it ceases in its efforts to approximate its tail to its mouth, and so *arching* its body, but remains quiet with an almost imperceptible vermicular action. Each leech may be calculated to remove, between what it sucks and that which is lost after it drops off, about half an ounce of blood; large sized, vigorous, and *hungry* leeches, of course taking more blood than those in an opposite condition. The triangular character of the wound which they inflict is too well known to require to be dwelt upon here. Frequently we experience considerable difficulty in getting leeches to take, and I have met with individuals to whose persons leeches exhibited an insuperable objection; when such is the case puncturing the skin with a lancet in the most trivial manner, so as only to produce a drop of blood, will in the generality of cases ensure their taking. Occasionally we experience considerable difficulty in controlling the hemorrhage; many plans have been suggested with this view, such as applying to the wound a point of nitrate of silver, a plan which though frequently resorted to is far inferior to those I am about to mention, and which is attended with the disadvantage of occasionally leaving a permanent black stain. The most effectual means is direct pressure, applied either by the finger, or if the situation will admit of it by a compress and bandage; a convenient way of applying digital compression is to pinch up the skin between the forefinger and thumb, a proceeding that will remove the objection generally urged against the application of leeches over the larynx. This proceeding can be conveniently imitated, as originally suggested by myself, by the use of the little spring forceps commonly known to surgeons as the *bull dog forceps*. Bits of lint saturated with some one or other of the astringent solutions already described (see *astringents*) may be applied to the wound; matico leaf applied in the manner already described (see p. 106) has also been used with advantage. Occasionally, however, nothing remains for the surgeon to do but transfix the wound with a needle and apply a ligature. When applying a leech to an internal cavity it should be always secured by a string fastened to its tail, lest it should penetrate deeper than the operator originally proposed. In applying a leech to the inside of the buccal cavity, should it by any accident make its way into the stomach, a couple of glasses of port wine should be swallowed in all haste, this acting as a poison to the animal; and the most convenient emetic administered without delay. For the application of leeches in those cavities glasses of suitable shape are manufactured; but even when using them the precaution should not be omitted of securing them as already described.

THERAPEUTICAL USES.—As to the therapeutical uses of leeches, the question is too wide a one to be here entered upon; suffice it to say that their value is not solely to be measured by the *quantity* of blood so eliminated, as some portion of their beneficial effects is unquestionably to be attributed to their *derivative action*—a fact of great clinical importance in selecting the site for their application. Thus, in cerebral affections, one or two applied to the *nasal cavity*, or half a dozen over the mastoid process, producing a far more marked effect than a far greater number applied elsewhere; in conjunctivitis one leech applied to the mucous membrane, covering the lower eye-lid, being far more effective than a large number applied on the cutaneous surface; whilst the emmenagogue properties of a leech or two applied in the crural region, when the menstrual period is due, are too well recognized in the present day to require here further comment.

HOG'S FAT. (The internal fat of the abdomen of the hog, Sus Scrofa, *Linn.*)

HYDROCHLORIC ACID OF COMMERCE. *Muriatic Acid.* (Described, p. 198.)

HYPOSULPHITE OF SODA. $NaO,S_2O_2+5HO(=124)$. (Described p. 184.)

TEST.—24·8 grains decolorize 100 measures of the volumetric solution of iodine.

INDIGO. $C_{16}H_5NO_2$. (A blue pigment prepared from various species of indigofera, *Linn.*) (Described, p. 560.)

IODINE OF COMMERCE. (Described, p. 561.)

IRON WIRE. *Annealed Iron Wire. Binding Wire.* (Described, p. 632.)

ISINGLASS. (The swimming bladder or sound of various species of acipenser, *Linn*, prepared and cut into fine shreds.)

LITMUS. (A blue pigment prepared from various species of rocella, *Ascharius.*) (Also obtained from Rocella fusiformis, *Lindley.*) Natives of the Mediterranean and Channel islands; belonging to the Natural family *Lichenaceæ* (*Lichenales*, Lindley), and to the Linnæan class and order *Cryptogamia Algæ.*

It is probable that these are not the only lichens employed in the preparation of litmus, but the plants used, as well as the exact process followed are kept secret by the manufacturers. Sir Robert Kane, who has bestowed much attention on the subject, states that the lichens employed are ground with water to form a uniform pulp, and sufficient water added to make the whole into a thick fluid; ammoniacal liquors are from time to time mixed with this, the whole being exposed to the air and frequently agitated; when it has acquired the requisite shade of blue, chalk and plaster of Paris are added to the liquor so as to form a consistent paste, which when cut into little cubical masses and dried, forms the litmus of commerce. It is not employed in medicine; in pharmacy it is used as a test for acids and alkalies, its colour being changed to red by the former, and the original blue tint again restored by the latter.

Litmus Paper, Blue. (Unsized paper steeped in tincture of litmus, and dried by exposure to the air.)

Litmus Paper, Red. (Unsized paper steeped in tincture of litmus which has been previously reddened by the addition of a very minute quantity of sulphuric acid, and dried by exposure to the air.)

Litmus Tincture. (Take of litmus, in powder, one ounce; proof spirit, ten fluid ounces. Macerate for seven days, and filter.) Used only as a test.

LYCOPODIUM.—*Vegetable brimstone. A powder contained in the spore cases of Lycopodium clavatum and Lycopodium selago.* These two species of club-moss belong to the Natural family *Lycopodiaceæ.*

Lycopodium is an extremely fine, very light powder, of a delicate yellow colour, inodorous and tasteless. It is exceedingly inflammable, burning like gunpowder, on which account it is used in the preparation of fireworks. It is commonly employed in France for rolling pills in, to facilitate their formation and to prevent them from adhering; and for this purpose it is far superior to liquorice powder or magnesia which are ordinarily used for the purpose in this country. Pills coated with lycopodium may be put into water without being injured.

MARBLE. (Hard white crystalline native carbonate of lime, in masses.)

MERCURY OF COMMERCE. Quicksilver. (Described p. 537.)

MILK. Cow's Milk. The natural and most perfect type of an emulsion. The following analysis, by Regnault, gives at a glance the characteristic features of several varieties of milk:—

	Cow.	Ass.	Goat.	Mare.	Bitch.	Human Female.
Water	87·4	90·5	82·0	89·6	66·3	88·6
Oil or butter......	4·0	1.4	4·5	traces.	14·0	2·6
Lactine and soluble salts.........	5·0	6·4	4·5	8·7	2·9	4·9
Casein, albumen, and fixed salts	3·6	1·7	9·0	1·7	16·8	3·9
	100·0	100·0	100·0	100·0	100·0	100·0

NITRATE OF POTASH OF COMMERCE. Nitre, Saltpetre. (Described p. 262.)

NITRATE OF SODA. $NaO,NO_5 (=71)$.

TESTS.—Entirely soluble in distilled water, the solution giving no precipitate with nitrate of silver or chloride of barium.

NITRITE OF SODA. $NaO,NO_3(=69)$.

PREPARATION.—Take of nitrate of soda, one pound; charcoal recently burned, and in fine powder, one ounce and a quarter. Mix the nitrate of soda and the charcoal thoroughly in a mortar, and drop the mixture in successive portions into a clay crucible heated to dull redness. When the salt has become quite white, raise the heat so as to liquefy it, pour it out on a clean flagstone, and, when it has solidified, break it into fragments, and keep it in a stoppered bottle.

EXPLANATION OF PROCESS.—In this case the nitric acid of a portion of the nitrate of soda is robbed of its oxygen by the carbon employed, and is reduced to the condition of nitrous acid. The resulting compound is composed of soda, carbonate of soda, nitrate of soda, and nitrite of soda, this latter constituting in general about 25 per cent. of the mass.

CHARACTERS.—In opaque white fragments, soluble in water and in rectified spirit. The aqueous solution gives a white crystalline precipitate with nitrate of silver, which dissolves in hot water. A fragment, moistened with a solution of sulphate of copper, acquires an emerald-green colour. Tartaric acid, added to a strong solution, developes ruddy fumes, but gives no precipitate.

OLEUM BERGAMOTÆ.—*Oil of Bergamot. Volatile oil of the rind of the fruit of Citrus limetta*, E. The bergamot citrus is cultivated in the South of Europe, and belongs to the Natural family *Aurantiaceæ*, and to the Linnæan class and order *Polyadelphia Polyandria*.

Oil of bergamot exists in the rind of the fruit, from which it is obtained either by expression or distillation; it is imported from the South of Europe. The oil is of a pale greenish-yellow colour, has a peculiar fragrant odour, and a warm pungent taste. Its specific gravity is 0·862. It is only employed in medicine as a perfume, chiefly to give an agreeable odour to ointments.

OXALIC ACID OF COMMERCE. *Oxalic Acid, Purified.* $HO,C_2O_3+2HO(=63)$.

PREPARATION.—Take of oxalic acid of commerce, one pound; boiling distilled water, thirty fluid ounces. Dissolve, filter the solution, and set it aside to crystallize. Pour off the liquor, and dry the crystals by exposure to the air on filtering paper placed on porous bricks.

TEST.—Is entirely dissipated by a heat below 350°.

(For properties, &c. see p. 391.)

OX BILE. Ox Gall. (The fresh bile of the ox, Bos Taurus, *Linn.*) (See p. 631.)

PHOSPHORUS. (It should be kept under water in well closed bottles.)

TEST.—Entirely soluble in boiling oil of turpentine.

PLASTER OF PARIS. (Native sulphate of lime, CaO,SO_3,(=68), deprived of water by heat.)

PLATINUM FOIL.

POTASSIUM.

PTEROCARPUS. *Red Sandal Wood.* Pterocarpus santalinus, *Linn.* Plate 254, *Woodv. Med. Bot.* (The wood; from Coromandel and Ceylon.)

CHARACTERS.—Dense heavy billets, outwardly dark-brown, internally variegated with dark and lighter red rings, if cut transversely. Powder, blood-red, of a faint peculiar odour, and an obscurely astringent taste. Also chips of the same.

PYROXYLIN. *Gun Cotton.* (Described p. 306.)

RESIDUE OF NITRIC ACID PROCESS. (Bisulphate of potash, $KO,HO,2SO_3$, not quite pure.)

ROSA CENTIFOLIA. *Cabbage Rose Petals.* Rosa centifolia, *Linn.* Plate 140, *Woodv. Med. Bot.* (The fresh petals, fully expanded; from plants cultivated in Britain.) The hundred-leaved or cabbage rose, originally a native of Asia, is now cultivated freely in our gardens. It belongs to the Natural family *Rosaceæ*, and to the Linnæan class and order *Icosandria Polygynia.*

CHARACTERS.—Taste sweetish, bitter, and faintly astringent; odour roseate; both readily imparted to water.

Aqua Rosæ. Rose Water. (Take of fresh petals of the hundred-leaved rose, ten pounds; water, two gallons. Distil one gallon.) Used only as an agreeable vehicle for more active medicines to be used as collyria, lotions, &c. It must not be used as a vehicle for permanganate of potash, as this salt would undergo rapid decomposition in it.

SAPO DURUS. *Hard Soap.* (Soap made with olive oil and soda.)

CHARACTERS.—Greyish-white, dry, inodorous; horny and pulverizable when kept in dry, warm air; easily moulded when heated.

TESTS.—Entirely soluble in rectified spirit; not imparting an oily stain to paper.
PREPARATIONS.—Emplastrum, linimentum, linimentum opii.

Soaps are also used in pharmacy as excipients for making pill masses; they possess aperient properties.

SAPO MOLLIS. *Soft Soap.* (Soap made with olive oil and potash.)

CHARACTERS.—Yellowish-white, inodorous, of the consistence of thick honey.
TESTS.—Entirely soluble in rectified spirit; not imparting an oily stain to paper.

SILVER, REFINED. (Pure metallic silver.)

TESTS.—If ammonia is added in excess to the solution of the metal in nitric acid, the resulting fluid exhibits neither colour nor turbidity.

SODA CAUSTICA. *Caustic Soda.* (Hydrate of soda, NaO, HO (=40).)

PREPARATION.—"Take of solution of soda, two pints. Boil down the solution of soda rapidly in a silver or clean iron vessel, until there remains a fluid of oily consistence, a drop of which when removed on a warm glass rod solidifies on cooling. Pour the fluid on a clean silver or iron plate, and, as soon as it has solidified, break it in pieces, and preserve it in stoppered green-glass bottles."

CHARACTERS.—In hard greyish-white fragments of cakes, very alkaline and corrosive. It imparts a yellow colour to flame, and its solution in water acidulated by nitric acid gives scanty white precipitates with nitrate of silver and chloride of barium.

TESTS.—Forty grains dissolved in water leave scarcely any sediment, and require for neutralization about ninety measures of the volumetric solution of oxalic acid.

SQUIRTING CUCUMBER FRUIT. *(The nearly ripe fruit of Ecbalium officinarum,* Richard.)

SUBACETATE OF COPPER OF COMMERCE. *Verdigris.* $2CuO, C_4H_3O_3+6HO$.

SULPHATE OF AMMONIA. $NH_4OSO_3(=66)$.

SULPHATE OF COPPER, ANHYDROUS. CuO,SO_3. (Sulphate of copper deprived of its water by a heat of 400°.)

CHARACTERS.—A yellowish-white powder, which becomes blue when moistened with water.

SULPHATE OF MERCURY. (See p. 556.)

SULPHURET OF ANTIMONY, PREPARED.—(Tersulphuret of antimony, SbS_3, reduced to fine powder.)

TEST.—Almost entirely soluble in boiling hydrochloric acid.

SULPHURET OF IRON. $FeS(=44)$.

SULPHURETTED HYDROGEN. $HS(=17)$.

PREPARATION.—"Take of sulphuret of iron, half an ounce; water, four fluid ounces; sulphuric acid of commerce, a sufficiency. Place the sulphuret of iron and the water in a gas-bottle closed with a cork perforated by two holes, through one of which pass air-tight a funnel tube of sufficient length to dip into the water, and through the other a tube for giving exit to the gas. Through the former pour from time to time a little of the acid, so as to develope the sulphuretted hydrogen according as it is wanted."

EXPLANATION OF PROCESS.—On introducing the acid upon the sulphuret of iron contained in the bottle with the water, some of this latter is resolved into its elements, the oxygen unites with the iron to form oxide of iron, which unites with the sulphuric acid to form sulphate of iron; whilst the hydrogen of the water unites with the sulphur to form sulphuretted hydrogen gas, thus, $FeS+SO_3+HO=FeOSO_3+SH$. Sulphuretted hydrogen is only used as a test, precipitating most, but not all, of the metals from their solutions in acids. Two groups of metals may be thus formed, viz., those which are precipitated and those which are not precipitated from their solutions in acids. To the first belong gold, silver, platinum, mercury, lead, copper, bismuth, antimony, tin, and cadmium; to the latter, provided their solution be slightly acid, belong iron, manganese, zinc, nickel, and cobalt. This latter group, however, will be precipitated by sulphide of ammonium. Most of these precipitates are black, but to this general rule we have these exceptions: the sulphide of zinc is white, that of manganese flesh-coloured, that of cadmium and of tin *(bisulphide)* yellow; of antimony *(tersulphide)* orange, and of arsenic *(tersulphide)* lemon-yellow.

It should never be forgotten that this gas is a most deadly poison, irrespirable when undiluted with atmospheric air; but when diluted, Thenard and Dupuytren ascertained that a linnet died in an atmosphere containing $\frac{1}{1500}$th, a dog in one containing $\frac{1}{800}$th, and a horse in one containing $\frac{1}{250}$th of its volume of sulphuretted hydrogen.

SULPHURIC ACID OF COMMERCE. Oil of Vitriol.

TESTS.—Specific gravity, 1·84 to 1·85. When the acid mixed with six times its volume of distilled water is placed in contact with pure zinc, and the hydrogen evolved is ignited as it escapes from the capillary extremity of a glass tube, if a dark stain is formed on a piece of porcelain held low down on the flame, the acid contains arsenic, and is to be rejected. When a solution of sulphate of iron is poured cautiously on the surface of the undiluted acid, if a red tint appears at the surface of contact, the acid contains nitrous acid, and if the acid diluted as above becomes turbid, it contains other impurities, and in either case requires purification.

TEST SOLUTIONS FOR QUALITATIVE ANALYSIS:—

OF ACETATE OF COPPER.—(Acetate of copper = $CuO,C_4H_3O_3 + HO$.) Take of subacetate of copper of commerce, in fine powder, half an ounce; distilled water, a sufficiency. Dilute the acid with half a fluid ounce of the water; digest the subacetate of copper in the mixture at a temperature not exceeding 212° with repeated stirring, and continue the heat until a dry residue is obtained. Digest this in four ounces of boiling distilled water, and by the addition of more of the water make up the solution to five fluid ounces.

OF ACETATE OF POTASH.—Take of acetate of potash, half an ounce; distilled water, five fluid ounces. Dissolve.

OF ACETATE OF SODA.—Take of acetate of soda, half an ounce; distilled water, five fluid ounces. Dissolve.

OF ALBUMEN.—Take the white of one egg; distilled water, four fluid ounces. Mix by trituration in a mortar, and filter through clean tow first moistened with distilled water. This solution must be recently prepared.

OF AMMONIO-NITRATE OF SILVER.—(Ammonio-nitrate of silver = $AgO,NO_5 + 2NH_3$.) Take of nitrate of silver, in crystals, a quarter of an ounce; solution of ammonia, half a fluid ounce, or a sufficiency; distilled water, a sufficiency. Dissolve the nitrate of silver in eight fluid ounces of the water, and to the solution add the ammonia until the precipitate first formed is nearly dissolved. Clear the solution by filtration, and then add distilled water, so that the bulk may be ten fluid ounces.

OF AMMONIO-SULPHATE OF COPPER.—(Described p. 629.)

OF BICHLORIDE OF PLATINUM.—(Bichloride of platinum = PCl_2.) Take of thin platinum foil, a quarter of an ounce; nitric acid, a sufficiency; hydrochloric acid, a sufficiency; distilled water, seven fluid ounces. Mix half a fluid ounce of the nitric acid with three fluid ounces of the hydrochloric acid and two fluid ounces of the water; pour the mixture into a small flask containing the platinum, and digest at a gentle heat, adding more of the acids mixed in the same proportion, should this be necessary, until the metal is dissolved. Transfer the solution to a porcelain capsule, add to it a fluid drachm of hydrochloric acid, and evaporate on a water bath, until acid vapours cease to be given off. Let the residue be dissolved in the remaining five ounces of distilled water, and preserved in a stoppered bottle.

OF BORACIC ACID.—Take of boracic acid, fifty grains; rectified spirit, one fluid ounce. Dissolve.

OF BROMINE.—Take of bromine, ten minims; distilled water, five fluid ounces. Place the bromine in a bottle furnished with a well-fitting stopper, pour on the water, and shake several times.

OF CARBONATE OF AMMONIA.—Take of carbonate of ammonia, in fine powder, half an ounce; distilled water, a sufficiency. Shake the carbonate of ammonia in a bottle with eight fluid ounces of the water until it is dissolved, and by the addition of more of the water make up the bulk of the solution to ten fluid ounces.

OF CHLORIDE OF BARIUM.—(Described p. 602.)

OF CHLORIDE OF CALCIUM.—(Described p. 606.)

(SATURATED) OF CHLORIDE OF CALCIUM.—(Described p. 607.)

OF CHLORIDE OF TIN. (Chloride of tin = $SnCl$.)—Take of granulated tin, one ounce; hydrochloric acid, three fluid ounces; distilled water, a sufficiency. Dilute the acid in a flask with one fluid ounce of the water, and, having added the tin, apply a moderate heat until gas ceases to be evolved. Add as much of the water as will make up the bulk to five fluid ounces, and transfer the solution, together with the undissolved tin, to a bottle with an accurately ground stopper.

OF CORROSIVE SUBLIMATE.—Take of corrosive sublimate, one hundred grains; distilled water, five fluid ounces. Dissolve, and keep the solution in a bottle impervious to light.

of Ferridcyanide of Potassium.—Take of ferridcyanide of potassium, in crystals, a quarter of an ounce; distilled water, five fluid ounces. Dissolve, and keep the solution in a stoppered bottle.

of Ferrocyanide of Potassium.—Take of ferrocyanide of potassium, in crystals, a quarter of an ounce; distilled water, five fluid ounces. Dissolve, and keep the solution in a stoppered bottle.

of Gelatine.—Take of isinglass, in shreds, fifty grains; warm distilled water, one fluid ounce. Mix, and digest for half an hour on a water bath with repeated shaking, and filter through clean tow moistened with distilled water.

of Hydrochlorate of Ammonia.—Take of hydrochlorate of ammonia, one ounce; distilled water, a sufficiency. Dissolve the hydrochlorate of ammonia in eight fluid ounces of the water, and with distilled water make up the bulk to ten fluid ounces.

of Hydrosulphuret of Ammonia.—(Described p. 459.)

of Iodate of Potash.—(Iodate of potash=KO,IO_5.) Take of iodine, fifty grains; chlorate of potash, fifty grains; nitric acid, five minims; distilled water, ten fluid ounces and a half. Rub the iodine and chlorate of potash together to a fine powder; place the mixture in a Florence flask, and, having poured upon it half an ounce of the water acidulated with the nitric acid, digest at a gentle heat until the colour of the iodine disappears. Boil for one minute; then transfer the contents of the flask to a capsule, and evaporate to perfect dryness at 212°. Finally dissolve the residue in the remaining ten ounces of distilled water; filter the solution, and keep it in a stoppered bottle.

of Iodide of Potassium.—Take of iodide of potassium, one ounce; distilled water, a sufficiency. Dissolve the iodide of potassium in eight fluid ounces of the water, and by the addition of distilled water make up the bulk of the solution to ten fluid ounces.

of Oxalate of Ammonia.—(Oxalate of ammonia crystallized$=NH_4O,C_2O_3+HO$.) Take of purified oxalic acid, one ounce; boiling distilled water, eight fluid ounces; carbonate of ammonia, in powder, a sufficiency. Dissolve the oxalic acid in the water, neutralize the solution with the carbonate of ammonia, filter, cool, and crystallize. Take of the crystals of oxalate of ammonia thus obtained, first dried on filtering paper by simple exposure to air, and free from efflorescence, half an ounce. Warm distilled water, one pint. Dissolve.

of Phosphate of Soda.—Take of phosphate of soda, in crystals, one ounce; distilled water, a sufficiency. Dissolve the phosphate of soda in eight fluid ounces of the water, and add as much distilled water as will make the bulk of the solution ten fluid ounces.

of Persulphate of Iron.—(Persulphate of iron=$Fe_2O_3,3SO_3$, in solution in water.) Take of sulphate of iron, eight ounces; sulphuric acid, six fluid drachms; nitric acid, four fluid drachms; distilled water, twelve fluid ounces, or a sufficiency. Add the sulphuric acid to ten ounces of the water, and dissolve the sulphate of iron in the mixture, with the aid of heat. Mix the nitric acid with the remaining two ounces of water, and add the dilute acid to the solution of sulphate of iron. Concentrate the whole by boiling, until, upon the sudden disengagement of ruddy vapours, the liquid ceases to be black and acquires a red colour. A drop of the solution is now to be tested with ferridcyanide of potassium, and if a blue precipitate forms, a few additional drops of nitric acid should be added, and the boiling renewed, in order that the whole of the protosulphate may be converted into persulphate of iron. When the solution is cold, make the quantity eleven fluid ounces, by the addition, if necessary, of distilled water.

The rationale of this process will be understood on reference to what has already been written, p. 651.

Characters.—A viscid solution of a dark-red colour, inodorous, and very astringent, miscible in all proportions with alcohol and water. Diluted with ten volumes of water it gives a white precipitate with the chloride of barium, and a blue precipitate with the ferrocyanide, but not with the ferridcyanide of potassium.

Tests.—Specific gravity 1·441. One fluid drachm diluted with two fluid ounces of distilled water gives upon the addition of an excess of solution of ammonia a precipitate, which when well washed and incinerated weighs 11·44 grains.

of Sulphate of Iron.—(Described p. 94.)

of Sulphate of Lime.—Take of plaster of Paris, a quarter of an ounce; distilled water, one pint. Rub the plaster of Paris in a porcelain mortar for a few minutes with two ounces of the water, introduce the white mixture thus obtained into a pint bottle containing the rest of the water, shake well several times, and allow the undissolved sulphate to subside. When this has occurred, filter, and preserve the clear solution in a stoppered bottle.

OF TARTARIC ACID.—Take of tartaric acid, in crystals, one ounce; distilled water, eight fluid ounces; rectified spirit, two fluid ounces. Dissolve the tartaric acid in the water, add the rectified spirit, and preserve the solution in a stoppered bottle.

OF TERCHLORIDE OF GOLD.—(Terchloride of gold = $AuCl_3$.) Take of fine gold, reduced by a rolling machine to a thin lamina, sixty grains; nitric acid, one fluid ounce; hydrochloric acid, seven fluid ounces; distilled water, nine fluid ounces. Place the gold in a flask with one fluid ounce of the nitric and six fluid ounces of the hydrochloric acid, first mixed with four fluid ounces of the water, and digest until it is dissolved. Add to the solution an additional fluid ounce of hydrochloric acid, evaporate at a heat not exceeding 212° until acid vapours cease to be given off, and dissolve the terchloride of gold thus obtained in five fluid ounces of distilled water. The solution should be kept in a stoppered bottle.

TEST SOLUTIONS FOR VOLUMETRIC ANALYSIS:—

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. The tube used with these solutions is an alkalimeter, which when filled to 0 holds 1,000 grains of distilled water at 60°, and is divided into 100 parts of equal capacity.

Under each of the following volumetric tests I propose to give an example explanatory of their mode of application.

OF BICHROMATE OF POTASH.—(Bichromate of potash, $KO,2CrO_3 = 147{\cdot}5$.) Take of pure bichromate of potash, 129 grains; distilled water, one pint. Dissolve. The quantity of this solution which fills the volumetric tube to 0 contains $\frac{1}{10}$ of an equivalent, in grains, of the bichromate of potash, and, when added to a solution of a protosalt of iron acidulated with hydrochloric acid, is capable of converting $\frac{1}{10}$ of six equivalents of iron (16·8 grains) from the state of a protosalt to that of a persalt.

In practising this volumetric process, it is known that the whole of the protosalt has been converted into a persalt when a minute drop of the solution, placed in contact with a drop of the solution of ferridcyanide of potassium on a white plate, ceases to strike with it a blue colour.

To understand this test, we shall take arseniate of iron as our example, "twenty grains of which dissolved in an excess of hydrochloric acid diluted with water continue to give a blue precipitate with the ferridcyanide of potassium, until at least seventeen measures of the volumetric solution of bichromate of potash have been added." The arseniate of iron is converted by the hydrochloric acid employed into protochloride of iron; water and arsenic acid being set free, thus, $3FeO,AsO_5 + 3HCl = 3FeCl + 3HO + AsO_5$. On the addition of the solution of bichromate of potash, in virtue of the reaction upon it of the excess of hydrochloric acid employed, chlorine is set free, which converts the protochloride into perchloride of iron, when it will cease to strike the blue colour with ferridcyanide of potassium. To explain the action of the hydrochloric acid upon the bichromate of potash, we will require one atom of bichromate of potash and seven of hydrochloric acid; the hydrogen of the acid unites with the oxygen of the salt to form water, one atom of chlorine unites with one of potassium to form chloride of potassium, three atoms of chlorine unite with two of chromium to form sesquichloride of chromium, and three chlorines are set free, thus, $KO2CrO_3 + 7HCl = KCl + Cr_2Cl_3 + 7HO + 3Cl$. The volumetric solution is so constructed that it can convert one-tenth of six equivalents of iron from the state of proto- to that of per-salt; but each equivalent of arseniate of iron contains *three* equivalents of iron, therefore the volumetric solution corresponds to one tenth of *two* equivalents of arseniate of iron, so an easy calculation will now show what the test indicates. The atomic weight of arseniate of iron is 223, two atoms of it will represent 446; the tenth of this last figure is 44·6, which would require 100 measures of the volumetric solution; but for the quantity operated upon only 17 measures are required, so by the rule of proportion we ascertain that there must have been present 7·582 grains of arseniate of iron; for 100 : 44·6 :: 17 : 7·582. The *per centage* will be ascertained by an equally simple calculation, for if 20 grains contain 7·582 grains of arseniate of iron, what will 100 grains contain?—20 : 7·582 :: 100 : 37·910.

OF HYPOSULPHITE OF SODA.—(Hyposulphite of soda crystallized, $NaO,S_2O_2 + 5HO = 124$.) Take of hyposulphite of soda, in crystals, 260 grains; distilled water, a sufficiency. Dissolve the hyposulphite of soda in one pint of the water, and drop the solution cautiously from the volumetric tube into one hundred measures of the volumetric solution of iodine, until the brown colour of the iodine is just discharged. Note the number of measures (N) which have been used to produce this effect; and having then taken sixteen fluid ounces of the same solution, augment this quantity by the addition of distilled water until it amounts to $\frac{1600}{N}$ fluid ounces. If for example $N = 96$, the sixteen ounces of the solution of the hyposulphite should be diluted with distilled water so as to become $\frac{1600}{96} = 16{\cdot}66$ fluid ounces.

This solution is used for estimating free iodine, an object which it accomplishes by forming with the iodine, iodide of sodium and tetrathionate of soda. One hundred measures of it include $\frac{1}{10}$ of two equivalents of the hyposulphite in grains, and therefore correspond to 12·7 grains of free iodine.

By this test we can directly estimate the quantity of free iodine present in a solution, and we can also *indirectly* ascertain the amount of chlorine present in any given compound. To explain the action of the test, I shall select the calx chlorata of the Pharmacopœia, where we find it stated that "ten grains of it mixed with thirty grains of iodide of potassium, and dissolved in four fluid ounces of water, produce, when acidulated with two fluid drachms of hydrochloric acid, a reddish solution, which requires for the discharge of its colour at least eighty-five measures of the volumetric solution of hyposulphite of soda." The theory upon which all this is based is simple enough. When a solution of chlorinated lime is acted upon by an acid, chlorine is set free; as in this instance, the hydrochloric acid becoming decomposed, its hydrogen uniting with the oxygen of the hypochlorite of lime (CaOClO) to form water, chloride of calcium, and free chlorine, thus, $CaClO + 2HCl = 2HO + CaCl + 2Cl$; this chlorine reacting upon the iodide of potassium sets free iodine, thus, $KI + Cl = KCl + I$, which colours the solution red, but which colour is again discharged by the solution of hyposulphite of soda, in virtue of the production of iodide of sodium and tetrathionate of soda (NaO,S_4O_5); this equation accounts for their appearance, $2(NaO,S_2O_2)+I=NaI+NaOS_4O_5$. It is evident that the quantity of iodine set free from the iodide of potassium must depend on the amount of chlorine developed from the chlorinated lime by the action of the hydrochloric acid; and the amount of the iodine is calculated from the quantity of the volumetric solution consumed; but this solution is so constructed that 100 measures of it correspond to 12·7 grains of free iodine, so that it becomes but a matter of calculation to ascertain by the quantity of the volumetric solution consumed, *first*, the amount of iodine set free by the chlorine, and next, from that to estimate the amount of chlorine that must have been present in the ten grains of chlorinated lime operated upon. The quantity of iodine so set free amounts to 10·795 grains, inasmuch as 100 : 12·7 : : 85 : 10·795. But this amount of iodine is equivalent to 3·017 grains of chlorine, for (the atomic weight of iodine being 127, of chlorine 35·5) 127 : 10·795 : : 35·5 : 3·017.

OF IODINE.—(Iodine, I=127.) Take of pure iodine, in powder, 111·125 grains; iodide of potassium, 150 grains; distilled water, a sufficiency. Mix the iodide of potassium and iodine in a bottle with eighteen ounces of the water, agitate until both are dissolved, and, when the solution is complete, add as much more distilled water as will make the total bulk exactly one pint.

This solution may be employed for determining the amount of sulphuretted hydrogen or of a metallic sulphuret in a fluid, but is chiefly used for the estimation of sulphurous and arsenious acids. It is dropped from the volumetric tube into the liquid to be tested, until free iodine begins to appear in the solution. 100 volumetric measures of it include 12·7 grains ($\frac{1}{10}$ of an equivalent) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid.

To explain this test we shall select for our example the sulphurous acid of the Pharmacopœia. One fluid drachm of which, "when mixed with a little mucilage of starch, does not acquire a permanent blue colour with the volumetric solution of iodine until 164 measures of the latter have been added to it." The rationale of the test is this: were a solution of iodine added to a simple solution of starch, it would at once strike a blue colour, forming with it *iodide of starch;* but when this solution contains sulphurous acid, a reaction takes place, in virtue of which we have sulphuric and hydriodic acids formed, neither of which produces a blue colour with starch. This equation explains the reaction, $SO_2+I+HO=SO_3+HI$. When at last all the sulphurous acid has disappeared from the solution, the iodine can now strike the blue colour with the starch, and it then comes to be but a simple sum in proportion to ascertain how much sulphurous acid must have been present in the solution. One hundred measures being equal to gr. 3·2, what are one hundred and sixty-four measures equal to? 100 : 3·2 : : 164 : 5·248. Therefore 5·248 grains of sulphurous acid are present in the quantity operated upon.

OF NITRATE OF SILVER.—(Nitrate of silver, $AgO,NO_5=170$.) Take of nitrate of silver, 148·75 grains; distilled water, one pint. Dissolve and keep in an opaque stoppered bottle. The quantity of this solution which fills the volumetric tube to 0 includes 17 grains of nitrate of silver, or $\frac{1}{10}$ of an equivalent of the salt in grains. Upon dropping it into dilute hydrocyanic acid rendered alkaline by soda, the precipitate first formed is upon agitation redissolved, and continues to be so until the whole of the cyanogen of the acid has united with the sodium and the silver, forming the double cyanide of sodium and silver. In such experiments 100 volumetric measures of the solution correspond to 5·4 grains of absolute hydrocyanic acid.

This test is used for the purpose of estimating the amount of absolute hydrocyanic acid present in a given sample; for instance, in the Pharmacopœia it is stated that half a fluid ounce of the officinal acid, "when treated with an excess of solution of soda, requires the addition of 80·66 measures of the volumetric solution of nitrate of silver before a permanent precipitate begins to form, which corresponds to two per cent. of anhydrous acid." The rationale of this is, that oxide of silver is precipitated from a solution of nitrate of silver by a solution of soda, the soda abstracting the nitric acid to form nitrate of soda, and the oxide of silver being precipitated; thus, $AgONO_5+NaO=NaONO_5+AgO$. This latter forms with cyanide of sodium a soluble double salt, cyanide of sodium and silver (NaCy,AgCy); thus, $2NaCy+AgO=NaCy,AgCy+NaO$. The cyanide of sodium being produced in virtue of the action of the hydrocyanic acid upon the liquor sodæ; thus, $NaO+HCy=HO+NaCy$; so that no permanent precipitate can form so long as any cyanide of sodium is present in the solution. The moment it disappears the oxide of silver remains a permanent precipitate; and from this fact we judge of the entire disappearance of the cyanide of sodium, and the estimation of the per-centage of acid becomes but a simple matter of calculation. If one hundred measures of the volumetric solution correspond to 5·4 grains of absolute hydrocyanic acid, what are 80·66 measures equivalent to? 100 : 5·4 : : 80·66 : 4·35. That is, half a fluid ounce of the solution contains 4·35 grains of anhydrous acid. But this only gives us the quantity of anhydrous acid present in the half ounce, not its *per-centage;* to ascertain this we must have recourse to another calculation; we must ascertain the number of grains in the half ounce, and that effected, we can easily by the rule of proportion arrive at its per-centage; to ascertain the number of grains by weight in a given measure of a fluid, it becomes necessary to multiply the number of grains contained in the measure by the specific gravity of the fluid; this will give us the number of grains by weight in the quantity operated upon; thus, the weight of a fluid half ounce of distilled water being 218·75 grains, that of a fluid half ounce of the officinal hydrocyanic acid will be $218·75\times·997$(its specific gravity)$=218·09375$: which last quantity represents, as already shown, 4·35 grains of absolute acid, or as nearly as possible two *per cent.* inasmuch as 218·09375 : 4·35 : : 100 : 1·99.

OF OXALIC ACID.—(Oxalic acid crystallized, $HO,C_2O_3+2HO=63$.) Take of purified oxalic acid in crystals, quite dry but not effloresced, 551·25 grains; distilled water, a sufficiency. Dissolve the oxalic acid in eighteen fluid ounces of the water, and when the solution is complete, add as much distilled water as will make its bulk exactly twenty fluid ounces at 60°.

The quantity of this solution which fills the volumetric tube to 0 includes exactly sixty-three grains of crystallized oxalic acid, and is therefore capable of neutralizing an equivalent in grains of any alkali or alkaline carbonate.

The rationale of this test is so self-evident as scarcely to require comment. To explain it we will take the pharmacopœial statement with reference to the *liquor calcis,* ten ounces of which are described as requiring for neutralization at least twenty measures of this solution. The chemical equivalent of lime being 28, and of oxalic acid 63, it is evident that 28 grains of lime will be exactly neutralized by 63 grains of oxalic acid; but 100 measures of the volumetric solution contain 63 grains of oxalic acid, therefore they are capable of neutralizing 28 grains of lime; the question, therefore, may be thus stated: if 100 measures can neutralize 28 grains of lime, what are 20 measures equivalent to? 100 : 28 : 20 : 5·6; therefore the ten ounces of lime water contain gr. 5·6 of lime, equivalent to gr. 11·2 to the pint.

OF SODA.—(Soda, $NaO = 31$.) 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 measures (N) of the solution used, and having then taken forty fluid ounces of the solution of soda, augment this quantity by the addition of distilled water, until it becomes $\frac{4000}{N}$ fluid ounces. If for example $N = 93$, the forty ounces of solution of soda should be diluted so as to become $\frac{4000}{93} = 43·01$ fluid ounces.

The quantity of this solution which fills the volumetric tube to 0 includes thirty-one grains of soda, and will therefore neutralize an equivalent in grains of any monobasic acid.

The converse of the preceding explanation applies here: the atomic weight of soda being 31, of course any amount of a solution which contains this number of grains of soda will saturate its equivalent of an acid. For instance, in the Pharmacopœia we read that "one fluid drachm of sulphuric acid requires for neutralization 206 measures of this solution;" now 100 measures contain 31 grains of soda, equivalent to 40 grains (its equivalent number) of sulphuric acid; but if 100 measures are equivalent to 40 grains of anhydrous sulphuric acid, what are 206 measures equal to? 100 : 40 : : 206 : 82·40. To ascertain the *per centage,* as already explained (see Volumetric Solution of Nitrate of Silver), we must multiply the weight of a drachm of distilled water (=gr. 54·68) by the specific gravity of the acid (=1·846), but $54·68 \times 1·846 = 100·93928$. From this we can easily calculate the per centage; if 100·93 grains contain 82·40 grains of anhydrous acid, what will 100 grains contain? 100·93 : 82·40 : : 100 : 81·54.

The only subject that remains now for consideration is the principle upon which the volumetric solutions themselves are constructed;

this is stated in each several instance in the Pharmacopœia, viz., that each 1000 gr. of the solution should contain an equivalent, or a definite proportion of an equivalent, of whatever the test is composed of. For instance, in the case of the volumetric solution of oxalic acid we are told to dissolve 551·25 gr. of the acid in a pint (or, in other words, in 8750 grains) of distilled water, but by using these proportions we exactly get 63 gr. (its equivalent number) of oxalic acid in each 1000 gr. of the solution, for 8750 : 551·25 :: 1000 : 63. The volumetric solutions of hyposulphite of soda and of soda at first sight are apparently more complex, but are really based on the same principles. For instance, in that of soda we are directed to make a strong solution of soda to fill the tube to 0, or in other words to take 1000 grains of the solution, and cautiously to drop this into a solution containing 63 grains of oxalic acid; when the acid is neutralized, it must be evident that the number of measures that were sufficient to effect this must have contained 31 grains of soda (its equivalent number); these are to be carefully noted, and if they correspond to 100 measures (representing 1000 grains) the solution will be of the correct strength; but if less than 100 measures complete the saturation, it is by so much too strong and must be diluted—the object being to have twenty ounces or 8750 grains of a solution, each 1000 grains of which shall contain 31 grains (or an equivalent) of soda. Let us then assume, as is done in the Pharmacopœia itself, that 93 measures effect the neutralization, that is, that 93 measures contain 31 grains of soda, the solution must be diluted to that extent that 100 measures shall contain this amount; in other words, seven measures of water must be added to the 93 measures to complete the 100 measures of the solution, which quantity will then contain an equivalent of soda. Having ascertained the number of measures consumed, it now becomes but a rule in proportion to ascertain how much dilution 40 ounces of the original solution will require to become of the desired strength, thus, 93 : 100 :: 40 : 43·01. But 93 is an imaginary number; it may be more or less; therefore N in the Pharmacopœia is taken to represent the quantity consumed, whatever it may be; so the sum may be thus expressed, N : 100 :: 40 : to the fourth proportion; which of course must always correspond to 4000 divided by N, or, as stated in the Pharmacopœia, $\frac{4000}{N} = x$.

TIN, GRANULATED. (Grain tin, granulated by fusing and pouring it into cold water.)

TURMERIC. (The rhizome of Curcuma longa, *Linn.*) A native of the East Indies and of China; belonging to the Natural family *Zingiberaceæ*, and to the Linnæan class and order *Monandria Monogynia*.

Turmeric is in short, roundish, somewhat curved pieces, about the thickness of the little finger, reddish-yellow externally, reddish-brown within; it has a peculiar aromatic odour, and a warm bitter taste. The colouring principle of turmeric has been obtained in a separate state by treating the alcoholic extract with ether; it has been named *curcumin.* Turmeric possesses some aromatic properties, in consequence of which, as well as its colour, it is an ingredient in *Curry-powder.* It is not employed as a medicine, but is generally used as a testing agent for alkalies, which change its yellow colour to a reddish-brown. For this purpose *Turmeric paper* or the tincture are employed; they are prepared as follows.

Turmeric Paper. (Unsized paper steeped in tincture of turmeric and dried by exposure to the air.)

Turmeric Tincture. (Take of turmeric, bruised, one ounce; proof spirit, six fluid ounces. Macerate for seven days, and strain.)

VALERIANATE OF SODA. (Described p. 61.)

WHITE OF EGG. (The liquid albumen of the egg of Gallus Banckiva, var. domesticus, *Temminck.)*

ZINC, GRANULATED. (Zinc granulated by fusing and pouring it into cold water.)

TESTS.—The hydrogen gas evolved when the metal dissolves in dilute pure sulphuric acid does not blacken a piece of paper moistened with a solution of acetate of lead; and when ignited gives no dark stain to the lid of a porcelain crucible held low down in the flame.

Did the hydrogen gas so evolved blacken the paper moistened with the solution of acetate of lead, it would indicate the presence in the zinc of traces of sulphuret of zinc; and were a dark stain produced, it would be evidence of the presence of arsenic. (See *Marsh's test*, p. 211.)

ZINC OF COMMERCE.

APPENDIX A.

FORMULÆ.

ANTACIDS.

℞ Liquoris Ammoniæ, min. x.; Infusi Chiratæ, f℥vij.; Tincturæ Aurantii, f℥j. M. Fiat haustus, mane meridieque sumendus. (A useful antacid draught in the dyspepsia of the debilitated, attended with acid eructations.)

℞ Ammoniæ Bicarbonatis, gr. viij.; Infusi calumbæ, f℥vij.; Tincturæ Lupuli, f℥j.; Tincturæ Hyoscyami, min. xx. M. Fiat haustus, bis quotidie sumendus. (Less stimulating than the former, and better adapted for cases in which the stomach is irritable.)

℞ Ammoniæ Carbonatis, gr. xxiv.; Fellis Bovini Purificati, gr. xxx.; Mucilaginis, q. s. M. Fiant pilulæ duodecim; Capiat unam ter in die. (In dyspepsia accompanied by vomiting of food and constipation.)

℞ Ammoniæ Carbonatis, gr. xx.; Infusi Cascarillæ, ad f℥viij.; Spiritus Ætheris Nitrosi, f℥j.; Tincturæ Cinnamomi, f℥iij. M. Fiat mistura, de quâ sumantur cochlearia ij. ampla ter in die. (In the lithic acid diathesis, with debility of the digestive organs.)

℞ Liquoris Calcis, f℥iv; Pulveris Aromatici, gr. cxx.; Tere simul, et gradatim adde, Misturæ Amygdalæ, f℥iiss.; Aquæ Lauro-cerasi, f℥ij. Fiat mistura; Capiat cochlearia ij. ampla bis terve in die, phialâ prius concussâ. (Useful in cardialgia and in gastrodynia.)

℞ Aquæ Calcis Effervescentis (*Carrara Water*, page 10); Lactis Recentis, ana, f℥ij.; Fiat haustus, ter quaterve in die sumendus. (In dyspepsia, with much irritability of the stomach, and cardialgia.)

℞ Misturæ Cretæ, f℥vj.; Tincturæ Lupuli, f℥j.; Tincturæ Cardamomi Compositæ, f℥vij.; Vini Opii, f℥j. M. Capiat semiunciam sextis horis. (In diarrhœa dependent on acidity of the *primæ viæ*.)

℞ Pulveris Cretæ aromatici, gr. xviij.; Carbonatis Sodæ Exsiccatæ, gr. vj.; Pulveris Tragacanthæ, gr. xij. M. Divide in partes sex æquales, quarum capiat unam secundâ vel tertiâ quâque horâ. (In the diarrhœa of children.)

℞ Lithiæ Citratis, gr. v.; Succi Colchici, min. x.; Tincturæ Cardamomi Compositæ, f℈ss.; Syrupi Aurantii Floris, f℈j.; Aquæ Camphoræ, f℥j. M. Fiat haustus; mitte tales sex, sumat unum ter in die. (An excellent draught in gout.)

℞ Aquæ Magnesiæ Bicarbonatis, f℈vijss.; Tincturæ Lavandulæ compositæ, f℈ss. M. Fiat haustus, sumat statim et repetatur semihorio si opus sit. (An excellent remedy in heartburn.)

℞ Magnesiæ Carbonatis, gr. xl.; Carbonis Ligni, gr. lx.; Pulveris Zingiberis, gr. x. M. et divide in chartulas iv. Sumat unam ter in die. (Useful in painful dyspepsia attended with acid eructations.)

℞ Solutionis Alkalinæ *(Brandish)*, f℈v.; Infusi Chiratæ, f℥x.; Essentiæ Anisi, f℈ij.; Syrupi Aurantii, f℥j. M. Fiat mistura; Capiat cochlearia ij. magna ter in die. (In the lithic acid diathesis.)

℞ Liquoris Potassæ effervescentis (No. 4), f℥iv.; Tincturæ Chiratæ; Tincturæ Lupuli, ana, f℈ss.; Fiat haustus, ex effervescentiâ sumendus, et repetatur ter in die. (An excellent antacid draught in dyspepsia with deposit of lithates in the urine. This draught is best prepared by putting the tinctures mixed together into a tumbler, and pouring the effervescing potash water on them; it should be swallowed immediately.)

℞ Liquoris Potassæ effervescentis (No. 4), f℥iij.; Vini Colchici, min. xx.; Tincturæ Cardamomi compositæ, f℈ss. Fiat haustus ter in die sumendus. (In dyspeptic affections occurring in gouty habits: see observations on last prescription, for preparation.)

℞ Liquoris Sodæ, f℈ij.; Succi Taraxaci, f℥ss.; Tincturæ Quassiæ, f℥ss.; Infusi Quassiæ, ad f℥viij. M. Sumat cochlearia duo magna ter in die. (Useful in the acid dyspepsia of those who indulge too freely in the use (or rather the *abuse*) of alcoholic stimulants.)

℞ Sodæ Bicarbonatis, gr. x.; Infusi Calumbæ, f℥iss.; Aquæ Lauro-cerasi, min. xxx; Creasoti, min. j. M. Fiat haustus, sextis horis sumendus, et ad tertiam vel quartam vicem repetendus si opus sit. (In acidity of the stomach with vomiting.)

℞ Sodæ Carbonatis Exsiccatæ, gr. xxx.; Pulveris Myrrhæ, gr. xviij.; Pulveris Ipecacuanhæ, gr. xij. M. Divide in chartulas vj. quarum sumat unam quartâ quâque horâ. (An excellent antacid in chronic diarrhœa and dysentery.)

℞ Hickory Ashes, one quart; Soot, six ounces; Boiling Water, one gallon. Mix and let them stand for twenty-four hours, frequently stirring the ingredients. Let it then be decanted, for if left standing on the materials, the resulting solution becomes too caustic and may do serious mischief. Dose, a tea-cupful three times a day. I have given this formulary inasmuch as it was that from the use of which that celebrated American physician, the late Dr. Physick, derived the most marked benefit in his own case.

ANTHELMINTICS.

℞ Syrupi Allii sativi (page 34), f℥j.; Olei Terebinthinæ, f℥ss.; Decocti Hordei, f℥vij. M. Fiat enema, injiciatur statim, et horæ unius spatio adhibeatur enema catharticum. (For ascarides in the rectum; half or a fourth part of the above may be used for children.)

℞ Pulveris Absinthii, gr. xxx.; Calomelanos, gr. vj.; Chloridi Sodii, gr. xij.; Saponis Jalapini (page 154), gr. xxiv.; Mellis Despumati, q. s. M. Divide in bolos ij.; Sumat unum mane, et alterum post horas sex, nisi priús benè dejecerit alvus. (In cases of lumbrici or ascarides.)

℞ Infusi Absinthii, f℥ij.; Extracti Spigeliæ et Sennæ Fluidi (page 46), f℥iss.; Tincturæ Valerianæ; Syrupi Zingiberis, ana, f℥ij. M. Fiat mistura, Capiat partem quartem trihorio. (For expelling lumbrici.)

℞ Extracti Filicis, (page 38), min. xxx.; Misturæ Amygdalæ, f℥ij. M. Fiat emulsio, et divide in partes æquales ij., quarum sumatur una horâ somni, et altera mane sequente. (A most efficacious anthelmintic for the *tape worm*. If it do not purge, an active cathartic should be given in four hours after the second dose.)

℞ Mucunæ, gr. xxx.; Pulveris Spigeliæ, gr. xij.; Syrupi, f℥ss.; in mortario terendo misce intimè. (An excellent anthelmintic in cases of lumbrici; the above quantity should be administered for three successive mornings before breakfast, and the third dose followed by an active mercurial purge.)

℞ Granati radicis corticis, gr. clxxx.; Pulveris Sabadillæ, gr. vj.; Pulveris Aromatici, gr. xxx. M. Divide in pulveres sex; Capiat unum omni semihorâ ad sextam vicem. (In cases of tænia; the last dose should be followed by an active saline purge.)

℞ Santonini, gr. j.; Resinæ Scammonii, gr. ij.; Sacchari Lactis, gr. iij. M. Fiat pulvis, mitte tales iv.; Sumat unum omni nocte. (A valuable powder in cases of lumbrici in children.)

℞ Santonini, gr. lx.; Sacchari, ℥j.; Syrupi Tolutani; Mucilaginis Tragacanthæ ana quantum sufficit ut fiat massa in trochiscos lx. dividenda. Sumat unum mane nocteque. (An agreeable, convenient, and efficacious form for administering santonine, especially to children.)

℞ Infusi Spigeliæ, f℥j.; Infusi Allii, f℥j.; Confectionis Terebinthinæ, gr. cxx.; Tincturæ Sennæ, f℥j.; Fiat haustus. (An effectual anthelmintic in cases of lumbrici.)

ANTISPASMODICS.

℞ Tincturæ Assafœtidæ, f℥ss.; Spiritus Ammoniæ aromatici, fʒss.; Aquæ Lauro-cerasi, fʒss.; Misturæ Camphoræ ut Murray, f℥viss. M. Fiat haustus. (A useful antispasmodic in hysteria and spasmodic colic.)

℞ Pilulæ Assafœtidæ compositæ, gr. l.; Olei Rutæ, min. xij.; fiant pilulæ duodecim. Capiat duas vel tres pro dosi. (In the flatulent colic of hysteria.)

℞ Tincturæ Castorei, fʒv.; Spiritus Ætheris compositi, fʒiij.; Infusi Valerianæ, f℥vij.; M. Fiat Mistura, de quâ sumatur cochleare unum magnum secundis horis, donec evanescant symptomata. (In cramp of the stomach, in spasmodic or flatulent colic, in hysteria, in hiccup, in nervous palpitations, &c.)

℞ Extracti Fuliginis, gr. xxx.; Pilulæ Assafœtidæ compositæ, gr. xx.; Olei Valerianæ, min. xij. M. Divide in pilulas duodecim, quarum capiat duas ter in die. (In hysterical neuralgia in females.)

℞ Spiritus Fuliginis, fʒj.; Sodæ carbonatis, gr. xxx.; Syrupi Aurantii, fʒiij.; Aquæ Menthæ pulegii, f℥iss. M. Fiat mistura, sumat cochleare medium tertiis vel quartis horis. (In the advanced stages of hooping-cough in children; a tea-spoonful for infants.)

℞ Tincturæ Fuliginis, f℥ss.; Misturæ Camphoræ, f℥viss.; Syrupi Aurantii, f℥j. M. Fiat mistura; capiat unciam omni horâ donec abierit spasmus. (In hysteria of females.)

℞ Moschi, gr. x.; Carbonatis Ammoniæ, gr. iij.; Spiritus Ætheris compositi, fʒss.: Mucilaginis; Syrupi, ana, fʒij.; Misturæ Camphoræ ut Murray, f℥iss. M. fiat haustus. Mitte tales iv. Sumat unum quartis horis. (An excellent stimulant and antispasmodic draught in the low stages of typhus fever, when nervous symptoms predominate.)

℞ Infusi Sumbul, ad f℥viij.; Tincturæ Valerianæ Ammoniatæ, f℥ss.; Spiritus chloroformi, fʒij. M. Sumat cochlearia duo ampla tertiis horis. (In hysteria.)

℞ Quiniæ Valerianatis, gr. xij.; Extracti Gentianæ, gr. xxiv.; Extracti Hyoscyami, gr. xij.; fiant pilulæ duodecim, quarum capiat unam ter in die. (In nervous debility, hysteria, &c.)

℞ Zinci Valerianatis, gr. viij.; Tincturæ Valerianæ, fʒij.; Aquæ Aurantii, f℥iiiss.; Syrupi Hemidesmi, fʒij.; fiat mistura cujus capiat semiunciam sextis horis. (An excellent mixture in hysteria, chorea, and other nervous affections.)

℞ Zinci Valerianatis, gr. xij.; Extracti Belladonnæ, gr. vj.; Extracti Gentianæ, gr. xxx. M. et divide in pilulas duodecim, sumat unam ter in die. (A valuable combination in the nervous symptoms attendant on sexual excesses.)

ASTRINGENTS.

℞ Aceti, f℥ij.; Aquæ Lauro-cerasi, f℈ij.; Syrupi Rhæados, f℈vj.; Aquæ destillatæ, f℥v. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. (An excellent sedative astringent in chronic mucous or purulent discharges, attended with much debility and irritability of the stomach.)

℞ Acidi Gallici, gr. xxx.; Mucilaginis Acaciæ, ℥ss.; Aquæ destillatæ, f℥iiiss.; Syrupi Rhæados, f℈ij. M. Fiat mistura, de quâ sumatur uncia secundis vel tertiis horis. (In hemorrhage from the kidneys or bladder.)

℞ Acidi Sulphurici aromatici, f℈iiss.; Syrupi Rosæ Gallicæ, f℈vss.; Aquæ destillatæ, f℥vij. M. Fiat mistura, sumat unciam sextis horis. (A useful astringent mixture in passive hemorrhages, and in the colliquative sweating of hectic.)

℞ Acidi Sulphurici diluti, f℈vj.; Tincturæ Cinnamomi, f℈ij.; Fiat mistura, cujus capiat guttas xx. ter in die, ex cyatho Vinosi Decocti Hordei. (In the same cases as the above mixture.)

℞ Aluminis, gr. xc.; Syrupi Rosæ Gallicæ, f℥j.; Aquæ Rosæ, f℥vij. M. Fiat mistura, cujus sumat cochleare amplum tertiis vel quartis horis. (In all cases of diarrhœa, and in painter's colic.)

℞ Extracti Belæ Liquidi, f℥ij.; Tincturæ Opii, f℈i.; Tincturæ Maticæ, f℥j.; Syrupi Zingiberis, f℥ss.; Aquæ ad f℥viij. M. Sumat cochlearia duo ampla tertiis horis. (In diarrhœa and dysentery.)

℞ Infusi Rosæ acidi; Misturæ Althææ, ana, f℥iij.; Aluminis, gr. lx.; Mellis Rosæ, f℥ij. M. Fiat gargarisma, sæpè utendum. (A useful gargle in relaxed sore throat, and in chronic ulceration of the mouth and fauces.)

℞ Creasoti, min. j.; Spiritus Juniperi compositi, min. xx.; Aquæ destillatæ, f℥j. M. Fiat haustus, secundis vel tertiis horis sumendus. (In chronic diarrhœa with vomiting.)

℞ Creasoti, min. iv.; Tincturæ Gallæ, f℈ij.; Aquæ destillatæ, f℥ij. M. Fiat lotio. (In indolent ulcers with excessive discharge.)

℞ Sulphatis Ferri; Carbonatis Potassæ, ana, gr. xxx.; Mucilaginis Gummi Tragacanthæ, q. s. Fiat massula et divide in pilulas xij.; Capiat unam ter in die. (An excellent remedy in leucorrhœa.)

℞ Ferri Pernitratis Liquoris, f℈iij.; Syrupi simplicis, f℈v.; Aquæ destillatæ, f℥iij. M. Capiat cochleare amplum sextis horis. (A very useful astringent and tonic mixture in chronic mucous diarrhœa, and in leucorrhœa.)

℞ Sulphatis Cupri, gr. vj.; Pulveris Myrrhæ, gr. xij.; Confectionis Rosæ, gr. xl. M. Divide in pilulas xij.; Sumat unam sextis horis. (In chronic diarrhœa and dysentery.)

℞ Tincturæ Gallæ, f℥j.; Misturæ Amygdalæ, f℥iss.; Mucilaginis, f℥ss.; Aquæ. ℥v. M. Capiat cochleare amplum post singulas liquidas dejectiones. (An excellent astringent mixture in colliquative diarrhœa.)

℞ Pulveris Kino cum Opio, gr. x.; Pulveris Cretæ compositi, gr. xv.; Syrupi Zingiberis, q. s. M. Fiat bolus, sextâ quâque horâ sumendus. (In diarrhœa occurring in the old and debilitated.)

℞ Decocti Hæmatoxyli, f℥viss.; Tincturæ Monesiæ, f℥j.; Syrupi Aurantii, f℥ss, Fiat mistura, cujus capiat cochleare amplum post singulas liquidas dejectiones. (In chronic diarrhœa and dysentery.)

℞ Decocti Hæmatoxyli ad f℥viij.; Pulveris Cretæ Aromatici, gr. cxx.; Tincturæ Catechu, f℈iij.; Tincturæ Opii, f℈j. M. Sumat cochlearia duo ampla tertiis horis, phialâ prius bene agitatâ. (A powerful astringent in obstinate diarrhœas.)

℞ Monesiæ, gr. lx.; Aluminis, gr. xxiv.; Pulveris Aromatici, gr. xxx.; Syrupi, q. s. ut fiant pilulæ xxiv. Sumat ij. ter in die. (In leucorrhœa, in chronic diarrhœa, and in pyrosis.)

℞ Tincturæ Matico, f℈vj.; Infusi Krameriæ, f℥vij.; Syrupi Croci, f℈ij. M. Fiat mistura, cujus capiat semunciam tertiis vel quartis horis. (In chronic mucous diarrhœa or in the diarrhœa of phthisis.)

℞ Acetatis Plumbi, gr. xxiv.; Acetatis Morphiæ, gr. ij.; Acidi Acetici diluti, f℥ss.; Aquæ destillatæ, ad f℥viij. M. Sumat cochlearia duo ampla secundis horis. (A valuable astringent in active hæmorrhages and in dysentery.)

℞ Plumbi Acetatis; Digitalis, ana, gr. vj.; Opii, in pulvere, gr. iij.; Confectionis Rosæ, gr. xij. M. Divide in pilulas sex, e quibus una ter in die sumatur. (In active hæmorrhages.)

℞ Plumbi Acetatis, gr. ix.; Pilulæ Opii, gr. v. M. Divide in pilulas tres, quarum capiat unam tertiis vel quartis horis. (An excellent remedy in the autumnal cholera of this country.)

℞ Decocti Tormentillæ, f℥vj.; Decocti Papaveris, f℥ij.; Acidi Tannici, gr. xviij.; M. Fiat liquor, cujus quantum satis sit quater de die, ope siphunculi eburnei, in vaginam injiciatur. (In chronic leucorrhœa.)

℞ Acidi Tannici, gr. xij.; Confectionis Rosæ, gr. xxxij. M. Divide in pilulas xij. e quibus sumatur una quartis horis. (An excellent astringent in the colliquative sweating and diarrhœa of phthisis.)

℞ Decocti Granati, f℥vij.; Mellis Boracis, f℥j. M. Sit gargarisma sæpè utendum. (In aphthous ulcerations of the mouth and fauces.)

℞ Sulphatis Zinci, gr. xx.; Aquæ destillatæ, f℥iv.; Tincturæ Croci, f℈ij. M. Fiat collyrium, sæpè utat. (A useful eye-wash in chronic ophthalmia.)

℞ Pulveris Uvæ-ursi, gr. cxx.; Acidi Tannici, gr. vj.; Pulveris Opii, gr. ij. M. Divide in portiones duodecim æquales; Capiat unam ter in die. (In passive hematuria, in albuminuria, and in chronic catarrh of the bladder.)

℞ Sulphatis Zinci, gr. xxiv.; Ipecacuanhæ, gr. iv.; Pulveris Myrrhæ, gr. xxiv.; Lactucarii; Confectionis Rosæ, ana, gr. xxx. M. Divide in pilulas xxiv. e quibus sumatur una sextâ quâque horâ. (In chronic diarrhœa and dysentery.)

℞ Calcis Chloratæ, ℥ss.; Aquæ destillatæ, f℥xj.; Solve et cola, dein adde, Syrupi Aurantii, f℥j. M. Fiat liquor, quo gingivas sæpè gargarizet. (A most efficacious gargle in excessive salivation.)

℞ Acetatis Zinci, gr. xl.; Infusi Matico, f℥viij. M. Fiat injectio, frequenter utenda. (An excellent injection in the advanced stages of gonorrhœa, in gleet, and in leucorrhœa.)

CATHARTICS.

℞ Decocti Aloës compositi, f℥iij.; Syrupi Croci, f℥ss.; Syrupi Rhei, f℥ss. M. Fiat mistura duabus vicibus sumenda. (In torpidity of the bowels, and in chlorosis.)

℞ Calomelanos, gr. xxx.; Saponis Crotonis, gr. vj.; Pilulæ Colocynthidis et Hyoscyami gr. xxiv. M. Divide in pilulas xij. e quibus sumatur una ter in die. (In spasmodic and nervous diseases attended with much constipation.)

℞ Pilulæ Colocynthidis compositæ; Saponis Jalapini, ana, gr. lx. M. Fiat massula et divide in pilulas xxiv. e quibus sumantur duæ, prout res poscit. (A good formula for purgative pills for general use.)

℞ Pilulæ Cambogiæ compositæ, gr. xl.; Pilulæ Hydrargyri, gr. xx. M. Divide in pilulas xij.; Capiat ij. pro re natâ. (In constipation with deficient secretion of bile.)

℞ Extracti Colchici acetici, gr. xij.; Pilulæ Hydrargyri, gr. xxx.; Extracti Hyoscyami, gr. xviij. M. Fiant pilulæ duodecim, e quibus sumantur duæ tertiâ quâque nocte. (An excellent cathartic in gouty and rheumatic habits, the following draught being administered the next morning.)

℞ Succi Colchici, min. x.; Magnesiæ Carbonatis, gr. xij.; Tincturæ Cinnamomi, f℈ss.; Aquæ Cinnamomi, f℥iss. M. Fiat haustus. (To be given in the morning, two of the above pills having been taken the previous evening.)

℞ Tincturæ Seminum Colchici, f℥ss.; Tincturæ Rhei et Aloës, f℥ss.; Spiritus Myristicæ, fʒij.; Infusi Rhei, ad f℥viij. M. Fiat mistura, de quà sumantur cochlearia ampla ij. tertiis vel quartis horis ad effectum. (A useful cathartic in gouty and rheumatic habits.)

℞ Tincturæ Colocynthidis, min. xx.; Infusi Sennæ, f℥ij.; Tincturæ Cardamomi Compositæ, fʒss. M. Fiat haustus, bis quotidie sumendus. (In dropsical cases.)

℞ Tincturæ Elaterii, fʒj.; Syrupi Sennæ, f℥ss.; Syrupi Zingiberis, fʒj.; Aquæ Menthæ Piperitæ, f℥j. M. Fiat haustus, quamprimum sumendus, et, nisi alvus sit intereà copiosè soluta, quadrihorio repetatur. (In ascites occurring in the robust, provided no inflammatory tendency be present.)

℞ Olei Ricini, fʒvj.; Mucilaginis Gummi Arabici, fʒiv.; Tere optimè simul, hisque inter terendum paulatim adjice, Syrupi Croci, fʒij.; Aquæ destillatæ, f℥iss. Fiat haustus. (A safe and efficacious purgative draught.)

℞ Saponis Crotonis, gr. ss.; Extracti Hyoscyami; Pilulæ Hydrargyri, ana, gr. iv. Olei Pimentæ, min. ij. M. Divide in pilulas ij. horâ somni sumendas.

℞ Tincturæ Hellebori, fʒiss.; Infusi Sennæ, f℥j.; Syrupi Zingiberis, fʒj. M. Fiat haustus, primo mane sumendus. (This draught and the pills immediately preceding will be found very useful in cephalalgia dependent on congestion of the vessels of the head, and accompanied by a torpid state of the bowels; also in some forms of mania.)

℞ Hydrargyri cum Cretâ, gr. xij.; Resinæ Scammonii, gr. xij.; Carbonatis Sodæ Exsiccatæ, gr. vj.; Pulveris Aromatici, gr. xij. M. Divide in portionibus paribus vj., quibus sumatur una omni nocte. (An excellent alterative and cathartic for children: very useful in worm cases.)

℞ Lini Carthartici, herbæ recentis, gr. clxxx.; Aquæ ferventis, f℥ij.; Digere per horas duas in vase clauso, cola et adde, Tincturæ Cardamomi compositæ, fʒj. Fiat haustus. (In simple constipation.)

℞ Resinæ Jalapæ, gr. v.; Pulveris Amygdalæ compositi, gr. xxx.; Simul terantur, hisque inter terendum adde, Aquæ destillatæ, f℥iss. M. Fiat haustus, illicò sumendus. (An excellent cathartic in simple constipation.)

℞ Sulphatis Magnesiæ, ʒj.; Syrupi Zingiberis, fʒj.; Infusi Rosæ acidi, f℥ij. M. Fiat haustus. (An excellent purgative draught in mild febrile and inflammatory affections, accompanied by constipation.)

℞ Manganesiæ Sulphatis, ʒss.; Tincturæ Seminum Colchici, min. xxx.; Syrupi Zingiberis, fʒij.; Aquæ Rosæ, ad f℥ij. M. Fiat haustus. (A useful purgative draught in gouty or rheumatic habits.)

℞ Manganesiæ Sulphatis, ℥ss.; Acidi Sulphurici diluti, min. viij.; Infusi Sennæ, f℥ij. M. Fiat haustus. (An excellent purgative draught in dyspeptic affections with deficient secretion of bile.)

℞ Mannitæ, gr. xxx.; Aquæ Menthæ piperitæ, f℥ss. Solve; Fiat haustus. (An excellent laxative for children.)

℞ Resinæ Podophylli, gr. iij.; Pilulæ Colocynthidis et Hyoscyami, gr. l. M. Divide in pilulas xij. Sumat duas nocte. (A convenient form for administering podophyllin; one will act mildly, two pretty freely; see remarks, p. 162.)

℞ Resinæ Podophylli, gr. iij.; Aloinæ, gr. xij.; Extracti Hyoscyami, gr. xij.; Extracti Taraxaci, gr. xij.; Saponis duri, gr. xij. M. et divide in pilulas xij. Sumat unam vel duas pro dosi. (A valuable combination in constipation accompanied with hepatic torpor.)

℞ Potassæ Sulphatis, ℥ss.; Acidi Sulphurici diluti, min. v.; Aquæ Rosæ, f℥ij. M. Fiat haustus. (In mild febrile and inflammatory affections.)

℞ Potassæ Tartratis Acidæ, ℥iv.; Acidi Boracici, gr. lx.; Aquæ destillatæ, f℥xij. Fiat mistura, cujus pars quarta tertiâ quâque horâ ad alvi plenam solutionem sumatur. (In dropsical effusions, more especially into the abdomen.)

℞ Potassæ Tartratis Acidæ, ℥ss.; Pulveris Jalapæ, gr. xxx.; Confectionis Sennæ, ℥iss.; Extracti Sennæ fluidi, f℥ss. M. Fiat electuarium, de quo sumatur instar nucis moschatæ ter quotidie, vel donec alvus commodè purgetur. (In hemorrhoidal affections.)

℞ Pilulæ Rhei Compositæ, gr. xxx.; Pilulæ Hydrargyri, gr. vj.; Sodæ Carbonatis Exsiccatæ, gr. xij.; Extracti Hyoscyami, gr. xij. M. et divide in pilulas xij. Sumat duas horâ decubitûs. (A useful aperient pill for ordinary constipation.)

℞ Infusi Sennæ, f℥ij.; Syrupi Rhei, f℥ij.; Spiritus Myristicæ, f℥j. M. Fiat mistura de quâ sumatur cochlearia ij. ampla secundis horis donec alvus leniter dejecerit. (In simple constipation of the old or debilitated.)

℞ Extracti Sennæ fluidi; Vini Rhei, ana, f℥ij.; Aquæ Cinnamomi, f℥iss. M. Fiat haustus. (A purgative draught, suited for cold leucophlegmatic habits.)

℞ Mellis Violæ; Mannæ, ana, ℥ss.; Syrupi Violæ, q. s. Fiat electuarium, cujus capiat cochleare parvulum pro re natâ. (A mild laxative readily taken by children.)

℞ Resinæ Scammonii, gr. v.; Pulveris Amygdalæ Compositi, gr. xxx.; Simul terantur, hisque inter terendum adde, Aquæ destillatæ, f℥iss. M. Fiat haustus. (An excellent cathartic in simple constipation. The dose for children is one-third or one-half of the above.)

℞ Resinæ Scammonii, gr. xxx.; Pulveris Jalapæ, gr. lx.; Syrupi Aurantii, et Mucilaginis, ana, q. s. ut fiant pilulæ xxiv. e quibus sumantur duæ alternis horis, vel donec bis dejecerit alvus. (In the constipation of lead colic.)

℞ Resinæ Jalapæ; Calomelanos; Saponis Hispanici, ana, gr. xv.; Olei Caryophylli, min. vj. M. Divide in pilulas xij. e quibus sumatur una semihorio ad plenam alvi solutionem. (In obstinate constipation.)

℞ Sodæ Hyposulphitis, gr. cxx.; Aquæ Menthæ piperitæ, f℥xiv.; Tincturæ Cardamomi compositæ, f℥ij. M. Fiat haustus. (An active cathartic draught in the constipation of atonic dyspepsia.)

℞ Sodæ Sulphatis, ℥ss.; Infusi Rosæ acidi, f℥ij.; Acidi Sulphurici diluti, min. ij. M. Fiat haustus. (A useful antiphlogistic cathartic.)

℞ Sodæ Phosphatis, ℥ss.; Aquæ Menthæ piperitæ, f℥iij.; Solve, dein adde, Extracti Sennæ fluidi, f℥j. Fiat mistura, de quâ capiat cochleare amplum secundis horis donec alvus commodè moveatur. (A useful purgative mixture.)

℞ Olei Terebinthinæ; Olei Ricini, ana, f℥iij.; Decocti Hordei, f℥vj. M. Fiat enema. (The best purgative in *purpura hæmorrhagica* occurring in children; it may be administered twice daily until the spots begin to fade.

CAUSTICS.

℞ Ammoniæ Hydrochloratis, ℥j.; Acidi Acetici diluti, f℥ij.; Aquæ, f℥iv. M. Fiat solutio. (A favourite application with Bell to venereal warts. I have found simply rubbing common warts with sal ammoniac each day a very certain method for their removal.)

℞ Chloridi Zinci, gr. xxx.; Antimonii Terchloridi Liquoris, min. xv.; Farinæ, gr. lx.; Aquæ destillatæ, q. s. Fiat massa, quâ pars morbida exedatur. (An excellent caustic paste in cancer and lupus.)

℞ Chloridi Zinci, gr. xxx.; Farinæ, gr. lx. *vel*, gr. cxx. *vel*, gr. clxxx. M. Fiat Massa. (The above proportions of flour may be used according to the strength the caustic paste is wished to be; it is employed in the same cases as the former.)

℞ Arsenici Albi, partes vj.; Calomelanos, partes xcvj. M. Fiat pulvis. DUPUYTREN. (Sprinkled on lint, and applied in small portions at a time to open cancer; the practice is not unattended with danger.)

℞ Hydrargyri Corrosivi, gr. lx.; Collodii, f℥j.; solve. (To be applied with a camel's hair brush to warts, nævi, condylomata, &c. On the evaporation of the ether, a film of the caustic is left on the surface to be destroyed; ulceration occurs in a few days, and after a short time a slough separates; in the case of nævi it is said without leaving any mark, an important consideration.)

℞ Hydrargyri Nitratis Liquoris Acidi, f℥ij.; Pulveris Tragacanthæ, quantum sufficit ut fiat massa. (A caustic paste for cancer and lupus.)

℞ Hydrargyri Oxidi rubri; Aluminis Exsiccati, ana, gr. lx. M. Fiat pulvis. (Sprinkled on the parts to repress exuberant and spongy granulations.)

℞ Hydrargyri Oxidi rubri; Amyli, ana, gr. xxx.; Sacchari Puri, ℥j. Misce benè simul terendo, ut fiat pulvis subtillissimus. (In thickening of the cornea, to be blown into the eye three or four times a day.)

℞ Carbonatis Cupri, gr. cxx.; Adipis preparati, ℥j. M. Fiat unguentum. DEVERGIE. (In the chronic forms of eczema and impetigo of the scalp, where stimulating applications are admissible.)

℞ Zinci Chloridi partes duas; Farinæ, partes tres; Antimonii Terchloridi partem unam; Aquæ quantum sufficit ut fiat pasta. (This paste should be spread thickly over the diseased surface, it is commonly known as *Canquoin's caustic paste.*)

℞ Ammoniæ Carbonatis, gr. xc.; Succi limonum quantum sufficit ad saturationem. Spiritus Etheris Nitrosi, fℨij.; Aquæ Camphoræ ad f℥viij. M. Sumat cochlearia duo ampla quartis horis. (An excellent diaphoretic in mild inflammatory affections.)

℞ Liquoris Ammoniæ Acetatis, f℥v.; Syrupi Croci, f℥ss.; Aquæ Camphoræ, ad f℥viij. M. Sumat cochlearia duo ampla tertiis horis. (A favourite remedy in incipient febrile disturbances.)

℞ Antimonii Oxidi, gr. l.; Morphiæ Hydrochloratis, gr. iss.; Confectionis Rosæ, q. s. Fiant pilulæ, xxiv. e quibus sumantur duæ, tertiis horis. (In chronic cutaneous diseases and in chronic rheumatism.)

℞ Pulveris Antimonialis, gr. iij.; Calomelanos, gr. ss.; Extracti Hyoscyami, gr. iss. M. Fiat pilula, sumenda tertiâ quâque horâ. (In acute rheumatism, and in mild febrile affections with a harsh dry skin.)

℞ Antimonii Tartarati, gr. ij.; Infusi Dulcamaræ, f℥viiss.; Syrupi Hemidesmi, f℥ss. M. Fiat mistura, de quâ capiat cochleare amplum secundis horis. (An excellent diaphoretic mixture in febrile and inflammatory affections.)

℞ Antimonii Tartarati, gr. j.; Tincturæ Lavandulæ Compositæ, fℨiij.; Syrupi Tolutani, f℥ss.; Aquæ, ad f℥viij. M. Sumat cochlearia duo ampla, tertiis horis. (A very generally employed diaphoretic mixture in febrile disturbances.)

℞ Tincturæ Guaiaci Ammoniatæ, ʒij.; Mucilaginis Tragacanthæ, fʒij.; Tere simul, et paulatim adjice, Misturæ Amygdalæ, f℥iiiss. Fiat mistura, sumenda in die partitis vicibus. (In atonic gout, in chronic rheumatism, and in chronic cutaneous diseases.)

℞ Sarsaparillæ radicis incisæ, ℥iss.; Aquæ destillatæ ferventis, Oj. Macera per horas duodecim in vase clauso, subinde agitans, dein cola.

℞ Hujus infusi, f℥x.; Infusi Sassafras; Decocti Mezerei, ana, f℥iiss.; Syrupi Hemidesmi, f℥j. M. Fiat Mistura, de quâ sumatur cyathum vinarium ter quaterve in die. (In secondary syphilitic affections, particularly the forms of cutaneous disease.)

℞ Resinæ Guaiaci, gr. xij.; Olei Sassafras, min. v.; Theriacæ, quantum sufficit ut fiat bolus, ter quarterve in die sumendus. (In chronic rheumatic affections, more especially when of syphilitic origin.)

℞ Pulveris Guaiaci Resinæ, gr. lx.; Nitratis Potassæ, gr. xxx.; Pulveris Ipecacuanhæ Compositi, gr. xxx. M. et divide in chartulas sex. Sumat unam omni nocte. (In painful rheumatic affections of a chronic character.)

DIURETICS.

℞ Decocti Pyrolæ, f℥vii.; Nitratis Potassæ, gr. xxx.; Spiritus Ætheris Nitrosi, f℥ss.; Spiritus Juniperi, fʒij. M. Fiat mistura; Capiat cochleare amplum tertiâ quâque horâ. (A stimulating diuretic in old cases of dropsy.)

℞ Tincturæ Bucco, f℥ss.; Infusi Uvæ Ursi, f℥viiss. M. Fiat mistura, cujus capiat unciam quater in die. (In chronic catarrh of the bladder, and in chronic mucous discharges from the vagina or urethra.)

℞ Decocti Scoparii, ad f℥viij.; Succi Scoparii, f℥ss.; Acetatis Potassæ, gr. lxxx.; Spiritus Juniperi, fʒij.; Aceti Scillæ, f℥ss. M. et sumat cochlearia duo ampla quartis horis. (A most certain diuretic.)

℞ Extracti Pareiræ, gr. lx.; Carbonatis Sodæ Exsiccatæ, gr. xij.; Extracti Conii, gr. vj.; Syrupi Papaveris, q. s. ut fiant pilulæ xxiv.; Capiat ij. sextâ quâque horâ. (In calculous affections, and in chronic catarrh of the bladder.

℞ Infusi Digitalis, ad f℥viij.; Spiritus Ætheris Nitrosi, fʒij.: Tincturæ Cinnamomi, f℥ss.; Acetatis Potassæ, gr. lxxx. M. et sumat cochlearia duo ampla quartis horis. (A valuable diuretic in anasarca occurring in enfeebled constitutions, and depending upon cardiac or renal disease.)

℞ Tartratis Potassæ Acidæ, ℥ss.; Ureæ, gr. cxx.; Mellis, ℥ss. M. Fiat electuarium, de quo capiat instar nucis moschatæ, ter quotidie. (In anasarca or ascites, with deficient secretion of urine.)

℞ Pulveris Scillæ, gr. xxx.; Potassæ Acetatis, ℥ss.; Aceti Scillæ, f℥ij; Mellis, ℥j.; Olei Juniperi, min. xx. M. Fiat electuarium, de quo capiat instar nucis moschatæ sextis horis. (In old cases of anasarca.)

℞ Olei Juniperi, f℥ss.; Spiritus Ætheris Nitrosi, Tincturæ Digitalis, ana, f℥iij. M. et sumat minima triginta, e cyatho vinoso aquæ, tertiis horis. (These drops are known in Germany under the name of the "*Diuretic Drops*," and are very generally used in all cases suited for the exhibition of diuretics.)

℞ Juniperi Contusi, ℥j. gr. cxx.; Pulveris Digitalis, cxx.; Pulveris Scillæ, gr. lx., Vini Xerici, Oj.; Macera per dies quatuor et adjice; Acetatis Potassæ, gr. clxxx. Exprime et cola, sumat cochleare amplum ter in die. (A favourite diuretic with Trousseau, and employed by him with much success in l'Hotel Dieu de Paris.)

℞ Amygdalarum Dulcium decorticatarum, ℥j.; Cantharidum, in pulvere subtilo, gr. x.; Sacchari Puri, ℥ss.; Tere benè simul, et gradatim adjice, Aquæ tepidæ, f℥x. Cola. Liquoris colatæ capiat cochleare amplum tertiis horis. (In torpor of the kidneys, and in incontinence of urine caused by paralysis of the neck of the bladder.)

℞ Boracis, gr. xxx.; Decocti Pareiræ, f℥xij. M. Fiat mistura, de quâ sumatur cyathum vinarium sextis horis. (In chronic mucous discharges from the bladder with excess of uric acid.)

℞ Tincturæ Bucco; Tincturæ Maticæ, ana, f℥ss.; Decocti Pareiræ; Infusi Uvæ Ursi, ana, f℥viiss. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. (In chronic catarrh of the bladder in old persons.)

℞ Olei Terebinthinæ, f℥j.; Gummi Tragacanthæ, gr. xxx.; Syrupi Aurantii, f℥j.; Tere benè simul, et gradatim adjice, Aquæ Menthæ Piperitæ, f℥vj.; Spiritus Ætheris Nitrosi, f℥ij. M. Capiat cochleare amplum secundâ quâque horâ. (A stimulating diuretic.)

EMETICS.

℞ Ammoniæ Carbonatis, gr. xxx.; Infusi Senegæ, f℥j.; Syrupi Croci, f℥ij. M. Fiat haustus statim sumendus. (In the suffocative catarrh of typhus.)

℞ Antimonii Tartarati, gr. ij.; Vini Ipecacuanhæ, f℥ij.; Infusi Anthemidis tepidi, f℥ij. M. Fiat haustus emeticus statim sumendus. (A certain and safe emetic.)

℞ Emetinæ impuræ, gr. ij.; Syrupi Aurantii florum, f℥j.; Aquæ destillatæ, f℥iij. M. Capiat cochleare amplum semihorio, donec supervenerit vomitio. (A certain emetic, applicable to the same cases as Ipecacuanha.)

℞ Violæ odoratæ radicis, gr. xxx.; Syrupi Scillæ, f℥j. M. Fiat bolus statim sumendus, et post horam repetendus si opus sit. (An excellent substitute for Ipecacuanha.)

℞ Sinapis, ℥j.; Aquæ tepidæ, f℥xij. M. Fiat mistura statim sumenda. (An excellent stimulating emetic, particularly useful when the vital powers are sinking.)

℞ Zinci Sulphatis, gr. xxx.; Aquæ, f℥ij. M. Fiat haustus statim sumendus. (A useful emetic in cases of narcotic poisoning.)

EMMENAGOGUES.

℞ Ergotinæ, gr. xij.; Syrupi Croci, f℥ss.; Aquæ Menthæ piperitæ, f℥iiiss. M. Fiat mistura, cujus capiat cochlearia duo ampla quartâ parte horæ ad effectum. (To accelerate delivery.)

℞ Tincturæ Ergotæ, f℥iss.; Syrupi Croci, f℥ij.; Decocti Aloës compositi, f℥vj. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. (In amenorrhœa, with torpor of the circulation.)

℞ Extracti Ergotæ Liquidi, f℥ij.; Syrupi Croci, f℥ss.; Infusi Sabinæ, ad f℥viij. M. Fiat mistura de quâ sumatur cochleare magnum ter in die. (In chlorotic amenorrhœa after the use of ferruginous preparations for some time.)

℞ Sulphatis Ferri Exsiccatæ, gr. xx.; Pilulæ Aloës cum Myrrhâ, gr. lx.; Olei Rutæ, min. vj. M. Fiat massula et divide in pilulas xxiv. e quibus sumantur ij. bis quotidie. (Useful in chlorosis.)

℞ Ergotæ, gr. xlviij.; Theriacæ, q. s.; Olei Sabinæ, min. xij. M. Fiat electuarium cujus capiat sextam partem ter in die. (In amenorrhœa dependent on simple atony of the uterine organs.)

℞ Pulveris Sabinæ; Pulveris Zingiberis, ana, gr. v.; Sodæ Biboratis, gr. x. M. Fiat pulvis, mitte tales vj. Sumat unam mane nocteque. (A useful emmenagogue in cases of amenorrhœa attended with sluggish circulation.)

EMOLLIENTS.

℞ Olei Olivæ, f℥ij.; Vitelli Ovi unius; Syrupi Althææ, f℥ij.; Decocti Lini compositi, f℥iij. Fiat secundum artem mistura; capiat æger cochleare amplum subindè. (In inflammatory affections of the kidneys, in ardor urinæ, and as a general demulcent.)

℞ Decocti Hordei, f℥x.; Syrupi Hemidesmi, f℥ij. M. Fiat mistura, cujus sumantur cochlearia duo ampla interdum. (An agreeable and excellent demulcent mixture, useful in inflammations of the mucous membranes.)

℞ Misturæ Althææ; Misturæ Amygdalæ, ana, f℥v.; Syrupi Hemidesmi, f℥ij. M. Fiat mistura, de quâ capiat cochlearia duo ampla horis intermediis. (A useful demulcent mixture in chronic bronchitis.)

℞ Misturæ Althææ, f℥vij.; Extracti Glycirrhizæ, gr. cxx.; Tincturæ Opii camphoratæ, fʒij.; Syrupi Hemidesmi, fʒvj. M. Fiat mistura, capiat cochleare amplum tussi urgenti. (In the troublesome cough of phthisis and of chronic bronchitis.)

℞ Camphoræ, rasæ et redactæ, gr. x.; Glycerinæ, fʒj.; Unguenti Cetacei, ʒvij.; M. Fiat unguentum. (To allay the itching attendant on some cutaneous diseases.)

℞ Sodæ Carbonatis, gr. xxx.; Aquæ Florum Sambuci, f℥viiss.; Glycerinæ, f℥ss.; M. Fiat lotio. (For the same purposes as the above ointment, especially applicable to eruptions on the scalp.)

EPISPASTICS.

℞ Cantharidum, in crasso pulvere, ℥iv.; Acidi Acetici Glacialis, f℥ij.; Spiritus Vini rectificati, Oj. Digere in vase vitreo clauso per dies tres, dein exprime et cola; Tinctura destillat calore gradûs 160° F. ad idoneam spissitudinem. (By this process a syrupy-looking extract is obtained, which, spread thinly on paper and applied to the skin, vesicates rapidly and freely. It should be used with extreme caution.)

℞ Terebinthinæ vulgaris; Mastiche, ana, partes sex; Cantharidum, in pulvere, partes duas; Euphorbiæ pulveris, partem unam. M. (For a perpetual blister, or to act as a powerful counterirritant.)

℞ Euphorbiæ, in pulvere subtilo, gr. xxx.; Adipis præparati, ℥j. M. Fiat unguentum. (An excellent issue ointment, see page 330.)

℞ Olei Terebinthinæ, f℥j.; Vitelli Ovi unius; Tincturæ Capsici, f℥iss.; Cetacei, ℥ss.; Tere bene, et adde inter terendum, Olei Olivæ, f℥iij. Fiat linimentum. (An excellent rubefacient liniment.)

℞ Linimenti Ipecacuanhæ (page 330); Linimenti Ammoniæ, ana, partes æquales. M. Fiat linimentum. (An excellent counterirritant, applied with friction.)

EXPECTORANTS.

℞ Syrupi Hemidesmi, f℥ij.; Tincturæ Tolutanæ, f℥ss.; Tincturæ Camphoræ cum opio, fʒj.; Vini Ipecacuanhæ, fʒij.; Aquæ destillatæ, ad f℥viij. M. Fiat syrupus expectorans, cujus sumat cochleare amplum secundâ quâque horâ. (In chronic bronchitis.)

℞ Vini Ipecacuanhæ, fʒiij.; Syrupi Tolutani, fʒv.; Mucilaginis Acaciæ, f℥j. M. Fiat mistura, capiat cochleare parvum omni horâ vel secundâ quâque horâ. CHEYNE. (For children threatened with an attack of croup or bronchitis.)

℞ Antimonii Tartarati, gr. ij.; Aquæ destillatæ, f℥vij.; Aquæ Laurocerasi, fʒij.; Syrupi simplicis, fʒvj. M. Fiat mistura, de quâ sumatur cochleare amplum bihorio. (In acute attacks of catarrh and bronchitis, combined with general antiphlogistic treatment.)

℞ Pulveris Senegæ, gr. xxx.; Carbonatis Sodæ Exsiccatæ, gr. vj.; Pulveris Scillæ, gr. j.; Sacchari Lactis, gr. xij. M. Divide in pulveres sex, capiat unum quartâ quâque horâ. (In the advanced stages of hooping cough and bronchitis in children.)

℞ Infusi Senegæ ad f℥viij.; Carbonatis Ammoniæ, gr. xxx.; Tincturæ Scillæ, f℥ss.; Tincturæ Camphoræ cum opio, f℥ss.; Syrupi Tolutani, f℥ss. M. Sumat cochlearia duo ampla quartis horis. (A valuable stimulating expectorant mixture in cases of chronic bronchitis, attended with difficult expectoration.)

℞ Tincturæ Lobeliæ, fʒij.; Misturæ Amygdalæ, f℥viss.; Succi Conii, fʒij.; Syrupi Hemidesmi, f℥j. M. Fiat mistura, cujus capiat cochleare amplum tertiis horis. (An excellent mixture in asthma and in paroxysmal coughs.)

℞ Spiritus Chloroformi, fʒij.; Vini Ipecacuanhæ, fʒj.; Aquæ Floris Aurantii, f℥i.; Liquoris Morphiæ Hydrochloratis, fʒij.; Aquæ ad f℥viij. M. Sumat cochlearia duo ampla tertiis horis. (A most agreeable and soothing mixture in troublesome and tickling cough.)

℞ Pilulæ Ipecacuanhæ cum Scillâ, gr. lx.; Styracis colati, gr. xxx.; Pulveris Lobeliæ, gr. xij. M. Divide in pilulas viginti quatuor, e quibus sumantur duæ sextis horis. (In old cases of bronchitis and in humoral asthma.)

NARCOTICS.

℞ Succi Belladonnæ, fʒiv.; Aquæ Camphoræ, f℥vij.; Syrupi Rhœados, f℥ss. M. Fiat Mistura, cujus capiat cochleare amplum sextis horis. (An excellent anodyne in neuralgia and tic douloureux.)

℞ Tincturæ Belladonnæ, f℥ij.; Linimenti Belladonnæ, f℥viij. M. Fiat linimentum anodynum, sæpe utendum. (In neuralgic pains and painful glandular enlargements.)

℞ Unguenti Belladonnæ, ℥ij.; Camphoræ, rasæ et redactæ, gr. lx,; Tincturæ Belladonnæ, f℥j. M. Fiat unguentum. (An excellent application to painful hemorrhoids, and along the urethra in chordee.)

℞ Tincturæ Cannabis Indicæ, f℥j.; Mucilaginis Acaciæ, f℥ij.; Aquæ Cinnamomi, f℥iss. M. Fiat haustus, statim sumendus, et repetatur secundis horis vel sæpius si minetur morbus. (In tetanus, or hydrophobia; half the above quantity may be taken every five or six hours in sciatica and other neuralgic pains.)

℞ Succi Hyoscyami, f℥ss.; Aquæ Camphoræ, f℥j.; Syrupi Rhœados, f℥ij.; M. Fiat haustus horâ somni sumendus, et repetatur alternâ horâ si non dormiat. (An excellent narcotic draught in cases where from any cause opium is inadmissible.)

℞ Olei Hyoscyami, min. xl. ad f℥ij.; Cataplasmatis Lini, quantum sufficit, ut cataplasma idoneæ magnitudinis fiat. (An admirable poultice in painful glandular enlargements.)

℞ Tincturæ Lupuli, f℥j.; Aquæ Destillatæ, f℥j.; Aquæ Lauro-cerasi, min. xx. Syrupi simplicis, f℥ij. M. Fiat haustus, mane et sero sumendus. (An excellent anodyne draught in phthisis.)

℞ Atropiæ, gr. viij.; Acidi Acetici, min. xij.; Glycerinæ, f℥ss. M. et infricentur minima triginta parti dolenti ter in die. (A very useful application in cases of facial neuralgia.)

℞ Lupulinæ, gr. viij.; Mucilaginis, q. s. Fiant Pilulæ duæ, horâ decubitûs sumendæ. (A doubtful narcotic, used sometimes in the restlessness and watchfulness of mania and other nervous affections.)

℞ Morphiæ Hydrochloratis, gr. ¼.; Extracti Glycirrhizæ, gr. ij. M. Fiat pilula horâ somni sumenda. (For relieving pain and procuring rest.)

℞ Liquoris Morphiæ Hydrochloratis, min. xxx.; Aquæ florum Aurantii, f℥j.; Syrupi Aurantii, f℥ss. M. Fiat haustus, horâ somni sumendus. (An excellent anodyne draught.)

℞ Codeiæ, gr. viij.; Ætheris, f℥j.; Syrupi Limonis ad f℥iv. M. Sumat cochleare parvum quartis horis. (A useful antispasmodic and sedative in hooping cough, &c.)

℞ Pilulæ Styracis, gr. xx. (L. P.); Camphoræ, rasæ et redactæ, gr. xxx.; Mucilaginis, q. s. M. Divide in pilulas xij., capiat unam sextâ quâque horâ. (In priapism and irritation of the neck of the bladder.)

℞ Magnesiæ Carbonatis, gr. xxx.; Tincturæ Assafœtidæ, min. lx.; Tincturæ Opii, min. xx.; Sacchari, gr. lx.; Aquæ Destillatæ, f℥j. M. (Used as a carminative in twenty minim doses, for infants suffering from colic. It is known in Philadelphia as *Dewees' Carminative*, having been a favourite prescription with that physician.)

℞ Liquoris Opii sedativi (Cooley), min. xx.; Syrupi Rhœados, f℥ij.; Aquæ Camphoræ, f℥vj. M. Fiat haustus. (A useful anodyne draught in febrile and inflammatory affections.)

℞ Tincturæ Stramonii, min. xv.; Aquæ destillatæ, f℥vij.; Syrupi Limonis, f℥ss. M. Fiat haustus tertiis horis repetendus, donec dolor mitescat. (Exceedingly useful in tic douloureux, sciatica, and all forms of chronic disease attended with acute pain.)

℞ Extracti Stramonii, gr. ij.; Extracti Hyoscyami, gr. vj.; Extracti Lupuli, gr. xxx. M. Divide in pilulas duodecim, quarum capiat unam quartâ quâque horâ dolorem lenire. (In painful nervous affections and in all forms of chronic disease attended with acute pain.)

℞ Extracti Stramonii, gr. vj.; Pilulæ Hydrargyri, gr. xij.; Sulphatis Quiniæ, gr. vj.; Sulphatis Ferri Exsiccatæ, gr. xij. M. Fiat massa, in pilulas xij. dividenda, sumat unam ter quaterve in die. (A formulary from the use of which I have derived the most marked relief in the treatment of facial neuralgia.)

REFRIGERANTS.

℞ Rosæ Caninæ fructûs, ℥j.; Aquæ ferventis, f℥viij.; Infunde per horam in vase clauso, exprime et cola, dein adde, Syrupi Mori, f℥ij. Fiat mistura, de quâ sumantur cochlearia duo ampla subindè. (An agreeable refrigerant in febrile disorders.)

℞ Acidi Oxalici, gr. v.; Syrupi Limonis, f℥ss.; Aquæ destillatæ, f℥viiss. M. Fiat mistura, cujus capiat cochlearia duo ampla tertiis horis. (In inflammation of the stomach.)

℞ Syrupi Acidi Citrici, f℥ss.; Aquæ destillatæ, f℥viiss.; Tere simul et inter terendo adde, Nitratis Potassæ, gr. xxx.; et fiat solutio. Capiat cochleare amplum bihorio. (A useful refrigerant in hemoptysis with active inflammation.)

℞ Syrupi Aceti, f℥ij.; Aquæ destillatæ, f℥x. M. Fiat mistura, capiat cochleare amplum subinde. (To allay thirst in febrile affections.)

℞ Nitratis Potassæ, gr. xv.; Aquæ destillatæ, f℥vj.; Syrupi Limonis, f℥ij. M. Fiat haustus, ter in die sumendus. (In active hemorrhages.)

℞ Sodæ Bicarbonatis, gr. xx.; Aquæ, f℥iss.; Syrupi simplicis, fʒij. M. Fiat haustus, in effervescentiâ cum succi limonis recentis cochleari magno subinde sumendus. (To allay thirst in febrile and inflammatory disorders.)

SEDATIVES OR CONTRA-STIMULANTS.

℞ Acidi Hydrocyanici Diluti, min. j.; Aquæ destillatæ, fʒvij.; Syrupi simplicis, fʒj. M. Fiat haustus secundâ quâque horâ sumendus donec evanescent symptomata. (In gastric irritability, in nervous palpitations, in angina pectoris, &c.)

℞ Tincturæ Aconiti, min. v.; Aquæ Camphoræ, f℥j. M. Fiat haustus sextis horis sumendus donec dolor mitescat. (Most useful in acute rheumatism and in neuralgia; its effects should be carefully watched.)

℞ Tincturæ Aconiti; Succi Conii, ana, f℥ss. M. Sit pro lotione. (Exceedingly useful applied over the seat of the pain in tic douloureux.)

℞ Extracti Aconiti, gr. iss.; Myristicæ adipis, gr. xviij.; Mucilaginis, q. s. ut fiat massula. Divide in pilulas sex, quarum sumatur una sextis horis. (In chronic rheumatism and other painful affections.

℞ Anilinæ Sulphatis, gr. xij.; Extracti Hyoscyami, gr. xij.; Extracti Gentianæ, gr. xxiv. M. et divide in pilulas, xij., Sumat unam ter quaterve in die. (In chorea.)

℞ Anilinæ Sulphatis, gr. xvi.; Acidi Sulphurici Diluti, fʒj.; Syrupi Floris Aurantii, fʒss.; Aquæ destillatæ, ad ℥viij. M. Sumat cochlearia duo ampla ter in die. (In chorea.)

℞ Acidi Carbolici, min. ij.; Acidi Hydrocyanici Diluti, min. j.; Syrupi Tolutani, fʒj.; Mucilaginis Acaciæ, fʒj.; Aquæ Menthæ Viridis, fʒvj. M. Fiat haustus, mitte tales, vj. Sumat unam tertiis horis. (In irritable stomach, and in gastrodynia.)

℞ Ceriæ Oxalatis, gr. x.; Extracti Gentianæ, gr. xxx. M. et divide in pilulas decem Sumat unam ter quarterve in die. (In the sickness of pregnancy.)

℞ Chloroformi, min. x.; Tincturæ Belladonnæ, min. x.; Syrupi Croci, fʒj.; Aquæ destillatæ, f℥iss. M. Fiat haustus, capiat unum talem ter quarterve in die. (In epileptiform hysteria, and in hysterical neuralgia.)

℞ Chloroformi, min. x.; Syrupi Rhœados, fʒj.; Aquæ destillatæ, f℥iss. M. Fiat haustus, urgenti dolore sumendus. (A sedative draught in cancerous and spasmodic diseases.)

℞ Chloroformi, min. xx.; Cataplasmatis Lini, q. s. Fiat Cataplasma. (An anodyne poultice for cancerous and other painful ulcerations.)

℞ Chloroformi; Tincturæ Aconiti; Tincturæ Opii, ana, f℥j.; Linimenti Camphoræ compositi, f℥xiij. M. Fiat linimentum. (For neuralgic and rheumatic pains.)

℞ Succi Conii, f℥vj.; Syrupi Aurantii, f℥x.; Aquæ Cinnamomi, f℥vj. M. Fiat mistura, cujus capiat cochleare amplum ter in die. (In chronic rheumatism, in neuralgia, and in painful spasmodic diseases.)

℞ Creasoti min. ij.; Mucilaginis Acaciæ, f℥ij.; Aquæ Destillatæ, f℥iss.; Spiritus Myristicæ, min. xv. M. Fiat haustus secundâ quâque horâ sumendus, donec sedantur vomitiones. (In obstinate vomitings.)

℞ Succi Digitalis, min. xij.; Aquæ Camphoræ, f℥vj.; Syrupi Aurantii, f℥ij.; Acidi Hydrocyanici, min. j. M. Fiat haustus, bis terve in die sumendus. (An excellent remedy in nervous palpitations.)

℞ Spiritus Pyroxilici Rectificati, min. x.; Syrupi Aceti, f℥ij.; Aquæ, f℥vj.; M. Fiat haustus, capiat unum talem sextis horis. (A useful anodyne in the hectic of phthisis.)

℞ Spiritus Pyroxilici Rectificati, f℥ij.; Aquæ Lauro Cerasi, f℥ij.; Spiritus Ætheris Compositi, f℥ij.; Syrupi Floris Aurantii, f℥ss.; Mucilaginis Acaciæ, f℥ss.; Aquæ ad f℥viij. M. et sumat cochleare amplum quartis horis. (In the hacking cough of phthisis this will be found a valuable formulary.)

℞ Cyanidi Potassii, gr. j.; Aquæ destillatæ, f℥iiiss.; Syrupi Limonis, f℥ss. M. Divide in haustus octo, sumatur unus pro dosi. DONOVAN. (Used as a substitute for hydrocyanic acid.)

℞ Tincturæ Veratri Viridis, f℥j.; Vini Ipecacuanhæ, f℥j.; Syrupi Morphiæ Muriatis, f℥ss.; Aquæ ad f℥viij. M. et sumat cochlearia duo ampla tertiis horis. (A powerful arterial sedative, to be used in active pulmonic inflammations.)

GENERAL STIMULANTS.

℞ Ætheris Acetici, min. xxx.; Misturæ Camphoræ ut Murray, f℥j. M. Fiat haustus statim sumendus, et si opus sit post horam repetatur. (In hysteria.)

℞ Ætheris, f℥j.; Cetacei, gr. ij.; Tere simul et gradatim adde Aquæ Menthæ Piperitæ, f℥vij. Fiat haustus. (In nervous headache, spasmodic colic, fainting, &c.)

℞ Spiritus Ætheris Compositi, f℥j.; Aquæ Camphoræ, f℥vj.; Tincturæ Cardamomi Compositæ, f℥j. M. Fiat haustus statim sumendus, et repetatur bihorio molestente flatulentiâ. (In flatulent cholic.)

℞ Spiritus Ætheris compositi, f℥ss.; Tincturæ Opii, min. x.; Aquæ Camphoræ, f℥vij.; Essentiæ Anisi, min. xx. M. Fiat haustus sextis horis sumendus. (A useful stimulant in the low stages of fever, and also in flatulent colic.)

℞ Carbonatis Ammoniæ, gr. v.; Aquæ Camphoræ, f℥vj.; Infusi Arnicæ, f℥ij.; Essentiæ Anisi, min. xv. M. Fiat haustus, secundâ quâque horâ sumendus. (In adynamic febrile affections.)

℞ Ammoniæ Hydrochloratis, gr. lx.; Syrupi Hemidesmi, f℥ss.; Aquæ Cinnamomi, f℥viiss. M. Fiat mistura cujus capiat cochlearia ampla duo sextis horis. (A useful mixture in adynamic fevers and in subacute laryngitis.)

℞ Olei Cajeputi, min. v.; Mucilaginis Tragacanthæ, f℥j.; Tere simul, et adde, Infusi Caryophyllorum, f℥iss.; Spiritus Ammoniæ Aromatici, min. xv. M. Fiat haustus. (In hysterical and nervous affections.)

℞ Spiritus Ætheris Compositi, f℥j.; Liquoris Morphiæ Hydrochloratis, min. xv.; Aquæ Menthæ Piperitæ, f℥vj. M. Fiat haustus statim sumendus, et repetatur, si opus sit, quartâ parte horæ. (A powerful stimulating antispasmodic; very useful in spasm of the stomach and in spasmodic colic.)

℞ Tincturæ Arnicæ, f℥ij.; Infusi Acori ad f℥viij. M. Fiat mistura, cujus capiat unciam tertiis vel quartis horis. (In nervous headache and in old paralytic cases.)

℞ Calcis Chloratæ, gr. cxx.; Aquæ Destillatæ, Oj.; Solve et cola, dein adde, Mellis depurati, ℥j. Fiat gargarismus sæpè utendus, prius phialâ concussâ. (An exceedingly useful gargle in excessive mercurial salivation.)

℞ Calcis Chloratæ Liquoris, f℥xij.; Acidi Hydrocyanici Diluti, f℥j. Fiat lotio; Signetur, POISON. (An excellent application in chronic cutaneous diseases, when itching and tingling are very troublesome.)

℞ Camphoræ, rasæ et redactæ, gr. cxx.; Mucilaginis Acaciæ, f℥j.; Aquæ destillatæ, f℥vij. M. Fiat mistura, de quâ sumatur cochleare amplum quartis horis. (In cases of chronic bronchitis in the old and debilitated.)

℞ Camphoræ, rasæ et redactæ, gr. cxx.; Lactis recentis, f℥vj.; Aquæ Menthæ Pulegii, f℥ij. M. Fiat mistura, cujus capiat cochleare amplum quartâ quâque horâ. (In the same cases as the above.)

℞ Camphoræ, rasæ et redactæ, gr. xij.; Carbonatis Ammoniæ, gr. ix.; Extracti Hyoscyami, gr. vj.; Mucilaginis, q. s. Fiat massula et divide in pilulas sex, quarum sumatur una bihorio. (In the advanced stages of typhoid and nervous fevers.)

℞ Cerevisiæ Fermenti; Aquæ Camphoræ, ana, f℥vj.; Tincturæ Arnicæ, f℥ij. M. Fiat mistura, de quâ sumantur cochlearia tria ampla tertiis horis. (An excellent stimulant in the advanced stages of fevers when nervous symptoms predominate.)

℞ Ammoniæ Hydrochloratis, gr. xx.; Pulveris Aromatici, gr. vj.; Theriacæ, q. s. ut fiat bolus. Capiat unum talem sextâ quâque horâ. (For uses, see page 460.)

℞ Potassii Sulphureti, gr. xl.; Aquæ destillatæ, f℥vj.; Syrupi Hemidesmi, f℥ij. M. Fiat mistura, cujus capiat cochleare amplum ter quaterve in die. (In some rebellious cutaneous diseases.)

℞ Tincturæ Sabadillæ, f℥j.; Tincturæ Camphoræ, f℥iiss.; Essentiæ Rosmarini, f℥ss. M. Fiat embrocatio, cum panno laneo partibus dolentibus applicanda. (In neuralgia and in muscular pains.)

℞ Liquoris Sodæ Chloratæ, f℥iiss.; Infusi Serpentariæ, f℥vj.; Syrupi Aurantii, f℥iss. M. Fiat mistura; capiat cochlearia duo ampla quartis horis. (In the advanced stages of typhoid fever.)

℞ Olei Terebinthinæ, f℥iiss.; Mucilaginis Tragacanthæ, f℥ss.; Spiritus Armoraciæ compositi, f℥ss.; Aquæ Camphoræ, ad f℥viij. M. Capiat cochleare amplum unum secundâ quâque horâ. (A useful stimulant in adynamic fevers.)

℞ Olei Terebinthinæ, f℥ss.; Adipis præparati, ℥iss.; Olei Bergamotæ, min. xij. M. Fiat unguentum, mane nocteque applicandum. (In very chronic cases of eczema and herpes of the scalp.)

SPECIAL STIMULANTS.

℞ Arsenici Iodidi, gr. ij.; Mannæ duræ, gr. xl.; Mucilaginis, q. s. M. Fiat massula et divide in pilulas xx. quarum capiat unam ter in die. (In scaly diseases of the skin: the dose should be gradually increased, until one-fourth of a grain is taken three times a day.)

℞ Auri Iodidi, gr. j.; Pulveris Acaciæ, gr. xxx. Misce intimè et divide in partes æquales quindecim, e quibus sumatur una ter in die. (In secondary syphilitic affections; the dose should be gradually increased to one-tenth of a grain.)

℞ Auri Chloridi, gr. j.; Extracti Aconiti, gr. vj.; Pulveris Glycirrhizæ, gr. xl.; Syrupi, q. s. Misce intimè et divide massulam in pilulas viginti, quarum sumatur una ter in die. (In secondary syphilitic affections attended with much pain.)

℞ Solutionis Ammoniæ Arseniatis, f℥j.; Decocti Ulmi, f℥vij. M. Fiat mistura, cujus capiat cochlearia duo ampla quater in die. (In obstinate cutaneous affections, especially lepra and psoriasis.)

℞ Sodii Auro-terchloridi, gr. ij.; Mannæ duræ, gr. l. Tere benè simul, et ope mucilaginis forma in pilulas vigintiquatuor, è quibus sumatur una ter in die. (In syphilitic affections both primary and secondary.)

℞ Sodii Auro-terchloridi, gr. iv. solve in aquæ destillatæ, q. s.; Extracti Aconiti, gr. x.; Extracti Dulcamaræ, gr. lx.; Althææ radicis, in pulvere, q. s. M. Divide in pilulas lxxx., quarum capiat unam ter in die. GROTZNER. (Said to be very efficacious in venereal skin diseases.)

℞ Sodii Auro-terchloridi, gr. ij.; Aquæ destillatæ, f℥j.; Syrupi Simplicis, fℨij. M. Fiat solutio, de quâ sumantur guttæ duodecim ter in die. (One of the best forms for administering the preparations of gold, as the dose can be apportioned with great accuracy.)

℞ Copaibæ, fℨiij.; Solutionis Alkalinæ (Brandish), fℨiss.; Tere benè simul in mortario vitreo, dein adde inter terendum, Olei Limonum, fℨss., et Syrupi Simplicis, fℨiij. Fiat mistura, capiat cochleare minimum ter in die ex cyatho aquæ. (This is an excellent form for administering copaiva.)

℞ Copaibæ, f℥j.; Spiritus Ætheris Nitrosi, f℥ss.; Liquoris Potassæ, fℨij.; Tincturæ Lavandulæ compositæ, f℥ss.; Mucilaginis Acaciæ, f℥ij.; Aquæ Menthæ Piperitæ ad f℥viij. M. Sumat cochleare amplum ter in die. (A favourite formulary for the administration of copaiva.)

℞ Copaibæ, f℥j.; Olei Cubebarum, fℨss.; Aluminis, gr. cxx.; Syrupi Simplicis; Mucilaginis Acaciæ, a a, f℥j.; Aquæ Camphoræ ad f℥viij. M. Sumat cochleare amplum ter quaterve in die. (A very useful combination in gonorrhœa.)

℞ Copaibæ, fℨxij.; Tincturæ Cantharidis; Tincturæ Ferri Sesquichloridi, a a, fℨij. M. Sumat minima lx., e cyatho vinoso aquæ, ter in die. (In old standing gleet.)

℞ Copaibæ, fℨj.; Pulveris Cubebarum, gr. lx.; Aluminis Siccati, gr. xxx.; Magnesiæ quantum sufficit ut fiat massa. In pilulas triginta et sex dividenda, sumat unam secundis horis. (A good method of administering balsam when the stomach resents its taste in the fluid form.)

℞ Copaibæ, fℨj.; Sulphatis Ferri Siccati, gr. x.; Acidi Tannici; Pulveris Cubebarum, a a, gr. xxx.; Magnesiæ quantum sufficit ut fiat massa in pilulas xxx. dividenda; sumat duas vel tres tertiis horis. (I have found this a most useful formulary in cases of gonorrhœa occurring in delicate constitutions.)

℞ Ceræ Flavæ, gr. xv.; Liquefac cum calore leni, dein adde; Copaibæ, minima xxx.; Pulveris Cubebarum, gr. lx. M. et divide in pilulas xxx. Sumat duas tertiis horis. (A convenient and simple form for making balsam into pills.)

℞ Hydrargyri Iodidi viridis, gr. ij.; Hydrargyri cum creta, gr. xij.; Pulveris Aromatici, gr. ix. M. Divide in pulveres sex, quorum capiat unum omni nocte. (An excellent alterative in the cutaneous eruptions of infancy and childhood. The above proportions are for a child two years old.)

℞ Hydrargyri Iodidi rubri, gr. j.; Extracti Gentianæ; Extracti Anthemidis, ana, gr. xxx. M. Divide in pilulas xij. Capiat unam mane nocteque. (Alterative and tonic.)

℞ Hydrargyri Iodidi rubri, gr. v.; Spiritus Vini Rectificati, fʒj.; tere simul, dein adde, Aquæ destillatæ, f℥j.; Iodidi Potassii, gr. cxx.; Syrupi Aurantii, f℥ss. M. Fiat solutio, cujus sumantur min. xx. ter in die. (In secondary syphilitic affections; every twenty minims contain about a tenth of a grain of iodide of mercury and about two grains of iodide of potassium; it may be taken in decoction of dulcamara, of elm bark, or of sarsaparilla.)

℞ Indigo (aquæ guttis nonnullis subacta), gr. cxx. to ℥ss.; Pulveris Aromatici, gr. xv. to gr. xxx.; Syrupi Simplicis, f℥ss. to f℥j. M. Fiat electuarium sumendum in die in portionibus divisis. (For uses, see page 560.)

℞ Iodi, gr. iv.; Ætheris, fʒj. Solve. Capiat guttas decem ter in die. (Magendie's ethereal tincture of iodine.)

℞ Iodi, gr. ij.; Iodidi potassii, gr. xvj.; Syrupi Aurantii Floris, f℥ij. M. Capiat cochleare minimum ter in die ex cyatho aquæ. (A convenient and agreeable form for administering iodine. Each fluid drachm contains an eighth of a grain of iodine and one grain of iodide of potassium.)

℞ Potassii Bromidi, gr. xx.; Aquæ Aurantii Floris, f℥iiiss.; Syrupi Aurantii, f℥ss. M. Fiat mistura, cujus capiat partem quartam sextâ quâque horâ. (In chronic enlargements of the liver and spleen, and in secondary syphilitic affections.

℞ Olei Morrhuæ, f℥iv.; Liquoris Potassæ, fʒij.; Olei Limonis, fʒj.; Aquæ Carui, f℥iij.; Essentiæ Carui, fʒij. M. Fiat mistura cujus sumantur cochlearia duo ampla ter in die. (In cases in which cod-liver oil is indicated.)

℞ Olei Morrhuæ; Mucilaginis Tragacanthæ, ana, f℥ij.; Aquæ Menthæ Piperitæ, f℥iv.; tere benè simul ut fiat mistura, cujus capiat cochlearia duo ampla ter in die. (This or the preceding formula may be prescribed for persons who have an insuperable disgust to the oil.)

℞ Olei Morrhuæ, f℥ss.; Liquoris Potassæ, fʒss.; Olei Bergamotæ, fʒj.; Adipis præparati, q.s. M. Fiat unguentum, sæpé utendum. (In scrofulous ulcerations, and in obstinate cutaneous diseases.)

℞ Tincturæ Nucis Vomicæ, fʒij.; Tincturæ Cinchonæ, fʒvj.; Infusi Cinchonæ, f℥vij. M. Fiat mistura, cujus capiat unciam ter in die. (An excellent mixture in paralysis consequent on fevers and other acute diseases.

℞ Strychniæ, gr. j.; Acidi Sulphurici diluti, min. ij.; Spiritus Vini Rectificati, f℥j.; Aquæ destillatæ, f℥xj. M. Fiat solutio, cujus capiat cochleare minimum ter in die. (Each fluid drachm contains a twelfth of a grain of strychnia in the state of sulphate.)

℞ Strychniæ, gr. j.; Acidi Acetici, min. iv.; Spiritus Vini Rectificati, f℥j. M. Fiat solutio, cujus sumantur min. v. ter in die. (Every five minims contain a twelfth of a grain of strychnia in the state of acetate.)

℞ Tincturæ Nucis Vomicæ, f℥ss.; Olei Olivæ, f℥iss. M. (Ten drops to be rubbed over the temples three or four times a day in cases of amaurosis depending on paralysis of the optic nerve.)

℞ Potassii Bromidi, gr. xxx.; Adipis præparati, ℥j.; Bromi, min. vj. M. Fiat unguentum. (About the size of a walnut of this ointment should be rubbed over chronic glandular enlargements twice daily.)

TONICS.

℞ Acidi Phosphorici diluti, f℥ss.; Infusi Calumbæ, f℥vij. Tincturæ Cardamomi compositæ, f℥ss. M. Fiat mistura, cujus capiat unciam ter in die. (In phosphatic deposits from the urine.)

℞ Argenti Nitratis, gr. ij.; Fellis Bovini purificati; Extracti Anthemidis, ana, gr. xxx. M. Divide in pilulas duodecim, quarum sumatur una mane meridieque. (In chronic affections of the stomach accompanied by much pain, but without organic disease.)

℞ Argenti Chloridi, gr. xxxvj.; Muriatis Quiniæ, gr. xviij.; Mannæ duræ, gr. viij. M. Fiat massula ope mucilaginis, et divide in pilulas duodecim, quarum capiat unam sextis horis. (An excellent tonic in the early stages of tubercular phthisis, and in dyspepsia occurring in debilitated habits.)

℞ Argenti Oxidi, gr. vj.; Extracti Anthemidis, gr. lx. M. Divide in pilulas xij. e quibus sumatur una ter in die. (In angina pectoris, epilepsy, chorea, &c.)

℞ Solutionis Mineralis ut Lugol, No. 3, f℥j.; Liquoris Arsenicalis, f℥j. M. Fiat mistura, cujus capiat min. x. ter in die e cyatho vinario misturæ sequentis.

℞ Decocti Dulcamaræ, f℥vij.; Syrupi Aurantii, f℥j. M. (This combination of iodine and arsenite of potash will be found very effectual in the treatment of chronic cutaneous affections of a scaly character.)

℞ Beberiæ Sulphatis, gr. xvj.; Acidi Sulphurici diluti, min. x.; Aquæ destillatæ, f℥iiiss.; Syrupi Florum Aurantii, f℥ss. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. In cephalagia or neuralgic affections assuming a periodic character.

℞ Bismuthi Albi, gr. lx.; Pilulæ Colocynthidis compositæ, gr. l.; Syrupi Zingiberis, q. s. M. Fiant pilulæ xxiv. quarum capiat duas mane meridieque. (In pyrosis with constipation.)

℞ Acidi Cetrarici, gr. xxiv.; Extracti Calumbæ, gr. xxx. M. Divide in pilulas xij. quarum sumatur una quartâ quâque horâ per dies duos, febre aggrediente. (An excellent febrifuge.)

℞ Tincturæ Chiratæ, f℥ss.; Extracti Cinchonæ Flavæ Liquidi, fʒij.; Infusi Cascarillæ, f℥viss.; Syrupi Aurantii, f℥vj. M. Fiat mistura, capiat cochlearia ampla duo ter in die. (An excellent tonic mixture in convalescence from acute diseases.)

℞ Quiniæ Hydrochloratis, gr. xij.; Acidi Hydrochlorici diluti, min. v.; Aquæ destillatæ, f℥vij.; Syrupi Aurantii Floris, f℥j. M. Fiat mistura, capiat cochlearia duo ampla ter in die. (A useful tonic mixture in chronic debility.)

℞ Quiniæ *informis*, gr. ij.; Acidi Citrici, gr. j.; Syrupi Limonis, fʒj.; Aquæ destillatæ, fʒvij. M. Fiat haustus; mitte tales sex, capiat unum ter in die. (In general debility and in convalescence from acute diseases.)

℞ Quiniæ Arseniatis, octavem partem grani; Aquæ destillatæ, fʒvij.; Syrupi Aurantii Floris, fʒj. M. Fiat haustus: Capiat æger unum talem quartis horis per dies duos, febre aggrediente. (In tertian agues, when quinia and arsenic separately fail to cure the disease.)

℞ Quiniæ Valerianatis, gr. viij.; Infusi Cascarillæ, f℥iv. M. Fiat mistura cujus capiat semiunciam sextis horis. (An excellent remedy for hysterical and neuralgic affections occurring in debilitated habits.)

℞ Ferri Pulveris, gr. xxxvj.; Pilulæ Aloës et Myrrhæ, gr. lx.; Olei Juniperi, min. x. M. Fiat massula ope mucilaginis, et in pilulas viginti quatuor divide: Capiat duas ter in die. (An excellent form for administering iron in chlorotic amenorrhœa.)

℞ Ferri Ammonio-tartratis, gr. xl.; Aquæ destillatæ, f℥vij.; Syrupi Hemidesmi, f℥j. M. Fiat mistura, cujus capiat cochlearia duo ampla ter in die. (A mild chalybeate tonic.

℞ Ferri Bromidi, gr. lx.; Syrupi Aurantii Floris, f℥ss.; Aquæ Aurantii, f℥iss. M. Fiat solutio, cujus capiat cochleare minimum sextis horis ex cyatho infusi amari. (In secondary syphilitic diseases attended with debility, in anemic affections, &c.)

℞ Ferri Carbonatis Saccharati, gr. xxx.; Pulveris Myrrhæ, gr. xxiv.; Pulveris Aromatici, gr. xxx. M. Divide in partes æquales duodecim, quarum sumatur una ter in die. (An excellent combination in the protracted diarrhœas of infancy and childhood.)

℞ Ferri Ammonio-citratis, gr. lx.; Aquæ Aurantii, f℥viiss.; Syrupi Simplicis, f℥ss. M. Fiat mistura cujus capiat cochleare amplum quartis horis. (An agreeable form for administering a mild preparation of iron.)

℞ Ferri Iodidi, gr. xxx.; Croci, in pulvere, gr. cxx.; Sacchari puri, ℥iv. M. Fiant Trochisci, No. 120; sumantur sex usque ad decem quotidie; PIERQUIN. (An agreeable mode of administering the iodide of iron in amenorrhœa and chlorosis.)

℞ Ferri Phosphatis, gr. xxx.; Pulveris Myrrhæ, gr. xij.; Sacchari puri, gr. vj. M. Divide in pulveres sex, quorum sumatur unus mane meridieque. (In scrofulous diseases of the bones in children.

℞ Ferri Valerianatis, gr. xij.; Olei Sabinæ, min. vj.; Mannæ duræ, quantum sufficit ut fiant pilulæ sex, quarum capiat unam ter in die. (In chorea and other nervous affections occurring in young girls about the age of puberty.)

℞ Salicin, gr. xvj.; Infusi Gentianæ compositi, f℥viiss.; Syrupi Hemidesmi, f℥ss. M. Capiat cochlearia ampla duo ter in die. (An excellent tonic in convalescence from acute diseases of the digestive organs.)

℞ Salicin, gr. xl.; Pulveris aromatici, gr. lx. M. Divide in partes æquales duodecim, quarum capiat unam quartâ quâque horâ per dies duos, febre aggrediente. (An excellent substitute for sulphate of quinia.)

APPENDIX B.

POSOLOGICAL TABLE.

In the following table I have endeavoured, as far as practicable, to give in a condensed form the dose of each medicine not only for adults but also for children of *one year of age*, and likewise the form in which such medicine is most generally exhibited. *When I consider the medicine not suited for infantile use, a blank is left in the column for the dose.* In most posological tables the average dose for an adult alone is given, and the dose for younger patients is to be regulated by some such rule as this :—The dose for an adult being 1, suppose gr. lx.; under one year it will be from 1–16th to 1–12th, that is, from gr. iv. to gr. v.; at two years old, 1–8th or gr. viii.; at three years old, 1–6th, or gr. x.; at four years old, 1–4th or gr. xv.; at seven years old, 1–3rd or gr. xx.; at fourteen years old, $\frac{1}{2}$ or gr. xxx.; and at twenty years old, 2–3rds or gr. xl.; and from twenty to sixty, a full dose. The rules furnished by Gaubius and Dr. Young differ somewhat from these. Gaubius takes the dose for an adult as unity, and for other ages as follows :—

One year old	$\frac{1}{13}$	Seven years old	$\frac{1}{3}$
Two years old	$\frac{1}{8}$	Fourteen years old	$\frac{1}{2}$
Three years old	$\frac{1}{6}$	Twenty years old	$\frac{2}{3}$
Four years old	$\frac{1}{4}$	From twenty to sixty years old	1

Dr. Young says : "For children under twelve years, the doses of most medicines must be diminished in the proportion of the age to the age increased by 12." Thus, for a child of two years,—2 : 2+12 : : the adult dose, or 1 : to the child's dose, or 7. Or, to state it more simply, $\frac{2}{2+12}=\frac{1}{7}$. Hence,

For one year.	For two years.	For three years.	For four years.	For six years.	
$\frac{1}{1+12}=\frac{1}{13}$.	$\frac{2}{2+12}=\frac{1}{7}$.	$\frac{3}{3+12}=\frac{1}{5}$.	$\frac{4}{4+12}=\frac{1}{4}$.	$\frac{6}{6+12}=\frac{1}{3}$.	&c.

At twelve the dose is one-half that of the adult.

Independent of the general differences which clearly must exist between the doses suited for a child and an adult, other circumstances must be considered in regulating the dose we should prescribe, such as sex, habit, disease, climate, mind, temperament, race, and idiosyncrasy.

Habit powerfully influences the dose we should direct, and of this statement the most remarkable example is opium. I myself had under my care some years ago a lady, whom I repeatedly saw drink off a wineglassful of laudanum with no more effort or effect than most other people would take a glass of sherry. In certain diseases we also see doses borne which could not otherwise be tolerated; witness the large doses of tartar emetic that may be administered in dislocation of the hip-joint, without producing nausea; and the large quantity of opium that may be administered in senile gangrene. The most remarkable case on record, of the combined influence of disease and habit in establishing a tolerance of otherwise potent medicines, is that related by Zeviani of a woman named Galvani, who in falling down stairs divided her urethra by coming into contact with a knife; the wound healed, but at the expense of the permeability of the passage, and for thirty-four years she could only void her urine by vomiting it up daily. To relieve the excruciating agony attendant upon this process, she had recourse to opium, and in the thirty-four years consumed two *cwt.* of the crude drug, her daily dose at last being two hundred grains.

But perhaps the most important item to enter into the prescriber's calculation is idiosyncrasy, by which term is meant the peculiar effects some medicines exert over particular persons. I have had under my care patients whom the smallest dose of assafœtida would make faint; I have had also patients to whom I could never administer iodide of potassium without the induction of severe coryza. I have seen others in whose case the smallest particle of mercury was inadmissible, in consequence of the severe salivation which it would bring on. The most remarkable idiosyncrasy with which I am acquainted existed in an individual whom I knew, who would fall down in a fit were any person to persevere in cracking his nails in his presence: at the first sound his face became congested and livid, and were the operator cruel enough to persevere with the experiment, he would go off, almost as if in epilepsy, although at all other times free from any such tendency.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Absinthium	gr. xxx. to gr. lx.	.. ..	In powder or infusion.
Acetum	fʒij. to f℥ss.	.. ..	In water.
Colchici	fʒss. to fʒij.	.. ..	In draught or mixture.
Opii	min. x. to min. xxx.	min. ss. to min. j.	ditto.
Scillæ	fʒss. to fʒiss.	min. v. to min. x.	ditto.
Acidum Benzoicum.. ..	gr. v. to gr. xxx.	.. ..	Largely diluted.
Citricum	gr. xx. to gr. lx.	.. ..	In draught or mixture.
Gallicum	gr. iij. to gr. x.	gr. ss. to gr. j.	Suspended in water or in pill.
Hydrocyanicum dilutum	min. j. to min. ij.	.. ..	In draught or mixture.
Muriaticum dilutum ..	fʒss. to fʒj.	min. ij. to min. v.	ditto.
Nitricum dilutum ..	fʒss. to fʒj.	ditto.	ditto.
Nitro-hydrochloricum dilutum	fʒss. to fʒj.	ditto.	ditto.
Oxalicum	gr. j. to gr. ij.	.. ..	ditto.
Phosphoricum dilutum	fʒss. to fʒj.	min. ij. to min. v.	ditto.
Sulphuricum dilutum..	fʒss. to fʒj.	ditto.	ditto.
Sulphuricum aromaticum	fʒss. to fʒj.	ditto.	ditto.
Tannicum	gr. ij. to gr. x.	gr. ½ to gr. ½	In pill, draught, or mixture.
Tartaricum ..	gr. x. to gr. xxx.	.. ..	In draught or mixture.
Æther Aceticus	fʒss. to fʒij.	min. ij. to min. v.	ditto.
Sulphuricus	fʒss. to fʒij.	ditto.	ditto.
Allium	ʒss. to ʒj.	.. ..	In infusion.
Aloine	gr. ½ to gr. iij.	.. ..	In pill.
Alumen	gr. x. to gr. xxx.	gr. j. to gr. iij.	In powder, pill, or mixture.
Ammoniacum	gr. x. to gr. xxx.	.. ..	In pill or emulsion.
Ammoniæ arsenias ..	gr. 1-12th to gr. 1-10th	.. ..	In pill or solution.
bicarbonas ..	gr. v. to gr. xxx.	.. ..	In draught or mixture.
liquor	min. x. to min. xxx.	min. j. to min. ij.	ditto.
hydrosulphuretum ..	min. iv. to min. vj.	.. ..	ditto.
hydrochloras ..	gr. v. to gr. xxx.	.. ..	In pill or solution.
carbonas (Antacid) ..	gr. ij. to gr. x.	.. ..	ditto.
(Emetic) ..	gr. xx. to gr. xxx.	.. ..	In draught.
(Stimulant)	gr. iij. to gr. x.	.. ..	In pill or solution.
Antimonii oxidum ..	gr. ij. to gr. x.	.. ..	In pill or powder.
pulvis compositus ..	gr. ij. to gr. v.	.. ..	ditto.
sulphuretum ..	gr. x. to gr. cxx.	.. ..	In electuary.
sulphuretum præcipitatum ..	gr. j. to gr. iv.	.. ..	In pill.
Antimonium tartaratum, viz.:—			
(Diaphoretic)..	gr. 1-12th to gr. 1-6th	.. ..	In draught or mixture.
(Emetic) ..	gr. ij. to gr. v.	gr. 1-12th to gr. ½	In draught.
(Expectorant)	gr. 1-10th to gr. 1-6th	.. ..	In draught or mixture.
(Sedative) ..	gr. j. to gr. iij.	.. ..	ditto.
Aqua Anethi	f℥ss. to f℥iij.	fʒss. to fʒj.	ditto.
Anisi	f℥ss. to f℥ij.	ditto.	ditto.
Camphoræ	f℥ss. to f℥j.	ditto.	ditto.
Carui	f℥j. to f℥iv.	ditto.	ditto.
Cassiæ	f℥j. to f℥iv.	ditto.	ditto.
Chalybeata	f℥j. to f℥ij.	ditto.	ditto.
Cinnamomi	f℥j. to f℥iv.	ditto.	ditto.
Fœniculi	f℥j. to f℥iv.	ditto.	ditto.
Lauro-cerasi ..	fʒss. to fʒj.	min. ij. to min. v.	ditto.
Magnesiæ bicarbonatis ..	f℥ss. to f℥iij.	fʒss. to fʒj.	ditto.
Menthæ piperitæ ..	f℥j. to f℥ij.	ditto.	ditto.
pulegii ..	f℥j. to f℥ij.	ditto.	ditto.
viridis ..	f℥j. to f℥ij.	ditto.	ditto.
Picis liquidæ ..	Oj. to. Oij.	.. ..	ditto.
Pimentæ	f℥j. to f℥ij.	fʒss. to fʒj.	ditto.
Potassæ effervescens ..	f℥ij. to f℥viij.	.. ..	In draught.
Sodæ effervescens ..	f℥ij. to f℥viij.	.. ..	ditto.
Argenti chloridum	gr. iij. to gr. v.	.. ..	In pill.
nitras (Tonic) ..	gr. 1-6th to gr. iij.	.. ..	ditto.
Argenti oxidum	gr. ss. to gr. j.	.. ..	ditto.
Arsenici iodidum	gr. 1-10th to gr. 1-4th.	.. ..	ditto.
Arsenicum album	gr. 1-16th to gr. 1-8th.	.. ..	ditto.
Assafœtida	gr. x. to gr. xxx.	.. ..	ditto.
Auri iodidum	gr. 1-15th to gr. 1-10th.	.. ..	ditto.
perchloridum ..	gr. 1-20th to gr. 1-15th.	.. ..	ditto.
peroxydum	gr. 1-10th to gr. 1-4th.	.. ..	ditto.
pulvis	gr. 1-4th to gr. 1-3rd.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Balsamum Canadense ..	gr. xx. to gr. xxx.	.. ..	In pill or emulsion.
Peruvianum ..	min. xx. to min. xl.	.. ..	Suspended in mixture.
Barii bromidum	gr. j. to gr. v.	.. ..	In draught or mixture.
chloridum	gr. ij. to gr. v.	.. ..	ditto.
Beberiæ sulphas	gr. j. to gr. v.	.. ..	In pill or mixture.
Bismuthum album ..	gr. x. to gr. xxx.	.. ..	Suspended in mixture.
Borax	gr. xx. to gr. xxx.	.. ..	In solution or powder.
Bromi solutio	min. iij. to min. vj.	.. ..	In draught.
Black drop	min. v. to min. viij.	.. ..	ditto.
Calcii bromidum	gr. iij. to gr. x.	.. ..	In pill.
Calomelas (Alterative) ..	gr. j. to gr. iij.	gr. ¼ to gr. j.	In powder or pill.
(Antiphlogistic) ..	gr. iij. to gr. v.	.. ..	ditto.
(Cathartic) ..	gr. ij. to gr. vj.	gr. ½ to gr. j.	ditto.
Calx chlorata	gr. ij. to gr. v.	.. ..	In draught.
Cambogia	gr. j. to gr. v.	.. ..	In pill or suspended in draught.
Camphora	gr. j. to gr. x.	.. ..	In pill, bolus, or suspended in draught.
Capsicum	gr. ij. to gr. viij.	.. ..	In pill.
Carrara water	f℥ij. to f℥vj.	.. ..	In draught.
Cassiæ pulpa	℥ss. to ℥iij.	.. ..	In confection.
Catechu	gr. x. to gr. lx.	gr. ½ to gr. ij.	In powder or pill.
Cerevisiæ fermentum ..	f℥ij. to f℥iv.	.. ..	In mixture.
Ceriæ Nitras	gr. j. to gr. iij.	.. ..	In pill.
Oxalas	gr. j. to gr. iij.	.. ..	ditto.
Cetrarin	gr. ij. to gr. v.	.. ..	ditto.
Chloroformum	min. v. to min. xxx.	.. ..	In draught suspended by mucilage, &c.
Cinchonæ cortex (Antiperiodic)	gr. lx. to gr. cxx.	.. ..	In powder.
(Tonic) ..	gr. v. to gr. xx.	.. ..	ditto.
Cinchonia	gr. j. to gr. v.	.. ..	In pill.
Confectio Cassiæ	gr. cxx. to ℥j.	.. ..	As confection.
Catechu composita ..	gr. xxx. to gr. cxx.	.. ..	ditto.
Piperis	gr. xxx. to gr. cxx.	.. ..	ditto.
Rosæ caninæ ..	gr. lx. to gr. cxx.	.. ..	ditto.
Rosæ gallicæ ..	gr. x. to gr. cxx.	.. ..	ditto.
Scammonii ..	gr. x. to gr. xxx.	.. ..	ditto.
Sennæ	gr. cxx. to ℥ss.	.. ..	ditto.
Sulphuris.. ..	gr. cxx. to ℥ss.	.. ..	ditto.
Terebinthinæ ..	gr. cxx. to ℥iv.	.. ..	Rubbed up with water.
Conia	gr. 1-60th to gr. 1-30th.	.. ..	In pill.
Copaiba	min. x. to f℥j.	.. ..	In emulsion.
Corrosivum sublimatum ..	gr. 1-12th to gr. 1-8th.	.. ..	In pill or solution.
Creasotum	min. j. to min. v.	.. ..	In draught or pill.
Creta præparata	gr. x. to gr. cxx.	gr. j. to gr. iij.	In powder or mixture.
Cubebæ pulvis	gr. xx. to gr. cxx.	.. ..	In powder.
Cupri sulphas (Astringent & Tonic)	gr. ss. to gr. iij.	.. ..	In pill.
(Emetic) ..	gr. xij. to gr. xv.	.. ..	In draught.
Cuprum ammoniatum ..	gr. ss. to gr. iv.	.. ..	In pill.
Cusso	f℥ss. to f℥j.	.. ..	In infusion.
Decoctum Actææ	f℥j. to f℥ij.	.. ..	In draught or mixture.
Aloes compositum ..	f℥ss. to f℥ij.	.. ..	ditto.
Althææ	f℥j. to f℥ij.	.. ..	ditto.
Belæ	f℥ss. to f℥ij.	.. ..	ditto.
Cetrariæ.. ..	f℥j. to f℥iv.	.. ..	ditto.
Chimaphilæ ..	f℥j. to f℥ij.	.. ..	ditto.
Cinchonæ Flavæ ..	f℥j. to f℥ij.	.. ..	ditto.
Colocynthidis ..	f℥ij. to f℥ss.	.. ..	ditto.
Gallæ	f℥ss. to f℥ij.	.. ..	ditto.
Granati radicis ..	f℥iv. to f℥viij.	.. ..	ditto.
Guaiaci	f℥ij. to f℥iv.	.. ..	ditto.
Hæmatoxyli ..	f℥j. to f℥ij.	.. ..	ditto.
Hordei	f℥j. to f℥ij.	.. ..	ditto.
Lichenis islandici (*Cetraria*) ..	f℥j. to f℥ij.	.. ..	ditto.
Mezerei	f℥ij. to f℥iv.	.. ..	ditto.
Pareiræ	f℥j. to f℥iij.	.. ..	ditto.
Pyrolæ (*Chimaphila*)	f℥j. to f℥ij.	.. ..	ditto.
Quercus	f℥j. to f℥iv.	.. ..	ditto.
Sarsæ	f℥iv. to f℥viij.	.. ..	ditto.
compositum ..	f℥iv. to f℥vj.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Decoctum Scoparii	f℥j. to f℥iv.	.. ..	In draught or mixture.
compositum	f℥j. to ℥iv.	.. ..	ditto.
Taraxaci ..	f℥j. to f℥ij.	.. ..	ditto.
Tormentillæ ..	f℥j. to f℥iss.	.. ..	ditto.
Ulmi	f℥ij. to f℥vj.	.. ..	ditto.
Delphinia	gr. 1-12th to gr. 1-4th	.. ..	In pill.
Digitalinum	gr. 1-60th to gr. 1-20th.	.. ..	ditto.
Digitalis (Diuretic)	gr. ss. to gr. ij.	gr. 1-8th to gr. ¼th.	In powder or pill.
(Sedative) ..	gr. j. to. gr. iij.	.. ..	ditto.
Elaterina	gr. 1-30th to 1-10th.	.. ..	In pill or draught.
Elaterium	gr. 1-16th to gr. 1-4th.	.. ..	ditto.
Emetina, *pure*	gr. 1-8th to gr. ss.	.. ..	ditto.
impure	gr. ss. to gr. iij.	.. ..	ditto.
Ergota	gr. x. to gr. lx.	.. ..	In draught
Ergotin	gr. ij. to gr. iv.	.. ..	In pill or draught.
Essentia Anisi	min. x. to min. xl.	min. j. to min. v.	ditto.
Carui	min. x. to min. xl.	ditto.	ditto.
Fœniculi	min. x. to min. xxx.	ditto.	ditto.
Zingiberis	min. x. to min. xl.	min. j. to min. ij.	ditto.
Extractum Aconiti	gr. 1-6th to gr. 1-3rd.	.. ..	ditto.
Aloes Barbadensis ..	gr. v. to gr. xv.	.. ..	In pill.
Socotrinæ ..	gr. v. to gr. xv.	.. ..	ditto.
Anthemidis ..	gr. x. to gr. xxx.	.. ..	ditto.
Belæ liquidum ..	fʒss. to fʒij.	.. ..	In mixture.
Belladonnæ ..	gr. ss. to gr. ij.	.. ..	In pill.
Calumbæ ..	gr. v. to gr. xx.	.. ..	ditto.
Cannabis Indicæ ..	gr. 2-3rd to gr. v.	.. ..	ditto.
Cinchonæ flavæ liquidum	min. x. to min. xx.	.. ..	In draught.
Colchici ..	gr. j. to gr. iij.	.. ..	In pill.
aceticum ..	gr. j. to gr. iij.	.. ..	ditto.
Colocynthidis compositum	gr. v. to gr. xv.	.. ..	ditto.
Conii	gr. iij. to gr. v.	.. ..	ditto.
Cotyledon ..	gr. j. to gr. v.	.. ..	ditto.
liquidi ..	fʒss. to fʒj.	.. ..	In draught or mixture.
Ergotæ liquidum ..	min. x. to min. xx.	.. ..	In draught.
Filicis liquidum ..	gr. xviij. to gr. xxiv.	.. ..	In emulsion.
Fuliginis ..	gr. v. to gr. x.	.. ..	In pill or draught.
Gentianæ ..	gr. x. to gr. xxx.	.. ..	In pill.
Glycyrrhizæ ..	gr. x. to gr. xxx.	.. ..	ditto.
Hæmatoxyli ..	gr. x. to gr. xxx.	.. ..	ditto.
Hydrocotyle Asiaticæ	gr. ss. to gr. iij.	.. ..	ditto.
Hyoscyami ..	gr. ij. to gr. xv.	.. ..	ditto.
Jalapæ	gr. v. to gr. xx.	.. ..	ditto.
Krameriæ ..	gr. x. to gr. xl.	.. ..	ditto.
Lactucæ ..	gr. xx. to gr. xl.	.. ..	ditto.
Lupuli	gr. v. to gr. xx.	.. ..	ditto.
Nucis-vomicæ ..	gr. ss. to gr. iij.	.. ..	ditto.
Opii	gr. ss. to gr. iv.	.. ..	ditto.
Liquidi ..	min. x. to min. xl.	.. ..	In draught.
Pareiræ liquidum ..	gr. x. to gr. xxx.	.. ..	Rubbed up in draught or mixture.
Quassiæ ..	gr. v. to gr. xv.	.. ..	In pill.
Rhei	gr. v. to gr. xx.	.. ..	ditto.
Sabadillæ ..	gr. ⅙ to gr. ¼.	.. ..	ditto.
Sarsæ liquidum ..	fʒss. to fʒij.	.. ..	In mixture or draught.
Sennæ fluidum ..	fʒj. to fʒij.	.. ..	ditto.
Sennæ fluidum et Spigeliæ fluidum ..	fʒss. to fʒj.	.. ..	ditto.
Stramonii ..	gr. ¼ to gr. ss.	.. ..	In pill.
Taraxaci ..	gr. v. gr. xx.	.. ..	ditto.
Uvæ ursi ..	gr. v. to gr. xv.	.. ..	ditto.
Veratri viridis (Emetic)	gr. ij. to gr. iij.	.. ..	ditto.
Veratri viridis (Sedative)	gr. 1-4th to gr. j.	.. ..	ditto.
Fel Bovinum Purificatum ..	gr. v. to gr. x.	.. ..	ditto.
Ferri acetatis tinctura ..	min. xxx. to fʒj.	.. ..	In draught or mixture.
ammonio-chloridum ..	gr. v. to gr. xv.	.. ..	In pill.
et ammoniæ-citras ..	gr. v. to gr. viij.	.. ..	In pill or mixture.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Ferri et ammoniæ-tartras ..	gr. v. to gr. viij.	.. ..	In pill or mixture.
arsenias	gr. 1-12th to gr. 1-8th.	.. ..	In pill.
bromidum	gr. iij. to gr. viij.	.. ..	In pill or mixture.
carbonas	gr. xxx. to ʒss.	.. ..	In bolus.
saccharata ..	gr. v. to gr. xxx.	.. ..	ditto.
et magnesiæ citras ..	gr. ij. to gr. x.	.. ..	In pill or draught.
et manganesiæ carbonas saccharata	gr. v. to gr. xx.	.. ..	In pill or bolus.
et quiniæ citras ..	gr. iij. to gr. vj.	.. ..	In pill or draught.
iodidum	gr. ij. to gr. v.	.. ..	In pill.
iodidi syrupus ..	fʒss. to fʒj.	min. v. to min. x.	In draught or mixture.
lactas	gr. vj. to gr. xij.	.. ..	In pill.
oxydum magneticum ..	gr. v. to gr. xx.	.. ..	ditto.
rubrum ..	gr. xxx. to ʒss.	.. ..	In bolus.
percyanidum ..	gr. iij. to gr. vj.	.. ..	In pill.
pernitras liquor ..	fʒss. to fʒj.	.. ..	In draught or mixture.
peroxidum	gr. xxx. to ʒss.	.. ..	In bolus.
hydratum ..	gr. xl. to ʒss.	.. ..	ditto.
phosphas	gr. v. to gr. x.	.. ..	In pill.
phosphatis syrupus ..	fʒj. to fʒiv.	min. v. to min. xx.	In draught or mixture.
pulvis	gr. j. to gr. x.	.. ..	In pill.
sulphas	gr. j. to gr. v.	.. ..	In pill or draught.
granulata	gr. j. to gr. v.	.. ..	ditto.
saccharata ..	gr. j. to gr. viij.	.. ..	ditto.
exsiccata ..	gr. ss. to gr. iij.	.. ..	In pill.
valerianas	gr. ss. to gr. j.	.. ..	ditto.
Ferrum tartaratum ..	gr. v. to gr. xx.	.. ..	In mixture or bolus.
Galbanum	gr. x. to gr. xx.	.. ..	In pill.
Gallæ	gr. v. to gr. xx.	.. ..	In pill or powder.
Guaiaci resina	gr. x. to gr. xxx.	.. ..	In confection.
Hydrargyri bicyanidum ..	gr. 1-12th to gr. 1-8th	.. ..	In pill.
bromidum ..	gr. 1-16th to gr. 1-4th	.. ..	ditto.
iodidum rubrum ..	gr. 1-16th to gr. 1-8th	.. ..	ditto.
viride ..	gr. j. to gr. iij.	.. ..	ditto.
iodo-chloridum ..	gr. 1-16th to gr. 1-12th	.. ..	ditto.
oxydum rubrum ..	gr. ¼ to gr. ss.	.. ..	ditto.
sub-bromidum ..	gr. j. to gr. ij.	.. ..	ditto.
Hydrargyrum cum creta ..	gr. v. to gr. xxx.	gr. j. to gr. ij.	In powder or pill.
magnesia ..	gr. v. to gr. xxx.	ditto.	ditto.
Hydrogenii peroxidum ..	fʒss. to f℥ss.	.. ..	In draught.
Indigo	gr. v. to gr. cxx.	.. ..	In bolus.
Infusum Absinthii	f℥j. to f℥ij.	.. ..	In draught or mixture.
Allii	f℥ij. to f℥iij.	.. ..	ditto.
Anthemidis ..	f℥j. to f℥ij.	.. ..	ditto.
Armoraciæ compositum	f℥j. to f℥ij.	.. ..	ditto.
Arnicæ	fʒij. to f℥ss.	.. ..	ditto.
Aurantii	f℥j. to f℥ij.	.. ..	ditto.
Bucco	f℥j. to f℥ij.	.. ..	ditto.
Calami aromatici ..	f℥j. to f℥ij.	.. ..	ditto.
Calumbæ	f℥j. to f℥ii.	.. ..	ditto.
Caryophylli ..	f℥j. to f℥ij.	.. ..	ditto.
Cascarillæ ..	f℥j. to f℥ij.	.. ..	ditto.
Catechu	f℥j. to f℥ij.	.. ..	ditto.
Centaurei ..	f℥j. to f℥ij.	.. ..	ditto.
Chiratæ	f℥j. to f℥ij.	.. ..	ditto.
Cinchonæ flavæ ..	f℥j. to f℥ij.	fʒss. to fʒj.	ditto.
Cuspariæ ..	f℥j. to f℥ij.	.. ..	ditto.
Cusso	℥iv. to ℥viii.	.. ..	ditto.
Digitalis (Diuretic) ..	fʒij. to f℥ss.	min. x. to min. xx.	ditto.
(Sedative) ..	f℥j. to f℥ij.	.. ..	ditto.
Dulcamaræ ..	f℥j. to f℥iij.	.. ..	ditto.
Ergotæ	f℥ss. to f℥ij.	.. ..	ditto.
Gallæ	f℥ss. to f℥ij.	.. ..	ditto.
Gentianæ	f℥j. to f℥ij.	.. ..	ditto.
compositum	f℥j. to f℥ij.	.. ..	ditto.
Hemidesmi ..	f℥j. to f℥ij.	.. ..	ditto.
Hydrocotyle Asiaticæ ..	f℥ij. to f℥iv.	.. ..	ditto.
Juniperi	f℥j. to f℥ij.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Infusum Krameriæ ..	f℥j. to f℥ij.	fʒss. to fʒj.	In draught or mixture.
Lini	f℥ij. to f℥iv.	.. ..	ditto.
Lupuli	f℥j. to f℥ij.	fʒss. to fʒj.	ditto.
Marrubii	f℥iij. to f℥iv.	.. ..	ditto.
Maticæ	f℥j. to f℥ij.	fʒss. to fʒj.	ditto.
Menthæ	f℥j. to f℥ij.	ditto.	ditto.
Quassiæ	f℥j to f℥ij.	.. ..	ditto.
Rhei	f℥ss. to f℥ij.	.. ..	ditto.
Rosæ acidum ..	f℥ss. to f℥ij.	fʒss. to fʒj.	ditto.
Sabinæ	f℥ss. to f℥j.	.. ..	ditto.
Sassafras	f℥j. to f℥ij.	.. ..	ditto.
Senegæ	f℥j. to f℥ij.	.. ..	ditto.
Sennæ	f℥ij. to f℥iv.	.. ..	ditto.
Serpentariæ ..	f℥j. to f℥ij.	.. ..	ditto.
Simarubæ ..	f℥j. to f℥ij.	.. ..	ditto.
Spigeliæ	f℥ss. to f℥j.	.. ..	ditto.
Sumbul	f℥ss. to f℥j.	.. ..	ditto
Uvæ ursi	f℥ss. to f℥ij.	.. ..	ditto.
Valerianæ ..	f℥j. to f℥ij.	.. ..	ditto.
Ipecacuanha (Emetic) ..	gr. xij. to gr. xxx.	gr. ij. to gr. iv.	In powder or draught.
(Expectorant) ..	gr. ¼ to gr. ij.	gr. 1-12th to gr. ¼.	ditto.
Jalapa	gr. x. to gr. xxx.	gr. j. to gr. ij.	In powder.
Jelly of Bark	gr. lx. to gr. cxx.		
Corsican Moss ..	gr. lx. to gr. cxx.		
Kamela	gr. lx. to ℥ss.	.. ..	In bolus.
Kino	gr. x. to gr. xxx.	gr. j. to gr. ij.	In powder or pill.
Krameria	gr. x. to gr. xxx.	ditto.	ditto.
Lactucarium	gr. v. to gr. xx.	.. ..	In pill.
Limonis Succus	f℥ss. to f℥vj.	.. ..	In draught or mixture.
Liquor Ammoniæ	min. x. to min. xxx.	.. ..	ditto.
acetatis ..	fʒss. to fʒj.	min. v. to min. x.	ditto.
citratis ..	fʒij. to fʒj.	min. x. to min. xx.	ditto.
Arsenicalis	min. ij. to min. viij.	.. ..	ditto.
Arsenici chloridi ..	min. iij. to min. x.	.. ..	ditto.
Arsenici et Hydrargyri hydriodatis ..	min. x. to min. xxx.	.. ..	ditto.
Barii chloridi ..	min. v. to min. x.	.. ..	ditto.
Calcii chloridi ..	min. xxx. to fʒij.	.. ..	ditto.
Calcis	f℥j. to f℥iv.	fʒss. to fʒj.	ditto.
chloratæ ..	min. x. to min. xx.		ditto.
saccharatus	fʒj. to fʒiij.	min. v. to min. x.	ditto.
Chlori	fʒss. to fʒij.	.. ..	ditto.
Ferri pernitratis ..	fʒss. to fʒj.	min. ij. to min. v.	ditto.
Morphiæ acetatis ..	min. xx. to min. lx.	min. ½ to min. j.	In draught.
hydrochloratis	min. xx. to min. lx.	min. ½ to min. j.	ditto.
Opii sedativus (*Cooley*)	min. xv. to min. xxx.	min. ½ to min. j.	ditto.
Potassæ	min. x. to fʒi.	.. ..	In draught or mixture.
effervescens ..	f℥ij. to f℥viij.	.. ..	In draught.
permanganatis (*internally*) ..	min. x. to fʒj.		In draught or mixture.
Sodæ	min. x. to fʒi.	.. ..	ditto.
arseniatis ..	min. iij. to min. x.	.. ..	In draught.
chloratæ ..	min. x. to min. xxx.	.. ..	ditto.
effervescens ..	f℥vj. to f℥viij.	.. ..	ditto.
Strychniæ	min. iij. to min. x.	.. ..	ditto.
Lithiæ Carbonas	gr. ij. to gr. iv.	.. ..	In effervescing solution.
Citras	gr. iij. to gr. x.	.. ..	In pill or draught.
Lobelia	gr. j. to gr. v.	.. ..	In pill or powder.
Lupulina	gr. v. to gr. xx.	.. ..	In pill or draught.
Magnesia (Antacid)	gr. x. to gr. xxx.	gr. ss. to gr. ij.	In powder, draught, or mixture.
(Cathartic) ..	gr. xx. to gr. lx.	gr. j. to gr. iv.	ditto.
Magnesiæ carbonas (Antacid) ..	gr. xv. to gr. xxx.	gr. j. to gr. ij.	ditto.
(Cathartic)	gr. lx. to gr. cxx.	gr. ij. to gr. v.	ditto.
sulphas	℥ss. to ℥j.	.. ..	In draught or mixture.
Manganesiæ sulphas ..	gr. lx. to ℥ss.	.. ..	ditto.
Manna	℥j. to ℥ij.	gr. v. to gr. x.	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Mannite	ʒss. to ℥j.	gr. ij. to gr. v.	In draught or mixture.
Mel Rosæ	gr. cxx. to ℥ss.	.. ..	ditto.
Violæ	gr. lx. to ℥ss.	.. ..	ditto.
Mistura Althææ	f℥j. to f℥ij.	.. ..	ditto.
Ammoniaci ..	f℥ss. to f℥j.	.. ..	ditto.
Amygdalæ	f℥j. to f℥ij.	.. ..	ditto.
Creasoti	f℥j. to f℥ij.	.. ..	ditto.
Cretæ	f℥j. to f℥ij.	fʒss. to fʒj.	ditto.
Ferri aromatica ..	f℥j. to f℥ij.	.. ..	ditto.
composita ..	f℥j. to f℥ij.	.. ..	ditto.
Guaiaci	f℥ss. to f℥ij.	.. ..	ditto.
Monesiæ	f℥ss. to f℥ij.	fʒss. to fʒj.	ditto.
Scammonii ..	f℥ij. to f℥iv.	fʒj. to fʒij.	ditto.
Spiritus vini gallici ..	f℥j. to f℥ij.	.. ..	ditto.
Monesia	gr. v. to gr. xv.	.. ..	In pill.
Morphia	gr. 1-4th to gr. ss.	.. ..	In pill or draught.
Morphiæ acetas	gr. 1-4th to gr. ss.	.. ..	ditto.
hydrochloras ..	gr. 1-4th to gr. ss.	.. ..	ditto.
sulphas	gr. 1-4th to gr. ss.	.. ..	ditto.
Moschus	gr. x. to gr. xx.	.. ..	In draught.
Mucuna	gr. lx. to ʒss.	.. ..	In confection.
Myristica	gr. x. to gr. xxx.	.. ..	In pill or powder.
Myrrha	gr. v. to gr. xxx.	.. ..	In pill or mixture.
Nux-vomica	gr. ij. to gr. v.	.. ..	In pill.
Oleum Amygdalæ amaræ ..	min. 1-8th to min. 1-4th.	.. ..	In pill or draught.
Anethi	min. j. to min. v.	.. ..	ditto.
Anisi	min. ij. to min. viij.	.. ..	ditto.
Anthemidis ..	min. iij. to min. viij.	.. ..	ditto.
Cajuputi	min. v. to min. x.	min. ½ to min. 1.	ditto.
Carui	min. j. to min. x.	.. ..	ditto.
Caryophylli ..	min. ij. to min. viij.	.. ..	ditto.
Cassiæ	min. ij. to min. v.	.. ..	ditto.
Cinnamomi ..	min. j. to min. v.	.. ..	ditto.
Copaibæ	min. xx. to fʒj.	.. ..	ditto.
Coriandri	min. ij. to min. v.	..	ditto.
Crotonis	min. j. to min. ij.	.. ..	ditto.
Cubebæ	min. x. to min. xxx.	.. ..	ditto.
Euphorbiæ lathyris ..	min. iv. to min. viij.	.. ..	ditto.
Fœniculi	min. ij. to min. x.	.. ..	ditto.
Juniperi	min. iij. to min. v.	.. ..	ditto.
Lavandulæ	min. ij. to min. v.	.. ..	ditto.
Limonis	min. ij. to min. v.	.. ..	ditto.
Menthæ piperitæ ..	min. ij. to min. v.	.. ..	ditto.
pulegii ..	min. ij. to min. v.	.. ..	ditto.
viridis ..	min. ij. to min. v.	.. ..	ditto.
Morrhuæ	f℥ss. to f℥ij.	fʒss. to fʒj.	See p. 567.
Myristicæ	min. j. to min. v.	.. ..	In pill or draught.
Olivæ	f℥j. to f℥ij.	.. ..	In draught.
Pimentæ	min. ij. to min. v.	.. ..	In pill or draught.
Ricini	f℥ss. to f℥ij.	fʒss. to fʒij.	In draught.
Rosmarini . ..	min. ij. to min. v.	.. ..	In pill or draught.
Rutæ	min. ij. to min. v.	.. ..	ditto.
Sabinæ	min. ij. to min. vj.	.. ..	ditto.
Sassafras	min. ij. to min. x.	.. ..	ditto.
Succini	min. v. to min. x.	.. ..	ditto.
Terebinthinæ (Anthelmintic)	f℥ss. to f℥ij.	min. x. to fʒj.	In draught or enema.
(Cathartic)	fʒij. to f℥j.	min. x. to fʒj.	ditto.
(Diuretic) ..	min. x. to min. xxx.	min. ij. to min. v.	ditto.
(Stimulant)	min. x. to min. xx.	min. ij. to min. v.	ditto.
Opium	gr. ss. to gr. iij.	.. ..	In pill.
Oxymel	fʒj. to f℥j.	.. ..	To a gargle.
Pepsina	gr. x. to gr. xx.	.. ..	In pill or powder.
Pilulæ Aloes Barbadensis ..	gr. v. to gr. xv.	.. ..	In pill.
Socotrinæ ..	gr. v. to gr. xv.	.. ..	ditto.
et myrrhæ ..	gr. x. to gr. xx.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Pilulæ Aloes et Assafœtidæ ..	gr. x. to gr. xv.	.. ..	In pill.
et Ferri ..	No. 1 to 3.	.. ..	ditto.
ante cibum ..	No. 1 to 2.	.. ..	ditto.
Asiaticæ	No. 1 to 2.	.. ..	ditto.
Assafœtida compositæ ..	gr. v. to gr. xx.	.. ..	ditto.
Calomelanos compositæ	gr. v. to gr. xv.	.. ..	ditto.
Catharticæ compositæ ..	No. 1 to 2.	.. ..	ditto.
Cambogiæ compositæ ..	gr. x. to gr. xx	.. ..	ditto.
Colocynthidis compositæ	gr. v. to gr. xv.	.. ..	ditto.
Colocynthidis et Hyoscyami	No. 1 to 3.	.. ..	ditto.
Corrosivi sublimati ..	No. 1 to 4.	.. ..	ditto.
Digitalis et Scillæ ..	gr. iij. to gr. v.	.. ..	ditto.
Ferri bromidi ..	No. 1 to 2.	.. ..	ditto.
carbonatis ..	gr. v. to gr. xx.	.. ..	ditto.
iodidi	gr. v. to gr. x.	.. ..	ditto.
sulphatis ..	gr. v. to gr. xv.	.. ..	ditto.
Hydrargyri (Alterative)	gr. iij. to gr. v.	.. ..	ditto.
(Cathartic)	gr. x. to gr. xx.	.. ..	ditto.
Ipecacuanhæ cum Scillâ	gr. v. to gr. xx.	.. ..	ditto.
Opii *sive* Thebaicæ ..	gr. ij. to gr. x.	.. ..	ditto.
Plumbi cum Opio ..	gr. iv. to gr. viij.	.. ..	ditto.
Quiniæ sulphatis ..	No. 2 to 5.	.. ..	ditto.
compositæ ..	gr. v. to gr. xx.	.. ..	ditto.
Scillæ compositæ ..	gr. v. to gr. x.	.. ..	ditto.
Styracis compositæ ..	gr. iij. to gr. x.	.. ..	ditto.
Piperin	gr. iij. to gr. v.	.. ..	In pill.
Plumbi acetas	gr. ij. to gr. viij.	.. ..	In pill or mixture.
iodidum	gr. iij. to gr. v.	.. ..	In pill.
Potassa sulphurata	gr. iij. to gr. x.	.. ..	In draught or mixture.
Potassæ acetas (Cathartic) ..	gr. cxx. to ʒss.	.. ..	ditto.
(Diuretic) ..	gr. x. to gr. xx.	.. ..	ditto.
Aqua effervescens ..	fʒij. to fʒviij.	.. ..	In draught.
bicarbonas.. ..	gr. x. to gr. xxx.	.. ..	In draught or mixture.
bichromas	gr. 1-8th to gr. iv.	.. ..	In pill or draught.
bisulphas	gr. xxx. to gr. lx.	.. ..	In draught or mixture.
tartras acida (Cathartic)	ʒss. to ʒj.	.. ..	In confection or mixture.
(Diuretic)	gr. xx. to gr. lx.	.. ..	In mixture.
carbonas	gr. v. to gr. xx.	.. ..	In draught or mixture.
chloras	gr. x. to gr. xx.	.. ..	ditto.
citras	gr. xxx. to gr. cxx.	.. ..	ditto.
liquor	min. x. to fʒij.	.. ..	ditto.
nitras (Diuretic) ..	gr. xxx. to xl.	.. ..	ditto.
nitras (Refrigerant) ..	gr. x. to gr. lx.	.. ..	In draught.
sulphas	gr. lx. to ʒss.	.. ..	In draught or mixture.
tartras	gr. cxx. to ʒj.	.. ..	ditto.
Potassii bromidum ..	gr. iij. to gr. xij.	.. ..	ditto.
cyanidum ..	gr. 1-8th to gr. 1-4th.	.. ..	In draught.
iodidum	gr. iij. to gr. xv.	.. ..	In draught or mixture.
Pulvis amygdalæ compositus ..	gr.v. to gr. lx.	.. ..	ditto.
Antimonialis ..	gr. iij. to gr. v.	gr. ¼ to gr. j.	In pill or powder.
Aromaticus	gr. v. to gr. xx.	gr. ss. to gr. j.	ditto.
Auri	gr. 1-4th to gr. iij.		In pill.
Catechu compositus ..	gr. x. to gr. lx.	gr. j to gr. v.	In powder or bolus.
Cretæ aromaticus ..	gr. x. to gr. xxx.	gr. ij. to gr. v.	In powder or mixture.
cum opio	gr. x. to gr. lx.	gr. ss. to gr j.	In powder.
Elaterii compositus ..	gr. v. to gr. x.	.. ..	ditto.
Ferri	gr. j. to gr. x.	.. ..	In pill.
Gallæ . ..	gr. v. to gr. xx.	.. ..	ditto.
Ipecacuanhæ cum opio ..	gr. v. to gr. xx.	.. ..	In pill or powder.
Jalapæ compositus ..	gr. xx. to gr. lx.	.. ..	In bolus.
Kino cum opio ..	gr. x. to gr. xxx.	gr. ¼ to gr. ss.	In powder.
Lobeliæ	gr. j. to gr. v.	.. ..	In pill.
Podophylli	gr. v. to gr. xx.	.. ..	ditto.
Rhei (Stomachic) ..	gr. v. to gr. x.	.. ..	In powder.
(Cathartic) ..	gr. xx. to gr. lx.	gr. ij. to gr. v.	ditto.
compositus ..	gr. xxx. to gr. lx.		In draught.
Salinus compositus ..	gr. cxx. to ʒss.		ditto.
Scammonii compositus ..	gr. x. to gr. xx.	gr. j. to gr. ij.	In powder.
Tragacanthæ compositus	gr. lx. to gr. cxx.		In draught or mixture.
Veretri Viridis (Emetic)	gr. iij. to gr. vj.	.. ..	In pill.
(Sedative)	gr. ss. to gr. ij.	.. ..	ditto.
Quinia	gr. iij. to gr. v.	.. ..	In pill or mixture.
amorphous	gr. iij. to gr. v.	.. ..	ditto.
Quiniæ acetas	gr. j. to gr. v.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Quiniæ arsenias	gr. 1-10th to gr. 1-4th	.. ..	In pill or mixture.
citras	gr. j. to gr. v.	.. ..	ditto.
murias	gr. j. to gr. v.	.. ..	ditto.
nitras	gr. j. to gr. v.	.. ..	ditto.
phosphas	gr. j. to gr. v.	.. ..	ditto.
sulphas	gr. j. to gr. xx.	.. ..	ditto.
tannas	gr. j. to gr. v.	.. ..	ditto.
tartras	gr. j. to gr. v.	.. ..	ditto.
valerianas	gr. ss. to gr. ij.	.. ..	ditto.
Quinidia (Febrifuge)	gr. v. to gr. xx.	.. ..	ditto.
(Tonic)	gr. j. to gr. v.	.. ..	ditto.
Resinæ Jalapæ	gr. iij. to gr. x.	.. ..	In pill or draught.
Podophylli	gr. ¼ to gr. iij.	.. ..	In pill.
Scammonii	gr. ij. to gr. v.	gr. ¼ to gr. j.	In pill, draught, powder.
Sabadilla	gr. j. to gr. viij.	.. ..	See article.
Sagapenum	gr. v. to gr. xx.	.. ..	In pill.
Salicin (Febrifuge)	gr. xx. to gr. xl.	.. ..	In bolus.
(Tonic)	gr. ij. to gr. v.	.. ..	In pill or mixture.
Santonine (brown)	gr. v. to gr. x.	.. ..	In lozenge, pill, draught.
(pure)	gr. j. to gr. ij.	.. ..	ditto.
Sapo Crotonis	gr. j. to gr. iij.	.. ..	In pill.
Jalapinus	gr. x. to gr. xx.	.. ..	ditto.
Scammonium	gr. v. to gr. x.	gr. ¼ to gr. j.	In draught.
Scilla (Expectorant)	gr. j. to gr. iss.	.. ..	In pill.
(Diuretic)	gr. j. to gr. iij.	.. ..	ditto.
Scoparin	gr. v. to gr. vj.	.. ..	In draught or mixture.
Sinapis (Emetic)	ʒss. to ʒj.	.. ..	In draught.
alba	gr. lx. to gr. cxx.	.. ..	ditto.
Sodæ acetas	gr. x. to gr. xx.	.. ..	In draught or mixture.
arsenias	gr. 1-12th to gr. 1-8th.	.. ..	In pill or draught.
biboras	gr. x. to gr. xxx.	.. ..	In draught.
bicarbonas	gr. x. to gr. xxx.	.. ..	In draught or mixture.
carbonas	gr. x. to gr. xxx.	.. ..	ditto.
chloratæ liquor	min. x. to min. xxx.	.. ..	ditto.
exsiccata	gr. v. to gr. xx.	gr. ss. to gr. ij.	In pill or powder.
et potassæ tartras	gr. lx. to ʒj.	.. ..	In draught or mixture.
hyposulphis	gr. lx. to cxx.	.. ..	ditto.
phosphas	ʒss. to ʒiss.	gr. x. to gr. xx.	ditto.
sulphas	ʒss. to ʒj.	.. ..	ditto.
Sodii auro-terchloridum	gr. 1-20th to gr. 1-15th.	.. ..	In pill.
chloridum	gr. x. to gr. cxx.	.. ..	In draught or mixture.
iodidum	gr. ij. to gr. xv.	.. ..	ditto.
Solutio alkalina (*Brandish*)	fʒss. to fʒij.	.. ..	ditto.
Elaterinæ	min. xxx. to min. xl.	.. ..	In draught.
Spiritus Ætheris nitrosi	fʒss. to fʒiij.	min. v. to min. x.	In draught or mixture.
Ætheris	fʒj. to fʒiij.	.. ..	ditto.
compositus	fʒss. to fʒij.	.. ..	ditto.
Ammoniæ	fʒss. to fʒiss.	.. ..	ditto.
aromaticus	min. xxx. to fʒj.	.. ..	ditto.
fœtidus	fʒss. to fʒj.	.. ..	ditto.
Armoraciæ compositus	fʒss. to fʒj.	.. ..	ditto.
Cajuputi	min. x. to min. xxx.	min. j. to min. v.	ditto.
Chloroformi	min. x. to min. xl.	ditto.	ditto.
Camphoræ	min. xx. to fʒj.	min. ij. to min. v.	ditto.
Fuliginis	min. xx. to min. xxx.	.. ..	ditto.
Juniperi	min. x. to min. xxx.	.. ..	ditto.
Lavandulæ	min. x. to min. xxx.	.. ..	ditto.
Menthæ piperitæ	min. x. to min. xxx.	min. j. to min. v.	ditto.
Myristicæ	min. x. to min. xxx.	.. ..	ditto.
Pyroxilicus	min. v. to min. xx.	.. ..	ditto.
Rosmarini	min. v. to min. xxx.	.. ..	ditto.
Strychnia	gr. 1-12th to gr. 1-8th.	.. ..	In pill.
Succus Belladonnæ	min. xx. to min. xl.	.. ..	In draught or mixture.
Colchici	min. v. to min. xx.	.. ..	ditto.
Conii	min. xxx. to fʒj.	.. ..	ditto.
Cotyledon	fʒvj. to fʒj.	.. ..	ditto.
Digitalis	fʒss. to fʒj.	.. ..	ditto.
Hyoscyami	min. xx. to min. xl.	.. ..	ditto.
Limonis	fʒj. to fʒiv.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Succus Scoparii	fʒss. to fʒij.	.. ..	In draught or mixture.
Taraxaci	fʒss. to fʒij.	.. ..	ditto.
Sulphur (Cathartic).. ..	gr. cxx. to ʒss.	.. ..	In confection.
(Stimulant) ..	gr. x. to gr. xxx.	.. ..	ditto.
iodatum	gr. j. to gr. iij.	.. ..	In pill.
præcipitatum ..	gr. cxx. to ʒss.	.. ..	In confection.
Suppositoria Acidi Tannici ..	.. ..	.. ..	One as required.
Morphiæ ..	.. ..	.. ..	One as required.
Syrupus Aceti	fʒij. to fʒj.	.. ..	In draught or mixture.
Acidi citrici ..	fʒij. to fʒj.	.. ..	ditto.
Allii	fʒss. to fʒj.	.. ..	ditto.
Althææ	fʒss. to fʒj.	.. ..	ditto.
Aurantii	fʒij. to fʒss.	.. ..	ditto.
floris ..	fʒss. to fʒij.	.. ..	ditto.
Cinchonæ	fʒj. to fʒss.	.. ..	ditto.
Croci	fʒij. to fʒss.	.. ..	ditto.
Ferri iodidi ..	min. xv. to min. lx.	min. ij to min. v.	ditto.
Ferri lactatis ..	fʒij. to fʒss.	.. ..	ditto.
phosphatis ..	fʒj. to fʒij.	min. ij. to min. v.	ditto.
Guaici	fʒj. to fʒij.	.. ..	ditto.
Hemidesmi ..	fʒj. to fʒss.	.. ..	ditto.
Ipecacuanhæ (Emetic)	fʒj. to fʒij.	fʒss. to fʒj.	In draught.
(Expectorant)	fʒj. to fʒij.	min. v. to min. x.	In mixture.
Limonis	fʒj. to fʒij.	.. ..	In draught or mixture.
Mori	fʒj. to fʒij.	.. ..	ditto.
Morphiæ acetatis ..	fʒss. to fʒiss.	min. v. to min. x.	ditto.
muriatis ..	fʒss. to fʒiss.	min. v to min. x.	ditto.
Papaveris	fʒss. to fʒj.	min. v. to min. x.	ditto.
Potassii cyanidi ..	fʒij. to fʒvj.	.. ..	In draught.
Rhamni	fʒss. to fʒj.	.. ..	In draught or mixture.
Rhei	fʒss. to fʒj.	fʒss. to fʒj.	ditto.
Rhæados	fʒss. to fʒj.	min. x. to min. xx.	ditto.
Rosæ gallicæ ..	fʒss. to fʒj.	.. ..	ditto.
Sarzæ	fʒiv. to fʒvj.	.. ..	ditto.
Scillæ (Emetic) ..	fʒj. to fʒij.	fʒss. to fʒj.	ditto.
(Expectorants)	min. x. to min. xxx.	min. ij. to min. v.	ditto.
compositus ..	fʒj. to fʒij.	min. ij. to min. v.	ditto.
Sennæ	fʒss. to fʒj.	fʒss. to fʒj	ditto.
Tolutanus	fʒj. to fʒss.	min. x. to min. xxx.	ditto.
Violæ	fʒj. to fʒij.	fʒss. to fʒj.	ditto.
Zingiberis	fʒij. to fʒss.	.. ..	ditto.
Tamarindus	ʒss. to ʒiss.	.. ..	In confection or mixture.
Tannin	gr. ss. to gr. x.	.. ..	In pill.
Terebinthina Canadensis .	gr. x. to gr. xxx.	.. ..	In pill or emulsion.
Chia	gr. x. to gr. xxx.	.. ..	ditto.
Tinctura Absinthii ..	fʒij. to fʒss.	.. ..	In draught or mixture.
Aconiti	min. v. to min. x.	.. ..	ditto.
Actææ	fʒss. to fʒij.	.. ..	ditto.
Aloes	min. xxx. to fʒss.	.. ..	ditto.
Arnicæ	min. x. to fʒj.	.. ..	ditto.
Assafœtidæ ..	fʒss. to fʒij.	.. ..	ditto.
Aurantii ..	fʒss. to fʒij.	.. ..	ditto.
Belladonnæ ..	min. xx. to fʒj.	.. ..	ditto.
Benzoini composita ..	fʒss. to fʒij.	.. ..	ditto.
Bucco ..	fʒss. to fʒij.	.. ..	ditto.
Calumbæ ..	fʒss. to fʒij.	.. ..	ditto.
Camphoræ cum opio ..	fʒss. to fʒij.	.. ..	ditto.
Cannabis indicæ ..	min. xx. to fʒj.	.. ..	ditto.
ætherea	min. x. to min. xx.	.. ..	ditto.
Cantharidis	min. v. to min. xl.	.. ..	ditto.
Capsici	min. xx. to fʒj.	.. ..	ditto.
Cardamomi Composita	fʒss. to fʒij.	.. ..	ditto.
Cascarillæ ..	fʒss. to fʒij.	.. ..	ditto.
Castorei	fʒj. to fʒss.	.. ..	ditto.
Catechu	fʒss. to fʒij.	min. v. to min. x.	ditto.
Chiratæ	fʒss. to fʒij.	.. ..	ditto.
Cinchonæ composita ..	fʒss. to fʒij.	.. ..	ditto.
flavæ ..	fʒss. to fʒij.	.. ..	ditto.
Cinnamomi ..	fʒss. to fʒij.	.. ..	ditto.
Cocci Cacti ..	fʒss. to fʒij.	.. ..	ditto.
Colchici seminis ..	fʒss. to fʒij.	.. ..	ditto.
Colocynthidis ..	min. x. to min. xv.	.. ..	ditto.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Tinctura Conii fructus	min. xx. to min. xl.	.. ..	In draught or mixture.
Croci	fʒss. to fʒij.	.. ..	ditto.
Cubebæ	fʒj. to fʒij.	.. ..	ditto.
Digitalis (Diuretic)	min. xx. to min. xxx.	min. j. to min. ij.	ditto.
(Sedative)	fʒss. to fʒj.	.. ..	ditto.
Elaterii	fʒss. to fʒij.	.. ..	ditto.
Ergotæ	min. x. to fʒj.	.. ..	ditto.
Ferri acetatis	min. xxx. to fʒj.	min. j. to min. v.	ditto.
ammonio-chloridi	min. x. to min. xl.	.. ..	ditto.
aurantiacea	fʒj. to fʒiv.	.. ..	ditto.
perchloridi	min. x. to fʒss.	.. ..	ditto.
Fuliginis	fʒj. to fʒij.	.. ..	ditto.
Gallæ	fʒss. to fʒij.	.. ..	ditto.
Gambogiæ	fʒss. to fʒj.	.. ..	ditto.
Gentianæ composita	fʒss. to fʒij.	.. ..	ditto.
Guaiaci ammoniata	fʒss. to fʒij.	.. ..	ditto.
Hellebori	fʒj to fʒij.	.. ..	ditto.
Hyoscyami	fʒss. to fʒij.	min. ij. to min. v.	ditto.
Iodi	min. v. to min. xx.	.. ..	ditto.
Jalapæ	fʒss. to fʒij.	.. ..	ditto.
Kino	fʒss. to fʒij.	min. v. to min. x.	ditto.
Krameriæ	fʒss. to fʒij.	.. ..	ditto.
Lavandulæ composita	min. xxx. to fʒij.	min. v. to min. x.	ditto.
Limonis	fʒss. to fʒij.	.. ..	ditto.
Lobeliæ	fʒss. to fʒj.	.. ..	ditto.
ætherea	min. xx. to min. xl.	.. ..	ditto.
Lupuli	fʒss. to fʒij.	.. ..	ditto.
Maticæ	fʒj. to fʒij.	.. ..	ditto.
Monesiæ	fʒj. to fʒij.	.. ..	ditto.
Myrrhæ	fʒj. to fʒij.	.. ..	ditto.
Nucis vomicæ	min. v. to min. xxx.	.. ..	In draught
Opii	min. x. to min. xxx.	.. ..	In draught or mixture.
Pinus Laricis	fʒss. to fʒij.	.. ..	ditto.
Quiniæ compositæ	fʒj. to fʒss.	.. ..	ditto.
Rhei	fʒj. to fʒiij.	.. ..	ditto.
et Aloes	fʒss. to fʒiij.	.. ..	ditto.
Sabinæ	fʒss. to fʒj.	.. ..	ditto.
Scillæ	min. x. to min. xxx.	.. ..	ditto.
Senegæ	fʒss. to fʒj.	.. ..	ditto.
Sennæ	fʒj. to fʒss.	.. ..	ditto.
Serpentariæ	fʒj. to fʒij.	.. ..	ditto.
Stramonii	min. x. to min. xxx.	.. ..	ditto.
Sumbul	fʒj. to fʒij.	.. ..	ditto.
Tolutana	fʒj. to fʒij.	.. ..	ditto.
Valerianæ	fʒij. to fʒiv.	.. ..	ditto.
ammoniata	fʒj. to fʒij.	.. ..	ditto.
composita	fʒj. to fʒij.	.. ..	ditto.
Veratri viridis	fʒss. to fʒij.	.. ..	ditto.
Veratriæ	min. v. to min. xv.	.. ..	ditto.
Zingiberis	min. xx. to fʒj.	.. ..	ditto.
Trochisci acidi tannici	6 to 24. (*Daily.*)		
Bismuthi	10 to 30. (*Daily.*)		
Catechu	10 to 20. (*Daily.*)		
Ferri lactatis	6 to 18. (*Daily.*)		
Morphiæ	10 to 12. (*Daily.*)		
et Ipecacuanhæ	10 to 12. (*Daily.*)		
Opii	5 to 10. (*Daily.*)		
Urea	gr. x. to gr. xx.	.. ..	In pill or draught.
Veratria	gr. 1-14th to gr. 1-10th.	.. ..	In pill.
Veratrum	gr. ij. to gr. v.	.. ..	ditto.
Vinum	fʒviij. to fʒxx.	.. ..	In divided doses.
Vinum Aloes	fʒss. to fʒss.	.. ..	In draught or mixture.
Antimoniale (Emetic)	fʒss. to fʒj.	min. xx. to fʒj.	In draught.
(Expectorant)	fʒss. to fʒj.	min. ij. to min. v.	In mixture.
Colchici	fʒss. to fʒij.	.. ..	In draught or mixture.
Ferri	fʒj. to fʒss.	.. ..	ditto.
Ipecacuanhæ (Emetic)	fʒij. to fʒiv.	min. xx. to fʒj.	In draught.
(Expectorant)	min. x. to min. xl.	min. ij. to min. v.	In mixture.
Opii	min. x. to fʒss.	min. ss. to min. j.	In draught.

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Vinum Quiniæ	f℥ss. to f℥j.	min. v. to min. xx.	In draught or mixture.
Rhei	f℥ij. to f℥j.	min. v. to min. xxx.	ditto.
Zinci acetas	gr. j. to gr. iij.	.. ..	In pill or mixture.
cyanidum	gr. 1·8th to gr. ss.	.. ..	In pill.
oxidum	gr. j. to gr. ij.	.. ..	ditto.
sulphas (Tonic) ..	gr. j. to gr. v.	.. ..	In pill or mixture.
(Emetic)	gr. xv. to gr. xxx.	.. ..	In draught.
valerianas	gr. 3-4th to gr. j.	.. ..	In pill or mixture.
Zingiber	gr. v. to gr. xxx.	.. ..	In powder or pill.

INDEX.

B.

C.

D.

M.

Q.

R.

S.