Neligan's Medicines : their uses and mode of administration / by Rawdon Macnamara.

Contributors

Neligan, J. Moore 1815-1863.
Macnamara, Rawdon.
Royal College of Physicians of Edinburgh

Publication/Creation

Edinburgh : Dublin, 1867.

Persistent URL

https://wellcomecollection.org/works/suhcrhe9

Provider

Royal College of Physicians Edinburgh

License and attribution

This material has been provided by This material has been provided by the Royal College of Physicians of Edinburgh. The original may be consulted at the Royal College of Physicians of Edinburgh. where the originals may be consulted.
This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

Ci 5: 23

R34814

MEDICINES,

THEIR USES AND MODE OF ADMINISTRATION.

NELIGAN'S MEDICINES,

THEIR

USES AND MODE OF ADMINISTRATION:

BY

RAWDON MACNAMARA,

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; HONORARY FELLOW OF THE MEDICAL SOCIETY OF CHRISTIANIA; ETC.

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

COLL. REG. MED. EDIN. LIBRARY

Seventh Edition.

"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.

1867.

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

DEDICATION OF THE SEVENTH EDITION.

TO THE

REV. SAMUEL HAUGHTON, M.D., F.R.S., F.T.C.D,

Professor of Geology in the University of Dublin.

THIS WORK IS INSCRIBED

AS A MEMORIAL OF A FRIENDSHIP NOW EXISTING FOR MORE THAN A QUARTER OF A CENTURY,

DATING FROM THE PERIOD WHEN FIRST THEY MET AS BOYS

IN THAT UNIVERSITY OF WHICH HE IS NOW SO DISTINGUISHED AN ORNAMENT;

AND AS AN EXPRESSION OF THE SINCERE RESPECT

IN WHICH HIS HIGH AND VARIED SCIENTIFIC ATTAINMENTS ARE HELD

BY HIS WARMLY ATTACHED FRIEND,

RAWDON MACNAMARA.

95, St. Stephen's Green South, Dublin,
20th November, 1867.

PREFACE TO THE SEVENTH EDITION.

NEARLY three years since a large impression of the sixth edition of this work was published under my supervision, and the circumstances under which it came into my sole charge were then fully explained in the preface now reprinted, and to which I beg to refer the reader. More than a year ago that impression was exhausted, and a reprint or a new edition was required to supply the still increasing demand. The promised advent of a new edition of the British Pharmacopœia having rendered the adoption of the latter alternative preferable, I was requested by the publishers to undertake this responsibility; and as they expressed their intention to spare no expense necessary to render the work worthy of the continued support of the profession, I have done my utmost to maintain its previous reputation. The whole work has been subjected to careful supervision, and, without unduly extending its limits, pains have been taken to allow nothing of importance, within our present knowledge of the Materia Medica, to escape observation. The result has been that although many articles which had become obsolete have been omitted, more than two hundred pages have been added to the extent of the sixth edition, which exceeded its predecessor by some hundred and fifty pages.

Two entirely new chapters—one upon Waters, the other on the Administration of Medicines—have been added. In the first of these, without pretending to exhaust the subject, I have endeavoured to give my reader a bird's-eye view of this most complex though apparently simple substance. Enough, however, has been recorded to enable the practitioner to advise his patient as to the therapeutic application of every variety of water suited to his complaint.

For the great improvement in the botanical descriptions through-

out the work, and the addition of a useful tabular classification of plants and vegetable products used in medicine (which will be found in the Appendix), the reader is solely indebted to my friend Dr. Hewitt, to whom, for his kindness in this respect, as well as for his unwearied supervision of the rest of the volume, I am greatly indebted.

One subject only remains for observation, and that is the difference on the title page between the last and the present edition. Dr. Neligan's work was originally, like every other one of the kind, based on the national pharmacopœias. Since the appearance of his Fifth edition, the last which was supervised by himself, two new and distinct editions of the British Pharmacopœia have appeared, which, from the indispensable alterations they involved, inevitably rendered Dr. Neligan's original treatisc practically obsolete. Nevertheless I retained the old title in the sixth edition, although the changes in the first edition of the British Pharmacopœia required, for reasons which I explained in the preface, the entire recasting of the book. Since then, a *second* edition of the British Pharmacopœia has appeared, involving still further changes, for which, *a fortiori*, Dr. Neligan could not be held responsible. Anonymous reviewers, and friends whose opinions I respect, have represented to me that the sixth edition was virtually a new work; that the alterations and additions were so important that it was unjust to the memory of Neligan that they should be supported by his reputation, if they proved unworthy of the consideration of the public; whilst, on the other hand, his character as an eminent medical writer required no light borrowed from the labour of others. Notwithstanding these considerations, and whilst thoroughly appreciative of the implied compliments thereby paid me, and deeply grateful for them, I have determined that the name of the original projector of the work should not be ignored, and that the title page of the present edition should be that under which it now appears for the kind consideration of all who may honour it with their patronage.

RAWDON MACNAMARA.

95, St. Stephen's Green South, Dublin,
20th November, 1867.

DEDICATION OF THE SIXTH EDITION.

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 AN EXPRESSION OF THAT WARM REGARD

IN WHICH THEY ARE HELD BY THEIR

OBLIGED AND HUMBLE SERVANT,

RAWDON MACNAMARA.

95, St. Stephen's Green, Dublin,
12*th November*, 1864.

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 labours, 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 forever, 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 wished him to undertake the revision of a new edition, he expressed his 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 anything 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 has 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. We have now 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 so 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 its 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.

TABLES OF WEIGHTS AND MEASURES

OF THE

BRITISH PHARMACOPŒIA.

WEIGHTS.

1 Grain	gr.		
1 Ounce	oz.		= 437·5 grains
1 Pound	lb.	= 16 ounces	= 7,000 grains

MEASURES OF CAPACITY.

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

MEASURES OF LENGTH.

1 Line = $\frac{1}{12}$ inch

1 Inch = $\frac{1}{39{\cdot}1393}$ seconds pendulum

12 ,, = 1 foot

36 ,, = 3 feet = 1 yard

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

RELATION OF MEASURES TO WEIGHTS.

1 Minim	is the measure of		0·91	grains of water
1 Fluid Drachm	,,		54·68	,,
1 Fluid Ounce	,,	1 ounce or	437·5	,,
1 Pint	,,	1·25 pounds or	8750.0	,,
1 Gallon	,,	10 pounds or	70,000·0	,,

WEIGHTS AND MEASURES OF THE METRICAL SYSTEM.

WEIGHTS.

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

MEASURES OF CAPACITY.

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

MEASURES OF LENGTH.

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

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

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

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

1 Gallon	=	4·543487	litres	
1 Pint	=	0·567936	,,	or 567·936 cubic centimetres
1 Fluid Ounce	=	0·028396	,,	28·396 ,,
1 Fluid Drachm	=	0·003549	,,	3·549 ,,
1 Minim	=	0.000059	,,	0·059 ,,

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

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

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

1 Millimetre	=	0·03937	inches
1 Centimetre	=	0·39371	,,
1 Decimetre	=	3·93708	,,
1 Metre	=	39·37079	,, or 1 yard 3.7 inches
1 Cubic centimetre	=	15·432	grain-measures

1 Litre = 1 pint 15 oz. 2 drs. 11 m. or 15432·348 grain-measures.

Metric Weights and Measures used in Pharmacy,

With their British 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 ,,
Decogramme	=	154·32349 ,,
Hectogramme	=	1543·23487 ,,
Kilogramme	=	15432·34870 ,,

APPROXIMATE VALUES.

Gramme	=	15½ Grains.
Killogramme	=	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.

Although the foregoing 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 Pharmacopæia (1850), prescriptions were directed to be compounded by *Avoirdupois Weights*, the ounce being subdivided 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 ,,

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	℔
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	f ʒ
The Fluid Scruple	f ℈
The Minim	♏ or Min.

These symbols, both for weights and measures, although 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.

List of Books referred to, containing Plates of Officinal Plants.

Asiatic Researches. 20 vols. 4to. Calcutta, 1788—1836.
Berg und Schmidt, *Darstellung und Beschreibung sämmtlicher in der Pharmacopœia Borussica aufgeführten offizinellen Gewächse.* 4 vols. 4to. Leipzig, 1858—1863.
Botanical Magazine. 8vo. London, 1787—1867.
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.
Nees Von Esenbeck, *Plantes Medicinales.* 2 vols. folio. Düsseldorf, 1828.
Pharmaceutical Journal. 8vo. London, 1842—1867.
Philosophical Transactions of the Royal Society. 4to. London, 1665—1867.
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 Himalayan Mountains, and of the Flora of Cashmere.* 2 vols. 4to. London, 1839.
Ruiz and Pavon, *Flora Peruviana et Chilensis.* 3 vols. folio. Madrid, 1798—1802.
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—1867.
Transactions of the Royal Society of Edinburgh. 4to. Edinburgh, 1788—1866.
Wallich, *Plantæ Asiaticæ rariores.* 3 vols. folio. London, 1830—1832.
Weddell, *Histoire Naturelles 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.

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

Elementary Bodies.	Symbols and Equivalents.	
	Old System.	New System.
Aluminium	Al = 13·75	**Al** = 27·5
Antimony (Stibium)	Sb = 122	**Sb** = 122
Arsenic	As = 75	**As** = 75
Barium	Ba = 68·5	**Ba** = 137
Bismuth	Bi = 210	**Bi** = 210
Boron	B = 11	**B** = 11
Bromine	Br = 80	**Br** = 80
Cadmium	Cd = 56	**Cd** = 112
Calcium	Ca = 20	**Ca** = 40
Carbon	C = 6	**C** = 12
Cerium	Ce = 46	**Ce** = 92
Chlorine	Cl = 35·5	**Cl** = 35·5
Chromium	Cr = 26·25	**Cr** = 52·5
Copper (Cuprum)	Cu = 31·75	**Cu** = 63·5
Gold (Aurum)	Au = 196·5	**Au** = 196·5
Hydrogen	H = 1	**H** = 1
Iodine	I = 127	**I** = 127
Iron (Ferrum)	Fe = 28	**Fe** = 56
Lead (Plumbum)	Pb = 103·5	**Pb** = 207
Lithium	L = 7	**L** = 7
Magnesium	Mg = 12	**Mg** = 24
Manganese	Mn = 27·5	**Mn** = 55
Mercury (Hydrargyrum)	Hg = 100	**Hg** = 200
Nitrogen	N = 14	**N** = 14
Oxygen	O = 8	**O** = 16
Phosphorus	P = 31	**P** = 31
Platinum	Pt = 98·5	**Pt** = 197
Potassium (Kalium)	K = 39	**K** = 39
Silver (Argentum)	Ag = 108	**Ag** = 108
Sodium (Natrium)	Na = 23	**Na** = 23
Sulphur	S = 16	**S** = 32
Tin (Stannum)	Sn = 59	**Sn** = 118
Zinc	Zn = 32·5	**Zn** = 65

Articles included in the British Pharmacopœia of 1867, but not in that of 1864.

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

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

Pyrethri Tinctura
Rhamni Succus, Lond., Edinb.
Sodæ Citro-tartras effervescens
,, *Sulphas, Lond., Edin., Dubl.*
Spiritus Ammoniæ Fœtidus, Lond., Edin., Dub.
Spiritus Vini Gallici, Lond.
,, ,, ,, *Mistura, Lond.*
Sulphuris Iodidum, Lond., Dubl.
,, *Iodidi, Unguentum, Lond.*
Sumbul Radix
,, Tinctura
Suppositoria Hydrargyri
,, Plumbi Composita
Syrupus Rhamni, Lond., Edin.
,, Rhei
Tinctura Chloroformi Composita
,, *Cubebæ, Dubl.*
,, *Ferri Acetatis, Dubl.*
,, *Opii Ammoniata, Edin.*
,, Pyrethri
,, *Quassiæ, Edin.*
,, Sumbul
,, Veratri Viridis
Tinctura Zingiberis Fortior
Trochisci Ferri Redacti
,, Ipecacuanhæ
,, Potassæ Chloratis
,, *Sodæ Bicarbonatis, Edin.*
Unguentum Cadmii Iodidi
,, Hydrargyri compositum
,, *Picis Liquidæ, Lond., Edin., Dubl.*
,, *Plumbi Acetatis, Lond.*
,, *Plumbi Iodidi, Lond., Dubl.*
,, Potassæ Sulphuratæ
,, *Sulphuris Iodidi, Lond.*
Vapor Acidi Hydrocyanici
,, Chlori
,, Coniæ
,, Creasoti
,, Iodi
Veratri Viridis Radix
,, ,, Tinctura
Vinum Aurantii
,, Ferri Citratis
,, Quiniæ
,, *Rhei, Dubl., Edin.*

Articles included in the British Pharmacopœia of 1864, but omitted in that of 1867.

Catechu Nigrum.
Cocculus.
Nitrite of Soda.
Spiritus Pyroxylicus Rectificatus.
Unguentum Cocculi.

Articles the Names of which have been altered in the British Pharmacopœia of 1867.

Present Names.	Names in the Pharmacopœia of 1864.
Acaciæ Gummi	Acacia.
Aconiti Folia	Aconitum.
Ammonii Chloridum	Ammoniæ Hydrochloras.
Amygdala Dulcis	Amygdala.
Anethi Fructus	Anethum.
Anthemidis Flores	Anthemis.
Antimonium Nigrum	Antimonii Sulphuretum.
Armoraciæ Radix	Armoracia.
Arnicæ Radix	Arnica.
Belæ Fructus	Bela.
Belladonnæ Folia	Belladonna.
Bismuthi Subnitras	Bismuthum Album.
Buchu Folia	Bucco.
Calcis Phosphas	Calcis Phosphas præcipitata.
Calumbæ Radix	Calumba.
Capsici Fructus	Capsicum.
Carui Fructus	Carui.
Cascarillæ Cortex	Cascarilla.
Cassiæ Pulpa	Cassia.
Cinchonæ Flavæ Cortex	Cinchona Flava.
Cinchonæ Pallidæ Cortex	Cinchona Pallida.
Cinchonæ Rubræ Cortex	Cinchona Rubra.
Cinnamomi Cortex	Cinnamomum.
Colocynthidis Pulpa	Colocynthis.
Conii Folia	Conium.
Coriandri Fructus	Coriandrum.
Cuspariæ Cortex	Cusparia.
Digitalis Folia	Digitalis.
Emplastrum Plumbi	Emplastrum Lithargyri.
Ferri Peroxidum Humidum	Ferri Peroxidum Hydratum.
Ferri Peroxidum Hydratum	Ferri Peroxidum.
Filix Mas	Filix.
Fœniculi Fructus	Fœniculum
Gentianæ Radix	Gentiana.
Glycyrrhizæ Radix	Glycyrrhiza.
Granati Radicis Cortex	Granati Radix.
Hæmatoxyli Lignum	Hæmatoxylum.
Hemidesmi Radix	Hemidesmus.
Hydrargyri Perchloridum	Hydrargyri Chloridum.
Hydrargyri Subchloridum	Calomelas.
Hyoscyami Folia	Hyoscyamus.
Kamala	Kamela.
Krameriæ Radix	Krameria.
Laurocerasi Folia	Laurocerasus.

Present Names.	Names in the Pharmacopœia of 1864.
Liquor Antimonii Chloridi	Liquor Antimonii Terchloridi.
Liquor Epispasticus	Linimenthum Cantharidis.
Liquor Ferri Perchloridi Fortior	Liquor Ferri Perchloridi.
Maticæ Folia	Matica.
Mistura Gentianæ	Infusum Gentianæ Compositum.
Nectandræ Cortex	Nectandra
Oleum Myristicæ Expressum	Myristicæ Adeps.
Papaveris Capsulæ	Papaver.
Pareiræ Radix	Pareira.
Pilula Hydrargyri Subchloridi Composita	Pilula Calomelanos Composita.
Pilula Saponis Composita	Pilula Opii.
Piper Nigrum	Piper.
Plumbi Oxidum	Lithargyrum.
Podophylli Radix	Podophyllum.
Potassæ Prussias Flava	Ferrocyanide of Potassium.
Pterocarpi Lignum	Pterocarpus.
Pulvis Ipecacuanhæ Compositus	Pulvis Ipecacuanhæ cum Opio.
Pulvis Kino Compositus	Pulvis Kino cum Opio.
Quassiæ Lignum	Quassia.
Quercus Cortex	Quercus.
Rhei Radix	Rheum.
Rhœados Petala	Rhœas.
Rosæ Caninæ Fructus	Rosa Canina.
Rosæ Centifoliæ Petala	Rosa Centifolia
Rosæ Gallicæ Petala	Rosa Gallica.
Sabinæ Cacumina	Sabina.
Saccharum Purificatum	Saccharum Album.
Sambuci Flores	Sambucus.
Sanguisuga Medicinalis	Sanguisuga Officinalis.
Sanguisuga Officinalis	Sanguisuga Medicinalis.
Sarsæ Radix	Sarsa.
Sassafras Radix	Sassafras.
Scoparii Cacumina	Scoparius.
Senegæ Radix	Senega.
Serpentariæ Radix	Serpentaria.
Soda Tartarata	Sodæ et Potassæ Tartras.
Tabaci Folia	Tabacum.
Taraxaci Radix	Taraxacum.
Tinctura Camphoræ Composita	Tinctura Camphoræ cum Opio.
Tinctura Conii	Tinctura Conii Fructus.
Ulmi Cortex	Ulmus.
Unguentum Hydrargyri Subchloridi	Unguentum Calomelanos.
Unguentum Iodi	Unguentum Iodi Compositum.
Unguentum Zinci	Unguentum Zinci Oxidi.
Uvæ Ursi Folia	Uva Ursi.
Valerianæ Radix	Valeriana.

Preparations the Composition of which has been altered in the British Pharmacopœia of 1867.*

Acidum Nitricum
Alumen
„ Exsiccatum
Decoctum Aloes Compositum
Emplastrum Belladonnæ
Enema Assafœtidæ
Ferri et Quiniæ Citras
Infusum Gentianæ Compositum
„ Sennæ
Linimentum Crotonis
„ Iodi
„ Terebinthinæ
Liquor Ammoniæ Acetatis
„ Ferri Perchloridi
Mistura Ferri Composita
Spiritus Cajuputi
„ Juniperi
„ Lavandulæ
„ Menthæ Piperitæ
„ Myristicæ
„ Rosmarini
Suppositoria Acidi Tannici
„ Morphiæ
Trochisci Bismuthi
„ Catechu
Vinum Ferri
„ Opii

* Minor alterations are not included.

Substitution.

Pulvis Cinnamomi compositus (Pulvis Aromaticus, *Edin.*)
substituted for Pulvis Aromaticus.

CONTENTS.

(Articles marked thus (*) are not in the British Pharmacopœia of 1867.)

CHAPTER I.—ANTACIDS.

	Page
Ammoniæ liquor fortior	3
Ammoniæ liquor, (Ammoniæ aqua)	5
*Ammoniæ bicarbonas	7
Ammoniæ carbonas	8
Calcis liquor, (Calcis aqua)	9
Calcis liquor saccharatus	11
Creta præparata	12
Calcis carbonas præcipitata	14
Lithiæ carbonas	15
Lithiæ liquor effervescens	18
Lithiæ citras	18
Magnesia	19
Magnesia levis	21
Magnesiæ carbonas	22
Magnesiæ carbonas levis	25
Magnesiæ carbonatis liquor	25
Potassæ liquor	26
Potassæ bicarbonas	29
Potassæ liquor effervescens	31
Potassæ carbonas	32
Sodæ liquor	34
Sodæ bicarbonas	35
Sodæ effervescens liquor	38
Sodæ carbonas	38
Sodœ carbonas exsiccata	41

CHAPTER II.—ANTHELMINTICS.

*Absinthium	44
*Allium sativum	45

Page

*Cucurbita pepo 46
Cusso 47
Filix mas 49
Granati radicis cortex 51
Kamala 53
*Mucuna 54
Sabadilla 54
Santonica 56
Santoninum 57
*Spigelia 60
Terebinthinæ oleum 61

CHAPTER III.—ANTISPASMODICS.

Assafœtida 64
Castoreum 66
*Cotyledon 67
*Fuligo ligni 68
Galbanum 69
Moschus 70
Ruta 71
Sumbul radix 72
Valerianæ radix 74
Valerianas sodæ 76
Valerianas zinci 77
*Valerianas ammoniæ 79
*Valerianas ferri 80
*Valerianas quinæ 81

CHAPTER IV.—ASTRINGENTS.

Acetum 84
Acidum aceticum dilutum 87
Acidum carbolicum 87
Acidum oxymel 87
Acidum sulphuricum 89
Alumen 94
Belæ fructus 97
Catechu pallidum 98
Creasotum 101
Creta 103
Cupri sulphas 104
Ergotin 106
Ferri perchloridi liquor fortior 107
Ferri pernitratis liquor 110
Ferri persulphatis liquor 111

Page
Ferri sulphas 113
Galla 116
Acidum tannicum 118
Acidum Gallicum 121
Hæmatoxyli lignum 123
Kino 124
Krameriæ radix 126
Maticæ folia 128
*Monesia 129
Plumbi acetas 130
Plumbi carbonas 133
Plumbi subacetatis liquor 135
Plumbi oxidum lithargyrum 136
Plumbi nitras 138
Quercus cortex 139
Rosæ Gallicæ petala 140
Sodæ biboras (Borax) 142
Uvæ-ursi folia 143
Zinci acetas 145
Zinci carbonas (Calamina) 146
Zinci oxidum 147
Zinci sulphas 148

CHAPTER V.—CATHARTICS.

Aloe Socotrina 152
Aloes Barbadensis 152
Cambogia 158
Cassiæ pulpa 160
Colchici cormus 161
Colchici semina 161
Colocynthidis pulpa 166
Crotonis oleum 168
Elaterium 171
*Heleborus 173
Hydrargyrum cum cretâ 177
*Hydrargyrum cnm magnesiâ 178
Hydrargyri pilula 174
Hydrargyri subchloridum (Calomel) 175
Jalapa 178
Magnesia 181
Magnesiæ carbonas 182
Magnesiæ sulphas 182
Manna 185
Mel 187
Olivæ oleum 188

Page
Podophylli radix 189
Potassæ acetas 191
Potassæ sulphas 192
Potassæ tartras 193
Potassæ tartras acida 195
Prunum 196
Rhamni succus 197
Rhei radix 198
Ricini oleum 203
Scammoniæ radix 206
Senna 210
Senna Alexandrina 210
Senna Indica 210
Sodæ hyposulphis 214
Sodæ phosphas 216
*Sodæ sulphas 218
Sodæ sulphis 219
Soda tartarata (Sodæ et potassæ tartras) . . . 221
Sulphur sublimatum 223
Sulphur precipitatum 225
Tamarindus 226
Terebinthinæ oleum 227
*Viola 227

CHAPTER VI.—CAUSTICS.

Acidum aceticum glaciale 230
Acidum aceticum 232
Acidum hydrochloricum (Acidum muriaticum) . . 234
Acidum nitricum 236
*Acidum nitro-hydrochloricum 238
Acidum sulphuricum 239
Acidum sulphurosum 239
Ammoniæ liquor fortior. Ammoniæ aqua fortior . . 241
Antimonii chloridi liquor 241
Argenti nitras 243
Acidum arseniosum (Arsenici oxidum album, Arsenicum album) 247
*Cupri subacetas (Ærugo) 252
*Cupri carbonas 253
*Cupri nitras 253
Cupri sulphas 254
Hydrargyri oxidum rubrum 254
Hydrargyri nitratis liquor acidus 256
Potassæ bichromas 257
Potassa caustica (Potassæ hydras, Potassa fusa) . . 258

Page
Soda caustica 261
Zinci chloridum 262
Zinci chloridi liquor 264
Zinci sulphas 265

CHAPTER VII.—DIAPHORETICS.

Ammoniæ acetatis liquor 267
Ammoniæ citratis liquor 269
Antimonii oxidum 270
Antimonii pulvis (Pulvis antimonialis) . . . 271
Antimonium nigrum (Antimonii sulphuretum præparatum, Antimonii tersulphuretum) 273
Antimonium sulphuratum 274
Antimonium tartaratum (Tartar emetic) . . . 275
Dulcamara 278
Guaiaci lignum 279
Guaiaci resina 279
Mezerei cortex 282
Potassæ citras 283
Pulvis ipecacuanhæ compositus 284
Sarsæ radix 285
Sassafras 289

CHAPTER VIII.—DIURETICS.

Ætheris nitrosi spiritus 292
Buchu folia 295
Cambogia 296
Cantharis 297
Digitalis folia 299
Juniperi oleum 301
Juniperus communis 301
Pareira 303
Potassæ acetas 305
Potassæ tartras acida 305
Potassæ nitras 306
Pyrola (Chimaphila) 307
*Scilla 308
Scoparii cacumina 311
Sodæ acetas 312
Sodæ biboras 313
Terebinthinæ Canadensis 313
Terebinthinæ oleum 314
*Terebinthina Chia 315
*Urea 315

CHAPTER IX.—EMETICS.

	Page
Ammoniæ carbonas	318
Antimonium tartaratum (Tartar emetic)	319
Cupri sulphas	320
Ipecacuanha	320
Scilla	324
Sinapis	324
*Viola odorata	325
Zinci sulphas	326

CHAPTER X.—EMMENAGOGUES.

Crocus	328
Ergota	330
Ruta graveolens	334
Sabinæ cacumina	335
Sodæ biboras	336

CHAPTER XI.—EMOLLIENTS.

Acaciæ gummi	337
Adeps præparatus	339
Amygdala amara	341
Amygdala dulcis	341
Amylum	343
*Avena (Oatmeal)	345
*Canna edulis	346
Carbo ligni	347
Cera flava	348
Cera alba	348
Cetaceum (Spermaceti)	350
*Cucumis sativus	350
Farina tritici (Wheaten Flour)	352
Ficus	352
Glycerinum	353
Glycirrhizæ radix	355
Gossypium	357
Gun cotton (Pyroxylin)	357
Hemidesmi radix	358
Hordeum decorticatum	360
Lini semina	361
Lini farina	361
Lini oleum	361
*Maranta	363

Page
Olivæ oleum 364
Ovi vitellus 365
Saccharum album 365
Saccharum lactis 367
*Sago 368
*Salep 369
Sambuci flores 370
Sevum præparatum 370
*Tapioca 371
Tragacantha 371
Uvæ 373

CHAPTER XII.—EPISPASTICS.

Acidum sulphuricum 376
Ammoniæ liquor fortior 376
Antimonium tartaratum (Tartar emetic) . . . 377
Aqua fervens 378
Cantharides 378
Capsici fructus 383
Crotonis tiglii oleum 384
*Euphorbia 384
Ipecacuanha 385
Mezereum 386
*Moxa 386
Ruta graveolens 388
Sabina 388
*Setons and Issues 388
Sinapis 389
*Succini oleum 389
Terebinthinæ oleum 390

CHAPTER XIII.—EXPECTORANTS.

Acidum benzoïcum 394
Antimonium tartaratum (Tartar emetic) . . . 395
Balsamum Peruvianum 396
Balsamum Tolutanum 397
Benzoïnum 398
Ipecacuanha 400
Lobelia 400
*Marrubium vulgare 402
Scilla 403
Senega 403
Styrax præparatus 405

CHAPTER XIV.—NARCOTICS.

	Page
Atropia	414
Atropiæ sulphas	417
Belladonnæ folia	408
Cannabis Indica	417
Hyoscyami folia	421
Lactuca	424
Lupulus	425
*Morphia	448
Morphiæ acetas	449
Morphiæ hydrochloras	450
*Morphiæ sulphas	454
Opium	429
Papaveris capsulæ	427
Rhœados petala	454
Stramonii folia. Stramonii semina.	455

CHAPTER XV.—REFRIGERANTS.

Acetum	460
Acidum citricum	460
Acidum oxalicum purificatum	462
Acidum tartaricum	464
*Citrus aurantium fructus	466
Limonis cortex. Limonis oleum. Limonis succus	467
Mori succus	470
Potassæ chloras	470
Potassæ nitras	472
Rosæ caninæ fructus	473

CHAPTER XVI.—SEDATIVES OR CONTRA-STIMULANTS.

*Acidum carbonicum	476
Acidum hydrocyanicum dilutum	477
Aconiti folia. Aconiti radix	483
Aconitia	486
*Amygdalæ amaræ oleum	488
*Amylena	490
*Anilina	491
Antimonium tartaratum (Tartar emetic)	492
Cerium	493
Chloroformum	493
Conii folia. Conii fructus	507

Page
Creasotum 512
Digitalinum 513
Lauro-cerasi folia 517
*Potassii cyanidum 519
*Spiritus pyroxilicus rectificatus 520
Tabaci folia 521
Veratri viridis radix 523
Zinci cyanidum 525

CHAPTER XVII.—SIALOGOGUES.

Armoraciæ radix 526
Mezereon 527
Pyrethri radix 527

CHAPTER XVIII.—GENERAL STIMULANTS.

*Acidum aceticum camphoratum 530
*Æther aceticus 530
Æther 531
Alcohol. Spiritus rectificatus. Spiritus vini Gallici. Spiritus tenuior 536
Ammoniacum 541
Ammoniæ liquor 542
Ammoniæ carbonas 543
Ammonii sulphidi liquor 543
Ammonii chloridum 544
Anethi fructus 546
Anisi oleum 547
Armoracia 548
Arnicæ radix 548
Balsamum Peruvianum 550
Cajuputi oleum 550
Calx chlorata 551
Camphora 554
Capsicum 558
Cardamomum 559
Carui fructus 560
Caryophyllum 561
*Cassiæ cortex et oleum 563
Cerevisiæ fermentum 564
Chlori liquor 565
Cinnamomi cortex 567
*Cocculus Indicus 569
Coriandri fructus 570

Page
*Electricity, Galvanism, and Magnetic Electricity . . 571
Elemi 575
Fœniculi fructus 576
Lavandulæ oleum 576
Mastiche 578
Menthæ piperitæ oleum 578
*Mentha pulegium 580
Menthæ viridis oleum 580
Myristica 581
Pimenta 583
*Piper longum 584
Piper nigrum 584
Pix Burgundica 586
Pix liquida 587
Potassæ permanganas 588
Potassa sulphurata 590
Resina 592
Rosmarini oleum 593
Sabadilla 594
Serpentariæ radix 594
Sinapis 595
Sodæ chloratæ liquor 596
Sodii chloridum 597
*Staphisagria 599
Sulphur 599
Terebinthinæ oleum 600
Thus Americanum 602
Veratria 602
*Veratrum 604
Vinum Xericum 605
Zingiber 610

CHAPTER XIX.—SPECIAL STIMULANTS.

*Actæa racemosa 613
*Ammoniæ arsenias 615
Ammoniæ benzoas 615
Ammoniæ phosphas 616
Ammonii bromidum 617
*Arsenici iodidum 618
*Arsenici et hydrargyri hydriodatis liquor . . . 619
*Auri pulvis 620
*Auri iodidum 621
*Auri perchloridum 621
*Auri peroxydum 622
Bromum 623

Page
Cadmii iodidum 624
*Cadmii sulphas 626
Copaiba 627
Cubeba 632
Hydrargyrum 634
Hydrargyrum ammoniatum 634
Hydrargyri iodidum rubrum 645
Hydrargyri iodidum viride 647
*Hydrargyri iodo-chloridum 648
Hydrargyri nitratis unguentum (Unguentum citrinum) . 649
*Hydrargyri oxydum nigrum 650
*Hydrargyri oxydum rubrum 651
Hydrargyri perchloridum (Corrosive sublimate) . . 651
Hydrargyri subchloridum (Calomelas) . . . 655
Hydrargyri sulphas 656
*Hydrargyrum sulphuretum rubrum 656
*Hydrocotyle Asiatica 658
*Hydrogenii peroxydum 658
Indigo 659
Iodum 660
Morrhuæ oleum 666
Nux vomica 670
*Pepsina 675
Physostigmatis faba (Calabar bean) 677
Plumbi iodidum 679
Potassii bromidum 681
Potassii iodidum (Potassæ hydriodas) . . . 683
Strychnia 673
*Sodii iodidum 686
Sulphuris iodidum 687

CHAPTER XX.—TONICS.

Acidum hydrochloricum dilutum 690
Acidum nitricum dilutum 691
Acidum nitro-hydrochloricum dilutum . . . 692
Acidum phosphoricum dilutum 693
Anthemidis flores 696
*Argenti chloridum 697
Argenti nitras 698
Argenti oxydum 699
Arsenicum album 700
Liquor arsenicalis (Fowler's solution) 703
Liquor arsenici hydrochloricus 704
Aurantii cortex 705
Aurantii floris aqua 705
Barii chloridum (Barytæ murias) 708

	Page
Bismuthum	710
Bismuthum purificatum	710
Bismuthi carbonas	711
Bismuthi subnitras	712
Bismuthi et ammoniæ citratis liquor	715
Calcii chloridum	717
Calcis phosphas	718
Calumbæ radix	719
Canellæ albæ cortex	721
Cascarillæ cortex	722
*Centaurium	723
Cetraria Islandica	724
Chirata	725
*Chondrus crispus	726
Cinchona flava. Cinchona pallida. Cinchona rubra	727
*Cinchona micrantha	731
*Cupri ammonio-sulphas (Cuprum ammoniatum)	743
Cupri sulphas	745
Cuspariæ cortex (Angostura bark)	745
Fel bovinum purificatum	747
Ferrum	748
Ferrum redactum	752
Ferri acetatis tinctura	724
*Ferri ammonio-chloridum	755
Ferri arsenias	756
*Ferri bromidum	758
Ferri carbonas saccharata	759
Ferri et ammoniæ citras	761
*Ferri et ammoniæ tartras	764
Ferri et quiniæ citras	765
Ferri iodidum	766
*Ferri lactas	769
Ferri oxidum magneticum	770
Ferri peroxidum humidum	771
Ferri peroxidum hydratum	772
*Ferri carbonas	773
*Ferri percyanidum	774
Ferri phosphas	774
Ferri sulphas	777
Ferri sulphas granulata	777
Ferrum tartaratum. Ferri potassio tartras	777
Gentianæ radix	779
Myrrha	782
Nectandræ cortex (Bebeeru bark)	784
Phosphorus	786
Quassiæ lignum	790
*Salix	792

Page
*Simaruba amara 793
Sodæ arsenias 794
Taraxaci radix 796
Ulmi cortex 798
Zinci oxidum 799
Zinci sulphas 799

CHAPTER XXI.—WATERS.

Aqua destillata 801
Aqua 802
*MINERAL WATERS 807
Sulphurous waters 808
—— Aix la Chapelle 808
—— Baden 809
—— Aix les Bains 809
—— Harrowgate 810
—— Strathpeffer 811
—— Lisdoonvarna 811
—— Nenndorff 811
Chalybeate waters 812
—— Lisdoonvarna 813
—— Harrowgate 813
—— Tunbridge Wells 813
—— Sandrock 814
—— Spa 814
—— Schwalbach 814
Saline mineral waters 815
Alkaline mineral waters 815
—— Vichy 815
—— Carlsbad 816
—— Vals 816
—— Fachingen 817
—— Selters or Seltz 817
—— Marienbad 818
Aperient mineral waters 818
—— Pullna 818
—— Sedlitz 818
—— Kissengen 818
—— Leamington 819
—— Baden Baden 819
—— Wiesbaden 819
—— Homburg 819
—— Cheltenham 820
Calcareous or earthy springs 820
—— Wildungen 820

Page

Saline mineral waters continued :—
Calcareous or earthy springs
—— Leuk 820
—— Bath 821
—— Scarborough 821
Indifferent thermal springs 821
—— Pfaffers 822
—— Buxton 822

CHAPTER XXII.—SUPPLEMENTARY AGENTS.

Albumen ovi 824
Alcohol 824
Alcohol amylicum 824
Argentum purificatum 824
Benzol 824
Boracic acid 825
Calcis hydras 825
Calx 825
Carbo animalis 825
Carbo animalis purificatus 826
Cerii oxalas 826
Chloride of barium 826
Coccus 827
Creta 827
Copper foil 828
Cuprum 828
Gold, Fine 828
Hirudo 828
Hyposulphite of soda 830
Indigo 830
Isinglass 830
Lac 832
Litmus 832
*Lycopodium 833
Manganesii oxidum nigrum 833
Marmor album 834
Mica panis 834
*Oleum bergamotæ 834
Oleum rutæ 834
Oleum theobromæ 834
Os ustum 835
Oxalic acid of commerce 835
Oxalate of ammonia 836
Plaster of Paris 836
Platinum foil 836
Potassæ prussias flava 836

Page
Pterocarpi lignum 836
Red prussiate of potash 837
Rosæ centifoliæ petala 837
Sapo duris 838
Sapo mollis 838
Sodæ nitras 838
Subacetate of copper of commerce 838
Sulphate of copper, anhydrous 838
Sulphide of iron 839
Sulphuretted hydrogen 839
Test solutions for qualitative analysis 839
Test solutions for volumetric estimations . . . 841
Tin, granulated 849
Tinctura veratri viridis 849
Trochisci potassæ chloratis 849
Turmeric 849
Vapor acidi hydrocyanici 850
Zincum granulatum 850

APPENDIX A.

Posological table 861

APPENDIX B.

Formulæ 873

APPENDIX C.

Classification of chief plants used in medicine . . 899

INDEX 915

MEDICINES,

THEIR USES AND MODE OF ADMINISTRATION.

CHAPTER I.

ANTACIDS.

(Alkalines—Antilithics—Absorbents—Lithontriptics.

ANTACIDS may, in general terms, be defined to be medicines which correct acidity by chemically combining with, and thereby neutralizing, any free acid that may exist in the system at large, but most markedly so in the alimentary canal and in the urinary secretion. Of all remedies of this class, the alkalies, alkaline earths and their carbonates, are the most direct in their action; but many of their salts also, such as citrates, tartrates, &c., are under certain conditions alkaline in their reaction, Wöhler having demonstrated the curious fact, that neutral salts of the alkalies with most of the *vegetable acids* can, by a process of oxidation in the system, be converted into carbonates, the action of which will of course be antacid. The action of medicines of this class 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 for any length of time 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 these more direct chemical actions,

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. This property of alkaline remedies is undoubtedly due to the solvent powers of alkalies over fats, rendering them fluid, and thereby promoting their elimination: hence the value of a course of alkalies in obesity. When administered in full doses or their use continued for some time, the fibrin of the blood becomes diminished in quantity, and with the view of producing this effect alkalies are sometimes employed in inflammatory affections; whilst after surgical operations, where the object should be to repair injuries, or in the treatment of aneurisms where we desire to produce consolidation of the fibrin of the blood, their exhibition will, as a rule, be contraindicated. 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 in consequence of their greater insolubility 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. When the acidity is attended with much flatulent distension of the stomach, the alkalies are to be preferred to their carbonates, inasmuch as the latter tend, by the elimination of carbonic acid, to add to the distress of the patient. And, finally, ammonia and its preparations are best adapted for the old and debilitated, as also for those of enfeebled constituion.

LIQUOR AMMONIÆ FORTIOR. *Strong Solution of Ammonia.*
(Ammoniacal gas, NH_3 (=17), or $\mathbf{NH_3}$ (≒17), dissolved in water, and constituting 32.5 per cent. of the solution.)

PREPARATION.—It may be obtained by the following process:—Take of chloride of ammonium, in coarse powder, three pounds; slaked lime, four pounds; distilled water, thirty-two fluid ounces. Mix the lime with the chloride of ammonium, 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 chloride of ammonium (NH_4Cl. *sal ammoniac*) with slaked lime, we find, as the result of this process, that the chlorine leaves the chloride of ammonium and unites with the calcium of the lime, whilst the ammonical gas, set free, is absorbed by the water, which it is made to traverse, thus, $NH_4Cl + CaO,HO = CaCl + 2HO + NH_3$.

CHEMICAL HISTORY.—Ammoniacal gas is composed of NH_3, or (according to Sir Robert Kane) of one equivalent of amidogene (NH_2) united to one of hydrogen. It 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 colour 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 hydrated acids it forms salts; its fumes, brought into contact with those of strong hydrochloric or nitric acids, furnishing dense white vapours, respectively chlorides of ammonium 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 colour it gives with the salts of copper, and the white precipitate it throws down with corrosive sublimate. Water dissolves it in varying proportions, two of which are officinal, viz., the present preparation, the Liquor Ammoniæ Fortior, and the next, the Liquor Ammoniæ, preparations which differ only in their respective strengths. The chemical composition of both gaseous ammonia and of its salts, 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 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.

CHARACTERS AND TESTS.—A colourless liquid, with a characteristic and very pungent odour *(burning, very alkaline, acrid taste)*, and strong alkaline reaction. Specific gravity 0·891. 52·3 grains by weight require for neutralisation 1000 grain-measures of the volumetric solution of oxalic acid. One fluid drachm contains 15·83

grains of ammonia, NH_3 or $\mathbf{NH_3}$. When diluted with four times its volume of distilled water, it does not give precipitates with solution of lime, oxalate of ammonia, sulphide of ammonium, 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 sulphide of ammonium; 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.

THERAPEUTICAL USES.—Although I have introduced this preparation under the head of antacids, and although undoubtedly, *if sufficiently diluted*, it may be used as such, still it is never so employed. The preparation immediately following, the Liquor Ammoniæ, or the Spiritus Ammoniæ Aromaticus preferably, should be selected when we consider uncombined ammonia is indicated as an antacid, the present preparation being intended solely for external or pharmaceutical uses. Still, as it is employed in the manufacture of the next preparation, I have thought proper for convenience sake to give its chemical history here. For its more special therapeutical uses, see *Caustics* and *Epispastics*.

PREPARATIONS.—Linimentum Camphoræ compositum; Liquor Ammoniæ; Spiritus Ammoniæ aromaticus; Spiritus Ammoniæ fœtidus; Tinctura Opii Ammoniata.

PREPARATIONS IN WHICH IT IS USED.—Ammoniæ Phosphas; Liquor Ammoniæ Citratis.

LIQUOR AMMONIÆ. *Solution of Ammonia.* (Ammoniacal gas, NH_3 (=17) or $\mathbf{NH_3}$, (=17) dissolved in water).

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

EXPLANATION OF PROCESS.—A case of simple dilution of the Liquor Ammoniæ Fortior with distilled water. In its chemical properties, in all respects save strength, it resembles the preceding preparation (which see).

TESTS.—Specific gravity 0·959. 85 grains by weight require for neutralisation 500 grain-measures of the volumetric solution of oxalic acid, corresponding to 10 per cent. by weight of ammonia, NH_3 or $\mathbf{NH_3}$. One fluid drachm contains 5.2 grains of ammonia.

THERAPEUTICAL EFFECTS.—Hufeland, whose observations have been confirmed by Richardson, states that ammonia and its salts, in the animal economy, exert a slow solvent action over the blood corpuscles and the protein textures generally. That they prevent the coagulation of freshly drawn blood has been repeatedly proved, the blood corpuscles being altered in shape or altogether destroyed. Mitscherlick in some experiments upon rabbits, killed by caustic water of ammonia, found that whilst the blood was all but fluid, its alkaline reaction was not altered. It has been observed that blood, drawn from patients to whom ammonia has been administered for some time, is, if not absolutely fluid, only susceptible of a very loose coagulation. As an antacid, ammonia acts 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. It is undoubtedly of inferior value in producing an alkaline condition of the urine, having a greater tendency to be eliminated by the skin and lungs than by the urinary organs; what does escape by the kidneys, according to Garrod, undergoing oxidation, and appearing in the urine as nitric acid. Of the two liquors, though both, *properly diluted*, may be administered internally, that which is adapted for such purpose is the liquor ammoniæ, which contains about 10 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 *Epispastics*, and *General Stimulants*).

DOSE AND MODE OF ADMINISTRATION.—Min. v. to min. xx. 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 lime and baryta.

In poisoning with either of these solutions of ammonia, the best

antidotes are the vegetable acids, of which perhaps vinegar is the most generally accessible, and of equal value.

PREPARATIONS.—Linimentum Ammoniæ (1 volume in 4); Linimentum Hydrargyri (1 part in 3).

PREPARATIONS IN WHICH IT IS USED.—Aconitia; Ammoniæ Benzoas; Beberiæ Sulphas; Calcis Phosphas; Ferri et Ammoniæ Citras; Ferri et Quiniæ Citras; Ferrum Tartaratum; Liquor Bismuthi et Ammoniæ Citratis; Morphiæ Acetas; Morphiæ Sulphas; Santoninum; Strychnia.

*AMMONIÆ BICARBONAS. *Bicarbonate of Ammonia.* (NH_4O, $HO2CO_2$=79).

PREPARATION.—Take of commercial carbonate 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.

EXPLANATION OF PROCESS.—Various theories have been brought forward to account for the conversion, by simple exposure to the air, of the carbonate *(Sesquicarbonate)* of ammonia into the bicarbonate. The most plausible is that each two atoms of the carbonate part with one atom of ammonia, and are thereby converted into three atoms of bicarbonate of ammonia. On this theory, the following equation will explain the reaction: $2(2NH_4O_2,3CO_2)=3(NH_4O, 2CO_2)+NH_3+HO$. A second theory is that this salt is composed of one atom of carbonate of ammonia and one atom of bicarbonate of ammonia, and that the atom of carbonate of ammonia escapes, leaving behind the bicarbonate. A third theory, that the sesquicarbonate is converted into bicarbonate by the absorption of carbonic acid from the atmosphere, is untenable, inasmuch as, instead of gaining weight, as, were this theory true, it should do, the carbonate loses weight on being exposed to the air.

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_32CO_2+2HO), or of one equivalent of *amidogene*, one of hydrogen, two of carbonic acid, and two of water, H,NH_22CO_2+2HO (Kane), or of one of oxide of ammonium, two of carbonic acid, and one of water, $NH_4O,HO,2CO_2$, (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 ant-

acid, 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 carbonate of ammonia (which see).

AMMONIÆ CARBONAS. *Carbonate of Ammonia.* Syn.—*Ammoniæ Sesquicarbonas*, Lond., Dub. *Sal volatile, smelling salts, baker's salt, salt of hartshorn, sal cornu cervi volatile*, &c. $2NH_4O,3CO_2$ (=118) or $\mathbf{N_4H_{16}C_3O_8}$ (=236). (A volatile and pungent ammoniacal salt, produced by submitting a mixture of sulphate of ammonia or chloride of ammonium and carbonate of lime to sublimation).

PREPARATION.—This salt 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 sesquicarbonate 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 AND TESTS.—In translucent crystalline masses, with a strong ammoniacal odour, *(acrid, highly alkaline taste)* and alkaline reaction; soluble in cold water, more sparingly in spirit. It volatilises entirely when heated, and is readily dissolved by acids with effervescence. If diluted nitric acid be added to it in slight excess, and the solution be boiled, it will give no precipitate with chloride of barium or nitrate of silver. Fifty-nine grains dissolved in one ounce of distilled water will be neutralised by 1000 grain-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 admits of no impurity, the proportions of the rëagents indicated being in strict accordance with their chemical equivalents.

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. In its solvent action over the blood corpuscles, it resembles the liquor ammoniæ, and if its use be too long persevered in, it is apt to produce irritation of the skin generally, and particularly itching of the scalp. 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. iij. to gr. x. in pill, or in any *cold* aqueous vehicle. Gr. xxx. usually produce vomiting. It is frequently used in the form of effervescence; when so used 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, 23½ 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.

PREPARATIONS.—Spiritus Ammoniæ Aromaticus.

PREPARATIONS IN WHICH IT IS USED.—Liquor Ammoniæ Acetatis.

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

LIQUOR CALCIS. *Solution of Lime.* Syn. *Aqua Calcis, Lime Water.*

PREPARATION.—Take of slaked lime, two ounces; distilled water, one gallon. Put 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.

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

TEST.—Ten fluid ounces require for neutralisation at least 200 grain-measures of the volumetric solution of oxalic acid, which corresponds to 5·6 grains of lime, CaO or CaO.

CHEMICAL PROPERTIES.—Lime is but 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 the diarrhœa of spoon-fed children, dependent on the employment of improper articles of diet, it will be found of great service also. In gastrodynia, as also in ulcer of the stomach, its administration in combination with milk has been attended with the happiest results. In chronic vomiting, as also in the vomiting of pregnant women, its use is attended with marked advantage. In phthisis Dr. T. K. Chambers strongly advocates its use in combination with milk, but here I suspect the remedial agent to be the milk, which the lime-water permits to sit lightly on the stomach, and thereby facilitates its assimilation. 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, or in combination with some of the vegetable bitter infusions, such as of calumba, gentian, &c. When lime-water has been administered for some time, its use should be occasionally intermitted.

INCOMPATIBLES.—The vegetable and mineral acids; ammoniacal salts; alkaline carbonates, and metallic salts; tartar emetic; borates, and astringent vegetable infusions.

PREPARATION.—Linimentum Calcis.

PREPARATIONS IN WHICH IT IS USED.—Argenti Oxidum; Lotio Hydrargyri Flava; and Lotio Hydrargyri Nigra.

Liquor Calcis Saccharatus. *Saccharated Solution of Lime.*

PREPARATION.—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.

EXPLANATION OF PROCESS.—In this process advantage is taken of the property possessed by sugar of increasing the solubility of lime in water.

TESTS.—Specific gravity 1·052. 460·2 grains by weight (1 fluid ounce) require for neutralisation 254 grain-measures of the volumetric solution of oxalic acid, which corresponds to 7.11 grains of lime in 1 fluid ounce.

CHEMICAL HISTORY.—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; this solution containing 7·11 grains of lime to the ounce, lime water but a little more than half a grain (gr. 0·56). Its chemical history, therefore, may be considered as identical with that of lime-water; physically it somewhat differs from that preparation in being more viscid, and, although transparent, of a slight yellowish tinge.

THERAPEUTICAL USES.—The therapeutical uses of saccharated solution of lime are identical with those of lime-water, requiring, however, in consequence of its causticity, rather free dilution. Dr. Cleland, who, some years ago, introduced a preparation very similar to this, under the name of *Saccharate of Lime*, speaks highly of its value. He states that it differs from other alkaline remedies in not weakening the digestive organs, but rather acting as a tonic to them. He also asserts that it does not produce constipation, but, on the contrary, is of use in overcoming the chronic constipation of the dyspeptic; and has suggested its use as a valuable agent in correcting the dipsomaniac's morbid cravings for alchoholic stimulants.

DOSE AND MODE OF ADMINISTRATION.—The dose for children will be from 20 to 30 minims; for adults, 1 to 3 drachms, in both cases well diluted, which may be repeated twice or thrice a day. It should not be administered on an empty stomach, inasmuch as under such circumstances it might produce nausea, or even be rejected, but should rather be given after meals. 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.* (Chalk, freed from most of its impurities by elutriation, and afterwards dried in small masses, which are usually of a conical form).

PREPARATION.—In the Pharmacopœia we have only indicated as it were the process by which prepared chalk is obtained; it is generally procured by reducing chalk to powder, and, having rubbed it in a mortar with as much water as will give it the consistence of cream, the mortar is then filled with more water, and stirred well, giving the whole a circular motion. The mixture is allowed to stand for fifteen seconds, and the milky liquid decanted into a large vessel. What remains is rubbed up in the mortar, adding as much water as was previously used, and, after allowing it to settle for fifteen seconds, again decanted; and this process is repeated several times, using, if necessary, additional chalk. The fine sediment which subsides from the decanted liquids is transferred to a filter, and dried at a temperature of 212°. By this process the coarser particles are first allowed to precipitate, and, on subsequent decan-

tation and rest, the chalk in the form of a fine powder subsides, and on drying is fit for use.

CHARACTERS AND TESTS.—A white amorphous powder, effervescing with acids, and dissolving with only a slight residue, in diluted hydrochloric acid. This solution, when supersaturated with solution of ammonia, gives, upon the addition of oxalate of ammonia, a copious white precipitate. The salt formed by dissolving the prepared 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.

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 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 the absence of oxide of iron, magnesia, alumina, baryta, and strontian is to be presumed should it behave as described on the addition of the saccharated solution of lime.

In addition to the pharmacopœial characters, it may be stated that prepared chalk 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, perhaps no medicine is more frequently prescribed than this, in the form of chalk mixture, which is generally and very advantageously combined with aromatics and with opium. It is an excellent antidote, indeed the very best, inasmuch as it is always at hand (in an emergency the ceilings of any room affording us an abundant supply), in poisoning with nitric, hydrochloric or oxalic acids, and is used with benefit as a desiccant in bedsores, burns and scalds, intertrigo, erysipelas, and some forms of skin disease when unattended with local inflammatory action. Carbonate of lime dissolved in water by means of carbonic acid in excess constitutes an ærated 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-indi-

cated in cases in which there is a tendency to phosphatic deposits in the urine, or to habitual constipation. (See also *Astringents.*)

DOSE AND MODE OF ADMINISTRATION.—Gr. lx. to gr. cxx. in powder.

PREPARATIONS.—Hydrargyrum cum Cretâ, 2 parts in 3; (described under the head of *Cathartics*) Mistura Cretæ, 1 part in 32; Pulvis Cretæ aromaticus 1 part in 4; Pulvis Cretæ aromaticus cum Opio, 1 part in 4, nearly (described under the head of *Astringents*).

Mistura Cretæ. Chalk Mixture. (Take of Prepared Chalk, gr. cxx.; Gum Acacia, in powder, gr. cxx.; Syrup, f℥ss.; Cinnamon Water, f℥vijss. Triturate the chalk and gum acacia with the cinnamon water, then add the syrup, and mix.) Chiefly used in diarrhœa as an antacid and astringent, and as a vehicle for more active remedies. In its preparation prepared chalk is rightly preferred to precipitated chalk (hereafter to be described), inasmuch as the latter is apt to irritate the mucous membrane of the alimentary canal, in consequence of its finely crystalline formation.

Pulvis Cretæ Aromaticus. Aromatic Powder of Chalk. Syn.—*Confectio Aromatica,* Lond. (Take of Cinnamon Bark, in powder, ℥iv.; Nutmeg, in powder, ℥iij.; Saffron, in powder, ℥iij.; Cloves, in powder, ℥jss.; Cardamom Seeds, in powder, ℥j.; Refined Sugar, in powder, ℥xxv.; Prepared Chalk, ℥xj. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. 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 in 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.* CaO,CO_2 (= 50) or $\mathbf{CaCO_3}$(=100).

PREPARATION.—Take of chloride of calcium, five ounces; carbonate of soda, thirteen ounces; boiling distilled water, a sufficiency. Dissolve the chloride of calcium and 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°.

EXPLANATION OF PROCESS.—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 $CaCl+NaO,CO_2 10HO=CaO,CO_2+NaCl+10HO$.

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 for drying the product would result in the production of caustic lime.

CHARACTERS AND TESTS.—A white crystalline powder, insoluble in water, dissolving in hydrochloric acid with effervescence. The solution, when neutralised by ammonia, lets fall a copious white precipitate on the addition of oxalate of ammonia. With diluted nitric acid it gives a clear solution, which, if perfectly neutral and deprived of carbonic acid by boiling, is not precipitated by saccharated solution of lime added in excess, or by the solution of nitrate of silver.

The copious white precipitate stated to be formed on the addition of oxalate of ammonia is oxalate of lime; the previous neutralization with ammonia being essential, inasmuch as the resulting oxalate is soluble in an acid solution. Its not precipitating on the addition of saccharated solution of lime, after being treated as directed, indicates that it is not contaminated with sulphate or chloride of magnesia, alumina, baryta, or ammonia, impurities occasionally found in it. The boiling directed previous to the application of these rëagents is essential to get rid of the pure carbonic acid which remains *entangled* in the solution, after being liberated from the carbonate of lime by the action of the nitric acid: this carbonic acid itself would precipitate in the form of carbonates the rëagents employed, and thus give rise to an erroneous suspicion that the preparation was not pure.

THERAPEUTICAL USES.—The remarks made as to the chemical history and therapeutical uses 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 last edition of the British Pharmacopœia as a constituent of the chalk mixture, it is not so in fact; prepared chalk, for the reason already assigned when describing the mixture, being the preparation which is employed; it is, however, a constituent of the *trochisci bismuthi*, which will be described hereafter.

DOSE.—10 to 60 grains.

PREPARATION.—Trochisci Bismuthi, 4 grains in each lozenge, nearly.

LITHIÆ CARBONAS. *Carbonate of Lithia.* LO,CO_2 (=37) or $\mathbf{L_2CO_3}$ (=74).

PREPARATION.—No directions are given in the Pharmacopœia for the manufacture of the carbonate of lithia; 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, thus $(2NH_4O,3CO_2)+2LOSO_3=2LOCO_2+2NH_4OSO_3+CO_2$.

CHARACTERS AND TESTS.—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 communicates a red colour to the flame of a spirit lamp, and redissolved in water yields a precipitate with phosphate of soda. Ten grains of the salt neutralised 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 red colour communicated to the flame of the spirit lamp is characteristic of the salts of lithia. The precipitate produced on the addition of phosphate of soda is phosphate of lithia ($3LO,PO_5$) which distinguishes it from the other alkaline carbonates, the phosphates of which are soluble. 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, did it exist as an impurity.

CHEMICAL HISTORY.—In the year 1817 Arfwedson announced the existence of lithia in the mineral petalite; since then 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, so called from *λίθος* a stone, inasmuch as on its first discovery it was supposed only to exist in the mineral kingdom. This metal is the lightest of all known solids, its specific gravity being 0·594, floating on water and naphtha; 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. 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 (Carlsbad, Baden-Baden, Bath, &c.), 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. 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 it from the carbonates of the alkaline earths by its superior solu-

bility, whilst the solubility of its chloride in alcohol, and the insolubility of its phosphate in water, distinguish it from potash and soda. Sulphate of lithia itself, from which the carbonate is made, is 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.

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 (7) 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 are now 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. He has 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 and Messrs. Oldham 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, should be preferred to the carbonate when we wish to prescribe lithia in the form of draught or mixture.

DOSE.—3 to 6 grains.

PREPARATION.—Liquor Lithiæ Effervescens.

PREPARATIONS IN WHICH IT IS USED.—Lithiæ Citras.

LIQUOR LITHIÆ EFFERVESCENS. *Effervescing Solution of Lithia.* Syn.—*Aqua Lithiæ Effervescens. Lithia Water.*

PREPARATION.—Take of carbonate of lithia, ten grains; water, one pint. Mix in a suitable apparatus, and pass into it as much pure washed carbonic acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

EXPLANATION OF PROCESS.—This is an officinal formula for the preparation of lithia water, in my opinion an unnecessary and useless one, inasmuch as the manufacture of all these aerated waters constitutes a vast trade which can never be emulated by the exertions of such parties as those for whose use a pharmacopœia should be compiled. In this case the carbonate of lithia is dissolved by the excess of carbonic acid employed, and the carbonic acid itself is set free by the action of the sulphuric acid upon the chalk, the acid going to the lime to form sulphate of lime, and the carbonic acid being set free, thus $CaO,CO_2+SO_3=CaO,SO_3+CO_2$.

CHARACTERS AND TESTS.—Effervesces strongly when the containing vessel is opened, carbonic acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. Half a pint of it, evaporated to dryness, yields five grains of a white solid residue, answering to the tests for carbonate of lithia.

THERAPEUTICAL USES.—Same as preceding preparation, which see.

DOSE.—5 to 10 fluid ounces.

LITHIÆ CITRAS. *Citrate of Lithia.* $3LO,C_{12}H_5O_{11}(=210)$ or $\mathbf{L_3C_6H_5O_7}$ $(=210)$.

PREPARATION.—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 pulverised, and enclosed in a stoppered bottle.

EXPLANATION OF 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. The reaction that ensues is thus expressed, $3(LO,CO_2)+(3HO,C_{12}H_5O_{11}+2HO)=5HO+3CO_2+3LO,C_{12}H_5O_{11}$. Its deliquescence explains why we are to pulverize it as rapidly as possible, and renders necessary the direction that it should be kept in a stoppered bottle.

CHARACTERS AND TESTS.—A white amorphous powder, deliquescent, and soluble in water without leaving any residue. Heated to redness it blackens, evolving inflammable gases; and the residue, neutralised by hydrochloric acid, yields with rectified spirit a solution which burns with a crimson flame. Twenty grains of the salt, burned at a low red heat with free access of air, leave 10·6 grains of white residue.

The blackness produced on its being heated to redness, as well as the development of inflammable gases (phenomena attendant upon the combustion of all the salts of the vegetable acids) are referrible to the charring of the citric acid, its elements being re-arranged so as to produce the gases alluded to, as well as charcoal and carbonic acid. The crimson flame is characteristic of the salts of lithia, whilst the 10·6 grains of white residue resulting upon the combustion of twenty grains of the citrate of lithia are carbonate of lithia, an amount of product that admits of no impurity in the specimen operated upon.

THERAPEUTICAL USES.—Same as carbonate of lithia. (See p. 17.)

DOSE AND MODE OF ADMINISTRATION.—It can be administered in doses from three to five or ten grains, or even more, dissolved in water, to which some syrup and carminative tincture may be added to suit the palate.

MAGNESIA. *Magnesia.* MgO(=20) or **MgO** (=40).

PREPARATION.—Take of carbonate of magnesia, four ounces. Put it into a Cornish or Hessian crucible closed loosely by a lid, and expose it to a low red heat until a small quantity, taken from the centre of the crucible when it has cooled, and dropped into diluted sulphuric acid, causes no effervescence.

EXPLANATION OF PROCESS.—On exposing carbonate of magnesia ($3MgO,CO_2+MgO+5HO$) to a low red heat, the carbonic acid and water are driven off, and it is reduced to the condition of magnesia (MgO). The process is known to be completed when it ceases to effervesce on the addition of diluted sulphuric acid, clear proof that all its carbonic acid has been expelled, and that it has been reduced to the condition of an oxide. 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 should be pre-

served in well corked bottles, as by exposure to the air it slowly absorbs moisture and carbonic acid.

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 5,142 times its weight of water at 60° for its solution, and 36,000 parts of boiling water; but it differs from lime in not producing a marked elevation of temperature on the addition of water. When moistened it acts feebly alkaline on vegetable colours. On the addition of phosphate of soda ($2NaO,HO,PO_5$) to its solution in hydrochloric acid, neutralized by a mixed solution of ammonia and chloride of ammonium, a copious white precipitate is thrown down, ammoniaco-phosphate of magnesia, ($NH_4O,2MgO,PO_5$) the production of which is thus accounted for. On the addition of hydrochloric acid to magnesia, chloride of magnesium and water are formed thus, $MgO + HCl = MgCl + HO$; on the addition of the phosphate of soda and ammonia to this solution, the ammoniaco-magnesian phosphate is precipitated, whilst chloride of sodium is held in solution. The following equation (into which, however, the chloride of ammonium is not introduced, inasmuch as it takes no part in the production of the salt, its only use being to prevent the premature precipitation of the magnesia,) accounts for the reaction $2NaO, HO,PO_5 + 2MgCl + NH_4O = (NH_4O, 2MgO, PO_5) + 2NaCl + HO$.

CHARACTERS AND TESTS.—A white powder, insoluble in water, but readily dissolved by acids without effervescence. Its solution in hydrochloric acid, when neutralised by a mixed solution of ammonia and chloride of ammonium, gives a copious crystalline precipitate when phosphate of soda is added to it. Dissolved in nitric acid, and neutralised with a mixture of ammonia and chloride of ammonium, it does not give any precipitate with oxalate of ammonia, or chloride of barium.

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 acids; if alumina is present, the solution in a dilute acid precipitates with excess of ammonia; and, under the conditions stated in the tests, oxalate of ammonia will not precipitate it unless lime, nor chloride of barium unless sulphate of magnesia, be present as an impurity. 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, (especially in that of pregnant women) 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; and in that of persons of a gouty and rheumatic diathesis, as it diminishes the quantity of uric acid in the urine; also 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. as an antacid twice or three times daily; gr. xxx. to gr. lx. as an aperient. (See *Cathartics.*) 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 concretions in 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.

PREPARATIONS OF MAGNESIA AND ITS COMPOUNDS.

Enema Magnesiæ Sulphatis . . .	oz. 1 of the sulphate in f℥xvj.
Liquor Magnesiæ Carbonatis . . .	gr. 12 of the carbonate in f℥j.
Magnesia.	
Magnesia Levis.	
Magnesiæ Carbonas.	
Magnesiæ Carbonas Levis.	
Magnesiæ Sulphas.	
Mistura Sennæ Composita . . .	oz. 1 of the sulphate in f℥v.
Pulvis Rhei Compositus	Six parts of light magnesia in nine.

MAGNESIA LEVIS. *Light Magnesia.* MgO(=20) or **MgO** (=40).

PREPARATION.—Take of light carbonate of magnesia, four ounces. Put it into a Cornish or Hessian crucible closed loosely by a lid, and expose it to a low red heat until a small quantity taken from the centre of the crucible, when it has been cooled and dropped into diluted sulphuric acid, causes no effervescence.

EXPLANATION OF PROCESS.—Same as preceding preparation, the only difference in the process being that, as in the preceding preparation heavy carbonate of magnesia was used, in this it is the *light* carbonate that is employed.

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.

THERAPEUTICAL EFFECTS.—Although these two forms of magnesia, the heavy and the light, have been introduced into the Pharmacopœia, I am not satisfied as to the existence of any marked difference in their physiological effects or therapeutic uses. While some for its smoothness prefer the heavy variety, others assert that the lighter is quicker in its action as an aperient; still the latter does not mix as readily as the former with water, nor does it make as smooth a draught. 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.

DOSE AND MODE OF ADMINISTRATION.—In these respects also it seems to be identical with the preceding preparation, which see.

PREPARATION.—Pulvis Rhei Compositus, 6 parts in 9.

MAGNESIÆ CARBONAS. *Carbonate of Magnesia.* $3(MgO, CO_2)+MgO+5HO$ (=191) or $3(\mathbf{MgCO_3})\mathbf{MgO5H_2O}$(=382).

PREPARATION.—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°.

EXPLANATION OF PROCESS.—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 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. This, 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 causes the precipitate to be composed partially of carbonate of magnesia and partly of oxide. Four equivalents of carbonate of soda, thus re-acting upon four equivalents of sulphate of magnesia, result in the production of four equivalents of sulphate of soda and one equivalent of bicarbonate of magnesia, which are held in solution; and two equivalents of carbonate of magnesia with one of magnesia, which at once are precipitated. 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, $4(MgO,SO_3+7HO)+4(NaO,CO_2+10HO)=(3(MgO,CO_2)+MgO+5HO)+CO_2+4(NaO,SO_3 10HO)+23HO$. 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.

CHARACTERS AND TESTS.—A white granular powder, which dissolves with effervescence in the diluted mineral acids, yielding solutions which, when first treated with chloride of ammonium, are not disturbed by the addition of an excess of solution of ammonia, but yield a copious crystalline precipitate upon the addition of phosphate of soda. With excess of hydrochloric acid it forms a clear solution in which chloride of barium causes no precipitate. Another portion of the solution supersaturated with ammonia gives no precipitate with oxalic acid or sulphuretted hydrogen. Fifty grains calcined at a red heat are reduced to twenty-two.

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 (see p. 20). 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, and metallic impurities by the sulphuretted hydrogen. The amount of residue *(magnesia)* left after calcination indicates the absolute purity of the salt, being in fact somewhat in excess of what theory would indicate. 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.

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 (next to be described) 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 (the present preparation) is preferred by many practitioners. (See also *Cathartics.*)

DOSE AND MODE OF ADMINISTRATION.—As an antacid, 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, under his own name, *Murray's Fluid Magnesia,* and which 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 Magnesia bicarbonatis,* and is given as an antacid in doses of f℥ss to f℥ij. 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. For this reason perhaps it is that the pharmacopœial authorities have introduced a formula for its preparation, so as to give us a solution, *on authority,* of definite strength, certainly not with the idea that their process ever will induce pharmaceutists to undertake its manufacture, such proceedings having developed themselves into trades of gigantic proportion. Messrs. Thwaites, Messrs. Bewley and Hamilton, and Messrs. Oldham 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.

PREPARATIONS:—Liquor Magnesiæ Carbonatis, gr. xij. in f℥j. Trochisci Bismuthi, gr. iiss. in each lozenge nearly. *(See Bismuth.)*

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

MAGNESIÆ CARBONAS LEVIS. *Light Carbonate of Magnesia.* $3(MgO,CO_2) + MgO + 5HO$ (=191) or $3(\mathbf{MgCO_3})\,\mathbf{MgO,5H_2O}$ (=382).

PREPARATION.—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°.

EXPLANATION OF PROCESS.—The reactions that ensue in this process on the admixture of the ingredients are precisely similar to those described in the preceding preparation (see p. 22); the relative amount of intimate aggregation of their particles constituting 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, as in the preceding preparation, is to remove carbonates and sulphates 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.

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.

CHEMICAL AND THERAPEUTICAL HISTORY.—For these the reader is referred to the preceding preparation, inasmuch as, so far as my experience goes, they seem to be as identical in therapeutic value as they are in chemical composition.

DOSE AND MODE OF ADMINISTRATION.—Same as preceding preparation, which see.

LIQUOR MAGNESIÆ CARBONATIS. *Solution of Carbonate of Magnesia.* Syn.—*Fluid Magnesia.*

PREPARATION.—Take of sulphate of magnesia, two ounces; carbonate of soda, two and a half ounces; distilled water, a sufficiency. Dissolve the two salts separately each in half a pint of water. Heat the solution of sulphate of magnesia to the boiling

point, then add to it the solution of carbonate of soda, and boil them together until carbonic acid ceases to be evolved. Collect the precipitated carbonate of magnesia on a calico filter, and wash it with distilled water until what passes ceases to give a precipitate with chloride of barium. Mix the washed precipitate with a pint of distilled water, and, putting them into a suitable apparatus, pass into it pure washed carbonic acid gas obtained by the action of sulphuric acid on chalk. Let the mixture remain in contact with excess of carbonic acid, retained there under pressure for about twenty-four hours, then filter the liquid to remove any undissolved carbonate of magnesia, and again pass carbonic acid gas into the filtered solution. Finally, keep the solution in a bottle securely closed, to prevent the escape of carbonic acid. This solution contains about thirteen grains of carbonate of magnesia in a fluid ounce.

EXPLANATION OF PROCESS.—The reaction that ensues on an admixture of sulphate of magnesia and carbonate of soda has been already described (see page 22). The carbonate of magnesia so obtained is subjected to the action of a stream of carbonic acid gas generated by the action of sulphuric acid upon chalk, the sulphuric acid uniting with the lime of the carbonate of lime to form sulphate of lime, and setting free its carbonic acid, thus $CaO\ CO_2 + SO_3 = CaOSO_3 + CO_2$.

CHARACTERS AND TESTS.—Effervesces slightly, or not at all, when the containing vessel is first opened. The liquid is clear and free from any bitter taste. A fluid ounce of it, evaporated to dryness, yields a white solid residue, which after being calcined weighs not less than five grains. This residue is insoluble in water and answers to the test for magnesia.

CHEMICAL HISTORY.—As this is nothing but a solution of carbonate of magnesia in water acidulated with carbonic acid, its chemical history must in every respect resemble that of carbonate of magnesia, which see. The amount of solid white residue *(magnesia)* obtained by evaporating a fluid ounce of it, and calcining the product (five grains,) would correspond more closely to a strength of *twelve* grains of carbonate of magnesia to the fluid ounce, than thirteen grains, which is put forward in the Pharmacopœia as its strength.

DOSE AND MODE OF ADMINISTRATION.—In therapeutic value this corresponds with the carbonate of magnesia, of which in fact it is but a more agreeable form for administration, and for which in most cases it may be substituted. It forms an admirable vehicle for many medicines, and combined with tincture of rhubarb, syrup of ginger, tincture of the seeds of colchicum, and a few drops of chlorodyne, constitutes an admirable antacid remedy for gouty, flatulent dyspepsia. Fluid magnesia may be given in doses of from one to two ounces. The addition of some acid syrup, such as that of lemons, makes it a most agreeable antacid laxative cooling draught.

LIQUOR POTASSÆ. *Solution of Potash.* Syn.—*Liquor Potassæ Causticæ. Caustic Water of Potash. Liquor Kali.*

PREPARATION.—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 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, and add distilled water if necessary, to make it correspond with the tests of specific gravity and neutralizing power.

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; this 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, $KO,CO_2 2HO + CaO = CaO,CO_2 + KOHO + HO$. It is correctly directed to be kept in green-glass bottles, inasmuch as it acts slightly upon those of white-glass, dissolving out a trace of lead; besides, if left undisturbed for some time, firmly cementing the stopper to the neck of the bottle.

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 carbazotic acids precipitate with it, respectively, bitartrate, perchlorate, and carbazotate of potash. If the solution of tartaric acid be not in excess, it may require brisk agitation to develope the precipitate. When supersaturated with hydrochloric acid, a solution of perchloride of platinum throws down with it a yellow precipitate, the double chloride of potassium and platinum ($KCl,PtCl_2$), the production of which can be accounted for by the union of one atom of chloride of potassium with one atom of bichloride of platinum resulting in the production of the salt in question, thus $KCl + PtCl_2 = KCl,PtCl_2$. 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 dissolves gums, resins, and extractive matter, and with fatty and oily matter forms soaps.

TESTS.—Specific gravity 1·058. 462·9 grains by weight (one fluid ounce) require for neutralization 482 grain-measures of the volumetric solution of oxalic acid, corresponding to 5·84 per cent. by weight of hydrate of potash, KO,HO or **KHO**. It does not effervesce when added to an excess of diluted hydrochloric acid. Mixed with an equal volume of distilled water it gives no precipitate with solution of lime or oxalate of ammonia. When it is treated with an excess of diluted nitric acid, and evaporated to dryness, the residue forms with water a nearly clear solution, which may

be slightly precipitated by chloride of barium and nitrate of silver, but is unaffected or but very slightly affected by ammonia. One fluid ounce contains twenty-seven grains of hydrate of potash.

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.

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 ardor urinæ and in chronic catarrh of the bladder its value has long been recognised by every practical surgeon. 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 fibrin more soluble tend to prevent its deposition, both of which effects serve as indications for its therapeutical employment. Perhaps to this property may be attributed its undoubted value in rheumatism both acute and chronic. Solution of potash when taken for some time diminishes nutrition, and by liquifying it 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; and in chronic bronchitis, as also in advanced stages of pneumonia, attended with thick, viscid, and difficult expectoration, it proves of service in liquefying 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. 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.)

DOSE AND MODE OF ADMINISTRATION.—Min. x. gradually increased to f3j. or f3ij.; 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, f3ss. to f3ij.

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

POTASSÆ BICARBONAS. *Bicarbonate of potash.* $KO,HO,2CO_2$ (=100) or $\mathbf{KHCO_3}$ (=100). May be obtained by the following process.

PREPARATION.—Take of carbonate of potash, one pound; distilled water, two pints; hydrochloric acid, a 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 bicarbonate of potash will have formed, which are to be removed, shaken 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 gas 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 AND TESTS.—Colourless right rhombic prisms, not deliquescent, of a saline feebly alkaline taste, not corrosive. Diluted hydrochloric acid causes strong effervescence, forming a solution with which perchloride of platinum gives a yellow precipitate. Fifty grains exposed to a low red heat, leave thirty-four and a half grains of a white residue, which require for exact saturation 500 grain-measures of the volumetric solution of oxalic acid. Twenty grains bicarbonate of potash neutralise fourteen grains citric acid, or fifteen grains tartaric acid.

Were it deliquescent the presence of carbonate of potash is to be inferred, due to the insufficient exposure of this salt to the action of the carbonic acid. By the action of hydrochloric acid upon bicarbonate of potash, effervescence is produced, its carbonic acid being expelled and chloride of potassium and water formed, thus, $KO\,HO,2CO_2+HCl=KCl+2CO_2+2HO$. The yellow precipitate produced on the addition of perchloride of platinum has been already explained (see p. 27). The action of a red heat upon the salt expels one of its atoms of carbonic acid, and thereby reduces 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. In addition to the characters given in the Pharmacopœia it may be stated that bicarbonate of potassa is odourless; 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 sesquicarbonate ; and that it re-acts feebly as an alkali on the test papers. Bicarbonate of potassa is distinguished from the carbonate by the addition of a solution of corrosive sub-

limate, 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, which possesses the advantage of being less unpleasant to the taste than the liquor potassæ; and its employment may be continued without interruption for a longer period. An officinal solution of this kind has been introduced into the present Pharmacopœia, in my opinion a most unnecessary formula, inasmuch as solutions of this kind are prepared by the mineral water manufacturers. Messrs. Thwaites, Messrs. Bewley and Hamilton, and Messrs. Oldham and Co. of this city keep them prepared of different strengths: No. 1 containing 10 grains of bicarbonate of potash; 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.

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 f3iiiss. of freshly prepared lemon-juice.

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

PREPARATION.—Liquor Potassæ Effervescens, thirty grains in one pint.

LIQUOR POTASSÆ EFFERVESCENS. *Effervescing Solution of Potash.* Syn.—*Aqua Potassæ Effervescens. Potash Water. Kali Water.*

PREPARATION.—Take of bicarbonate of potash, thirty grains; water, one pint. Dissolve the bicarbonate of potash in the water and filter the solution; then pass into it as much pure washed carbonic acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

EXPLANATION OF PROCESS.—In this case the water containing the bicarbonate of potash in solution is charged with carbonic acid set free by the action of the sulphuric acid upon the chalk. This action will be understood by reference to p. 26.

CHARACTERS AND TESTS.—Effervesces strongly when the containing vessel is opened, carbonic acid gas escaping. The liquid is clear and sparkling and has an agreeable acidulous taste. Ten fluid ounces, after been boiled for five minutes, require for neutralisation 150 grain-measures of the volumetric solution of oxalic acid. Five fluid ounces, evaporated to one-fifth, and twelve grains of tartaric acid added, yield a crystalline precipitate, which when dried weighs not less than twelve grains.

These tests and characters require but little comment; the volumetric test determines the fifteen grains of bicarbonate of potash, which is very nearly corroborated by the amount of the crystalline precipitate (acid tartrate of potash) obtained on the addition of the tartaric acid.

DOSE AND MODE OF ADMINISTRATION.—It may be drank *ad libitum*, its uses and effects corresponding in every respect to the preceding preparation, which see.

POTASSÆ CARBONAS. *Carbonate of Potash.* KO,CO_2 (=69) or $\mathbf{K_2CO_3}$ (=138) with about sixteen per cent. of water of crystallization.

PREPARATION.—Obtained from commercial pearl-ash, the product of lixiviation of wood-ashes, by treating the pearl-ash with its own weight of distilled water, and evaporating the solution so formed to dryness, while it is kept briskly agitated.

CHEMICAL HISTORY.—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, the flame of which is allowed to play over the mass, and thus its volatile impurities are got 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 to 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. With this object in view the present directions are given us in the Pharmacopœia, but the method 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, formerly officinal, is so no longer.

CHARACTERS AND TESTS.—A white crystalline powder, alkaline and caustic to the taste, very deliquescent, readily soluble in water but insoluble in spirit, effervescing with diluted hydrochloric acid, and forming a solution with which perchloride of platinum gives a yellow precipitate. Loses about sixteen 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; and the solution is precipitated only faintly by chloride of barium, and nitrate of silver. Eighty-three grains require for neutralisation at least 980 grain-measures of the volumetric solution of oxalic acid. Twenty grains carbonate of potash neutralise seventeen grains citric acid, or eighteen grains tartaric 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 amount of water associated with it when crystallized; 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. In cases of poisoning with this salt, the antidotes are the same as those for solution of potash. 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 cold cream or cucumber cerate.

INCOMPATIBLES.—Same as the bicarbonate; but sulphate of magnesia is decomposed by the carbonate.

PREPARATIONS IN WHICH CARBONATE OF POTASH IS USED.—Atropia; Decoctum Aloes compositum; Enema Aloes; Liquor Arsenicalis; Liquor Potassæ; Mistura Ferri composita; Potassa Sulphurata; Potassæ Acetas; Potassæ Bicarbonas; Potassæ Chloras; Potassæ Citras; Potassæ Tartras; Unguentum Potassii Iodidi.

Liquor Sodæ. *Solution of Soda.*

PREPARATION.—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 with it the slaked lime, and continue the ebullition for ten minutes with constant stirrring. 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, and add distilled water, if necessary, to make it correspond with the tests of specific gravity and neutralising power.

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, $NaO,CO_2 + 10HO + CaO = CaO,CO_2 + NaO,HO + 9HO$.

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. 458 grains by weight (1 fluid ounce) require for neutralisation 470 grain-measures of the volumetric solution of oxalic acid, corresponding to 4·1 per cent. by weight of hydrate of soda, NaO,HO or **NaHO**. It does not

effervesce when added to an excess of diluted hydrochloric acid. Mixed with an equal volume of distilled water it gives no precipitate with solution of lime or oxalate of ammonia. When it is treated with an excess of diluted nitric acid, and evaporated to dryness, the residue forms with water a clear solution which is only slightly precipitated by chloride of barium or by nitrate of silver, and not at all by ammonia. One fluid ounce contains 18·8 grains of hydrate of soda.

The volumetric test indicates the presence in each ounce of 18.8 grains of hydrate of soda, a quantity compared with that of hydrate of potash in the analogous preparation, liquor potassæ, in very close proportion to their relative chemical equivalents. The non-effervescence on the addition of hydrochloric acid indicates the absence of carbonate of soda, as also does the non-precipitation on the addition of the lime; the non-precipitation on the addition of 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 of soda and of 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. It is also asserted to act with more energy on the liver than does liquor potassæ, a statement in which my own experience leads me very strongly to coincide, hence it is to be preferred in the treatment of dyspepsia associated with biliary derangement. In cases of poisoning with solution of soda the best antidotes are vinegar, lemon-juice, and the fixed oils.

DOSE AND MODE OF ADMINISTRATION.—It may be prescribed in the same manner and in the same doses as liquor potassæ, which see.

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

PREPARATIONS IN WHICH IT IS USED.—Sodæ Valerianas; Antimonium Sulphuratum; Ferri Oxidum Magneticum; Ferri Peroxidum Humidum, and Quiniæ Sulphas.

SODÆ BICARBONAS. *Bicarbonate of Soda.* $NaO,HO,2CO_2$, (=84) or $\mathbf{NaHCO_3}$ (=84). May be obtained by the following process:—

PREPARATION.—Take of carbonate of soda, two pounds; dried carbonate of soda, three pounds; white marble, in fragments, four pounds; hydrochloric acid, 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. Pour upon the damp salt which is formed half its weight of cold distilled water; and shake it occasionally during the course of half an hour; then 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. Dried carbonate of soda alone evidently would not do, inasmuch as it contains no water; carbonate of soda also *per se* would be ineligible, inasmuch as it contains far more water of crystallization (ten atoms) than is required for the bicarbonate, and an inconvenient amount of dampness would result were it solely employed, hence the advantage of using the mixed salts. A slight excess of the carbonate of soda is employed, which communicates the damp appearance alluded to; by washing, any carbonate that may remain unacted upon is removed.

CHARACTERS AND TESTS.—In powder or small opaque irregular scales, white, of a saline not unpleasant taste. Imparts a yellow colour to flame. Dissolves with much effervescence in diluted hydrochloric acid, forming a solution in which perchloride of platinum causes no precipitate. A solution of the salt in cold water gives a white and not a coloured precipitate with solution of perchloride of mercury. 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 neutralisation 1000 grain-measures of the volumetric solution of oxalic acid. Twenty grains of bicarbonate of soda neutralise 16·7 grains of citric acid, or 17·8 grains tartaric acid.

The yellow colour imparted to flame is characteristic of the salts of soda; the effervescence resulting on its solution in the hydrochloric acid indicates the presence of carbonic acid, whilst the non-precipitation by perchloride of platinum distinguishes it from the salts of potash, with which the perchloride would yield a yellowish precipitate (see p. 27). When supersaturated with nitric acid, its non-precipitation with chloride of barium indicates the absence of sulphates; with 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 31 grains of oxide of sodium—tests indicating the absolute purity of the salt. It is soluble in ten parts of water.

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 bicar-

bonate 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 33 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.

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

PREPARATIONS CONTAINING BICARBONATE OF SODA.—Liquor Sodæ effervescens, thirty grains in one pint; Sodæ Citro-tartras effervescens, seventeen parts in thirty-one; Trochisci Sodæ Bicarbonatis, five grains in each lozenge.

Sodæ Citro-Tartras Effervescens. Effervescent Citro-tartrate of Soda. (Take of bicarbonate of soda, in powder, 17 ounces; tartaric acid, in powder, 8 ounces; citric acid, in powder, 6 ounces. Mix the powders thoroughly, place them in a dish or pan of suitable form heated to between 200° and 220°, and when the particles of the powder begin to aggregate, stir them assiduously until they assume a granular form; then, by means of suitable sieves, separate the granules of uniform and most convenient size, and preserve the preparation in well-closed bottles.) This is a new preparation, and will be accepted as a useful one; this powder has been for some time in use as an extemporaneous way of preparing an agreeable, cooling, effervescing drink. A couple of drachms of it, added to a tumblerful of water, will effervesce briskly. *Dose*, 60 grains to 120 grains.

Trochisci Sodæ Bicarbonatis. Bicarbonate of Soda Lozenges. (Take of bicarbonate of soda, in powder, 3,600 grains; refined sugar, in powder, 25 ounces; gum acacia in powder, 1 ounce; mucilage of gum acacia, 2 fluid ounces; distilled water, 1 fluid ounce. Mix the powders and add the mucilage and water to form a proper mass

Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains five grains of bicarbonate of soda. An agreeable method of introducing soda into the stomach in cases of trifling casual acidity. Dose, 1 to 6 lozenges.

LIQUOR SODÆ EFFERVESCENS. *Effervescing Solution of Soda.* Syn.—*Aqua Sodæ Effervescens. Soda Water.*

PREPARATIONS.—Take of bicarbonate of soda, thirty grains; water, one pint. Dissolve the bicarbonate of soda in the water and filter the solution; then pass into it as much pure washed carbonic acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

EXPLANATION OF PROCESS.—The explanation of this process is identical with that of the Liquor Potassæ Effervescens (p. 32,) except that in this case bicarbonate of soda is used instead of bicarbonate of potash.

CHARACTERS AND TESTS.—Effervesces strongly when the containing vessel is opened, carbonic acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. Ten fluid ounces, after being boiled for five minutes, require for neutralisation 178 grain-measures of the volumetric solution of oxalic acid.

THERAPEUTICAL USES.—This constitutes *soda water,* the form in which the bicarbonate is most generally used. As but too frequently 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 in a coarse way 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, and after being heated to expel the carbonic acid; when no further effervescence will take place, unless the alkaline carbonate be present. The volumetric test of the Pharmacopœia however leaves no room for error, inasmuch as it would indicate rather more than fifteen grains of bicarbonate of soda (the amount that should be present) in the quantity of soda water operated upon. Being usually prepared on the large scale by mineral water vendors, it might have been omitted from the Pharmacopœia. The soda water manufactured by Messrs. Thwaites, Messrs. Bewley and Hamilton, and Messrs. Oldham 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.

Dose, f℥vj. to f℥viij. two or three times a-day.

SODÆ CARBONAS. *Carbonate of Soda.* NaO,CO_2+10HO,(=143) or $\mathbf{Na_2CO_310H_20}$ (=286). Obtained from the ashes of marine plants, or produced by chemical decomposition with chloride of sodium.

CHEMICAL HISTORY.—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 incineration; barilla being the produce of phanerogamous plants, growing near the sea, and belonging to the genera *Salsola*, *Salicornia*, and *Chenopodium*, natural order *Chenopodiaceæ*; while kelp is procured from cryptogamous plants growing in the sea, of which the most valued are the Fuci, and some species of Laminaria, Chorda, and Himanthalia, all included in the Algæ. These latter plants 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, of a peculiar odour and caustic alkaline taste, in hard, dry, porous, greyish-blue masses covered with efflorescence. Barilla was formerly our great source of carbonate of soda, kelp being then but rarely employed for this purpose; and now its use is 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 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 subjected to a high heat in a furnace; and the final 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 part the charcoal plays in this process is to deoxidize the sulphate of soda, which it does by removing its oxygen in the form of carbonic oxide gas, and thereby reducing it to the state of sulphide of sodium, thus $NaO,SO_3+4C=4CO+NaS$. This, reacting upon the carbonate of lime, forms sulphide of calcium and carbonate of soda, thus, $CaO,CO_2+NaS=CaS+NaO,CO_2$. Each two atoms of sulphide of calcium uniting with one of lime forms an insoluble salt, the oxysulphide of calcium (Ca_2S_2,CaO). That this should be the residual salt is essential to the success of the process, as were it sulphide of calcium, it being a soluble salt would be dissolved out along with the carbonate of soda, and would react upon it, forming sulphide of sodium

and carbonate of lime, thus, $CaS+NaO,CO_2=CaO,CO_2+NaS$. This reaction, however, in consequence of its insolubility, cannot take place with the *oxysulphide* of calcium: hence the necessity for the third atom of chalk.

CHARACTERS AND TESTS.—In transparent colourless laminar crystals of a rhombic shape, efflorescent, 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 perchloride of platinum. By heat it undergoes aqueous fusion, and then dries up, losing sixty-three per cent. of its weight. When supersaturated with nitric acid it precipitates only slightly with chloride of barium or nitrate of silver. One hundred and forty-three grains require for neutralisation at least 960 grain-measures of the volumetric solution of oxalic acid. Twenty grains carbonate of soda neutralise 9·7 grains citric acid, or ten and a-half grains tartaric acid.

The loss in weight by heat referred to in the characters is due to the expulsion of its water of crystallization. The volumetric test allows for the presence of some slight amount of impurity, inasmuch as were the salt pure, reference to its chemical equivalent will show that instead of 960 grain-measures of the volumetric solution of oxalic acid being sufficient for the neutralization of the quantity operated upon, 1000 grain-measures would be required; as it is, it indicates the presence of but 29·76 grains of oxide of sodium instead of 31 grains, which, if absolutely pure, should be present. The rest of the characters and tests will be understood by referring to what has been written under the head of Bicarbonate of Soda (see p. 36). In addition to the pharmacopœial characters it may be stated that the crystals are soluble in twice their weight of water at 60°, and in their own water of crystallization at 212°, and that they are not soluble in alcohol.

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 33), 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.

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

PREPARATION.—Sodæ Carbonas Exsiccata.

PREPARATIONS IN WHICH IT IS USED.—Liquor Sodæ; Liquor Sodæ Chloratæ; Soda Tartarata; Sodæ Bicarbonas; Sodæ Phosphas; Magnesiæ Carbonas; Magnesiæ Carbonas Levis; Liquor Magnesiæ Carbonatis; Calcis Carbonas Præcipitata.

SODÆ CARBONAS EXSICCATA. *Dried Carbonate of Soda.* NaO, CO_2, (=53) or $\mathbf{Na_2CO_3}$ (≒106).

PREPARATION.—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.

EXPLANATION OF PROCESS.—The water of crystallization of the carbonate of soda is simply expelled by the heat employed, and the dried carbonate of soda remains behind.

DOSE AND MODE OF ADMINISTRATION.—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 equivalent to 143 grains of the crystallized salt; so that for all practical purposes we may assume one grain of dried soda to be equal to three grains of crystallized carbonate of soda. Dose, gr. iij. to gr. x.

PREPARATIONS IN WHICH DRIED CARBONATE OF SODA IS USED.—Sodæ Arsenias; Sodæ Bicarbonas.

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 always be 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 it—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 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 athelmintics 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* (*στερεος, 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 *Tænia solium,* or common tape-worm, an inhabitant of the small intestines of the English, Germans, Dutch, but preeminently of the Abyssinians, amongst whom it is rare to find one exempt from its presence; so much so that it is the custom of the country to give along with each slave that is sold a dose of the popular vermifuge, cusso. 2. The *Bothriocephalus*

latus, or broad tape-worm, which occupies the intestines of the Swiss and Russians. The principal characters which distinguish from each other these two varieties of tape-worm, are that the segments into which both varieties are subdivided are broader than they are long in the Bothriocephalus; hence its name *latus;* whilst in the Tænia solium they are longer than they are broad. In the Tœnia the sexual orifices are marginal, whilst in the Bothriocephalus they are central. The head of the Tænia is globular, with a terminal enlargement and two circlets of hooks (hence it is often called the armed worm), whilst that of the Bothriocephalus presents no such appearances, being simply elongated; finally, the Tænia is of a white colour, the Bothriocephalus of a gray colour.

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. However, for practical purposes, this list may be still greatly reduced, since, 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; Flower-heads in erect leafy panicles, hemispherical, drooping, large, dingy yellow. Florets numerous, receptacle hairy, outer involucral scales hairy, linear, inner ones roundish, scarious.

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 is a medicine of undoubted antiquity, being frequently referred to in the Bible, and described by Hippocrates, Pliny, &c. Although rarely used, and in consequence omitted from the British Pharmacopœia, it 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. In the treatment of epilepsy high testimony has been borne in its favor, especially in Germany; it has also been used successfully in chorea and in the convulsive diseases of children. It is well adapted for giving tone to the digestive organs in debilitated habits. In over doses, however, it produces gastric derangement, headache and giddiness; that it is absorbed is proved by the bitter taste it gives the flesh of animals fed upon it. It is largely used as a cordial on the continent of Europe, and over indulgence in its use is stated to be productive of serious consequences.

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, f℥ij. to f℥ss.

INCOMPATIBLES.—The sesquisalts 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.—A perennial herb with an underground stem consisting of several bulbs enclosed in a membranous covering; flowering stalk about two feet high, bearing at its summit an umbel of flowers, mixed with bulblets, enclosed in an ovate spathe; leaves surrounding the lower half of the stem, linear, entire; flowers small, white, with a 6-partite perianth and 6 stamens inserted into its base.

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 of 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, in consequence of the unpleasant odour it gives the breath, 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 desirable way), and at the same time causes friction to be made with a liniment of it over the abdomen. In my hands it proved very successful in the treatment of a case in which troublesome symptoms were produced by the ascaris lumbricoides. It has also been successfully used by Dr. Dewees in what he terms the "cough of habit" after hooping cough. It is a popular remedy for otalgia, a roasted onion being applied externally to the ear, or, as the Hindoos do, some garlic juice dropped into it. Dr. Waring mentions a severe case of otalgia which was rapidly relieved in this manner, after resisting leeches, opiates, injections, and blisters.

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.* A plant belonging to the natural family *Cucurbitaceæ*, of tropical origin but now cultivated extensively in the United States of America.

BOTANICAL CHARACTERS.—A trailing annual herbaceous plant having hispid much branched stems, furnished with tendrils at the nodes, which are believed to be of the nature of stipules. Leaves cordate, 5-lobed, obtuse, minutely dentate. Flowers monœcious. Male flowers with a 5-toothed calyx, and a 5-fid carolla—stamens 3, filaments joined above, but distinct at the base, adherent to the calyx. Female flowers floral envelopes as in the males; ovary inferior, style conical, stigma lobed. Fruit, *a pepo*, oblong-ovate, often as much as four feet in circumference. Seeds oval, 6 to 9 lines

in length and 5 to 6 lines broad, flat, pointed at one end, margin grooved on both sides.

THERAPEUTICAL USES.—For some years past, testimony has been growing in America in favor of the efficacy of the seeds of the pumpkin, in the treatment of Tænia. The virtue is stated to exist in the bland mucilaginous oil with which the seeds abound. This plan of treatment is supported by most respectable evidence on the part of American practitioners; and although apparently a new remedy, it is by no means such, being rather the reintroduction into medicine of one fallen into disuse, Mongény, a Cuban physician, having published in 1820 cases of tænia successfully treated by it. I myself have administered, in the manner hereafter 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 medicine, 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.

DOSE AND MODE OF ADMINISTRATION.—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. The oil of the pumpkin in two-ounce doses has also been used, and, as stated, with success. It is a bland and by no means disagreeable oil.

CUSSO. *Kousso.* (The flowers and tops of Brayera anthelmintica, *DC. Hooker's Journ. Bot.* 3rd. ser. vol. ii. plate 10. Collected in Abyssinia.) 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 twenty years ago.

BOTANICAL CHARACTERS.—A tree about twenty feet high; branches round, rusty, tomentose-villose, marked with the annular cicatrices of the fallen leaves, which, crowded near the ends of the branches, are large, interruptedly-imparipinnate, sheathing at the base with lanceolate, serrate leaflets, villous at the margin, and nerved beneath. Flowers in panicles, dichotomously divided, arranged in fours upon hairy peduncles, with an ovate bract at the base of each, dicœcious, greenish, and becoming purple. Calyx turbinate, limb 10-partite in two circles, outer ones larger, reticulate-

veined; petals 5; stamens 15-20, perigynous; carpels 2. Named by Kunth, the Prussian botanist, after a French physician, Dr. Brayer, who sent him some of the male flowers.

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.

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

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. St. Martin states that he has obtained from it a white crystalline principle, soluble in alcohol and ether, and which he proposes to name *Kwoseine*. Pavesi, however, and subsequently Vée represent it as being yellow, insoluble in alcohol and alkalies, and uncrystallizable. The infusion and decoction are changed to a dark-green colour by the sesqui-salts of iron.

THERAPEUTICAL EFFECTS.—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. 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. 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.*

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 to be 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 Kousso, in coarse powder, half an ounce; boiling distilled water, eight fluid ounces. Infuse in a covered vessel, for fifteen minutes, without straining.) This formulary must be considered a medium dose, and may be substituted for that already described. In the Pharmacopœia the dose of it is stated to be from four to eight ounces, but inasmuch as four ounces would contain but two drachms of Kousso, that would be a very inefficient dose.

FILIX MAS. *Male Fern.* (The dried rhizome with the bases of the footstalks and portions of the root fibres of Aspidium Filix Mas, *Swartz*; *Woodv. Med. Bot.* plate 271. Collected in summer.)

The *Filix Mas* or *Male Shield Fern* belongs to the Linnæan class and order *Cryptogamia Filices,* and to the Natural family *Filices (Polypodiaceæ,* Lindley.)

BOTANICAL CHARACTERS.—Rhizome short, tufted, scaly, decumbent; fronds bipinnate, or rarely pinnate, glabrous, pinnæ diminishing in size toward the base of the frond; pinnules oblong with a broad base, serrate or incised, but not spinulose; sori near the midvein large, covered with a very convex, nearly peltate or reniform indusium; stipes and rachis chaffy.

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 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-

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

stoppered bottles; the druggist's stock should be renewed annually, as in two years the plant loses its medical properties.

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

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 on its action of numerous observers, but more especially of Dr. Christison. 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 griping, sickness, and even vomiting occurred in a few. 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. In one case which recently came under my care at the Meath Hospital, in which a variety of anthelmintic remedies had been previously tried in vain, I had perfect success with this extract. 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 gr. clxxx.; 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 Male Fern. (Take of Male Fern, in coarse powder, two pounds; Ether four pints, or a sufficiency. Pack the male fern closely in a percolator, and pass the ether slowly through it until it passes 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; its dose is from 15 to 30 minims. 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 RADICIS CORTEX. *Pomegranate Root Bark.* (The dried bark of the root of Punica Granatum, *Linn. Steph. and Church. Med. Bot.* plate 57. Obtained from the South of Europe.) 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 *Granateæ*.

BOTANICAL CHARACTERS.—A small handsome tree, growing to the height of twenty feet, with brownish bark and opposite smooth lanceolate leaves on short petioles. Flowers terminal on the young branches; calyx with a turbinate tube, and a 5–7 cleft limb; petals 5–7, crumpled, of a rich scarlet color; stamens numerous, perigynous; ovary inferior; style filiform; stigma globular; fruit larger than an orange, crowned with the limb of the calyx with a thick coriaceous rind. It is made up of several cells arranged in two strata, separated by a transverse septum; lower stratum of 3, upper of 5 to 9 cells, containing numerous seeds immersed in acidulous pulp. The root is hard, heavy, knotty, ligneous, and covered with a bark which is yellowish-grey outside, yellow within.

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 affects the nostrils something like veratria, 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 Granati Radicis, two ounces to one pint.

Decoctum Granati Radicis. Decoction of Pomegranate Root. (Take of pomegranate root bark, sliced, two ounces ; distilled water, two pints ; boil down to a pint, and strain, making the strained product up to a pint, if necessary, by pouring distilled water over the contents of the strainer). Dose : in the Pharmacopœia the dose is stated as being from one to two fluid ounces, but reference to what has been written above will show that this is entirely too small a dose ; it should be given as described above.

**Extractum Punicis granati*, KÜCHENMEISTER (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.

* *Opus citatum*, p. 174.

KAMALA. *Kamala.* (A powder which consists of minute glands that cover the capsules of Rottlera tinctoria, *Roxb. Corum.* plate 168. Imported from India). The minute glands, *mixed with hairs*, collected from the capsules of the Rottlera Tinctoria, an East Indian plant belonging to the Natural family *Euphorbiaceæ*, section *Crotonæ*, constitutes the Kamala of commerce. It is used by the natives under the name of kamala (kameela, or kamela,) or Reroo, both as a dye-stuff and as a vermifuge.

BOTANICAL CHARACTERS.—A small, much branched tree, 15–20 feet high, diœcious; leaves on round, long, downy petioles, alternate, simple, ovate, acute, entire, downy beneath, furnished at the base of the lamina with two brown glands; flowers in axillary and terminal racemes. Staminate flowers of 30–40 stamens, inserted into the base of the twice two-cleft calyx, petals 0. Fertile flowers: calyx 3–5 toothed (generally 4), petals 0; ovary superior covered with red powder, with 3 feathery, reflected styles; capsule roundish, 3-lobed, 3-celled, 3-valved, size of a small cherry, covered with much red powder; seed globular. When the capsules are ripe, in February and March, they are gathered, and the red powder is brushed off and collected for sale. When treated with caustic alkali, and viewed under the microscope, each granule is seen to be made up of a number of oval cells grouped into a mulberry-shaped mass.

CHARACTERS.—A fine granular mobile powder, of a brick-red colour; it is with difficulty mixed with water, but when boiled with alcohol the greater part is dissolved, forming a red solution. Ether dissolves most of it; the residue consisting principally of tufted hairs. It should be free from sand or earthy impurities.

CHEMICAL PROPERTIES.—No accurate analysis has been as yet made of the Kamala; 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, Kamala 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. Mr Leared, however, states that it is equally effectual against all kinds of worms, and that it is incomparably superior to all other remedies in the treatment of the oxyurides and the ascaris lumbricoides. The merit of introducing it to our notice as a remedy for tænia is 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 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 been passed alive, others dead. Its use in India is not confined to its employment as an anthelmintic, for the natives use an ointment containing it for the cure of scabies, and Dr. W. Moore of this city has used it successfully in the treatment of herpes circinatus, and has suggested its use in other allied eruptions.

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 herbaceous, twining, branched stem, with a perennial root and trifoliate pinnate leaves; flowers purplish, papilionaceous, with an alliaceous odor, in axillary racemes; stamens 10, diadelphous; legumes hairy, stinging, *f*-shaped, coriaceous, each containing three to five seeds.

PHYSICAL PROPERTIES.—The entire legumes, with the hairs attached, are usually imported; they are shaped like the letter *f*, 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 acuminated 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.* (The dried fruit of Asagræa officinalis, *Lind.; Bot. Reg.* vol. xxv. plate 33. Imported from 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.—Bulbous herbs, with long, linear grass-like leaves, sending up a flowering scape, which is about 6 feet high, bearing many white flowers in a spikose-raceme; perianth 6-partite; segments linear; stamens 6; ovaries 3, simple, attenuated into an obscure stigma; fruit of 3 follicles; seeds, 1 or 2 in each follicle, corrugate, scimitar-shaped; named from the supposed resemblance of its inflorescence to that of barley (Spanish *cebada*, barley).

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 *(and but little odour; yet when powdered and snuffed into the nostrils they produce violent sneezing and discharge of mucus)*.

CHEMICAL PROPERTIES.—Cevadilla consists of a 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*, differing from veratria in not being soluble in ether); 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. Formerly cevadilla was only employed externally for the purpose of destroying vermin and lice, and was known in France as the "poudre des Capuchins"; for the cure of itch its use has been reported as being very valuable, but even when so employed dangerous symptoms and even death has followed its use. (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.* (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.* Named from Artemis (Diana) the goddess of chastity. It is also called *semen sanctum.*

BOTANICAL CHARACTERS.—An evergreen shrub; cauline leaves, pinnate, with linear segments glabrous; branches undivided; ramal leaves, gradually becoming less deeply divided; flower-heads arranged in reflexed spikes; florets, enclosed by an involucre of round imbricated bracts, tubular, 4 or 5; *receptacle naked.*

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, Flower-heads not round or hairy.

Wormseed, or European wormseed as it should be called to distinguish it from American wormseed, the seeds of the chenopodium anthelminticum, has long been known under the name of *Semen contra;* it is stated to have been introduced into Europe by the Crusaders; as usually met with, it 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.

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. In small doses it is stated to increase the appetite and to stimulate digestion generally.

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.* $C_{30}H_{18}O_6$ (=146) or $\mathbf{C_{15}H_{18}O_3}$ (=146.) (A crystalline neutral principle prepared from santonica. It may be obtained by the following process:—)

PREPARATION.—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 crystallise. Separate the mother liquor from the crystals, and concentrate to obtain a further product. Collect the crystals, let them drain, redissolve them in four ounces of boiling spirit, and let the solution crystallise as before. Lastly, dry the crystals on filtering paper in the dark, and preserve them in a bottle protected from light.

EXPLANATION OF PROCESS.—In this process lime is used with the view of insulating the santoninum, forming with it a salt, santonate of lime, from which the lime 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. On the addition of the hydrochloric acid, the santonate of lime is decomposed, the santoninum being precipitated, whilst chloride of calcium is held in solution, this together with some oily matter is removed in the next step

of the operation. We are now directed to wash the precipitate, first with distilled water and then with ammonia, so as to free it effectually from any adhering acid, and then to mix it with animal charcoal. 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 preparation becomes of a yellow colour. 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 then 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 as a substitute for the more expensive and purer form:—*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."

CHARACTERS AND TESTS.—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; not dissolved by diluted mineral acids; entirely destructible by a red heat with free access of air.

CHEMICAL PROPERTIES.—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 cold water, requiring 5,000 parts for its solution, but dissolves readily in fatty matters, in chloroform and in alcohol; it volatilises at a low heat.

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 there-

fore 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. In many cases under its use the urine acquires a reddish tint, which may give rise to an unfounded apprehension of hæmaturia.

DOSE AND MODE OF ADMINISTRATION.—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. 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 cocoa not deprived of its oil. In my experience I have found them quite satisfactory and regret very much that the Pharmacopœial authorities have not given us an officinal formula for their preparation, they can be had however 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. Brown santonine is best given according to M. Gaffard in the form of lozenges, which may be prepared as follows :—Brown santonine, ℥ij. ; 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.

*SPIGELIA. *Root of Spigelia Marilandica; Carolina-pink Worm-grass.* A native of the United States; belonging to the Linnæan class and order *Pentandria Monogynia*, and to the Natural family *Gentianaceæ (Loganiaceæ,* Lindley).

BOTANICAL PROPERTIES.—A herbaceous plant, with a perennial rhizome, bearing fibrous rootlets; stems several, alate, erect, simple; leaves sessile, ovato-lanceolate, acute or acuminate, with the veins and margin pubescent; spike one-sided, 3 to 8-flowered; calyx 5-partite; corolla gamopetalous, funnel-shaped, much longer than the calyx, of a rich carmine colour; stamens 5, inserted into the tube of the corolla; ovary 2-celled; capsule didymous, 2-celled, 4-valved, many-seeded.

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 ADMINSTRATION.—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 above, be by the *importation* of it in some such form as this.

TEREBINTHINÆ OLEUM. *Oil of Turpentine.* (The oil distilled from the oleo-resin (turpentine) obtained from Pinus palustris *Miller's Dict.*, Pinus Tæda, *Linn.*, and sometimes Pinus Pinaster *Aiton; Lambert, Pinus*, plates 4, 5, 16, 17, 20.) 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 comes 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) distills 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 oxyurides in the rectum. That turpentine, no matter how introduced into the system, is absorbed can easily be proved ; it is notably eliminated by the urine, to which secretion it communicates a peculiar odour, resembling that of violets. When first ingested, it produces a sensation of warmth throughout the body generally, and if given in full doses, and especially so if the stomach be empty, it occasionally produces nausea and vomiting. Occasionally also its administration is attended with other 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℥j. ; for children, f℥ss. to f℥ij. 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 Terebinthinæ, one part in four, nearly ; Enema Terebinthinæ, one volume in sixteen ; Linimentum Terebinthinæ, sixteen parts in nineteen, nearly (see *Epispastics*); Linimentum Terebinthinæ Aceticum, one volume in three (see *Epispastics*); Unguentum Terebinthinæ, one part in two nearly (see *General Stimulants*).

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 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 3ij. to 3vj. for children. The maximum dose stated in the Pharmacopœia (120 grains) is in my opinion too small, and under many circumstances would be absolutely useless.

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.* (A gum-resin obtained by incision from the living root of Narthex Assafœtida, *Falconer* in *Royle's Mat. Med.; Edinb. Roy. Soc. Trans.* vol. xxii. plates 20, 21. 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, 3-parted, segments bipinnatifid with oblong-lanciolate, obtuse, decurrent lobes; 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 *(varying in weight from half a pound to three pounds)*, partly composed of tears, moist or dry. The colour of a freshly cut or broken piece is opaque white, but *(on exposure to air)* gradually becomes purplish-pink, and ultimately dull-yellowish or pinkish-brown. Taste bitter, acrid; odour fetid, alliaceous, and persistent. *(Specific gravity from* 1·31 *to* 1·35.*)* It dissolves almost entirely in rectified spirit.

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 observed 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, or in the form of enema.

PREPARATIONS.—Enema Assafœtidæ, gr. xxx. to f℥iv.; Pilula Aloes et Assafœtidæ, 1 part in 4; Pilula Assafœtidæ Composita, 1 part in 3½; Spiritus Ammoniæ Fœtidus, gr. xxxiij. to f℥j.; Tinctura Assafœtidæ, gr. livss. to f℥j.

Enema Assafœtidæ. Enema of Assafœtida. Syn.—*Enema Fœtidum,* Edin. Dub. (Take of assafœtida, gr. xxx.; distilled water, f℥iv. Rub the assafœtida in a mortar with the water added gradually, so as to form an emulsion.) A valuable remedy in

flatulent colic, and a useful form for introducing assafœtida into the system in any case requiring its administration, as by so employing it we avoid its disgusting taste.

Pilula Aloes et Assafœtidæ. Pill of Aloes and Assafœtida. (Take of socotrine aloes, in powder, assafœtida, hard soap in powder, confection of roses, of each, ℥j. Beat all together, until thoroughly mixed.) A very useful pill in the constipation accompanied with flatulence of old people. Dose, gr. v. to gr. x.

Pilula Assafœtidæ Composita. Compound Pill of Assafœtida. Syn.—*Pilula Galbani Composita,* Lond. (Take of assafœtida, ℥ij.; galbanum, ℥ij.; myrrh, ℥ij.; treacle, by weight, ℥j. Heat all together by means of a water-bath, and stir the mass until it assumes a uniform consistence.) Dose, gr. v. to gr. x.

Spiritus Ammoniæ Fœtidus. Fetid Spirit of Ammonia. (Take of assafœtida, ℥jss.; strong solution of ammonia, f℥ij.; rectified spirit, a sufficiency. Break the assafœtida into small pieces, and macerate it in a closed vessel in fifteen fluid ounces of the spirit for twenty-four hours, then distil off the spirit, mix the product with the solution of ammonia, and add sufficient rectified spirit to make one pint.) If any *fluid* preparation of assafœtida be admissible by the mouth, it is this. Dose, f℥ss. to f℥i.

Tinctura Assafœtidæ. Tincture of Assafœtida. (Take of Assafœtida, in small fragments, ℥ijss.; rectified spirit, a sufficiency. Macerate the assafœtida in fifteen fluid ounces of the spirit for seven days in a closed vessel, with occasional agitation, then 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. It is very frequently added to the turpentine enema, in cases of flatulent colic. Dose, f℥ss. to f℥j.

CASTOREUM. *Castor.* (The dried præputial follicles and their secretion, obtained from the beaver, Castor Fiber, *Linn.*, and separated from the somewhat shorter and smaller oil sacs 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 liga-

ment; 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 held 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 the pharmacopœia the dose is stated at from gr. v. to gr. x.; but, if we expect any good effects to follow its use, it must be given in far larger doses, viz. from gr. lx. to gr. cxx.

PREPARATION.—Tinctura Castorei, gr. xxij. to f℥j.

Tinctura Castorei. Tincture of Castor. (Take of castor in coarse powder, one ounce; rectified spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation; strain, press, filter, and add sufficient rectified spirit to make one pint.) Dose.—In the pharmacopœia the dose is stated at from half to one fluid drachm, 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.

BOTANICAL CHARACTERS.—A succulent herb, with a perennial rootstalk; leaves chiefly radical, peltate, crenate, depressed in the centre. Flowering stem erect, 6–12 inches high, simple, or slightly branched, leafy at the base, bearing a raceme of pendulous flowers, of a yellowish-green color; calyx small, 5-partite; corolla cylindrical, with five acute, ovate, erect lobes; stamens 10, inserted on the tube of the corolla; carpels 5, many-ovuled, each with a scale at its base. The generic name is derived from a Greek noun (κοτυλη) which signifies a cup, the leaves of some species being somewhat cup-shaped. The plant may be found in the crevices of rocks, on walls, and in old buildings. Flowers June to August.

THERAPEUTICAL USES.—A few years ago the cotyledon 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. I am not aware that the cotyledon has been tried in any other spasmodic disease than epilepsy.

DOSE AND MODE OF ADMINISTRATION.—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 five grain doses in the pilular form.

*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 effect 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. cxxx.; 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 probably obtained from the root of whatever plant furnishes it, by a process similar to that followed for obtaining assafœtida. 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.

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 dark 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 by the heat of the hand, and liquefies at 212° F. To free it from mechanical impurities it should be melted and strained previous to use.

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.

PREPARATIONS.—Emplastrum, Pilula Assafœtidæ composita, 1 part in $3\frac{1}{2}$ (see p. 66.)

Emplastrum Galbani. Galbanum plaster. (Take of Galbanum, ammoniacum, yellow wax, of each one ounce, lead plaster, eight ounces. Melt the galbanum and ammoniacum together, and strain. Then add them to the lead 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.* (The inspissated and dried secretion from the præputial follicles of Moschus moschiferus, *Linn.*; native of the mountainous regions of Central Asia. Imported from China and India.) 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, but 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-sac, or as it is commonly called musk-pod, is somewhat oval, about $2\frac{1}{2}$ inches long, and $1\frac{3}{4}$ 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 first pointed out by Neligan 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 sacs.

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 the peculiar nervous symptoms attendant upon cerebro-spinal arachnite its administration has been attended with advantage. 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. v. to gr. x. It may be given in pill, or in draught 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 perennial plant, from 1 to 3 feet high, woody at the base, but herbaceous in its ultimate ramifications. Leaves doubly imparipinnate, dotted with oil-glands, which are transparent when viewed by transmitted light. Flowers in terminal corymbs, yellow; calyx persistent, 4 or 5 partite; corolla of 4 or 5 petals, concave, entire or toothed, unguiculate; stamens 8 or 10; fruit capsular, 4 or 5 lobed, each lobe opening in two valves. Flowers from June to September; the leaves and fruit are the most active parts of the plant.

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*, distilled in England, is officinal in the Pharmacopœia; it is obtained by distilling the fresh herb with water. Oil of rue is of a pale yellow colour, becoming darker by age; it has the peculiar, disagreeable 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.

**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.

SUMBUL RADIX. *Sumbul Root.* Syn.: *Jatamansi; Musk root.* (The dried transverse sections of the root of a plant the botanical history of which is unknown. Imported from Russia and also from India.) 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 has been imported chiefly from Russia, and is stated to be procured from the district in the neighbourhood of Bucharest.

CHARACTERS.—The pieces are nearly round, from 2½ to 5 inches in diameter, and from ¾ to 1½ inch in thickness. They are covered on the outer edge with a dusky brown rough bark frequently beset with short bristly fibres. The interior is porous, and consists of irregular, easily separated fibres. It has a strong odour, resembling

that of musk. The taste is at first sweetish, becoming after a time bitterish and balsamic. That brought from India differs from the Russian, being closer in texture, more dense and firm, and of a reddish tint.

CHEMICAL HISTORY.—This root has been chemically examined by Reinsch and other German chemists, who have announced the existence in it of a volatile oil, a balsamic resin soluble in alcohol, and a second balsamic resin soluble in ether; a bitter substance soluble in water; a crystallized acid, named by Reinsch *Sumbulic Acid*, some saline matter, together with starch, gum, wax, &c. The odorous principle has not been as yet insulated, but is presumed to be connected with the balsamic resins. The volatile oil in taste resembles that of peppermint.

THERAPEUTICAL USES.—Sumbul was first employed in regular medicine by several Russian physicians; but some years since the attention of the profession in these countries 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. 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 also been employed in cholera, and it 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.

DOSE AND MODE OF ADMINISTRATION.—Sumbul may be given either in infusion or tincture. The resin also, prepared as below, is employed. The infusion, which I consider the preferable form, may be employed 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 *resin* 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. ¼ to gr. j. twice or three times daily.

PREPARATION.—Tinctura Sumbul; gr. livss. to f℥j.

Tinctura Sumbul. Tincture of Sumbul. (Take of sumbul, in coarse powder, ℥ijss.; proof spirit, one pint. Macerate the sumbul for forty-eight hours in 15 fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining 5 ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, xxx. minims to f℥ij.

VALERIANÆ RADIX. *Valerian Root.* (The dried root of Valeriana officinalis, *Linn. Woodv. Med. Bot.*, plate 96. From plants indigenous to and also cultivated in Britain; collected in autumn, wild plants being preferred.) The Valeriana officinalis belongs to the Linnæan class and order *Triandria Monogynia,* and to the Natural family *Valerianaceæ.*

BOTANICAL CHARACTERS.—A herbaceous plant, consisting of a short, thick, underground stem (rhizome), bearing a number of slender, cylindrical roots, and sending up one, or rarely two erect stems, 2–4 feet high, simple, sulcate. Leaves opposite, pinnate; leaflets 7–10 pairs, lanceolate, dentato-serrate, of varying length and breadth, pubescent on the under surface. Flowers in terminal corymbs, pale, flesh-coloured. Corolla 5-cleft, gibbous at the base; stamens 3. Fruit crowned with a feathery pappus. The plant is found abundantly in moist situations, sides of ditches, streams, and in damp woods.

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.

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 cultivated plants or of those plants which grow on the banks of rivers or in marshy places are generally supposed not to be so active as those of wild plants growing on dry soils.

CHEMICAL HISTORY.—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 $HO,C_{10}H_9O_3$. 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; its reputation indeed in the treatment of epilepsy dating from the time of Galen. In hysterical headache it frequently acts as a charm, especially in the form of the ammoniated tincture; in many nervous affections also, especially chorea, I have found it serviceable; 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 therapeutical agents.

DOSE AND MODE OF ADMINISTRATION.—It may be administered in the form of powder in doses of from ten to thirty grains; but, in consequence of its unpleasant taste and smell, it is very rarely pre-

scribed in this way, some one or other of the following preparations being preferred :—

PREPARATIONS.—Infusum valerianæ, gr. ccxl. to one pint ; Tinctura valerianæ, ℥ijss. to one pint ; Tinctura Valerianæ Ammoniata, ℥ijss. to one pint.

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

Tinctura Valerianæ. Tincture of Valerian. (Take of valerian root in coarse powder, two ounces and a half ; proof spirit, one pint. Macerate the valerian root for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.)

Tinctura Valerianæ Ammoniata. Ammoniated Tincture of Valerian. (Take of valerian root, in coarse powder, two ounces and a half ; aromatic spirit of ammonia, one pint. Macerate for seven days in a well-closed vessel, with occasional agitation ; then strain, press, 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.* $NaO,C_{10}H_9O_3(=124)$ or $\mathbf{NaC_5H_9O_2}(=124)$.

PREPARATION.—Take of amylic alcohol (fousel oil), four fluid ounces ; bichromate of potash, nine ounces ; sulphuric acid, six and a half fluid ounces ; solution of soda a sufficiency ; 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 of the water 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.

EXPLANATION OF PROCESS.—To understand this process it becomes necessary in the first instance to make some observations upon amylic alcohol, the most important ingredient in the preparation. Amylic alcohol, or fousel oil, by which name it is also known, is an oily colourless liquid, with a penetrating and oppressive odour

and a burning taste, found in the liquid that remains after the rectification of the crude spirit produced by the fermentation of saccharine solutions with yeast, and generally containing a small proportion of other spirituous ingredients. It is composed of carbon, hydrogen, and oxygen, in these proportions, $C_{10}H_{12}O_2$. When pure its specific gravity is ·818, and its boiling point 270°. It is sparingly soluble in water, but soluble in all proportions in alcohol, ether, and essential oils; with the agency of oxygen it is converted into valerianic acid ($HOC_{10}H_9O_3$). But as a preliminary to its conversion into valerianic acid, valerianic aldehyd ($C_{10}H_{10}O_2$) is formed, which subsequently becomes valerianic acid. We are now in a position to consider the pharmacopœial process, in which 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 $C_{10}H_{12}O_2+2O=C_{10}H_{10}O_2+2HO$; and by the addition of two other atoms of oxygen this is converted into valerianic acid, thus, $C_{10}H_{10}O_2+2O=HOC_{10}H_9O_3$. 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 in the process 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 diluted sulphuric acid.

THERAPEUTICAL USES.—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.

DOSE AND MODE OF ADMINISTRATION.—It may be given in solution in water, to which is added some syrup to mask its flavor, or in pill.—Dose 1 grain to 5.

PREPARATION IN WHICH VALERIANATE OF SODA IS USED. Zinci Valerianas.

ZINCI VALERIANAS. *Valerianate of Zinc.* $ZnO,C_{10}H_9O_3$ (= 133·5) or $\mathbf{Zn_2(C_5H_9O_2)}$ (=267).

PREPARATION.—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 AND TESTS.—In brillant, 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 diluted sulphuric acid, yields with ammonia a precipitate which entirely dissolves in an excess of the reagent, and the resulting solution gives a white precipitate with sulphide of ammonium. Its solution in hot water is not precipitated by chloride of barium. It gives when heated with diluted 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.

The white precipitate, characteristic of the salts of zinc, produced by sulphide of ammonium is the sulphide of zinc. Sulphate of zinc, if present, would precipitate a sulphate of barytes on the addition of chloride of barium, whilst the last 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 some power. Combined with extract of belladonna, I have found it of marked service in controlling nocturnal emissions, as also in the amelioration of the anomalous train of symptoms that follow the pernicious habit of masturbation. In chorea I have used it with advantage ; in epilepsy its exhibition has been attended with varying advantage, in some cases seemingly of service, in others of none. In short, I look on it as a most valuable addition to the Materia Medica, and I fully agree with the observations of Devay, 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 thee 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 are all but insoluble 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, $C_{10}H_9O_3 = 119$).

PREPARATION.—Valerianate of ammonia 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.

PHYSICAL AND CHEMICAL PROPERTIES.—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.

THERAPEUTICAL USES.—This salt has been recently a good deal employed in medicine in consequence of a favourable report made upon it by several French physicians, but it 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., and in the nervous affections of feeble and debilitated individuals, especially if advanced in life, I have found its exhibition attended with marked advantage; but in the majority of 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.

DOSE AND MODE OF ADMINISTRATION.—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:—

*PIERLOT'S SOLUTION.—(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). The extract is added to prevent the salt undergoing decomposition. The dose of *Pierlot's Solution* of valerianate of ammonia is from min. v. to f℥ss. largely diluted.

*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 per-sulphate 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, $Fe_2O_3,3SO_3 + 3(NaO,C_{10}H_9O_3) = Fe_2O_3 3C_{10}H_9O_3 + 3NaO,SO_3$.

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.—Hydrochlorate 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 hydrochlorate 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 zinc. 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 vegetable 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 morbid 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, as also the effect which we can *see* them produce on the capillaries in the web of the frog's foot, confined in an extended position under the microscope, making them contract or diminish in calibre. 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. That the majority of medicines of this class possess the power of coagulating albumen outside of the organization, is true, but to what extent they may possess this property within the living economy, or how much of their astringent power they may owe to it, if they

possess it, is the great question to be solved, and notwithstanding its apparent simplicity, one which has not yet been satisfactorily answered. 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 antacids 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.* Syn.—*Acetum (Britannicum),* Lond. (An acid liquid, prepared from malt and unmalted grain by the acetous fermentation.)

PREPARATION.—In commerce we meet with two varieties of vinegar—one of French, the other of British origin. In the last edition of the British Pharmacopœia, French vinegar was ordered; in this edition British vinegar is officinal. 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 thirty-six 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 ($C_4H_4O_2$) 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.

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 varies from 1·006 to 1·019. 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 bitartrate 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. Chemically, French may be distinguished from British vinegar by the action of ammonia added slightly in excess, producing a purplish colour with the French vinegar, and either not affecting the colour of the British vinegar, or making it brownish.

CHARACTERS AND TESTS.—A liquid of a brown colour and peculiar odour. Specific gravity 1·017 to 1·019. 445·4 grains by weight (1 fluid ounce) of it require at least 402 grain-measures of the volumetric solution of soda for their neutralization, corresponding to 4·6 per cent. of anhydrous acetic acid. If ten minims of solution of chloride of barium be added to a fluid ounce of the vinegar, and the precipitate, if any, be separated by filtration, a further addition of the test will give no precipitate. Sulphuretted hydrogen causes no change of colour.

Chloride of barium would demonstrate the existence, were it present, of sulphuric acid; the pharmacopœial test only allowing for an amount of sulphuric acid, somewhat less than that the manufacturer is legally allowed to mix with it. Sulphuretted hydrogen, did it darken it in colour, would indicate the presence of metallic impurities, such as lead and copper, derivable from the improper use in its manufacture of vessels made of these metals.

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 the volumetric test directed in the Pharmacopœia. 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 coppper or lead ; lime, a trace of which is almost invariably present; some acrid vegetable substance, as capsicum, grains of paradise, etc., and sulphuric acid. If the colour be altered on the addition of sulphuretted hydrogen, it contains metallic matter ; if it precipitates on the addition of a solution of oxalate of ammonia, lime is present ; 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 of nitrate of baryta.

THERAPEUTICAL EFFECTS —Vinegar is an excellent refrigerant 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.

PREPARATION IN WHICH VINEGAR IS USED.—Emplastrum Cerati Saponis.

**Antihectic Mixture,* NELIGAN.—(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 ACETICUM DILUTUM. *Dilute Acetic Acid.*

PREPARATION.—Take of acetic acid, one pint; distilled water, seven pints. Mix.

TESTS.—Specific gravity 1·006. 440 grains by weight (1 fluid ounce) require for neutralisation 313 grain-measures of the volumetric solution of soda, corresponding to 3·63 per cent. of anhydrous acetic acid. One fluid ounce therefore corresponds to 16 grains of anhydrous acid.

THERAPEUTICAL USES.—This preparation is to be preferred to common vinegar, of which it purports to be the analogue, in consequence of its more equable strength and greater purity, for external use in lotions, eye-washes, etc. For internal use, in virtue of its more agreeable taste, French vinegar should be preferred, in all other respects it resembles vinegar (which see).

DOSE AND MODE OF ADMINISTRATION.—Same as those of vinegar (which see).

PREPARATIONS IN WHICH DILUTED ACETIC ACID IS USED.—Acetum Scillæ; Liquor Morphiæ Acetatis.

OXYMEL. *Oxymel.*

PREPARATION.—Take of clarified honey, forty ounces; acetic acid, five fluid ounces. Liquefy the honey by heat, and mix with it the acetic acid and water.

THERAPEUTICAL USES AND MODE OF ADMINISTRATION.—This is nearly the only representative in the British Pharmacopœia (the other being the oxymel of squill) of what in olden time was a most favorite form of administering medicines. Oxymel is an excellent addition to astringent gargles, and may also be employed as a substitute for vinegar in the preparation of refrigerant drinks.

DOSE.—f℥j to f℥ij.

ACIDUM CARBOLICUM. *Carbolic Acid.* Syn.: *Phenic Acid.*

$HO,C_{12}H_5O$ (=94) or $\mathbf{HC_6H_5O}$ (=94.) (An acid obtained from coal-tar oil by fractional distillation and subsequent purification.)

PREPARATION.—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, when a

crystalline mass is obtained which by the action of water is resolved into a light oil and a heavy alkaline liquid; this latter is neutralized with hydrochloric acid, and by subsequent rectification off chloride of calcium, and distillation, the acid is obtained.

CHARACTERS AND TESTS.—In colourless acicular crystals, which at a temperature of 95° become an oily liquid, having a strong odour and taste, resembling those of creasote, which it also resembles in many of its characters and properties. Its specific gravity is 1·065; boiling point, 370°. The crystals readily absorb moisture on exposure to the air, and they are thus liquefied; the acid, however, is but slightly soluble in water, but it is freely soluble in alcohol, ether, and glycerine. It does not redden blue litmus paper. A slip of deal dipped into it, and afterwards into hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. It coagulates albumen. It does not affect the plane of polarisation of a ray of polarised light.

THERAPEUTICAL USES.—Carbolic acid 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 may be used internally in all cases suited for the employment of creasote, and is to be prescribed in the same form and doses (see Creasote); it is, however, principally as a deodorizing agent that it is employed, applied to foul ulcers, etc., in the form of a wash—f℥ij. of the glycerine of carbolic acid to f℥viij. of distilled water. Its use in such cases is highly spoken of by many practitioners; in some cases, however, in which I employed it in the wards of the Meath Hospital, it disappointed my expectations, not acting as satisfactorily as many of our older remedies. Its cheapness and efficiency nevertheless recommend its use on the large scale for sanitary purposes. Mr. Sedgwick speaks highly of its value as a topical agent in the treatment of diphtheria; and Mr. Lister has placed on record some important results obtained by its use in the treatment of compound fractures, relieving pain and acting as a powerful antiseptic agent. The manner in which he applies it is by liquefying the crystals, by plunging the bottle in which they are contained into warm water, steeping pledgets of lint into the solution, and applying it over the wound; the evaporation of the acid is to be prevented by the superimposition of a piece of sheet tin.

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; in the form of the glycerine; or made into an emulsion with distilled water by means of sugar or yoke of egg.

PREPARATION.—Glycerinum Acidi Carbolici, one part in six by weight.

Glycerinum Acidi Carbolici. Glycerine of Carbolic Acid. (Take of Carbolic Acid, one ounce; Glycerine, four fluid ounces. Rub them together in a mortar until the acid is dissolved.) A useful formula, intended for external use in skin affections, &c., but may be used internally in all cases suited for the administration of carbolic acid. Dose, min. vi. to min. xxx.

ACIDUM SULPHURICUM. *Sulphuric Acid.* (An acid produced by the combustion of sulphur and the oxidation of the resulting sulphurous acid by means of nitrous vapours. It contains 96·8 per cent. by weight of the sulphuric acid, HO,SO_3 or $\mathbf{H_2SO_4}$, and corresponds to 79 per cent. of anhydrous sulphuric acid, SO_3 or $\mathbf{SO_3}$.)

CHEMICAL HISTORY.—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 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.

This commercial sulphuric acid *(Acidum Sulphuricum Venale)*, or *oil of vitriol*, invariably contains many impurities, notable amongst which are lead (derived from the chamber in which it is originally made), water, nitrous acid, and arsenious acid (derived from the occasional employment of iron pyrites instead of sulphur in its manufacture). Should it contain this last, it is unfit to be

employed at all in medicine and should be absolutely rejected; from all the rest it can be freed by distilling it in an appropriate manner, and although we have no such directions given us in the present pharmacopœia, still from the tests of its purity that the authorities require it to answer, and which will be noticed further on, it is evident that they do not contemplate the employment of any other than the distilled acid, as no commercial variety could come up to this standard of purity. We can, however, procure an acid sufficiently pure to come up to the pharmacopœial standard (provided always that it did not originally contain arsenious acid) by taking a given quantity, say twelve ounces of commercial oil of vitriol, and a quarter of an ounce of sulphate of ammonia in fine powder; having added the sulphate of ammonia to the sulphuric acid, the mixture is to be introduced into a plain retort with a few slips of platinum foil, the upper part of the body of the retort should be covered with a sheet-iron hood, and one-tenth of the acid distilled over, this should be rejected as containing all the more volatile impurities present in the acid, and then the distillation should be continued until only a fluid ounce of liquid remains behind.

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 into the retort from which it is distilled of slips of platinum, or of portions of glass. The object with which the first portion is rejected is to get rid of water and volatile impurities; whilst we should not distil to dryness, 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 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, $NO_3 + NH_4O,SO_3 = SO_3 + 4HO, + {}^2N$.

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 preceding process is insufficient to free it from arsenic. Many processes have been suggested with this object in view; 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, gene-

rated 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, $NO_3 + 3HS = N + 3S + 3HO$. The production of the sulphide of hydrogen is thus accounted for, $BaS + SO_3HO = BaO,SO_3 + HS$. The distillation of it from off sal ammoniac (NH_4Cl), instead of ammonia, has also been suggested as a convenient way of freeing it by one and the same operation from the acid compounds of nitrogen and from arsenious acid. The sulphuric acid reacting upon the chloride of ammonium forms hydrochloric acid and sulphate of ammonia, thus, $NH_4Cl + SO_3HO = HCl + NH_4O,SO_3$. The sulphate of ammonia frees the sulphuric acid from the acid compounds of nitrogen as already explained, whilst the hydrochloric acid reacts upon the arsenious acid, converting it into terchloride of arsenicum and water thus, $AsO_3 + 3HCl = AsCl_3 + 3HO$, all of which go over in the first portion of the distillation. Should there be no arsenious acid present for the hydrochloric acid to act upon, it itself would go over in the first stage of the process, and could thus be gotten rid of.

CHARACTERS AND TESTS.—A colourless liquid of oily appearance, intensely acid and corrosive. Specific gravity 1·843. It evolves much heat on the addition of water, and when thus diluted gives a copious precipitate with chloride of barium. 50·6 grains by weight, mixed with an ounce of distilled water, require for neutralisation 1000 grain-measures of the volumetric solution of soda. Evaporated in a platinum dish it leaves little or no residue. When a solution of sulphate of iron is carefully poured over its surface, there is no purple colour developed where the two liquids unite. Diluted with six times its volume of distilled water it gives no precipitate with sulphuretted hydrogen.

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. The specific gravity indicates 79·9 per cent. of anhydrous sulphuric acid; the volumetric test indicates the presence of 80 grains anhydrous acid in each 100·12 grains operated upon, 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 of an acid so contaminated would be justified by the dangerous character of the impurity, and the trouble attendant on its elimination. In addition to the pharmacopœial characters may be remarked its great weight, readily recognized by even the most uneducated person; the absence of vapour 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.

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 profuse sweating, generally, it is one of our most valuable remedies, its astringent properties being markedly evidenced over the skin. 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.

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 or magnesia, though generally recommended, should not be employed, as with the former, a very insoluble salt, sulphate of lime is formed, whilst the combination of sulphuric acid with either base 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.

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 CONTAINING FREE SULPHURIC ACID.—Acidum Sulphuricum aromaticum; Acidum Sulphuricum dilutum; Infusum Rosæ acidum.

Acidum Sulphuricum Aromaticum. Aromatic sulphuric acid. (Take of sulphuric acid, three fluid ounces, or two thousand four hundred and nineteen grains by weight ; rectified spirit, two pints ; cinnamon bark, in coarse powder, two ounces ; ginger, in

coarse powder, one and a quarter ounce. Mix the sulphuric acid gradually with the spirit, add the cinnamon and ginger, macerate for seven days, agitating frequently, then filter.) The specific gravity of the aromatic sulphuric acid is 0·927. 304·2 grains by weight (6 fluid drachms) require for neutralisation 830 grain-measures of the volumetric solution of soda, corresponding to 10·91 per cent. of anhydrous sulphuric acid. Six fluid drachms therefore correspond to 33·2 grains of anhydrous acid. Dose, 5 to 30 minims.

Acidum Sulphuricum Dilutum. Diluted sulphuric acid. (Take of sulphuric acid, seven fluid ounces; distilled water a sufficiency. Dilute the acid with 77 fluid ounces of the water, and when the mixture has cooled to 60° add more water, so that it shall measure 83½ fluid ounces. Or as follows:—Take of sulphuric acid, one thousand three hundred and fifty grains; distilled water, a sufficiency. Weigh the acid in a glass flask, the capacity of which, to a mark on the neck, is one pint, then gradually add distilled water until the mixture, after it has been shaken and cooled to 60°, measures a pint.) The specific gravity of the dilute sulphuric acid is 1·094. 359 grains by weight (6 fluid drachms) of it require for neutralisation 1000 grain-measures of the volumetric solution of soda, corresponding to 10·14 per cent. of anhydrous sulphuric acid. Six fluid drachms therefore correspond to 40 grains of the anhydrous acid (one equivalent of SO_3, or half an equivalent of $\mathbf{SO_3}$. Dose, 5 to 30 minims. It is used in the preparation of the acid infusion of roses, 1 fluid drachm being contained in 10 fluid ounces.

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.

ALUMEN. *Alum.* $NH_4O,SO_3,Al_2O_3,3SO_3+24HO$ (=453·5) or $\mathbf{NH_4Al\,2(SO_4),12H_2O}$ (=453·5). (A sulphate of ammonia and alumina, crystallized from solution in water.)

PREPARATION.—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

ammonia, and the salt in question is obtained. Formerly sulphate of potash was added to the sulphate of alumina, and the salt then, of course, was a sulphate of alumina and *potassa*, instead of, as now, a sulphate of alumina and ammonia; but, in consequence of the sulphate of ammonia having become a cheaper article than the sulphate of potassa, it has of late years been extensively and fraudently substituted in the alum of commerce for sulphate of potash; and, as alum, whether it contains a sulphate of potash or of ammonia has the same therapeutic value, I presume that the pharmacopœial authorities have made a merit of necessity, and have now authorized that which hitherto has been substituted for the more expensive variety of alum.

CHARACTERS AND TESTS.—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 or soda a white precipitate soluble in an excess of the reagent, and the mixture evolves ammonia, especially when heated. The aqueous solution gives an immediate precipitate with chloride of barium; it does not acquire a blue colour from the addition of yellow or red prussiate of potash.

The precipitates produced on the addition of caustic potash or soda is alumina, which is soluble in an excess of the reagent, and ammonia is also set free. The precipitate with chloride of barium is sulphate of barytes, demonstrating the nature of the acid constituent of the salt. The non-production of a blue colour on the addition of the ferro- or ferrid-cyanide 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* would also precipitate it, but would not redissolve it. 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 decidedly acid reaction.

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, etc. 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, etc. *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. (Take of alum, ʒiv. Heat the alum in a porcelain dish or other suitable vessel, till it liquefies, then raise and continue the heat, not allowing it to exceed 400°, till aqueous vapour ceases to be disengaged, and the salt has lost forty-seven per cent. of its weight. Reduce the residue to powder, and preserve it in a well stopped bottle.) 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, fʒij.; 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 ʒj.; 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.

BELÆ FRUCTUS. *Bael Fruit.* (The dried half-ripe fruit of Ægle Marmelos, *DC., Pharm. Journ.* vol. x. page 166, plate. From Malabar and Coromandel.)

BOTANICAL CHARACTERS.—A tree of moderate size, with an ash-coloured bark and a few irregular branches, often furnished with strong, sharp axillary thorns; leaves ternate; leaflets ovate-lanceolate, crenulated, furnished with minute transparent glands; flowers larger, hypogynous; stamens numerous; ovary compound, many-celled, many-ovuled; fruit (often incorrectly called a berry) is an *Amphisarca*, consisting of a hard shell enclosing 8–15 cells, which contain 6–10 seeds immersed in a very tenacious transparent mucus.

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.

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, therefore it is a medicine that I shall not be surprised to see omitted in

a future edition of our British Pharmacopœia; 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 ℥j., tincture of catechu or kino ℥iij., and water to complete the quantity, and be administered in ounce-doses every third hour in diarrhœa. Each fluid ounce of the extract represents one ounce of bela.

CATECHU PALLIDUM. *Pale Catechu.* (An extract of the leaves and young shoots of Uncaria Gambir, *Roxburgh, Flor. Ind.; Trans. Linn. Soc. (Nauclea Gambir)*, vol. ix. plate 22. Prepared at Singapore and in the Eastern Archipelago.) Although but one source is now indicated in the Pharmacopœia for catechu, and but one variety, catechu pallidum, is mentioned, still in commerce we meet with several varieties of catechu, but most especially with catechu nigrum, which was officinal in the last edition of the British Pharmacopœia, and is an extract prepared from the heart-wood of the acacia catechu, imported from Pegu. We also meet with an extract prepared from the seeds of the areca catechu, a rarer variety, however, than either of the two first mentioned. *Uncaria gambir* is a native of many of the islands of the Indian Archipelago; it is placed in the Natural family *Cinchonaceæ* (*Rubiaceæ*, Jussieu), and in the Linnæan class and order *Pentandria Monogynia*. *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*. *Areca catechu*, which inhabits most of the Indian continent and islands, belongs to the Natural family *Palmaceæ*, and to the Linnæan class and order *Monœcia Hexandria*.

BOTANICAL CHARACTERS.—*Uncaria gambir:* a stout scandent shrub; leaves ovato-lanceolate, acute, glabrous; stipules ovate, interpetiolar; flowers green and pink, in loose heads, on opposite axillary peduncles.—*Acacia catechu:* stem 15–20 feet high, with a brown scabrous bark, and a hard heavy wood, dark-red in the centre; leaves bipinnate; stipules spinose, or none; flowers numerous, pale-yellow; legumes 4 to 8-seeded.—*Areca catechu:* a beautiful palm, between 40 and 50 feet high, monœcious; 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, containing a single *seed (the betel nut)*, with a ruminate albumen, and a small embryo at the base of the albumen.

PREPARATION.—From the Acacia catechu is obtained by boiling the red heartwood 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 catechu in tubes 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 seed, 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 varieties of catechu occur in commerce, but I shall direct attention only to the two sorts which are most usually met with in druggists' shops, the others being chiefly employed for tanning. 1st.—The officinal variety, *Catechu in cubes (Gambier; Terra Japonica; Cubical resinous catechu)*. This catechu 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. 2nd.—*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.

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.

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. 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 in which pale catechu 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* presenting an appearance far different from that of a similar mixture made with a tincture and an infusion of catechu *pallidum;* different as they would be in physical appearance, their physiological effects, nevertheless, would still be the same.

PREPARATIONS.—Infusum Catechu, sixteen grains to one fluid ounce; Pulvis Catechu compositus, one part in two and a half; Tinctura Catechu, fifty-four and a half grains to one fluid ounce; Trochisci Catechu, one grain in each lozenge.

Infusum Catechu. Infusion of Catechu. (Take of pale catechu, in coarse powder, one hundred and sixty grains; cinnamon bark 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 pale catechu in powder, four ounces; kino, in powder; rhatany root in powder, of each two ounces; cinnamon bark in powder; nutmeg, in powder, of each one ounce. Mix them thoroughly, and pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.) Dose, gr. xx. to gr. cxx.

Tinctura Catechu. Tincture of Catechu. (Take of pale catechu, in coarse powder, two ounces and a half; cinnamon bark bruised, one ounce; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation, strain, press, filter, 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, seven hundred and twenty grains; refined sugar, in powder, twenty-five ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; distilled water, a sufficiency. Mix the catechu, sugar, and gum, and add the mucilage and water to form a proper mass; divide into seven hundred and twenty 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, ℥j.; kino, ℥iv.; nutmeg, ℥j.; opium, diffused in a little sherry, ℥iss; 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 substances the active principle of which 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 that the alkaloidal tannates are sufficiently soluble in the acids of the gastric juice.

CREASOTUM. *Creasote.* A product of the distillation of wood tar.

PREPARATION.—Creasote, an *oxhydrocarburet*, is the product of a complicated process, in virtue of which wood 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 carbo-

nate 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.

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, and 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 (*κρεὰς σώζω*). It should be neutral.

CHARACTERS AND TESTS.—A liquid, colourless or with a yellowish tinge, and a strong empyreumatic odour. It is sparingly dissolved by water, but freely by alcohol, ether, and glacial acetic acid. Specific gravity, 1·071. It coagulates albumen. A slip of deal dipped into it, and afterwards into hydrochloric acid, acquires, on exposure for a short time to the air, a greenish-blue colour. Dropped on white filtering paper and exposed to a heat of 212°, it leaves no translucent stain. It turns the plane of polarisation of a ray of polarised light to the right. It is not solidified by the cold produced by a mixture of hydrochloric acid and sulphate of soda.

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; 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 fixed oils. It is distinguished from carbolic acid by its behaviour during polarization, and by its not solidifying by the amount of cold produced as directed.

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 hæmatemesis, 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 the 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. 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. 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 that which 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.

PREPARATIONS.—Mistura Creasoti, one minim in one fluid ounce; Unguentum Creasoti, one part in nine; Vapor Creasoti.

Mistura Creasoti. Creasote Mixture. (Take of creasote; glacial acetic acid, of each 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.)

Vapor Creasoti. Inhalation of Creasote. (Take of creasote, twelve minims; boiling water, eight fluid ounces. Mix the creasote and water in an apparatus so arranged that air may be made to pass through the solution, and may afterwards be inhaled.) A most unnecessary formula, inasmuch as the strength of the solution will vary with the caprice of the prescriber or the emergency of the case; it should have been left for extemporaneous prescription; it is intended for purposes of inhalation.

CRETA, *Chalk* (described in the division *Antacids*, p. 12) is employed as an astringent in the various forms of diarrhœa; its bene-

ficial effects as such depend principally upon its antacid properties (see p. 13). Chalk mixture (see p. 14) 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. Aromatic Powder of Chalk and Opium. Syn: *Pulvis Cretæ Opiatus, Pulvis Cretæ Compositus cum Opio.* (Take of aromatic powder of chalk, nine ounces and three quarters; opium, in powder, a quarter of an ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.) Dose for adults, gr. x. to. gr. xl.; for children, gr. ij. to gr. v. One grain of opium is contained in each 40 grains.

CUPRI SULPHAS. *Sulphate of Copper.* Syn: *Blue Vitriol.* CuO,SO_3+5HO (=124·75) or $\mathbf{CuSO_4.5H_2O}$ (=249.5) May be obtained by heating sulphuric acid and copper together, dissolving the soluble product in hot water, and evaporating the solution until crystallisation takes place on cooling.

PREPARATION.—This salt is made in a variety of ways: when produced as indicated in the Pharmacopœia, by the action of sulphuric acid upon metallic copper, two equivalents of sulphuric acid react upon one of copper; one of the two equivalents of sulphuric acid is resolved into sulphurous acid (SO_2) which escapes, and oxygen which unites with the copper to form an oxide of copper, and this unites with the second equivalent of sulphuric acid, to form sulphate of copper thus :—$Cu+2SO_3=SO_2+CuO,SO_3$. Sulphate of copper may also be obtained in any 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 sulphur of the sulphuret is converted into sulphuric acid and the copper is oxidized, and the two unite to form the sulphate; and, finally, it is obtained in large quantities in the processes for refining gold and silver.

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, 2·27.

CHEMICAL PROPERTIES.—The crystals are composed of one equivalent of protoxide of copper, one of sulphuric acid, and five 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.

CHARACTERS AND TESTS.—A blue crystalline salt, in oblique prisms, soluble in water, forming a pale blue solution which strongly reddens litmus. The aqueous solution gives with chloride of barium a white precipitate, insoluble in hydrochloric acid, and a maroon-red precipitate with yellow prussiate of potash. If an aqueous solution of the salt be mixed with twice its volume of solution of chlorine, and solution of ammonia be added, the precipitate formed by the first addition of the ammonia will be dissolved by a further and sufficient addition of the alkali, and a violet-blue solution will be produced, leaving nothing undissolved.

The chloride of barium proves that it is a salt of sulphuric acid, the precipitate being sulphate of barytes. The *maroon-red precipitate* produced on the addition of the yellow prussiate of potash (Ferrocyanide of potassium) is ferrocyanide of copper, accounted for by the copper in two equivalents of the sulphate replacing the two equivalents of potassium contained in the ferrocyanide of potassium (K_2FeCy_3), whilst the two equivalents of potassium replace the copper, forming two equivalents of sulphate of potash, thus, $2(CuO,SO_3)+K_2FeCy_3=2(KO,SO_3)+Cu_2FeCy_3$. 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. The pharmacopœial *test* is directed against sulphate of iron, the only likely impurity; with which, however, sulphate of copper is very often adulterated. 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 for its detection is the pharmacopœial one. Were iron present, on the addition of the solution of chlorine and 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. The sapphire colour is due to the production of the salt, "Ammonio-sulphate of copper," and the manner in which its appearance is to be accounted for will be understood by reference to the description of that salt in the chapter on *Tonics*. The part the chlorine plays is to set free an equivalent of oxygen from the water; the oxygen converts the protosulphate of iron (FeO,SO_3) into the basic sulphate ($Fe_2O_3,2SO_3$); this it can evidently do by supplying one atom of oxygen to each two equivalents of protosulphate of iron. The basic sulphate of iron on meeting the ammonia is decomposed by it, sulphate of ammonia being held in solution, and sesquioxide of iron (insoluble in an excess of ammonia) precipitated, thus, $Fe_2O_3,2SO_3+2NH_4O=2(NH_4O,SO_3)+Fe_2O_3$.

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. 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. (See, also, *Caustics*, *Emetics*, and *Tonics*.)

DOSE AND MODE OF ADMINISTRATION.—As an *astringent*, 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.

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.

ERGOTIN. *Ergotin.* (An extract obtained from Ergot of Rye.) Under the name of Ergotin M. Bonjean has introduced an extract prepared from the ergot of rye, for which he claims peculiar advantages. Whatever these may be, the preparation has no right to the title *Ergotina*, until proved to be a characteristic principle.

PREPARATION.—It is prepared by exhausting the ergot with water, having first deprived it of its oil by treating it with ether; the aqueous solution is to be concentrated to the consistence of a thick syrup, and alcohol added to it to precipitate its gum, albumen, &c.; the filtered liquid it now to be evaporated in vacuo to the consistence of an extract.

PHYSICAL APPEARANCES.—Pure ergotine is a solid extract of a dark brownish-red when in the lump, and of a fine blood-red when in thin flakes. It has a pleasing smell, something like roast meat; its taste, rather pungent and bitter, resembles that of spoiled corn. It dissolves easily and rapidly in cold water; the solution is of a fine red colour, limpid and transparent as if it had been filtered. Rectified spirits and ether will not dissolve it at all.

THERAPEUTICAL USES.—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, and in many cases when administered internally, 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.

DOSE AND MODE OF ADMINISTRATION.—M. Bonjean's method of employing it for external use 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 of almost every variety, in doses of from five to ten grains; but, notwithstanding his zealous advocacy, its effect is not so decided as when it is employed locally. For internal exhibition it may be given in the form of dragees, each of Bonjean's dragees containing one grain of the extract. 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.

**Ergotin Styptic.* (Benzoic acid, one part; sulphate of alumina and potash, three parts; Bonjean's ergotine, two parts; water, twenty-five parts. Boil the whole together for half an hour in a porcelain dish, stirring it all the while, and adding more warm water as evaporation takes place. Reduce the liquid to the thickness of an extract.) A product is thus obtained, which, according to Dr. Hannon, its inventor, is very superior to the Pagliari water, and he regards it as the most powerful hemostatic hitherto discovered. For external use, a coat of greater or less thickness must be extended over the seat of the hemorrhage.

LIQUOR FERRI PERCHLORIDI FORTIOR. *Strong Solution of Perchloride of Iron.* Syn.—*Liquor Ferri Perchloridi*, 1864.

PREPARATION.—Take of iron wire, two ounces; hydrochloric acid, twelve fluid ounces; nitric acid, nine fluid drachms; distilled water, eight fluid ounces. Mix eight fluid ounces of the hydrochloric acid with the distilled water and in this dissolve the iron at a gentle heat. Filter the solution, add to it the remainder of the hydrochloric acid and the nitric acid, heat the mixture briskly until on the sudden evolution of red fumes the liquid becomes of an orange-brown colour; then evaporate by the heat of a water-bath until it 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 by the mutual reaction of the two acids upon each other, produces three equivalents of chlorine, which convert six equivalents of chloride into three equivalents of perchloride of iron ($6FeCl+3Cl=3Fe_2Cl_3$), and one equivalent of nitric oxide gas (NO_2). The result of this re-action is explained by this equation, $3HCl+NO_5=3Cl+NO_2+3HO$. As long as any protochloride of iron remains unchanged into perchloride, the nitric oxide gas is retained by it; but, when all the proto- is converted into perchloride of iron, the gas escapes energetically, and abstracting oxygen from the air, becomes hyponitric acid, thus $NO_2+2O=NO_4$.

CHARACTERS AND TESTS.—An orange-brown solution, with a strong styptic taste, miscible with water and rectified spirit in all proportions. Diluted with water it is precipitated white by nitrate of silver, and blue by yellow prussiate of potash, but not at all by red prussiate of potash. Specific gravity, 1·338. A fluid drachm of it 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 white precipitate produced on the addition of nitrate of silver is chloride of silver, the blue precipitate produced on the addition of yellow prussiate of potash is Prussian blue; did the red prussiate of potash yield a precipitate, it would prove that the proto- had not been effectually converted into the perchloride of iron. To understand the production of these two precipitates, it will be necessary to bear in mind the difference between ferrocyanogen ($FeCy_3$) and ferridcyanogen (Fe_2Cy_6) and their salts, ferrocyanide of potassium or yellow prussiate of potash (K_2FeCy_3), and ferridcyanide of potassium or red prussiate of potash, ($K_3Fe_2Cy_6$). A solution of the first of these two salts, throws down a precipitate of a blue colour, as in this case, with *per*-salts of iron: this blue colour is known as Prussian blue, and its production is thus accounted for, $2(Fe_2Cl_3)+3(K_2FeCy_3)=6KCl+(Fe_43FeCy_3)$. A solution of the second of these two salts, ferridcyanide of potassium, throws down a precipitate of a blue colour with the *proto*-salts of iron, known as Turnbull's blue, the production of which is thus accounted for, $3FeCl+K_3Fe_2Cy_6=3KCl+Fe_3Fe_2Cy_6$. The precipitate yielded on the addition of the solution of ammonia 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 perchloride of iron in each fluid drachm. By evaporating this solution we can obtain the perchloride 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 in-

ternally—either the tincture or solution of the perchloride of iron being preferred to it, but 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 preparations that are generally employed for internal exhibition are the solution and the tincture of the perchloride of iron, either of which, if taken in large doses, acts as an irritant poison, principally in consequence of the free hydrochloric acid which they contain. They possess styptic and astringent properties, on which account they are sometimes used as topical agents to check bleeding from small vessels. Although many practitioners assert that they can see no difference in the remedial virtues of these two preparations, I entertain no doubt as to the superior value of the tincture. In addition to 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 urinogenital 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. xv. every ten or fifteen minutes. Of late years tincture of the perchloride of iron has been administered with very successful results in the treatment of erysipelas; and Dr. Heslop of Birmingham states that he has found it most useful in diphtheria, and analogically suggests its employment in puerperal peritonitis and allied diseases. In poisoning with this preparation the treatment is the same as in poisoning with hydrochloric acid (which see).

PREPARATIONS IN WHICH STRONG SOLUTION OF PERCHLORIDE OF IRON IS USED.—Liquor Ferri Perchloridi, one volume in four; Tinctura Ferri Perchloridi, one volume in four.

Liquor Ferri Perchloridi. Solution of Perchloride of Iron. (Take of strong solution of perchloride of iron, five fluid ounces; distilled water, fifteen fluid ounces. Mix.) This solution is one-fourth the strength of Liquor Ferri Perchloridi, 1864, and is the same strength as tincture of perchloride of iron. Dose, ten to thirty minims.

Tinctura Ferri Perchloridi. Tincture of Perchloride of Iron. Syn.: *Tinctura Ferri Sesquichloridi,* Lond. (Take of strong solution of perchloride of iron, five fluid ounces; rectified spirit, fifteen fluid ounces. Mix, and preserve in a stoppered bottle.) Specific gravity, 0·992. This tincture has about *one-third* the strength of Tinctura Ferri Sesquichloridi, *Dubl.* Dose, 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.

Liquor Ferri Pernitratis. *Solution of Pernitrate of Iron.*

PREPARATION.—Take of fine iron wire, free from rust, one ounce; nitric acid, four and a half 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 AND TESTS.—A clear solution of a reddish-brown colour, slightly acid and astringent to the taste *(and with a weak nitric acid odour);* gives a blue precipitate with the yellow prussiate of potash. 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. 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 red prussiate of potash.

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, $6(FeOSO_3)+3SO_3+NO_5=3(Fe_2O_33SO_3)+NO_2$. The 2·6 grains yielded on incineration are peroxide 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 further explanation, see p. 108).

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 1½ 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 almost be 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.

LIQUOR FERRI PERSULPHATIS. *Solution of Persulphate of Iron.*

PREPARATION.—Take of sulphate of iron, eight ounces; sulphuric acid, six fluid drachms; nitric acid, six fluid drachms; distilled water, twelve 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 the water, and add the dilute acid to the solution of sulphate of iron. Concentrate the whole by boiling, until, by 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 red prussiate of potash, 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 sulphate 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.

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, $6FeO,SO_3+3SO_3+NO_5=3Fe_2O_33SO_3+NO_2$. 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, $NO_2+2O=NO_4$.

CHARACTERS AND TESTS.—A dense 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 chloride of barium, and a blue precipitate with yellow, but not with red, prussiate of potash. Specific gravity, 1·441. One fluid drachm diluted with two 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.

The white precipitate (sulphate of barytes) yielded on the addition of chloride of barium, demonstrates the acid constituent of the salt to be sulphuric acid; and the blue precipitate obtained on the addition of the yellow prussiate of potash, whilst the red prussiate does not precipitate it, proves it to be a pure per-salt of iron (see p. 108). The precipitate procured by treating the solution with ammonia, washing and incinerating it, is peroxide of iron, the production of which is thus accounted for, $Fe_2O_33SO_3+3NH_4O=3NH_4O\ SO_3+Fe_2O_3$. The amount so formed would indicate 28·6 grains of anhydrous persulphate of iron in each fluid drachm.

THERAPEUTICAL USES.—This solution is not employed therapeu-

tically; however it might be substituted for the liquor ferri perchloridi. As a topical astringent, Gross prefers a solution of the persulphate of iron, in the treatment of aneurisms by injection, to the perchloride of iron, asserting that it produces less constitutional irritation. It has been introduced into the Pharmacopœia with the view of its employment in the making of the following preparations.

PREPARATIONS IN WHICH SOLUTION OF PERSULPHATE OF IRON IS USED. Ferri et Ammoniæ Citras; Ferri et Quiniæ Citras; Ferri Oxidum Magneticum; Ferri Peroxidum Humidum; Ferrum Tartaratum; Tinctura Ferri Acetatis.

FERRI SULPHAS. *Sulphate of Iron.* FeO,SO_3+7HO (=139) or $\mathbf{FeSO_4 7H_2O}$ (=278) (Syn.: *Green vitriol, copperas.*)

PREPARATION.—Take of iron wire, four ounces; sulphuric acid, four fluid ounces; distilled water, one and a half pint. Pour the water on the iron placed in a porcelain dish, 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 AND TESTS.—In oblique rhombic prisms, of a pale greenish blue colour and styptic taste; insoluble in rectified spirit, soluble in water. The aqueous solution is clear, gives a white precipitate with chloride of barium, a blue one with the red, and a nearly white or light blue one with the yellow, prussiate of potash. It gives no precipitate with sulphuretted hydrogen.

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, $3(FeO,SO_3)+K_3Fe_2Cy_6=Fe_3Fe_2Cy_6+3KOSO_3$. The white, rapidly becoming light blue, precipitate on the addition of the yellow prussiate of potash is also characteristic of a protosalt of iron. The production of this precipitate is thus accounted for, $K_2FeCy_3+FeOSO_3=KOSO_3+KFeFeCy_3$. It is carefully to be distinguished from that produced with a persalt of iron (see p. 108).

CHEMICAL PROPERTIES.—The crystals are composed of 1 equivalent of protoxide of iron, 1 of sulphuric acid, and 7 of water, thus,

($HO,FeOSO_3+6HO$). They effloresce slightly in dry air, but if moisture be present, they attract oxygen and become covered with a brownish-yellow crust of the subsesqui-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, 12·93 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 ℥ss. 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 or mixture. 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 granulated sulphate should be selected.

PREPARATIONS.—Ferri Sulphas Exsiccata; Pilula Aloes et Ferri, 1 part in 7.

PREPARATIONS IN WHICH IT IS USED.—Ferri Arsenias; Ferri Carbonas Saccharata; Ferri Oxidum Magneticum; Ferri Phosphas; Mistura Ferri Composita.

Ferri Sulphas Exsiccata. Dried Sulphate of Iron. (FeO, SO_3,HO(=85) or $\mathbf{FeSO_4H_2O}$(=170). (Take of sulphate of iron, four ounces. Expose it in a porcelain or iron dish to a heat commencing at 212°, but 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 Granulata. Granulated Sulphate of Iron. FeO,SO_3+7HO(=139) or $\mathbf{FeSO_47H_2O}$ (=278). (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 tiles, 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; the resulting salt is in fine granular crystals of a pale greenish blue colour; in all other respects what has already been written with respect to the sulphate holds good with regard to this preparation.

Pilula Aloes et Ferri. Pill of Aloes and Iron. (Take of sulphate of iron, one ounce and a half; Barbadoes aloes, in powder, two ounces; compound powder of cinnamon, three ounces; confection of roses, four ounces. Reduce the sulphate of iron to powder, rub it with the aloes and compound powder of cinnamon, and adding the confection, make the whole into a uniform mass.) Dose, gr. v. to x.

Ferri Sulphas Saccharata, 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 two-thirds 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, *Olivier*, caused by the punctures and deposited ova of Diplolepis Gallæ tinctoriæ, *Latr.*; *Steph. and Church. Med. Bot.* plate 152.) 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 and subsequent influx of sap to the part, 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 space 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.

PREPARATIONS.—Acidum Gallicum ; Acidum Tannicum ; Tinctura Gallæ, fifty-four and a half grains to one fluid ounce ; Unguentum Gallæ, eighty grains to one ounce ; Unguentum Gallæ cum Opio, eighty grains to one ounce, nearly.

Tinctura Gallæ. Tincture of Galls.—(Take of galls, in coarse powder, two and a half ounces ; proof spirit, one pint. Macerate the galls for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards 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. in Oj. of water, for a gargle, lotion, or injection.

Unguentum Gallæ. Ointment of Galls.—(Take of galls, in fine powder, eighty grains ; benzoated lard, 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.* $C_{54}H_{22}O_{34}(=618)$ or $\mathbf{C_{27}H_{22}O_{17}}(=618.)$ (An acid extracted from galls. It may be obtained from the following process.)

PREPARATION.—Take of galls in powder; ether; of each a sufficient quantity. Expose the powdered galls to a damp atmosphere for two or three days, and afterwards add sufficient ether to form a soft paste. Let this stand in a well-closed vessel for twenty-four hours, then, having quickly enveloped it in a linen cloth, submit it to strong pressure in a suitable press, so as to separate the liquid portion. Reduce the pressed cake to powder, mix it with sufficient ether, to which one-sixteenth of its bulk of water has been added, to form again a soft paste, and press this as before. Mix the expressed liquids, and expose the mixture to spontaneous evaporation, until, by the aid subsequently of a little heat, it has acquired the consistence of a soft extract; then place it on earthen plates or dishes, and dry it in a hot-air chamber at a temperature not exceeding 212°.

EXPLANATION OF PROCESS.—Reference to what has been written upon Galls (p. 117) will show that tannic acid exists ready formed in them; so the pharmacopœial process is one of simple exhaustion of the galls of their tannic acid. Various theories have been advanced for the purpose of explaining how it is that ether, which is a bad solvent of pure tannic acid, should so effectually exhaust the galls of their tannic acid as it does. Béral believed that the tannic acid, ether, and water form a definite compound which is essentially liquid, and is decomposed during the evaporation, the fluids escaping and the tannic acid remaining behind. Other chemists adopt Robiquet's view, that it is a simple case of juxtaposition of water, tannic acid, and ether, from which the tannic acid is removed by the evaporation directed. The amount of tannic acid obtained will vary with the character of the galls employed, but generally speaking from 30 to 40 per cent. of tannic acid will be the result of the process, if properly conducted.

CHARACTERS AND TESTS.—In pale yellow vesicular masses or thin glistening scales, *(inodorous)* with a strongly astringent taste, and an acid reaction; readily soluble in water and rectified spirit, very sparingly soluble in ether. The aqueous solution precipitates solution of gelatine yellowish-white, and the persalts of iron of a bluish-black colour. It leaves no residue when burned with free access of air.

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 blue 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 sophistication, 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 recognised 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 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 Frérichs, 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, etc. 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. Dr. Richardson of London has suggested its use in a form which he has termed *Styptic Colloid* (see below), for which he claims peculiar advantages. He asserts that it is of the greatest service as an application after operations, promoting adhesion by the first intention, by preventing the access of atmospheric air; restraining hemorrhage by coagulating the blood, and forming thereby a plug, the formation of which is still further favored by the deposition of the cotton contained in the styptic, and finally acting as a deodorizing agent. I have employed it after some operations, and have been much pleased with the result. In one case (the removal of a cancerous mass from

a lady's forehead) the union by the first intention was of the most perfect character; and its power of arresting hemorrhage was most satisfactorily proved; but its application has the drawback of being attended with pain—at least such was complained of in all cases in which I have hitherto used it, or seen it used by others. As a *topical* astringent, tannic is to be preferred to gallic acid.

DOSE AND MODE OF ADMINISTRATION.—Gr. ij. to gr. x. in the form of pill, or dissolved in water or glycerine. 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.

PREPARATIONS.—Glycerinum Acidi Tannici, 1 part in 6 by weight; Suppositoria Acidi Tannici, gr. ij. in each suppository; Trochisi Acidi Tannici, gr. ss. in each lozenge.

Glycerinum Acidi Tannici. Glycerine of Tannic Acid. (Take of tannic acid, ℥j.; glycerine, f℥iv. Rub them together in a mortar, then transfer the mixture to a porcelain dish and apply a gentle heat until complete solution is effected.) In my opinion an unnecessary formula, inasmuch as each individual case will require solutions of different strengths, and tannic acid is sufficiently soluble in water; it may, however, be used as described above. The glycerine is a valuable addition when tannic acid is employed externally.

Suppositoria Acidi Tannici. Tannic Acid Suppositories. (Take of Tannic acid, gr. xxxvj.; benzoated lard, gr. xliv.; white wax, gr. x.; oil of theobroma, gr. xc. Melt the wax and oil of theobroma with a gentle heat, then add the tannic acid and benzoated lard previously rubbed together in a mortar, and mix all the ingredients thoroughly. Pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.) A convenient form for the application of tannic acid in such diseases of the uterus, vagina, or rectum as may require its employment.

Trochisci Acidi Tannici. Tannic Acid 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 acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; distilled water, one fluid ounce. Dissolve the tannic acid in the water; add, first the tincture of tolu, previously mixed with the mucilage, then the gum and the sugar, also previously well mixed. Form the whole into a proper mass; divide it into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains half a grain of tannic acid. They are convenient forms for the employment of tannic acid locally in cases of relaxed uvula, sore throat, &c. They may be used *ad libitum*.

* *Styptic Colloid.* RICHARDSON. (Take pure tannic acid, absolute alcohol, gun cotton, and absolute ether. Digest for several days the tannic acid in the alcohol, until it becomes saturated with it, then add as much pure ether as will render the alcoholic solution liquid, and add to the mixture as much gun cotton as it will dissolve; add to this a few drops of tincture of benzoin, and keep in a well-stoppered bottle.) This solution is applied to the lips of a recent wound after they have been placed in accurate juxtaposition, either with a camel's hair pencil, or by means of a pledget of lint steeped in it. To apply it in a cavity, it must be mixed with an equal portion of pure ether, and can then be applied in the form of *spray*, with the assistance of the useful instrument Dr. Richardson has devised for the purpose of producing local anæsthesia.

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.* $3HO,C_{14}H_3O_7+2HO$ (=188) or $\mathbf{H_3C_7H_3O_5H_2O}$ (=188.) (A crystalline acid prepared from galls. It may be obtained by the following process):—

PREPARATION.—Take of galls in coarse powder, one pound; distilled water, a sufficiency. Place the powder of galls in a porcelain dish, pour on as much of the water as will convert it into a thick paste, and keep it 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 redissolve 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 at a temperature not exceeding 100°. By boiling the undissolved portion of the galls with forty-five additional ounces of water, filtering into a dish 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 crystallisation.

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 reaction that so occurs, $C_{54}H_{22}O_{34}+24O=3(3HO,C_{14}H_3O_7)+4HO+12CO_2$. 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. According to Buchner, 7·5 per cent. of gallic acid is produced from galls, and from 50 to 60 per cent. from tannin.

CHARACTERS AND TESTS.—Crystalline, in acicular prisms or silky needles, sometimes nearly white, but generally of a pale fawn-colour. It requires about 100 parts of cold water for its solution, but dissolves in 3 parts of boiling water. Soluble also in rectified spirit, and in glycerine. The aqueous solution reddens blue litmus paper and gives no precipitate with solution of isinglass. It gives a bluish-black precipitate with a persalt of iron. The crystalline acid when dried at 212° loses 9·5 per cent. of its weight. It leaves no residue when burned with free access of air.

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.

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 9 is to 10. It is also one of our best astringents in hemorrhage from the stomach and bowels, on its efficacy in which Neligan published some observations in the Dublin Quarterly Journal of Medical Science, new series, vol. ix. p. 349. In hemorrhage from the uterus, also, my experience of it is corroborative of the published observations of Sir James 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. As a topical astringent, however, it is far inferior to tannic acid, a fact to be inferred from its inability to precipitate albuminous or gelatinous solutions.

DOSE AND MODE OF ADMINISTRATION.—Gr. iij. to gr. xx. two or three times a day in the form of a pill, dissolved in glycerine, 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 ℥j. of it daily for 53 days.

PREPARATION.—Glycerinum Acidi Gallici, one part in six by weight.

Glycerinum Acidi Gallici. Glycerine of Gallic Acid. (Take of gallic acid, one ounce; glycerine, four fluid ounces. Rub them together in a mortar, then transfer the mixture to a porcelain dish and apply a gentle heat until complete solution is affected.) Dose, min. xx. to f℥ij.

INCOMPATIBLES.—The sesqui-salts of iron.

HÆMATOXYLI LIGNUM. *Logwood.* (The sliced heart-wood of Hæmatoxylum campechianum, *Linn.; Woodv. Med. Bot.* plate 17. Imported from Campeachy, Honduras, and Jamaica.) The log-wood tree is 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.—A middle-sized tree about 20–30 feet high; stem and branches very crooked; leaves abruptly pinnate, bearing three or four pairs of sessile obcordate leaflets; flowers pentamerous, in axillary racemes, of a yellow colour; fruit a legume with two boat-shaped valves.

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.

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 sesqui-salts 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.

PREPARATIONS.—Decoctum Hæmatoxyli, one ounce to one pint; Extractum Hæmatoxyli.

Decoctum Hæmatoxyli. Decoction of Logwood. (Take of logwood, in chips, one ounce; cinnamon bark, in coarse powder, sixty grains; distilled water, one pint. Boil the logwood in the water for ten minutes in a covered vessel, adding the cinnamon towards the end. Strain the decoction, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) *Dose*, 1 to 2 fluid 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. Infuse the logwood in the water for twenty-four hours, then boil down to one half, strain, and evaporate to dryness by a water-bath, 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.* (The inspissated juice obtained from incisions made in the trunk of Pterocarpus Marsupium, *DC.: Roxb. Corom.* plate 116. 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, belonging also to the Natural family *Leguminosæ*. Botany Bay Kino, sometimes met with also, is the inspissated juice of the Eucalyptus Resinifera, a native of Australia and Van Dieman's Land; it belongs to the Natural family *Myrtaceæ*.

BOTANICAL CHARACTERS.—*Pterocarpus Marsupium* is a large tree with exstipulate, alternately imparipinnate leaves, consisting of 5–7 elliptical, emarginate, coriaceous, entire, glabrous leaflets. Flowers in axillary and terminal panicles, papilionaceous; stamens 10, monadelphous at the base, becoming diadelphous; legumes, woody, indehiscent, 1 or 2-celled, surrounded by a waved, veined, downy, membranous wing.

PREPARATION.—"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.

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 one 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. 100), 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.

PREPARATION.—Pulvis Catechu Compositus, one part in five, (see page 101); Pulvis Kino Compositus, three and three quarter parts in five; Tinctura Kino, two ounces to one pint.

Pulvis Kino Compositus. Compound Powder of Kino. Syn.—*Pulvis Kino cum Opio*, 1864.—(Take of Kino, in powder, three and three quarter ounces; opium, in powder, a quarter of an ounce; cinnamon bark, in powder, one ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. 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 coarse powder, ℥ij.; rectified spirit, Oj. Macerate for seven days in a closed vessel, with occasional agitation, 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.

KRAMERIÆ RADIX. *Rhatany Root.* (The dried root of Krameria triandra, *Ruiz and Pavon, Flor. Peruv.; Steph. and Church, Med. Bot.* plate 72. Imported from Peru.) Rhatany is a native of Peru; belonging to the Natural family *Krameriaceæ*, and to the Linnæan class and order *Tetandria Monogynia.*

BOTANICAL CHARACTERS.—An undershrub with long, much-branched, spreading roots, and a procumbent stem. Leaves sessile, oblong-ovate, acute, covered on both surfaces with long silky hairs; flowers terminal, solitary, lake-colored: sepals 4, petaloid; petals 4, small, irregular; stamens 3; ovary usually 1-celled, style terminal, stigma simple; fruit globose, dry, beset with stiff, red hairs furnished with hooks at their apex.

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, hard, 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 constituent 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.

PREPARATIONS.—Extractum Krameriæ ; Infusum Krameriæ, ℥j. to Oj.; Pulvis Catechu Compositus, 1 part in 5 (see p. 101); Tinctura Krameriæ, ℥ijss. to Oj.

Extractum Krameriæ. Extract of Rhatany. (Take of rhatany root in coarse powder, one pound ; distilled water, a sufficiency. 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 twelve pints have been collected, or the rhatany root is exhausted. Evaporate the liquor by a water-bath to dryness.) Dose, gr. xx. to gr. xl.

Infusum Krameriæ. Infusion of Rhatany. (Take of rhatany root 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.

Tintura Krameriæ. Tincture of Rhatany. (Take of rhatany root, in coarse powder, two and a half ounces ; proof spirit, one pint. Macerate the rhatany root for forty-eight hours, in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally ; then transfer to a percolator, and whenthe fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit.

Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint). Dose f3ss. to f3ij.

INCOMPATIBLES.—All substances incompatible with tannin.

MATICÆ FOLIA *Matico Leaves.* (The dried leaves of Artanthe elongata; *Miquel, Comment.; Ruiz and Pavon, Flor. Peruv. (Piper angustifolium)*, plate 57. 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.*

BOTANICAL CHARACTERS.—A shrub, about 12 feet high; stem erect, jointed, knotted, branched; leaves on short petioles, or sessile, cordate at the base, oblong-lanceolate, acuminate, crenate, upper surface bright green and tesselated, under surface paler and pubescent; flowers hermaphrodite in long cylindrical spikes, which are solitary and opposite the leaves; bracts peltate or cucullate.

CHARACTERS.—From two to eight inches long, veined and tesselated 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 to some extent 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, etc.; there is no doubt of its being a styptic of some

power. Like many other good astringents, though 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.

PREPARATION.—Infusum Maticæ.

Infusum Maticæ. Infusion of Matico. (Take of Matico leaves, cut small, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for two hours, 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. *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 glycyphlœum* (Casaretti), a native of Brazil, belonging to the Natural family *Sapotaceæ.*

PREPARATION.—The extract is brought over in large cakes, which are purified by dissolving them in water, filtering and evaporating.

PHYSICAL APPEARANCES.—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 is especially experienced in the fauces, and usually very persistent; the odour is feebly aromatic.

CHEMICAL PROPERTIES.—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 *Monesin*, and various salts.

THERAPEUTICAL USES.—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 sprinkled.

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.* $PbO,C_4H_3O_3+3HO(=189{\cdot}5)$ or $\mathbf{Pb2(C_2H_3O_2)3H_2O}$ (=379). (It may be obtained by the following process:—)

PREPARATION.—Take of oxide of lead, 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 oxide of lead, and dissolve with the aid of a gentle heat. Filter, evaporate till a pellicle forms, and set aside to crystallise, first adding a little acetic acid, should the fluid not have a distinctly acid reaction. Drain and dry the crystals on filtering paper, without heat.

EXPLANATION OF PROCESS.—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, $PbO+C_4H_3O_3+3HO=PbO,C_4H_3O_3+3HO$.

CHARACTERS AND TESTS.—In white crystalline masses, 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. Its solution in distilled water is clear, or has only a slight milkiness, which disappears on the addition of acetic acid. Thirty-eight grains dissolved in water require for complete precipitation 200 grain-measures of the volumetric solution of oxalic acid.

The *yellow* precipitate alluded to is iodide of lead, the production of which is explained by the annexed equation, $PbO,C_4H_3O_3+KI=PbI+KO,C_4H_3O_3$. The *white* precipitate is sulphate of lead, thus accounted for, $PbO,C_4H_3O_3+SO_3=PbO,SO_3+C_4H_3O_3$; the water in each case being omitted from the equations, as taking no part in the reactions. The slight milkiness 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 milkiness 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, as occasionally it does, 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 medical 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 embedded 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. 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 poisonous effects produced by its continued administration, as for those of poisoning by lead generally, see *Carbonate of Lead.*

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

PREPARATIONS IN WHICH ACETATE OF LEAD IS USED.—Liquor Plumbi Subacetatis, five ounces to one pint (which see); Pilula Plumbi cum Opio, thirty-six parts in forty-eight; Suppositoria Plumbi Composita, six parts in thirty; Unguentum Plumbi Acetatis, one part in thirty-eight.

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 three 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. vj. 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 mèconate 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 preserve 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. j.; acidi acetici diluti, f℥ss.; aquæ distillatæ ad f℥viij. M. Dose for an adult, one ounce.

Suppositoria Plumbi Composita. Compound Lead Suppositories. (Take of acetate of lead, thirty-six grains; opium, in powder,

twelve grains; benzoated lard, forty-two grains; white wax, ten grains; oil of theobroma, eighty grains. Melt the wax and oil of theobroma with a gentle heat, then add the other ingredients previously rubbed together in a mortar, and having mixed them thoroughly, pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.) A convenient formula for the introduction of acetate of lead into either the rectum or vagina; each suppository contains three grains of acetate of lead and one grain of opium.

Unguentum (Ceratum) Plumbi Acetatis. (Take of acetate of lead in fine powder, twelve grains; benzoated lard, one ounce; mix thoroughly.) 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. So diluted, I know no more efficient preparation in the treatment of blistered surfaces which do not show a disposition to heal.

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.

PLUMBI CARBONAS. *Carbonate of Lead.* (Syn:—Cerussa, White Lead.)

PREPARATION.—An article of the Materia Medica, no formula being given in the Pharmacopœia for its manufacture. 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 AND TESTS.—A soft heavy white powder, blackened by sulphuretted hydrogen, insoluble in water, soluble with effervescence in diluted acetic acid without leaving any residue, and forming a solution which is precipitated white by sulphuric acid, and yellow by iodide of potassium. The acetic solution when treated with excess of sulpuretted hydrogen, boiled and filtered, gives no precipitate with oxalate of ammonia.

The black precipitate produced by sulphuretted hydrogen, the yellow with iodide of potassium, and the white with sulphuric acid, are respectively sulphide, sulphate, and iodide of lead.

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 alumina and potassa, &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 pre-

sents 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.

PREPARATION.—Ungentum Plumbi Carbonatis one part in eight.

Unguentum Plumbi Carbonatis. (Take of carbonate of lead, in fine powder, sixty-two 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) or $\mathbf{PbC_2H_3O_2}$ (=266) dissolved in water.) Some error has crept into the pharmacopœial formula on the new system of chemical notation for this salt; instead of that just given, which, however, I did not feel myself justified in altering, it should be, $\mathbf{Pb2(C_2H_3O_2)PbO}$=548.

PREPARATION.—Take of acetate of lead, five ounces; oxide of lead, in powder, three ounces and half; distilled water, one pint, or a sufficiency. Boil the acetate of lead and the oxide of lead 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.

EXPLANATION OF PROCESS.—On the addition of the 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. $PbO,C_4H_3O_3+PbO=2PbO,C_4H_3O_3$. This salt, dissolved in water, constitutes the present preparation.

CHARACTERS AND TESTS.—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. Specific gravity, 1·26. 413·3 grains by weight (six fluid drachms) require for perfect precipitation 810 grain 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 being 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. Diluted Solution of Subacetate of Lead. (Syn.: *Goulard's Vegeto-Mineral Water.*) (Take of solution of subacetate of lead, rectified spirit, of each 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 Compositum. Compound Ointment of Subacetate of Lead. (Take of solution of subacetate of lead, six fluid ounces; camphor, sixty grains; white wax, eight ounces; oil of almonds, one pint. Melt the wax with sixteen ounces of the oil by the heat of a 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 while 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.

PLUMBI OXIDUM. *Oxide of Lead.* Syn.—*Litharge yrum*, 1864. *Semivitreous Oxide of Lead.* PbO (=111.5) or **PbO** (=223).

PREPARATION.—We have no process given us in the Pharmacopœia for the preparation of oxide of lead, it being always manufactured on a large scale. 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 AND TESTS.—In heavy scales of a pale brick-red colour, completely soluble without effervescence in diluted nitric and acetic acids; either solution, when neutral, giving a copious yellow precipitate with iodide of potassium. Its solution in diluted nitric acid, when supersaturated with ammonia and then cleared by filtration, does not exhibit a blue colour.

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.

THERAPEUTICAL USES.—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.

PREPARATIONS IN WHICH OXIDE OF LEAD IS USED.—Emplastrum Cerati Saponis; Emplastrum Plumbi; Liquor Plumbi Subacetatis; Plumbi Acetas.

PREPARATIONS CONTAINING LEAD.—Emplastrum Belladonnæ; Emplastrum Calefaciens; Emplastrum Cerati Saponis; Emplastrum Ferri; Emplastrum Galbani; Emplastrum Hydrargyri; Emplastrum Opii; Emplastrum Plumbi; Emplastrum Resinæ; Emplastrum Saponis; Liquor Plumbi Subacetatis; Liquor Plumbi Subacetatis Dilutus; Plumbi Acetas; Plumbi Carbonas; Plumbi Iodidum; Plumbi Nitras; Suppositoria Plumbi Composita; Unguentum Plumbi Acetatis; Unguentum Plumbi Carbonatis; Unguentum Plumbi Iodidi; Unguentum Plumbi Subacetatis Compositum.

Emplastrum Cerati Saponis. Soap Cerate Plaster. (Take of hard soap, in powder, ten ounces; yellow wax, twelve and a half ounces; olive oil, one pint; oxide of lead, fifteen ounces; vinegar, one gallon. Boil the vinegar and oxide of lead together, by the heat of a steam-bath, constantly stirring them until the oxide has combined with the acid; then add the soap, and boil again until most of the moisture is evaporated; finally, add the wax and oil melted together, and stir the whole continuously, maintaining the heat until by the evaporation of the remaining moisture the product has acquired the proper consistence for a plaster.) In the first portion of this process the vinegar and lead unite to form an acetate of lead, which is subsequently decomposed on the addition of the soap, the fatty acids uniting with the lead, and the acetic acid with the soda contained in the hard soap. It is used as a mild soothing applica-

tion to scrofulous ulcers, to enlarged glands, &c., its principal value being the support it gives and the pressure it exercises.

Emplastrum Plumbi. Lead Plaster. Syn.—*Emplastrum Lithargyri*, 1864. *Diachylon Plaster.* (Take of oxide of lead, in fine powder, four pounds ; olive oil, one gallon ; water, three and a-half pints. Boil all the ingredients together gently by the heat of a steam-bath, and keep them simmering for four or five hours, stirring constantly until the product acquires a proper consistence for a plaster, and 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. Lead Plaster enters into the preparation of Emplastrum Ferri ; Emplastrum Galbani ; Emplastrum Hydrargyri ; Emplastrum Resinæ; Emplastrum Saponis.

Emplastrum Resinæ. Resin Plaster. (Take of resin, four ounces ; lead plaster, two pounds ; hard soap, two ounces. To the lead plaster, previously melted with a gentle heat, add the resin and soap, first liquefied, and stir 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. Resin plaster enters into the preparation of Emplastrum Belladonnæ ; Emplastrum Calefaciens; Emplastrum Opii ; Emplastrum Plumbi Iodidi.

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

PLUMBI NITRAS. *Nitrate of lead.* PbO,NO_5 (=165·5) or $\mathbf{Pb\,2(NO_3)}$ (=331). In the Pharmacopœia no process is given for its manufacture, but it may be prepared as follows :—

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 ; these should be dried on blotting paper in a warm atmosphere, and preserved in a close bottle.

EXPLANATION OF PROCESS.—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 AND TESTS.—In colourless octahedral crystals which are nearly opaque, permanent in the air, of a sweetish astringent taste, soluble in water and in alcohol. The aqueous solution is precipitated black by sulphuretted hydrogen, white by diluted sulphuric acid, and yellow by iodide of potassium. Added to sulphate of indigo it discharges the colour.

The black precipitate produced by sulphuretted hydrogen, the yellow with iodide of potassium, and the white with sulphuric acid, are respectively sulphide, sulphate, and iodide 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 exposing the infant to great risk with careless nurses, 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, $SH+PbO,NO_5=PbS+HO+NO_5$. The nitric acid thus developed by its oxidizing properties also is a deodorizing agent.

DOSE AND MODE OF ADMINISTRATION.—For internal exhibition, in the form of pill or mixture, gr. $\frac{1}{4}$ to gr. j. ; as a lotion, gr. v. to gr. x., dissolved in $f\bar{3}j$. of distilled water ; as a deodorizer, gr. xxx. to lx. dissolved in $f\bar{3}j$. of distilled water.

PREPARATION IN WHICH NITRATE OF LEAD IS USED.—Plumbi Iodidum.

QUERCUS CORTEX. *Oak Bark.* (The dried bark of the small branches and young stems of Quercus pedunculata, *Willd.; Woodv. Med. Bot. (Q. Robur)*, plate 126. Collected in spring from trees growing in Britain.) The oak, "monarch of the forest," belongs to

the Natural family *Cupuliferæ (Corylaceæ,* Lindley), and to the Linnæan class and order *Monœcia Polyandria.*

BOTANICAL CHARACTERS.—A stately, long-lived tree; leaves deciduous, in some species remaining through a great part of the winter, oblong-ovate, deeply sinuate, lobes obtuse; flowers monœcious; male flowers in lax catkins, usually without scales, consisting of 5 to 10 stamens surrounded by a perianth of 5-7 scales; female flowers, each enclosed by an involucre of closely imbricate obtuse scales which is much shorter than the fruit, perianth adherent to the ovary at its base, with 6 small teeth; ovary 3-celled; style short, with 3 stigmata.

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 tannic, 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 large 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), 3ss. to 3j.

Decoctum Quercus. Decoction of Oak Bark. (Take of oak bark, bruised, one ounce and a quarter; distilled water, one pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) Dose, f℥j. to f℥iv. a convenient strength for a gargle, injection, or lotion.

INCOMPATIBLES.—All substances incompatible with tannin.

ROSÆ GALLICÆ PETALA. *Red-Rose Petals.* (The fresh and dried unexpanded petals of Rosa Gallica, *Linn.; Woodv. Med. Bot.* plate 141. From plants cultivated in Britain.) Syn.: *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, variable in size and character owing to cultivation; the prickles which cover the epidermis are unequal; the leaves are imparipinnate with 5–7 ovate leaflets; calyx urceolate, fleshy, contracted at the orifice; petals generally multiplied owing to cultivation, obcordate, spreading; stamens numerous, perigynous; achenes numerous, hairy, fixed to the inside of the calyx-tube; fruit oval, shining, coriaceous.

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 velvety 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 biborate 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.

PREPARATIONS.—Confectio Rosæ Gallicæ, one part fresh petals in four; Infusum Rosæ Acidum, half an ounce of the dried petals in one pint; Syrupus Rosæ Gallicæ.

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, ʒj. to ʒij. 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. In the Pharmacopœia it enters into the composition of the following pill masses:—Pilula Aloes Barbadensis; Pilula Aloes et Assafœtidæ; Pilula Aloes et Ferri; Pilula Aloes et Myrrhæ; Pilula Aloes Socotrinæ; Pilula Ferri Carbonatis; Pilula Hydrargyri; Pilula Plumbi cum Opio.

Infusum Rosæ Acidum. Acid Infusion of Roses. (Take of red-rose petals, broken up, a quarter of an ounce; diluted 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, heat the liquor to the boiling point, 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. Dose, one to two fluid drachms.

INCOMPATIBLES.—All substances incompatible with tannin.

SODÆ BIBORAS. *Biborate of Soda.* Syn.: *Borax*, NaO, $2BO_3$ + 10HO (=191) or $\mathbf{Na_2B_4O_7 10H_2O}$ (=382). (A native salt. Is also made artificially by boiling together, in proper proportions, boracic acid and carbonate of soda.)

PREPARATION.—Borax, by which name the pharmacopœial authorities recognize biborate of soda, is always an article of commerce; 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.

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

CHARACTERS AND TESTS.—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 (boracic acid), the solution of which in spirit burns with a green flame. 191 grains dissolved in 10 fluid ounces of distilled water require for saturation 1000 grain-measures of the volumetric solution of oxalic acid.

These characters and tests require but little comment. The green colour communicated to the flame of alcohol is characteristic of boracic acid. The volumetric test admits of no impurity, inasmuch as the quantities used are in strict proportion with their chemical equivalents.

CHEMICAL PROPERTIES.—Crystallized borax consists of 1 equivalent of soda, 2 of boracic acid, and 10 of water ($NaO, 2BO_3$ + 10HO; but *octahedral 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.

ADULTERATIONS.—Commercial borax, generally speaking, is free from any adulteration; the pharmacopœial test, however, admits of no impurity, inasmuch as the proportions used in it are in strict 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* and *Emmenagogues.)*

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 following preparation in f℥v. of water.

PREPARATIONS.—Glycerinum Boracis, 1 part in 6 by weight; Mel Boracis, 56 grains in 1 ounce.

Glycerinum Boracis. Glycerine of Borax. (Take of borax, in powder, one ounce; glycerine, four fluid ounces. Rub them together in a mortar until the borax is dissolved.) This is a convenient form for the application of borax, and may be substituted for the following preparation whenever we wish to employ a strong solution of borax.

Mel Boracis. Borax Honey. (Take of borax, in fine powder, gr. lxiv.; clarified honey, ℥j.; mix.) The best form for applying borax to aphthous ulcerations.

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

UVÆ URSI FOLIA. *Bearberry Leaves.* (The dried leaves of Arctostaphylos Uva Ursi, *Spreng. Syst. Woodv. Med. Bot.* plate 70 *(Arbutus Uva Ursi).* From indigenous plants.) Uva Ursi is an indigenous plant belonging to the Natural family *Ericaceæ,* and to the Linnæan class and order *Decandria Monogynia.*

BOTANICAL CHARACTERS.—A small trailing shrub with obovate, entire, coriaceous leaves, evergreen; flowers in small dense terminal racemes, of a rose-color; fruit, incorrectly named a *berry,* is small, scarlet, fleshy, 5-celled, cells single-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 per-chloride of iron. 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 emarginate apex and 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 admissible) 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 the extract to 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.

PREPARATION.—Infusum Uvæ Ursi, one ounce to one pint.

Infusum Uvæ Ursi. Infusion of Bearberry. (Take of bearberry leaves bruised, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for two hours, and strain. Dose, fʒj. to fʒiij.; 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), or $\mathbf{Zn2(C_2H_3O_2)\ 2H_2O}$ (=219).

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 crystals in a funnel to drain, then spread them on filtering paper on a porous tile, and dry them by exposure to the air at ordinary temperatures.

EXPLANATION OF PROCESS.—On the addition of the acetic acid to the carbonate of zinc, effervescence occurs, the acid uniting with the oxide of zinc of the salt to form acetate of zinc, and its carbonic acid escaping, thus, $(ZnOCO_2+2ZnO+3HO)+3C_4H_3O_3 = 3(ZnOC_4H_3O_3)+CO_2+3HO$.

CHARACTERS AND TESTS.—Thin translucent and colourless crystalline plates, of a pearly lustre, *(inodorous)* with a sharp unpleasant taste, evolving acetic acid when decomposed by sulphuric acid; soluble in water; completely precipitated pure white by sulphuretted hydrogen. A dilute watery solution is not affected by chloride of barium or nitrate of silver; and, when slightly acidulated with hydrochloric acid, is not precipitated by sulphuretted hydrogen. 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.

That it is a salt of acetic acid is proved by the action of sulphuric acid upon it; whilst the *white* precipitate obtained on the addition to its solution of sulphuretted hydrogen *(sulphide of zinc)* is characteristic of the salts of zinc. Did it precipitate on the addition of chloride of barium, it would indicate the presence of sulphate, if with nitrate 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.

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.* $ZnO,CO_2+2ZnO+3HO$ (=170·5) or $\mathbf{ZnCO_3\ 2(ZnO)\ 3H_2O}$ (=341).

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.

EXPLANATION OF PROCESS.—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, $3(ZnO,SO_3 7HO) + 3(NaO,CO_2 10HO) = (ZnO,CO_2 + 2ZnO + 3HO) + 3(NaOSO_3 10HO) + 2CO_2 + 18HO$.

CHARACTERS AND TESTS.—White, tasteless, inodorous, insoluble in water; soluble, with effervescence and without residue, in diluted nitric acid. This solution is not affected 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, forming a solution which is precipitated white by sulphide of ammonium.

These characters and tests have been already explained under the head of *Zinci Acetas.* (See p. 145.)

PROPERTIES.—This preparation has been introduced as a substitute for *native* calamine, a remedy of established reputation for many years, 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. Calamine Ointment.* (Prepared calamine and wax, 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.

PREPARATIONS.—Zinci Acetas; Zinci Oxidum.

ZINCI OXIDUM. OXIDE OF ZINC. (Syn.: *Flowers of Zinc, Tutty, Nihil Album, Lana Philosophica, Philosopher's Wool*, &c.) ZnO (=40·5) or **ZnO** (=81).

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.

EXPLANATION OF PROCESS.—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 AND TESTS.—A soft, nearly white, tasteless and inodorous powder, becoming pale-yellow when heated. Dissolves without effervescence in diluted 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 reagent, forming a solution which is precipitated white by sulphide of ammonium.

Both characters and tests will be understood on reference to *Zinci Acetas*. (See p. 145.)

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.)*

Unguentum Zinci. Ointment of Zinc. (Syn.: *Unguentum Zinci Oxidi*, 1864.) (Take of oxide of zinc, eighty grains; benzoated lard, one ounce. Add the oxide of zinc to the benzoated lard, previously melted with a gentle heat, and stir the mixture constantly while it cools.) 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 (=143·5), or $\mathbf{ZnSO_4 7H_2O}$ (=287).

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 tiles. More crystals may be obtained by again evaporating the mother liquor.

EXPLANATION OF PROCESS.—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 $Zn+SO_3$ $HO=ZnO,SO_3+H$; but an invariable impurity in the zinc of commerce is iron, which undergoing a similar reaction is converted into sulphate of iron, and were it not removed would contaminate the product: the addition of the chlorine is intended to effect this. By its action the sulphate of iron is converted into persulphate ($Fe_2O_3 3SO_3$), which on the addition of the carbonate of zinc is converted into sesquioxide of iron (the *brown* precipitate) removed by the filtration directed, and sulphate of zinc, thus, $Fe_2O_3 3SO_3$ $+(ZnOCO_2+2ZnO+3HO)=Fe_2O_3+3ZnOSO_3+CO_2+3HO$. The conversion of the proto-sulphate of iron into persulphate will be accounted for by the action of the chlorine upon the water, in virtue of which hydrochloric acid and oxygen are formed. One equivalent of oxygen so produced, and one equivalent of the sulphuric acid em-

ployed in the process, convert each two atoms of proto-sulphate of iron into one of persulphate, $2FeOSO_3+O+SO_3=Fe_2O_33SO_3$.

CHARACTERS AND TESTS.—In colourless transparent prismatic crystals with a strong metallic styptic taste. Its solution in water gives white precipitates with chloride of barium and sulphide of ammonium. 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.* (See p. 145.)

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. 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. (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 ℥ss. 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, swelled testicle, etc., 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.

PREPARATIONS.—Zinci Carbonas ; Zinci Valerianas.

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 canal. 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, Drastics*, or *Cathartics*, 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 *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 cha-

racteristics 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 characterized by the property which they possess of augmenting nearly all the secretions, but especially that of the liver; and the latter by their operation being attended with an increased discharge of serum, the evacuations which they produce being consequently termed watery. The prescriber should remember that the effects 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 SOCOTRINA. *Socotrine Aloes.* (The inspissated juice of the leaf of one or more undetermined species of Aloe, *Linn.* Produced chiefly in Socotra, and shipped to Europe by way of Bombay.)

ALOE BARBADENSIS. *Barbadoes Aloes.* (The inspissated juice of the leaf of Aloe vulgaris, *Lam. Encycl.; Steph. and Church. Med. Bot.* plate 109. Imported from Barbadoes.) 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.—*Aloe Vulgaris* is a shrubby plant with a short, simple, cylindrical, woody stem; bearing lanceolate, amplexicaul leaves, flat above, convex below, very succulent; armed with hard, reddish, distant spines, which are perpendicular to the margin; flowers *yellow* in a cylindrical-ovate spike; perianth nectariferous at the base, deeply divided into 6 segments; stamens 6, hypogynous, as long as the perianth. Most of the species of the genus aloe agree very closely with that given above, the points of distinction being chiefly in the character of the inflorescence and color of the flower, comparative length of stamens, &c.

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 is obtained; a still worse description is procured by evaporating a decoction of the leaves.

CHARACTERS OF SOCOTRINE ALOES.—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.

CHARACTERS OF BARBADOES ALOES.—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.

PHYSICAL PROPERTIES.—Obtained in different ways, and from various parts of the world, aloes differ very much in their 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 the 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. 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 and nauseous. It is reduced to powder with difficulty, the powder being of a dull dark-yellow colour. 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. Smyth 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 two or three 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 practised upon 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 ADMINISTRATION.—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.

PREPARATIONS OF BARBADOES ALOES.—Enema Aloes, four grains

in one fluid ounce; Extractum Aloes Barbadensis, eight parts from ten, nearly; Pilula Aloes Barbadensis, one part in two, nearly; Pilula Aloes et Ferri, one part in five and a quarter (see p. 115); Pilula Cambogiæ Composita, one part in six, nearly; Pilula Colocynthidis Composita, one part in three, nearly; Pilula Colocynthidis et Hyoscyami, one part in four and a half, nearly.

PREPARATIONS OF SOCOTRINE ALOES.—Decoctum Aloes Compositum *(Extract)*, four grains in one fluid ounce; Enema Aloes, four grains in one fluid ounce; Extractum Aloes Socotrinæ, one part from two, nearly; Extractum Colocynthidis Compositum *(Extract)*, one part in two and a quarter, nearly; Pilula Aloes et Assafœtidæ, one part in four (see p. 66); Pilula Aloes et Myrrhæ, one part in three; Pilula Aloes Socotrinæ, one part in two, nearly; Pilula Rhei Composita, one part in six; Tinctura Aloes, eleven grains to one fluid ounce; Tinctura Benzoini Composita, eight grains to one fluid ounce; Vinum Aloes, sixteen and a half grains to one fluid ounce.

Decoctum Aloes Compositum. Compound Decoction of Aloes. (Take of extract of Socotrine aloes, one hundred and twenty grains; myrrh and saffron, of each, ninety grains; carbonate of potash, sixty grains; extract of liquorice, one ounce; compound tincture of cardamoms, eight fluid ounces; distilled water, a sufficiency. Reduce the extract of aloes and myrrh to coarse powder, and put them together with the carbonate of potash and extract of liquorice into a suitable covered vessel with a pint of distilled water; boil gently for five minutes, then add the saffron. Let the vessel with its contents cool, then add the tincture of cardamoms, and covering the vessel closely, allow the ingredients to macerate for two hours; finally, strain through flannel, pouring as much distilled water over the contents of the strainer as will make the strained product measure thirty fluid ounces.) This decoction contains four grains of extract of aloes in a fluid ounce, while that of the Pharmacopœia of 1864 contained 5·6 grains, and that of the *Lond. Phar.* contained only 3·3 grains. The carbonate of potash is introduced into it for the purpose of increasing the solubility of the aloes. It was originally introduced by Leliévre, under the name of *Beaume de Vie* (balm of life), and 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 varying 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 with advantage 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 dryness.) 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 dryness.) 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. v. to gr. xv.

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 them 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. xv.

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, a sufficiency. Macerate the aloes and extract of liquorice in fifteen fluid ounces of the spirit for seven days in a closed vessel with occasional agitation, then filter, 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; cardamom seeds freed from the pericarp and bruised; ginger, in coarse powder; of each eighty grains; sherry, two pints. Macerate for seven days in a closed vessel, with occasional agitation, filter the liquor, and add sufficient sherry to make two pints.) 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 teaspoonful of the mixture in a wine-glassful of sherry one hour before dinner.

**Pilulæ ante cibum*, Paris Codex. (Aloes, six parts; extract of cinchona, three parts; canella, one part; syrup of wormwood, a sufficiency; divide into four grain pills.) One or two before dinner.

CAMBOGIA. GAMBOGE. (A gum-resin obtained from Garcinia Morella, *Desrous. var.* pedicellata. Imported from Siam.) The plant which yields commercial or Siam gamboge has only recently been 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 tended to prove that it was the produce of a species of Garcinia until recently unascertained, so that the reference in the last edition of the London Pharmacopœia *(an unascertained species of Garcinia)* was nearer the truth. This Garcinia is now designated Garcinia Morella, var. pedicellata, on the authority of Mr. Daniel Hanbury, to whom the Messrs. D'Almeida of Singapore sent specimens of the plant which yields gamboge. A plate of the plant is given, with Mr. Hanbury's paper, in vol. xxiv. of the Transactions of the Linnæan Society, 1864. The gamboge of medicine was erroneously ascribed by the Dublin College to the Ceylon gamboge tree *(Hebradendron Cambogoides)*. The Garcinia Morella belongs to the Natural family *Guttiferæ* (*Clusiaceæ*, Lindley), and to the Linnæan class and order *Monœcia Monadelphia.*

BOTANICAL CHARACTERS.—A handsome tree, 35–50 feet high; leaves opposite, exstipulate, coriaceous, entire, acute or acuminate, with a strong midrib and numerous oblique, laterally parallel veins; flowers unisexual or polygamous; males:—pedicellate; calyx and corolla hypogynous; stamens numerous, short, thick, densely packed with adnate anthers containing the pollen in cells near the apex, and discharging the pollen by circumcissile dehiscence; females:—ovary globose, with a much lobed stigma, 4-celled, seed single in each cell; fruit succulent, 4-celled, or, 1-celled and 1-seeded by abortion. The entire plant abounds in an opaque yellow juice.

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.

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 potassæ, 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*.

CHARACTERS AND TEST.—In cylindrical pieces, breaking easily with a smooth conchoidal glistening fracture; colour tawny, changing to yellow when it is rubbed with water; taste acrid. 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 sometimes even 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. 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.

DOSE AND MODE OF ADMINISTRATION.—In powder, pill, or emulsion, gr. j. 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.

PREPARATION.—Pilula Cambogiæ Composita. 1 part in 6 nearly.

Pilula Cambogiæ Composita. Compound Pill of Gamboge. (Take of gamboge, in powder; Barbadoes aloes, in powder; compound powder of cinnamon; of each one ounce; hard soap, in powder, two ounces; syrup a sufficiency. Mix the powders together, add 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 Cambogiæ. Tincture of Gamboge*, 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.

CASSIÆ PULPA. *Cassia Pulp.* (The pulp obtained from the pods of the Purging Cassia, Cassia Fistula, *Linn.; Woodv. Med. Bot.* plate 163. 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 tree, often 40 feet in height; leaves abruptly pinnate, leaflets 4–6 pairs on short petioles, ovate, undulate, acute or acuminate; calyx and corolla pentamerous, nearly regular; stamens 10:—3 lowest having long filaments curved inwards, the other 7 have very short filaments and large rostrate anthers; legume cylindrical, ligneous, 1–2 feet long, divided into a number of cells by spurious transverse dissepiments; each cell contains a single seed surrounded by a blackish pulp.

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 the 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, ʒss. to ʒiij.

PREPARATION.—Confectio Sennæ (which see), one part in eight, nearly.

* *Confectio Cassiæ.* (Cassia pulp, prepared, ℔ss.; manna, ʒij.; tamarind pulp, prepared, ʒj.; syrup of roses, fʒviij.; 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 ʒj.

COLCHICI CORMUS. *Colchicum Corm.* (The fresh corm of Colchicum autumnale. (Syn: *Meadow saffron, Naked lady.*) *Linn.; Woodv. Med. Bot.* plate 177; collected about the end of June; and the same stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150°.)

COLCHICI SEMINA. *Colchicum Seeds.* (The fully ripe seeds of Colchicum autumnale, *Linn.*) Meadow saffron is a common indigenous plant, belonging to the natural family *Melanthaceæ,* and to the Linnæan class and order *Hexandria Trigynia.*

BOTANICAL CHARACTERS.—An indigenous herb; corm (often improperly called a bulb) ovoid, enclosed by loose, brown, mem-

branous scales; flowers several, emerging, in September or even later, from a cylindrical, underground spathe; perianth, *tube* two-thirds under ground, 3–5 inches long, *limb* campanulate, petaloid, 6-partite; stamens 6 (anthers extrorse), inserted on the perianth; ovary superior, 3-celled, enclosed in the tube of the perianth under ground; styles 3, long and filiform; fruit capsular, dehiscing septicidally; leaves, *appearing with the fruit in spring*, plane, broadly lanceolate, acute. The mode of growth of this plant is peculiar. The old corm when a year old produces a rudimentary corm at its base, which gives rise to the flowering scape; the flowers are perfected in September; are unaccompanied by leaves, and hence are called *naked ladies*. The fruit appears in the following February or March with the leaves, which thus follow the flowers after a lapse of some months, during which time the rudimentary corm has been slowly enlarging and becoming plump, while the parent corm is becoming shrivelled, and at length disappears. The young corm continues to grow throughout the months of April, May, and June, and in July it attains its full growth, and in turn gives rise to a fresh embryonic corm to pass through the same course of development.

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 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, rarely on both sides, firm, flat, whitish, amylaceous. *Of the Seeds.*—About the size of white mustard seed, very hard, and of a reddish-brown colour.

PHYSICAL PROPERTIES.—Colchicum corm 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 charac-

ters, 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 guaiacum, 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 corm 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 is 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 crystalline 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, to-

gether 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 Médicinale*, 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. 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.

DOSE AND MODE OF ADMINISTRATION.—In the administration of colchicum or of 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.

PREPARATIONS OF THE CORMUS.—Extractum Colchici; Extractum Colchici Aceticum; Vinum Colchici, 88 grains to 1 fluid ounce.

PREPARATION OF THE SEEDS.—Tinctura Colchici seminum, 54½ grains to 1 fluid ounce.

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°, until the extract is of a suitable consistence for forming pills.) 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 three. 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 the consistence of a soft extract.) 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 more 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 Seminum. Tincture of Colchicum Seeds. (Take of colchicum seeds, bruised, two ounces and a-half; proof spirit, one pint. Macerate the colchicum for forty-eight hours in fifteen ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f3ss. to f3ij.

Vinum Colchici. Wine of Colchicum. (Take of colchicum corm, sliced, dried, and bruised, four ounces; sherry, one pint. Macerate the colchicum in the wine for seven days in a closed vessel, with occasional agitation, press and strain through calico; then add sufficient sherry to make one pint.) Dose, f3ss. to f3ij.

* *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.

COLOCYNTHIDIS PULPA. *Colocynth Pulp.*—(The dried decorticated fruit, freed from seeds, of Citrullus Colocynthis, *Schrad.; Woodv. Med. Bot. (Cucumis Colocynthis)*, plate 175. 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 procumbent annual, stem somewhat hispid; leaves ovate, triangular, deeply divided, under surface pale and clothed with short hairs; each leaf is furnished with a single stipular tendril; flowers single, on axillary peduncles, unisexual, of a yellow colour; calyx 5-toothed; corolla 5-partite; males:—stamens 3, short, free, 2 of them bearing double anthers; females:—ovary inferior, style short, stigmas 3; fruit a *pepo*, about the size of an orange, with a thin solid rind, which contains numerous ovate flattened seeds on the involute fleshy placentæ.

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 in taste.

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 five 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.

PREPARATIONS.—Extractum Colocynthidis Compositum, one part to four and a-half nearly ; Pilula Colocynthidis Composita, one part

in six nearly ; Pilula Colocynthidis et Hyoscyami, one part in nine nearly.

Extractum Colocynthidis Compositum. Compound Extract of Colocynth.—(Take of colocynth pulp, six ounces ; extract of Socotrine aloes, twelve ounces ; resin of scammony, four ounces ; hard soap, in powder, three ounces ; cardamom seeds, in fine powder, one ounce ; proof spirit, one gallon. Macerate the colocynth in the spirit for four days; press out the tincture and distil off the spirit; then add the aloes, scammony, and soap, and evaporate by a water-bath until the extract is of a suitable consistence for forming pills, 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* (p. 159). Dose, gr. v. to gr. xv.

Pilula Colocynthidis Composita. Compound Pill of Colocynth. (Take of colocynth pulp, 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 into a mass with the aid of the water.) An excellent preparation, well adapted for persons with irritable bowels. Dose, gr. v. gr. xv.

Pilula Colocynthidis et Hyoscyami. Pill of Colocynth and Hyoscyamus. (Take of compound pill of colocynth, two ounces; extract of hyoscyamus, one ounce. Beat them into a uniform mass.) 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,* (Colcynth, ℥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 Colcynthidis,* (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.* (The oil expressed from the seeds of Croton Tiglium, *Linn. Steph. and Church. Med. Bot.*, plate 4. 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 tree 15-20 feet high, with a smooth ash-coloured bark; leaves oblong-ovate, acuminate, serrate, with two flat round glands at the base; flowers in terminal racemes, the lower ones, male, with 5 straw-coloured petals and 15 stamens, the upper ones, female, are destitute of petals; capsule trilocular and smooth, each loculus contains a single oblong seed, which is rather larger than a grain of coffee.

PHYSICAL PROPERTIES.—Croton seeds *(Grana Tiglii)* are of an irregularly-oval shape, about 6 lines long, $2\frac{1}{2}$ 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 embyro with its large leafy cotyledons. From the kernels croton oil is obtained by pressure; it is thicker than castor oil, generally of a pale amber colour, occasionally approaching brown, has a feeble sickly odour, and an intensely acrid taste. The kernels yield about half their weight of oil.

CHARACTERS.—Slightly viscid; colour brownish yellow, taste acrid, odour faintly nauseous.

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. Two varieties of this oil are found in commerce—East Indian croton oil, or oil expressed from the seeds abroad, and English croton oil, expressed at home from the imported seeds. 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 into two portions, the oil subsiding, slightly increased in bulk, by retaining some of the alcohol incorporated with it, the alcohol being correspondingly diminished in bulk; 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. In the last edition of the British Pharmacopœia this alone was officinal; now, from their silence on the point, the pharmacopœial authorities seem to permit the use of either variety.

ADULTERATIONS.—Castor and perhaps jatropha oil are the only substances likely to be employed to adulterate croton oil—the former being mostly likely to be met with in British, the latter in

East Indian oil. It was supposed that the former sophistication might be readily detected by the solubility of the castor oil in alcohol. 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. An efficient test for the purity of croton oil is still a desideratum in pharmacy.

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. 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, and in 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. (See, also, *Epispastics*.)

DOSE AND MODE OF ADMINISTRATION.—Min. j. to 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 disagreeable acrid impression in the back of the throat; it should be made into a 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.

PREPARATION.—Linimentum Crotonis, 1 volume in 8 (which see.)

ECBALII FRUCTUS. *Squirting Cucumber Fruit.* (The fruit, very nearly ripe, of the Squirting Cucumber, Ecbalium Officinarum, *Richard. Steph. and Church. Med. Bot.* plate 34.) The wild or squirting cucumber (Ecbalium Agreste, D.P.; Momordica Elaterium, E.P.) 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 Monadelphia.* It is only introduced into the Pharmacopœia for the purpose of obtaining from it its sediment, elaterium.

BOTANICAL CHARACTERS.—A trailing, annual plant, with a thick branching stem about two feet in length; leaves cordate, slightly lobed, crenato-dentate, very rugose, on long bristly petioles without tendrils; flowers axillary, yellow, monœcious; males:—stamens, 3, two with doubly-folded anthers, or 5; females:—ovary inferior, style simple, stigmas 3, bifid; pepo small, elliptical, pendulous, peduncle and fruit covered with soft bristles. When ripe, separating from its stalk, and expelling, with considerable force, its brown seeds and a thin mucus through an 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. From this fruit we obtain elaterium (which is but a sediment from its juice,) in the following manner:—

ELATERIUM.—PREPARATION.—Take of squirting cucumber fruit very nearly ripe, one pound. Cut the fruit lengthwise, and lightly 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 tiles with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way.

PHYSICAL PROPERTIES.—Elaterium is in thin, flat, or slightly-curled pieces or fragments, light and friable; of a pale, greenish-gray 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 that 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 five to twenty-six per cent.

CHARACTERS AND TESTS.—In light friable slightly incurved cakes, about one line thick, greenish-grey, acrid and bitter; fracture finely granular. 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 elaterin in colourless crystals.

ADULTERATIONS.—English 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 hydragogue 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 hydrothorax, 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. In poisoning with elaterium the same treatment should be followed as in poisoning with gamboge.

DOSE AND MODE OF ADMINISTRATION.—1-16th to 1-4th of a grain in pill (it should be always given at first in the smaller dose), 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.

*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.—A perennial herb, having a horizontal tuberculated rhizome some inches long; pedate leaves on long petioles, which are radical and furnished with 5-7 ovate-lanceolate leaflets, serrate at the apex, smooth, shining, and coriaceous. The flowers are 1-2 on each scape, with ovate bracteas ; calyx of 5 sepals, ovate or roundish, persistent, white or tinged with pink, eventually turning green ; petals short, numerous, tubular ; stamens numerous, hypogynous ; pistils 3-10, simple ; follicles erect, many seeded.

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, vesicans; *recenter siccata,* emetica, purgans, antiphthisiaca, sternutatoria ; *diu conservata,* vix purgans, alterans, diuretica." An empirical remedy, used under the name of its inventor, " 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, f℥j. to f℥ij.

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 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 solution of nitrate of baryta to the filtered liquor; 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.

HYDRARGYRI SUBCHLORIDUM. *Subchloride of Mercury.* (Syn.: *Calomelas*, 1864, Edin., Dubl. *Hydrargyri Chloridum.* Lond. *Calomel.*) Hg_2Cl (=235·5) or **HgCl** (=235·5).

PREPARATION.—Take of sulphate of mercury, ten ounces; mercury, seven ounces; chloride of sodium, dried, five ounces; boiling distilled water, a sufficiency. Moisten the sulphate of mercury with some of 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 sulphide of ammonium. 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 sulphide of ammonium, which precipitates mercury from its solutions in the form of black sulphide of mercury. Thus, $HgCl + NH_4S = HgS + NH_4Cl$.

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*. By contact with aqueous hydrocyanic acid it is decomposed, metallic mercury, cyanide of mercury, and hydrochloric acid being the result, thus— $Hg_2Cl + HCy = Hg + HgCy + HCl$.

CHARACTERS AND TESTS.—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. Contact with hydrocyanic acid also darkens its colour. It is entirely volatilised by a 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 it 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, complaining 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 headache, 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 thus been 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 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 Hydrargyri Subchloridi Composita, one part in five; Unguentum Hydrargyri Subchloridi, one part in six and a half, nearly.

PREPARATION IN WHICH IT IS USED.—Lotio Hydrargyri Nigra.

* *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.

HYDRARGYRUM CUM CRETA. *Mercury with 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.

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, a very small proportion of 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.

CHARACTERS AND TESTS.—A powder of a light-grey colour; free from grittiness; insoluble in water; partly dissolved by diluted hydrochloric acid, leaving the mercury in a finely divided state. The solution formed with hydrochloric acid is not precipitated by the addition of chloride of tin.

ADULTERATIONS.—I have always found this a very pure preparation; the pharmacopœial test with chloride of tin is directed against *peroxide* of mercury, a possible impurity, and which, were it present, would be a most serious one. On the addition of hydrochloric acid to the powder, its chalk is decomposed, the carbonic acid escaping, and water and chloride of calcium being formed, $CaOCO_2 + HCl = CO_2 + HO + CaCl$. Were peroxide of mercury present, it also would be acted upon, and we would get perchloride of mercury and water, thus, $HgO + HCl = HgCl + HO$. On the addition of the protochloride of tin, the perchloride of mercury would be reduced to the condition of subchloride *(calomel)*, which would be precipitated, the chloride of tin itself becoming bichloride of tin, thus, $HgCl + SnCl = Hg_2Cl + SnCl_2$.

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 if ever prescribed as a cathartic for adults; the dose would be from gr. x. to gr. xx. in which quantity salivation might possibly 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.*)

JALAPA. *Jalap.* (Syn.:—*Ipomœa Purga (Nees Von Esenbeck.) Convolvulus Jalapa. Mexican Bindweed.* The dried tubercules of Exogonium Purga, *Bentham. Bot. Mag.* vol. lxxiii. plate 4280. Imported from Mexico.) The officinal jalap root is now well known to be obtained from the Exogonium Purga. 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, perennial, incrassated; stems annual, twining, branched, smooth; leaves ovate, acuminate, cordate at the base, entire, glabrous; peduncles 1-3 flowered; sepals 5, unequal, obtuse; corolla hypocrateriform, with a long cylindrical purplish-violet tube and a horizontally expanded limb; stamens 5, exserted; ovary 2-celled; style 1; stigma 2-lobed.

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.

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.

CHARACTERS.—Varying from the size of a nut to that of an orange, ovoid, the large tubercules frequently incised, covered with a thin brown wrinkled cuticle; presenting when cut, a yellowish-grey colour, with dark-brown concentric circles.

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 insoluble in water, but readily soluble in rectified spirit. 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 too 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 Jalapæ; Pulvis Jalapæ Compositus, one part in three; Pulvis Scammonii Compositus, three parts in eight; Resina Jalapæ; Tinctura Jalapæ, fifty-four and a-half grains to one fluid ounce.

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° until it has acquired a suitable consistence for forming pills.) 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. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar.) 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. Digest 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, continue the percolation with successive portions of spirit until it ceases to dissolve anything more. 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 the heat of a stove or water-bath.) Resin of jalap is generally in dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture; it is readily reduced to a pale brown powder; is sweetish in odour, and acrid in the throat; it is 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 nonsolubility in oil of turpentine distinguishes it from, and 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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the 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*, p. 19) given in full doses operates as a gentle cathartic; its effect, how-

ever, 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 formed large 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*, p. 22) 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. xx. 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) or $\mathbf{MgSO_4 7H_2O}$ (=246)

PREPARATION.—In the Pharmacopœia we have no formula either for the manufacture of sulphate of magnesia or for the purification of the commercial salt; 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; for this process Dr. Henry took out a patent; or the lime may be separated from the magnesia by the addition of sulphuric acid, the two salts being separated in virtue of the superior solubility of the sulphate of magnesia. From *bittern* it is obtained by evaporation and crystallization, after having been boiled for some time with sulphuric acid; the resulting crystals being purified by repeated solution, evaporation, and crystallization.

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 one equivalent of magnesia, one of acid, and seven of water ($MgO,SO_3,HO+6HO$). It is permanent in the air, but at a slightly increased temperature effloresces; and at a temperature considerably under 300° it fuses in its water of crystallization, and loses six of its equivalents of water. 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.

CHARACTERS AND TESTS.—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 solution of ammonia, hydrochlorate of ammonia, and phosphate of soda. Its aqueous solution at ordinary temperatures, is not precipitated by oxalate of ammonia. Nor should it give a brown precipitate with chlorinated lime or soda. 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 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, $2NaO, HO, PO_5 + 2(MgOSO_3)+NH_4O = NH_4O,2MgO,PO_5 + 2NaOSO_3+HO$; 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. The non-precipitation on the addition of oxalate of ammonia argues the absence of lime; did it yield a brownish precipitate on the addition of either

chlorinated lime or soda, it would indicate the presence of iron, an occasional impurity, 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 recognised. 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; this constitutes the *red bottle* of the hospitals, an elegant and beneficial form as an aperient in the commencement of febrile diseases. In consequence of their resemblance, oxalic acid has been frequently sold by mistake for this salt. For diagnostic characters, see *Oxalic Acid*.

PREPARATION.—Enema Magnesiæ Sulphatis, one ounce in sixteen fluid ounces. Mistura Sennæ Composita, one ounce in five fluid ounces.

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 Effervescing 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 teaspoonfuls 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 of 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 ; nitrate of silver. The bicarbonates of the alkalies are not incompatible with sulphate of magnesia, unless at the temperature of boiling water.

MANNA. *Manna.* (A concrete saccharine exudation from the stem of Fraxinus Ornus, *Linn.* and F. rotundifolia, *DC. Steph. and Church. Med. Bot.* plate 53. Obtained by making incisions in the stems of the trees, which are cultivated for the purpose, chiefly in Calabria and Sicily.) Nearly all the species of the genus Fraxinus 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 imparipinnate; leaflets 7–9, ovato-elliptical, serrate, acute, glabrous; flowers in large panicles, small, polygamous ; calyx 0, or of 4 ovate sepals ; corolla 0, or of 4 linear-oblong petals, yellowish or greenish-white ; stamens 2 ; fruit a *Samara,* 2-celled, compressed, winged at

the apex, usually 1-seeded by abortion. *Fraxinus rotundifolia* is by many considered to be a variety of the preceding; the chief difference between them is in the shape of the leaflets.

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, curved on one side, of a yellowish-white colour, with a faintly nauseous odour, and a sweetish taste. It consists principally of mannite, $C_6H_7O_6$ or $C_3H_7O_3$, together with common sugar and extractive matter. The mannite, which forms from 60 to 80 per cent. of the manna, may be extracted by means of boiling rectified spirit, from which it will afterwards separate on cooling in colourless, shining crystals. It requires five parts of cold water for its solution, and this does not undergo vinous fermentation in contact with yeast.

PHYSICAL PROPERTIES.—Two sorts are frequently 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; good manna contains about 80 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 as described above. 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 ℥ss.; for adults, ℥j. to ℥ij.—*Mannite*, for children, gr. xxx. to gr.

cxx.; for adults, ℥ss. to ℥j. Manna which has become hard by keeping forms an excellent excipient for forming the more active insoluble powders into pills.

MEL. *Honey.* (A saccharine secretion deposited in the honeycomb by Apis mellifica, *Linn.*, the hive-bee.) 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.

CHEMICAL HISTORY.—Honey is too well known to need description; it is composed of grape-sugar, cane-sugar, mannite, acetic acid, aromatic principle, wax, &c.

CHARACTERS AND TESTS.—When recently separated from the honeycomb, it is a viscid translucent liquid, of a brownish-yellow colour, which gradually becomes partially crystalline and opaque. It has a peculiar heavy odour, and a very sweet taste. Boiled with water for five minutes and allowed to cool it does not become blue with the solution of iodine.

ADULTERATIONS.—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.

THERAPEUTICAL EFFECTS.—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.

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.) Both the flavor and odour of honey are injured by this process.

PREPARATIONS.—Confectio Piperis, fifteen parts in twenty; Confectio Scammonii, one part and a half in ten; Confectio Terebinthinæ, one part in two, nearly (see p. 62); Mel Boracis, eight parts in nine, nearly (see p. 143); Oxymel, forty parts in fifty (see p. 87); Oxymel Scillæ.

OLEUM OLIVÆ. *Olive Oil.* (The oil expressed in the South of Europe from the ripe fruit of Olea Europæa, *Linn.; Steph. and Church. Med. Bot.*, plate 15.) 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.—The Olea Europœa is an evergreen, low-sized tree, of slow growth; leaves opposite, oblong or lanceolate, entire, acute, shortly petioled, green above, pale and hoary beneath; flowers in axillary racemes; calyx 4-cleft; corolla gamopetalous, with a short tube and a spreading 4-partite limb, or absent; stamens 2, inserted on the tube of the corolla; ovary 2-celled, style simple, stigma bifid; fruit (erroneously termed a drupe) is a *Tryma*, ellipsoidal, bluish-green, consisting of a fleshy-oily epicarp, and a bony endocarp, usually 1-celled and 1-seeded from abortion.

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 re-pressing it; and a third, and very inferior sort, by boiling this cake in water, and submitting it to very strong pressure.

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, it is 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.

CHARACTERS.—Pale yellow, with scarcely any odour, and a bland oleaginous taste; congeals partially at about 36°.

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 it 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.—Cataplasma Lini, Enema Magnesiæ Sulphatis.

PREPARATIONS IN WHICH IT IS USED.—Charta Epispastica; Emplastrum Ammoniaci cum Hydrargyro; Emplastrum Cerati Saponis, (see p. 137); Emplastrum Hydrargyri; Emplastrum Picis; Emplastrum Plumbi (see p. 138); Linimentum Ammoniæ; Linimentum Calcis; Linimentum Camphoræ; Unguentum Cantharidis; Unguentum Hydrargyri Compositum; Unguentum Hydrargyri Nitratis; Unguentum Veratriæ.

PODOPHYLLI RADIX. *Podophyllum Root.* (The dried rhizome of Podophyllum Peltatum, *Linn. Bot. Mag.* plate 1819. 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.—An herbaceous perennial, consisting of a horizontal rhizome, which produces at its nodes numerous rootlets, and annually sends up one or more herbaceous stems, each of which is about a foot high, erect, divided at top into 2 petioles, supporting at the fork a solitary 1-flowered peduncle. Each petiole bears a large peltate, palmate leaf, with 6 or 7 wedge-shaped lobes, yellowish-green on upper, pale on lower surface; calyx of three deciduous sepals; corolla, 6 to 9 petals, white, fragrant; stamens usually double the number of the petals, with oblong yellow anthers; fruit succulent (from its colour and shape called the *wild lemon*); seeds, 3-12 ovate.

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 oils, 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' *Amer. Journ. of Pharmacy*, xix. 165.)

THERAPEUTICAL EFFECTS.—The powder of the root is possessed of cathartic, approaching cholagogue, 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.* In smaller doses it seems to be possessed also of alterative as well as of indirect emmenagogue properties. 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. In some cases of jaundice in which I have employed it, it acted most beneficially, the patients continuing to pass large quantities of bile, although the use of the medicine had been discontinued. In one case particularly, where the conjunctiva and skin were tinged of a deep yellow, the patient himself, a most intelligent gentleman, drew my attention to this circumstance. I have used it frequently of late with satisfactory results in the treatment of gouty constipation, and in that dependent upon a sluggish condition of the liver. It has also been employed in secondary syphilis, in chronic rheumatism, &c. When used for these specific effects, it should be given in small but repeated doses, combined with hyoscyamus or belladonna. When a cholagogue effect is desired, it should be given in large doses combined with some of the aloetic pill masses, which last medicine it seems to me to resemble in its action. Its use is contraindicated in inflammatory conditions of the alimentary canal. Occasionally it produces violent hypercatharsis, tormina, and griping; these will be best combated by the administration of tincture of opium in warm infusion of ginger. Lactic acid is said very much to modify its action, so in such cases the patient might be allowed to drink freely of *sour* milk. Chloride of sodium is stated to increase its cathartic action to an undesirable degree.

DOSE AND MODE OF ADMINISTRATION.—I know no medicine so uncertain in this respect, the dose appearing to vary with almost every individual case,—in some, half a grain of the *resin* acting with energy, others requiring two or three 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 greater part of 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. one-sixth to gr. ij. (see *Formulæ.*)

POTASSÆ ACETAS. *Acetate of Potash.* (Syn.: *Foliated Earth of Tartar.*) $KO,C_4H_3O_3(=98)$ or $\mathbf{KC_2H_3O_2}(=98.)$

PREPARATION.—Take of carbonate of potash, twenty ounces; acetic acid, two pints, or a sufficiency. To the acetic acid, placed in a thin 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, $KOCO_2+C_4H_3O_3=KOC_4H_3O_3+CO_2$.

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, *pyroacetic 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.

CHARACTERS AND TESTS.—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. Neutral to test-paper, entirely soluble in rectified spirit. Its solution is unaffected by sulphide of ammonium.

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, $Fe_2Cl_3+3KO,C_4H_3O_3=Fe_2O_33C_4H_3O_3+3KCl$. Its not being affected by the sulphide of ammonium proves the absence of metallic impurities which might have been accidentally introduced from the employment in its preparation of metallic vessels.

THERAPEUTICAL EFFECTS.—Scarcely ever used as a cathartic, nevertheless in sufficient doses it operates effectually, producing

watery evacuations, and is therefore, independently of its duretic 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) or $\mathbf{K_2SO_4}$ (= 174.) In the Pharmacopœia we have no directions given us for the preparation of this salt, but it can be procured in the following manner, in a state sufficiently pure to answer the pharmacopœial tests.

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 litmus 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 thus to 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.

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.

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.

CHARACTERS AND TESTS.—In colourless hard six-sided prisms, terminated by six-sided pyramids; decrepitates strongly when heated, sparingly soluble in water, insoluble in alcohol. The aqueous solution is neutral to test paper; gives no precipitate with oxalate of ammonia, but acidulated with hydrochloric acid, it is precipitated white by chloride of barium, and yellow by bichloride of platinum.

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 the double chloride of potassium and platinum, *potassio bichloride of platinum* ($KCl,PtCl_2$). (See page 27.)

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 sulphide of ammonium, or with nitrate of silver.

THERAPEUTICAL EFFECTS.—In doses from two to four drachms, this salt is stated to have 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. xxx. to 3j. dissolved in warm water, or in powder combined with rhubarb, the purgative properties of which it is very generally supposed to increase, and 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.*) $2KO,C_8H_4O_{10}(=226)$ or $\mathbf{K_2C_4H_4O_6(=226)}$.

PREPARATION.—Take of acid tartrate of potash, twenty ounces, or a sufficiency; carbonate of potash, nine ounces, 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 tar-

trate. 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, $HO,KO,C_8H_4O_{10}+KOCO_2=2KO,C_8H_4O_{10}+CO_2+HO$. 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.

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.

CHARACTERS AND TESTS.—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. Acetic acid added sparingly to its solution causes the separation of a white crystalline precipitate, entirely dissolved by its own weight of water. 113 grains heated to redness till gases cease to be evolved, leave an alkaline residue, which requires for exact saturation 1000 measures of the volumetric solution of oxalic acid.

The destructive action of the sulphuric acid on the tartaric acid results in the production of a black colour, 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 developed on the addition of acetic acid to its solution is acetate of potash, produced by the abstraction by the acetic acid from the tartrate of potash of one of its atoms of base, thus, $2KO,C_8H_4O_{10}+C_4H_3O_3HO=KO,C_4H_3O_3+HO,KO,C_8H_4O_{10}$.

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 1000 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 infusions 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. Cream of Tartar. Crystals of Tartar. Crude Tartar.)* $KO,HO,C_8H_4O_{10}$ (=188) or $\mathbf{KHC_4H_4O_6}$ (=188). (An acid salt obtained from the crude tartar which is deposited during the fermentation of grape juice.)

PREPARATION.—No definite instructions are given us in the Pharmacopœia for the preparation of bitartrate of potash, it being always an article of commerce. 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.*

PHYSICAL PROPERTIES.—This salt is met with in the form either of a fine white powder, or of 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.

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).*

CHARACTERS AND TESTS.—A gritty white powder, or fragments of cakes crystallised 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 diluted hydrochloric acid, and forms a solution which when filtered gives a yellow precipitate with perchloride of platinum, and when neutralised by ammonia is rendered slightly turbid by oxalic acid. 188 grains heated to redness till gas ceases to be evolved, leave an alkaline residue, which requires for exact neutralisation 1000 grain-measures of the volumetric solution of oxalic acid.

The yellow precipitate ($KCl+PtCl_2$) proves it to be a salt of potash (see p. 27), whilst the *slight turbidity* is due to the presence of lime. For further explanation of characters see p. 194. 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.

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 throwing down from its solution in hydrochloric acid a white precipitate, oxalate of lime; alum and bisulphate of potash, detected by chloride of barium yielding with it a white precipitate, sulphate of barytes; and wheaten flour or starch, detected by the blue colour struck with them by iodine, iodide of starch.

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 confection, 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 a confection 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.

PREPARATIONS.—Confectio Sulphuris (which see); Pulvis Jalapæ Compositus (see p. 180).

PREPARATIONS IN WHICH ACID TARTRATE OF POTASH IS USED.—Acidum Tartaricum; Antimonium Tartaratum; Ferrum Tartaratum; Potassæ Tartras; Soda Tartarata.

INCOMPATIBLES.—The mineral acids; the alkalies; lime water; the carbonates of potash and of soda; acetate of lead; and magnesia and its sulphate.

PRUNUM. *Prune.* (The dried drupe of the Plum. Prunus domestica, *Linn. Woodv. Med. Bot.* plate 85, from 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.*

BOTANICAL CHARACTERS.—A small tree; branches destitute of spines; leaves ovate-lanceolate, convolute; flowers white, almost solitary, often appearing before the leaves; calyx inferior, campanulate, divided into 5 segments; petals 5, roundish, concave, inserted on the calyx; stamens numerous, perigynous; ovary simple; drupe ovate or oblong, pruinose, 1–2 seeded.

CHARACTERS.—The fruit of the plum dried in the sun constitutes *prunes;* they are imported principally from Bourdeaux; they are about an inch long, ovate, wrinkled, black, sweet, and somewhat austere.

THERAPEUTICAL EFFECTS.—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. Occasionally they are employed, stewed, as a domestic remedy for constipation.

PREPARATION.—Confectio Sennæ, one part in twelve and a half.

RHAMNI SUCCUS. *Buckthorn Juice.* (The recently expressed juice of the ripe berries of common Buckthorn, Rhamnus catharticus, *Linn.*) An indigenous shrub belonging to the Natural family *Rhamnaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—A shrub with spreading branches, the smaller often ending in a stout thorn; leaves petiolate, ovate, acute or acuminate, rarely obtuse, minutely serrate, marked with a few prominent veins obliquely diverging from the midrib; flowers small, diœcious, in axillary clusters; calyx 4–5 cleft; petals 4, broader in the female flowers than in the male; stamens 4–5, opposite the petals, inserted on a disk lining the base of the calyx; ovary 3-4 celled, with one erect ovule in each cell; fruit, succulent, black, about the size of a pea, with a green pulp and four seeds.

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 the juice to dryness, and mixing it with lime or with alum, the pigment, *sap-green,* 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 nau-

sea: 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.

PREPARATION.—Syrupus Rhamni.

Syrupus Rhamni. Syrup of Buckthorn. (Take of buckthorn juice, four pints; ginger, sliced; pimento, bruised; of each three quarters of an ounce; refined sugar, five pounds, or a sufficiency; rectified spirit, six fluid ounces. Evaporate the juice to two pints and a half, add the ginger and pimento, digest at a gentle heat for four hours, and strain. When cold add the spirit, let the mixture stand for two days, then decant off the clear liquor, and in this dissolve the sugar with a gentle heat, so as to make the specific gravity 1·32.) Dose, f3j. to f3iv.

RHEI RADIX. *Rhubarb Root.* (The dried root deprived of the bark, from one or more undetermined species of Rheum, *Linn.* From China, Chinese Tartary, and Thibet. Imported from Shanghai and Canton, and brought overland by way of Moscow.) 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 plants belonging to this genus are perennial and herbaceous, having large branching roots which send up vigorous flowering stems 4-8 feet high, furnished at the base with numerous petiolate leaves. Flowers in branching panicles; perianth petaloid, 6-partite, withering; stamens nine, inserted into the base of the calyx; styles three, reflexed, stigmas peltate, entire; fruit, a three-cornered winged achenium with the withered perianth at its base.

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 Mongols are *said* to hang them on the horns of their sheep (?), or about their tents.

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 Kiâchta for barter, where it is subjected to a careful examination, none but what is sound being allowed to pass, inferior specimens, by virtue of treaty, being burnt; and from thence 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.*

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.

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 peculiar. Free from decay, not worm-eaten. Boracic acid does not turn the yellow exterior brown.

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 rich golden 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 ra-

phides, 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.

PREPARATIONS.—Extractum Rhei, Infusum Rhei, eleven grains to one fluid ounce; Pilula Rhei Composita, one part in four, nearly; Pulvis Rhei Compositus, two parts in nine; Syrupus Rhei; Tinctura Rhei, forty-four grains to one fluid ounce; Vinum Rhei, thirty-three grains to one fluid ounce.

Extractum Rhei. Extract of Rhubarb. (Take of rhubarb root 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° until the extract

has acquired a suitable consistence for forming pills.) Dose, gr. v. to gr. xx.

Infusum Rhei. Infusion of Rhubarb. (Take of rhubarb root, in thin slices, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for an 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 root in powder, three ounces; Socotrine aloes, in powder, two ounces and a quarter; myrrh, in powder; hard soap, in powder, of each one ounce and a half; oil of peppermint, one fluid drachm and a half; treacle, by weight, four ounces; mix the powders with the oil, then add the treacle, 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 root, 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. xx. to gr. lx.

Syrupus Rhei. Syrup of Rhubarb. (Take of rhubarb root, in coarse powder; coriander fruit, in coarse powder, of each two ounces; refined sugar, twenty-four ounces; rectified spirit, eight fluid ounces; distilled water, twenty-four fluid ounces. Mix the rhubarb and coriander; pack them in a percolator; pass the spirit and water, previously mixed, slowly through them; evaporate the liquid that has just passed until it is reduced to thirteen fluid ounces, and in this, after it has been filtered, dissolve the sugar with a gentle heat.) Dose, f℥j. to f℥iv.

Tinctura Rhei. Tincture of Rhubarb. (Take of rhubarb root, in coarse powder, two ounces; cardamom seeds, freed from the pericarps, and bruised; coriander fruit, bruised; saffron, of each, a quarter of an ounce; proof spirit, one pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) A valuable cordial cathartic, frequently added to aperient draughts. Dose, one to two fluid drachms as a stomachic; four to eight fluid drachms as a purgative.

Vinum Rhei. Wine of Rhubarb. (Take of rhubarb root, in coarse powder, one ounce and a half; canella alba bark, in coarse powder, sixty grains; sherry, one pint. Macerate for seven days in

a closed vessel with occasional agitation, then strain, press, filter, and add sufficient sherry to make one pint.) An admirable stomachic, both tonic and aperient, one which I am much in the habit of using. (See p. 157.) Dose, one to two drachms.

* *Tinctura Rhei et Aloes.* (Rhubarb in moderately fine powder, ℥iss.; Socotrine, or East Indian aloes, in moderately fine powder, ʒvj.; cardamom seeds, bruised, ʒv.; proof spirit, Oij.; mix the powders and proceed as for tincture of cinchona.) A cordial purgative. Dose, f℥ss. to f℥j.

INCOMPATIBLES.—*With the Infusion.*—Ammonia; carbonate of potash; lime water; the mineral acids; acetate of lead; tartar emetic; corrosive sublimate; the sesquisalts of iron; and astringent vegetable infusions or decoctions.

OLEUM RICINI. *Castor Oil.*—(The oil expressed from the seeds of Ricinus communis, *Linn.; Bot. Mag.*, plate 2209. Imported chiefly from Calcutta.) The castor oil tree, or Palma Christi, is a native of Africa and the East Indies; it is cultivated at present very extensively in the West Indies, and in North and South America; it also grows in the South of Europe and in the British Isles. It belongs to the Natural family *Euphorbiaceæ*, and to the Linnæan class and order *Monœcia Monadelphia*.

BOTANICAL CHARACTERS.—In northern countries an herbaceous annual, seldom exceeding 3 or 4 feet in height, in warm climates it becomes an arborescent perennial, attaining a height of 20 to 30 feet; leaves large, of a dull green colour, shining, palmate, deeply cut into acute lobes, serrated; flowers, in terminal panicles, glaucous-green, monœcious; fruit, a three-celled capsule covered with spines, each cell containing one seed, which is oval, about three lines broad, four lines long, and a line and a half thick, and is furnished at its narrow extremity with a somewhat conical *strophiole*, from which the *raphe* extends to the opposite end of the seed; the seed-coat is pale-grey, shining, marbled with blackish and yellowish-brown spots and stripes; it encloses a thick, fleshy, oily nucleus, within which is a large, dicotyledonous, leafy embryo.

PREPARATION.—The fixed oil of the seeds, which alone is officinal, is obtained by expression with or without the aid of heat, the seed coats being usually first removed; that obtained without heat is called *cold drawn castor oil*, and bears the highest character. This is the process followed in the West Indies, and for the finer qualities of oil in the East; more generally, however, in the East Indies, the seeds are boiled in water, dried and bruised, and again boiled in water till the oil separates and floats on the surface. In North America the seeds are heated and pressed, and the oil thus obtained is boiled with water to free it from impurities. The seeds yield about 30 per cent. of oil.

PHYSICAL PROPERTIES.—Castor oil is a viscid oily liquid, of a

very pale straw colour (inferior sorts are deep yellow), having a faint, slightly nauseous odour, and a mild greasy taste. Specific gravity, 0·964.

CHEMICAL PROPERTIES.—According to the analysis of Bussy and Lecanu, it is a compound of, or rather is converted by distillation into, three fatty acids, *ricinic, elaiodic*, and *margaritic;* but the source of its laxative properties has not been as yet discovered. Its ultimate constituents, according to Ure, are 74 per cent. of carbon, 10·29 of hydrogen, and 15·71 of oxygen. Exposed to a cold a little below 32°, it becomes thick and turbid; at 0° it congeals into a transparent yellow mass; by exposure to the air it thickens and dries without becoming opaque, and hence is called a *drying oil;* and it is decomposed by a heat above 500°. Castor oil is soluble in ether and in cold alcohol; the latter property is not possessed by any other fixed oil with which we are acquainted, except concrete palm oil, and British expressed croton oil (see page 169); nevertheless it possesses the remarkable power of conferring this property on many other fixed oils (olive, nut oils, &c.), mixed with them even to the amount of 33 per cent.; a fact which I have for many years been in the habit of demonstrating to my classes at lecture. East Indian castor oil is the kind principally employed at present in the British Isles; West Indian castor oil is not imported; and American castor oil is but little esteemed by druggists, although equally efficacious as a medicine, and free from any unpleasant flavour, in consequence of its becoming turbid in cold weather and throwing down a copious deposit of white fatty crystals, a fault which can be remedied, according to Boutran Chalard, by heating it to 212° F. This proceeding is attended, however, with the disadvantage of making it gripe when employed medicinally.

CHARACTERS.—Viscid, colourless, or pale straw-yellow, having a slightly nauseous odour, and a somewhat acrid taste. Entirely soluble in one volume of alcohol, and in two volumes of rectified spirit.

ADULTERATIONS.—The adulterations of castor oil with other fixed oils, a fraud more frequently practised in former days than at present, cannot, as was formerly believed, be readily detected by its solubility in alcohol; inasmuch as though it is true that castor oil is entirely dissolved by its own volume of alcohol, still, as already stated, it confers this property on other fixed oils; fortunately its low price at present in the market renders this of less importance than it might otherwise be. It should be free from any rancid odour or acrid taste.

THERAPEUTICAL EFFECTS.—Castor oil is a mild but effectual cathartic, operating soon after it has been taken, without pain or uneasiness, producing three or four thin, feculent, not watery evacuations; these properties adapt it for all cases in which we desire to evacuate the contents of the intestinal canal without producing abdominal irritation or general disturbance of the system. The

great objection to its employment is its disagreeable greasy taste, in consequence of which it frequently occasions nausea and vomiting. Another drawback upon its use is that when continuously employed it loses its cathartic properties. For a time this will be compensated for by increasing the dose; but even this will eventually fail. Under these circumstances its full cathartic energy will be restored not by any increase, but by a *diminution* in the quantity 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 can be 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), in chicken broth, which effectually masks its taste, in coffee, 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 f℥ij. to f℥iij. 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, ℥ij.; 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, f℥vj.; essential oil of lemons, min. x.; essential oil of cloves, min. ij.; simple syrup,

f℥iss. ; solution of caustic potash, f℥j. ; 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 compounding it the oils should first be mixed and then be rubbed up with xx. minims of the liquor potassæ ; 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.

PREPARATIONS IN WHICH IT IS USED.—Collodium Flexile, one fluid drachm to six fluid ounces; Linimentum Sinapis Compositum, five fluid drachms to five fluid ounces; Pilula Hydrargyri Subchloridi Composita.

SCAMMONIÆ RADIX. *Scammony Root.* (The dried root of Convolvulus Scammonia, *Linn. Woodv. Med. Bot.* plate 5, p. 13. From Syria and Asia Minor.) 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.*

BOTANICAL CHARACTERS.—Root perennial, cylindrical, tapering, 3–4 feet long, fleshy, abounding in a milky juice; stems numerous, smooth, herbaceous, twining ; leaves on long petioles, sagitate, acuminate, auricles acute; flowers 3 on each peduncle ; calyx of 5 sepals; corolla campanulate, pale yellow, with purplish stripes, or, white with red external stripes ; stamens 5, included; ovary, 2-celled ; style, 1 ; stigmas, 2 ; capsule 2-celled.

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.

PHARMACEUTICAL HISTORY.—This root, until the appearance of the last edition of the British Pharmacopœia 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 as imported from abroad, and describe it as

"SCAMMONIUM, *Scammony*. A gum resin obtained by incision from the living root of Convolvulus Scammonia, *Linn.*, chiefly in Asia Minor."

PREPARATION OF SCAMMONIUM.—The inspissated juice of the scammony root, which constitutes the scammony of commerce, 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.

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.

CHARACTERS AND TESTS.—Ash-gray 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, converted with water into a smooth emulsion. 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.

PREPARATION OF THE ROOT.—Resina Scammoniæ.

PREPARATIONS OF SCAMMONIUM.—Confectio Scammonii, one part in three, nearly ; Pilula Colocynthidis Composita, one part in three nearly ; Pilula Colocynthidis et Hyoscyami, one part in four and a

half, nearly; Pulvis Scammonii Compositus, one part in two; Resina Scammoniæ.

PREPARATIONS OF THE RESIN.—Extractum Colocynthidis Compositum, one part in seven, nearly; Mistura Scammonii, two grains to one fluid ounce.

Scammoniæ Resina. Resin of Scammony. (Take of scammony root, in coarse powder, eight ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Digest 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, add more spirit and let it percolate slowly 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 several times with hot water, and dry it on a porcelain plate with the heat of a stove or water-bath. It may also be prepared in a similar way from scammony.) It occurs in brownish translucent pieces, brittle, resinous in fracture, of a sweet fragrant odour if prepared from the root. It cannot form singly an emulsion with water. Its tincture does not render the fresh-cut surface of a potato 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. v. to gr. x.; 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.) This, which is the pharmacopœial formula, is stated to be intended for children; for adults six to ten grains of the resin should be rubbed up with the milk, and the addition to this draught of ten 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. to f℥ij. of the pharmacopœial formula may be given to children, who will rarely object to take it if sweetened with sugar.

Confectio Scammonii. Confection of Scammony. (Take 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. It would have been far more prudent

to have employed the *resin* of scammony instead of scammony in its composition.

Pulvis Scammonii Compositus. Compound Powder of Scammony. (Take of scammony, in powder, four ounces; jalap, in powder, three ounces; ginger, in powder, one ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar.) 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. x. to gr. xx.

* *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.* (The leaflets of Cassia lanceolata, *Lamarck, Encyc., Nees, Plant. Med.* plate 345; and Cassia obovata, *Colladon (C. Senna); Nees, Plant. Med.* plates 347 and 348. Imported from Alexandria; carefully freed from the flowers, pods, and leafstalks of the same, and from the leaves, flowers, and fruit of Solenostemma Argel, *Hayne.*)

SENNA INDICA. *Tinnivelly Senna.* (The leaflets of Cassia elongata, *Lemaire. Royle, Bot. Himal.*, plate 37. 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.—The species of the genus cassia which yield senna are either shrubs or herbs with abruptly pinnate leaves, sepals 5, unequal, cohering at the base; petals 5, unequal; stamens 10, free, unequal, the 3 lower ones very long, the 4 middle ones short and straight, and the 3 upper ones with abortive anthers; anthers dehiscing at the apex; legume various. The species are distinguished by differences in habit, in the shape of the leaflets, which in all the species are *entire and unequal at the base*, and in the character of the legume.

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.

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 its weight, of the leaves, flowers, and fruit of the *solenostemma argel;* 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 solenostemma 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 then 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.

CHARACTERS AND TESTS OF ALEXANDRIAN SENNA.—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. The unequally oblique base, and freedom from bitterness, distinguish the Senna from the Argel leaves, which moreover are thicker and stiffer.

CHARACTERS OF TINNIVELLY SENNA.—About two inches long, lanceolate, acute, unequally oblique at the base, flexible, entire, green, without any admixture; odour and taste those of Alexandrian Senna.

ADULTERATIONS.—In Egyptian senna, as met with in British commerce, the only adulteration that is practised has been before indicated, namely, with argel, 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 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 :—

PREPARATIONS.—Confectio Sennæ, one part in eleven, nearly ; Infusum Sennæ, two ounces to one pint; Mistura Sennæ Composita; Syrupus Sennæ, one ounce to two fluid ounces; Tinctura Sennæ, two and a half ounces to one pint.

Confectio Sennæ. Confection of Senna. (Take of senna, in fine powder, seven ounces; coriander fruit, 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, a sufficiency. Boil the figs and prunes gently with twenty-four ounces of distilled water in a covered vessel for four hours; then, having added more distilled water to make up the quantity to its original volume, mix the tamarind and cassia pulp, digest for two hours, and rub the softened pulp of the fruits through a hair sieve, rejecting the seeds and other hard parts. To the pulped product add the sugar and extract of liquorice, and dissolve them with a gentle heat; while the mixture is still warm, add to it gradually the mixed senna and coriander powders, and mix the whole thoroughly, making the weight of the resulting confection seventy-five ounces either by evaporation or by the addition of more distilled water.) Commonly known as *lenitive electuary;* a mild and 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, one ounce; ginger, sliced, thirty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel, for one hour, and strain.) This infusion corresponds in strength with *Infusum Sennæ Compositum, Lond.* It is double the strength of *Infusum Sennæ, Brit. Pharm.* 1864, and *Dub. Dose*, 1 to 2 fluid ounces. It enters into the composition of the Mistura Sennæ Composita.

Mistura Sennæ Composita. Compound Mixture of Senna. (Take of sulphate of magnesia, four ounces ; extract of liquorice, half an ounce; tincture of senna, two and a half fluid ounces; compound tincture of cardamoms, ten fluid drachms; infusion of senna, a sufficiency. Dissolve the sulphate of magnesia and extract of liquorice in 14 fluid ounces of the infusion of senna, with the aid of a gentle heat, then add the tinctures, and sufficient infusion of senna to make one pint.) This formulary is the well known black dose of the hospitals, the *black bottle*, so hateful to children. The introduction into a national pharmacopœia of such a formula appears to me to be most unnecessary, and has a most injurious tendency ; such formulæ should be left for extemporaneous prescription ; its dose is from one to two ounces.

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 at a temperature of 120°; press out the liquor and strain it. Digest the marc in thirty ounces of the water for six hours at the same temperature; again press out the liquor and strain it. Evaporate the mixed liquor in a water-bath 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. (Take of senna, broken small, two and a half ounces; raisins, freed from seeds, two ounces; caraway fruit, bruised, coriander fruit, bruised, of each half an ounce; proof spirit, one pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) A stimulating and cordial cathartic, in doses of f℥ss. to f℥j., 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. It enters into the preparation of the Mistura Sennæ Composita. (One fluid drachm in one fluid ounce.)

* *Fluid Extract of Senna*, DUNCAN. (Tinnivelly senna, lbxv.; exhaust with boiling water by displacement—about four times its weight of water is sufficient; concentrate the infusion *in vacuo* to lbx.; dissolve in the product lbvj. of treacle previously concentrated over the vapour-bath till a little of it becomes nearly dry on cooling; add of rectified spirit (density, ·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 solenostemma 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. $NaOS_2O_2+5HO(=124)$ or $\mathbf{Na_2H_2S_2O_4.4H_2O}$ (=248.)

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.

EXPLANATION OF PROCESS.—In this process the sulphur is first converted into sulphurous acid (SO_2) by the combustion to which it is subjected; this decomposes the carbonate of soda, expelling its carbonic acid and forming sulphite of soda, thus, $NaOCO_2+SO_2=CO_2+NaOSO_2$. On the subsequent addition of sulphur the salt associates with it an additional atom of sulphur, forming the hyposulphite of soda, thus, $NaO,SO_2+S=NaO,S_2O_2$.

PHYSICAL PROPERTIES.—Hyposulphite of soda occurs in beautiful, rectangular, flattened prisms, transparent, inodorous, with a bitter saline, somewhat hepatic taste.

TEST.—24·8 grains decolorise 100 measures of the volumetric solution of iodine.

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, thus, $NaO,S_2O_2+SO_3=NaOSO_3+SO_2+S$. In virtue of its power of dissolving any salt of silver save the sulphide, and those which have been decomposed by light, this salt has become of commercial importance in the photographic art. It has only been introduced into the Appendix to the Pharmacopœia with a view of its being employed as a volumetric test for ascertaining the per-centage of iodine and chlorine; reference to what is written under this heading in the Appendix will explain its mode of action when so used.

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. Cazenave recommends its employment in combination with the syrups of sarsparilla and of mezereon in the treatment of psoriasis. It has also been recommended by Dr. R. Neale in that curious form of stomach affection accompanied with yeasty vomiting containing *Sarcinæ Ventriculi ;* in which cases, however, in consequence of its more agreeable taste, I prefer the sulphite of soda; to the remarks upon which salt I must refer my readers for further information on

this important topic. 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. The addition of an acid, such as sulphuric acid, to this bath will occasionally be found of service, precipitating its sulphur, and setting free its sulphurous acid; when so employed, care must be taken that the patient shall not suffer from the irritant fumes of the sulphurous acid.

INCOMPATIBLES.—The mineral and vegetable acids, and most salts.

SODÆ PHOSPHAS. *Phosphate of Soda. (Tasteless Purging Salt.)* $2NaO,HO,PO_5 + 24HO$ (= 358) or $\mathbf{Na_2HPO_4,12H_2O}$ (=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 these 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, $CaOCO + SO_3 = CaOSO_3 + CO_2$; 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 ($2NaO,HO,PO_5$), by which reaction another portion of the soluble is converted

back again into insoluble phosphate of lime. The entire of this latter reaction is expressed in the following equation, $3(2HO,CaO,PO_5) + 4NaOCO_2 = 3CaO,PO_5 + 2(2NaO,HO,PO_5) + 4HO + 4CO_2$. The subsequent stages of the operation require no explanation.

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 ($2NaO,HO,PO_5 + 24HO$); 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 insoluble in alcohol.

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 has a faintly alkaline reaction, it gives a yellow precipitate with nitrate of silver, the resulting fluid acquiring an acid reaction. 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.

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* in its reaction, will be understood by reference to the annexed equation, $3AgONO_5 + 2NaO,HO,PO_5 = 3AgO,PO_5 + 2NaONO_5 + NO_5 + 3HO$.

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. Latham recommended its use in diabetes, and Prout went so far as to say that it is the only saline cathartic admissible in this disease, inasmuch as its action is simply purgative, unaccompanied by diuretic effects.

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 SULPHAS. *Sulphate of Soda.* (Syn: *Glauber's Salt.*) NaO,SO_3+10HO, (=161) or $\mathbf{Na_2SO_4 10H_2O}$. (=322.) (May be obtained from the residue left in the manufacture of hydrochloric acid, by neutralising it with carbonate of soda, and crystallising from solution in water.)

PREPARATION.—This salt, for the preparation of which we have no formula in the Pharmacopœia, can be readily procured by the following process:—Take of the salt which remains after making pure muriatic acid, lbij.; 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.

EXPLANATION OF PROCESS.—The residual salt after the manufacture of hydrochloric acid, as will be seen by reference to thi sacid, 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.

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 recognised 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.

CHARACTERS AND TESTS.—In transparent oblique prisms; has a salt and bitter taste; effloresces on exposure to the air; soluble in water, insoluble in spirit. Exposed to heat in a porcelain crucible it loses 55·9 per cent. of water. Heated with solution of potash no odour of ammonia is evolved, and no precipitate is formed. Imparts a yellow colour to flame. Fifty grains of it dissolved in distilled water and acidulated with hydrochloric acid, give by the addition of chloride of barium a white precipitate, which, when it has been washed and dried, weighs 72·2 grains.

ADULTERATIONS.—Generally speaking this salt is found free from impurities; but, in consequence of one of its commercial sources being the process for obtaining sal ammoniac by the action of common salt upon sulphate of ammonia, in virtue of which sulphate of soda is left as the residual salt, it might contain either sul-

phate of ammonia or chloride of ammonium; were either present, solution of potash would set free the ammoniacal gas, as it would also precipitate any salt of iron, did such exist in the sulphate of soda.

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 by any means so frequently employed as that salt.

DOSE AND MODE OF ADMINISTRATION.—℥ss. to ℥ij. dissolved in from two to four ounces of water; a tablespoonful of lemon-juice or 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.

* SODÆ SULPHIS. *Sulphite of Soda.* $NaOSO_2+8HO(=135)$ or $\mathbf{Na_2S0_38H_20}(=270.)$

PREPARATION.—This salt can be prepared by saturating a solution of carbonate of soda with sulphurous acid, and subsequent evaporation and crystallization.

CHARACTERS.—This salt is generally found in masses of prismatic crystals, white in colour, inodorous, and of a very cooling, saline, slightly disagreeable taste. It is soluble in four parts of water at 60°. It will be recognised as a salt of soda by the yellow colour it communicates to flame, and as a salt of sulphurous acid by the suffocative characteristic odour of that acid developed on the addition to its solution of dilute sulphuric acid. This latter test will also enable us to distinguish this salt from the hyposulphite of soda. On the addition of dilute sulphuric acid to the solution of hyposulphite of soda also, sulphurous acid is evolved, but in addition, the mixture becomes turbid and of a light yellow colour, in consequence of the precipitation of the sulphur (see p. 215); this will not occur with the solution of sulphite of soda.

THERAPEUTICAL USES.—This salt is used both internally and externally; internally in large doses it acts as a purgative; it is rarely, however, employed in these countries with that object in view, its principal use being in the treatment of that most troublesome form of vomiting attendant upon *sarcinæ 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, and 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 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. I myself have employed the sulphite of soda in such cases with signal benefit, preferring it in consequence of its less disagreeable taste to the hyposulphite of soda, which, however, so far as physiological effects go, is equally efficacious. Dr. Polli has drawn the attention of the profession to what, if his views be verified, will be indeed a most important improvement in the treatment of zymotic diseases. Whatever be the theory as to the cause of the so-called zymosis (and either Liebig's albumenoid, or Pasteur's animalcular, or any other theory may be adopted), the practical facts, according to Polli, are that there are two morbid elements in the blood in these zymotic diseases ; the one is of the nature of a ferment or excitor of change, the other is the material capable of fermentation. When either of these is absent from the blood, zymosis is impossible; but when both are present, then such a reaction takes place that zymotic phenomena result. Now the ferment may be rendered innocuous, although it may not be readily destructible itself, by destroying the fermentable material, or by at least so changing its composition that fermentation is effectually hindered : and after a series of experimental researches Dr. Polli affirms that he has found in the sulphites and hyposulphites of potassa, soda, and magnesia, medicinal agents which do not act upon the ferment, nor upon the vital processes, but upon the fermentable *something* without which the ferment is innocuous; and in this way they constitute safe and efficacious anti-zymotics. He was led to make this assertion from the results of the following experiments:—He selected a number of dogs; a proportion of these he dosed with the sulphites, while the remainder were left without. He then killed them all, the weather being warm. He found that the urine, the blood, the viscera, and the flesh of the sulphited dead dogs resisted putrefaction for many days, while the same elements of the unsulphited animals were already putrid. These experiments were next extended to animals subjected to various forms of inoculation, and the results were sufficiently encouraging to induce him to make an extended series of clinical investigations on the remedial powers of the sulphites in the treatment of the various zymotic diseases, such as pyœmia, endemic or miasmatic fevers, the exanthemata, typhus fever, &c. in all of which cases he reports most

favourably of their value. Dr. De Ricci of this city warmly supports these views of Dr. Polli, and their importance calls for extended and searching clinical investigation. Externally a strong solution of this salt is employed in the treatment of these forms of cutaneous affections which appear to depend upon the production and extension of a low form of vegetable parasite, such as porrigo favosa, as also in sycosis, pruritus, &c.

DOSE AND MODE OF ADMINISTRATION.—Sulphite of soda may be given in from ten to sixty-grain doses, dissolved in a little water, to which some aromatic tincture, as of orange-peel, may be added to mask its taste. In the treatment of Sarcinæ Ventriculi, it should be given *immediately after each meal.* The sulphites are not decomposed in the stomach under ordinary circumstances, but when they are, there is a manifest production of sulphurous acid gas. When this is the case, a little magnesia must be added to the sulphite to neutralise the acids of the stomach. The sulphites of soda and magnesia are tolerated in large doses if dissolved freely in water. A concentrated solution is apt to lie heavy on the stomach and cause a frontal headache; the more diluted, as a general rule, the better. They are decomposed by all the vegetable acids, however weak. Hence their beneficial influence will be counteracted if the patient takes citric, tartaric, malic, or oxalic acids, or foods or drinks containing them. This is important to remember when administering them in fever, inasmuch as lemonade, imperial, apple tea, and the like are all incompatible drinks and destroy their efficacy. For external use in the skin affections alluded to, a saturated solution should be employed.

INCOMPATIBLES.—Any of the mineral or vegetable acids, and all acid salts.

SODA TARTARATA. *Tartarated Soda.* $NaO, KO, C_8H_4O_{10} + 8HO$ (=282), or $\mathbf{NaKC_4H_4O_6.4H_2O}$(=282.) (Syn.: *Sodæ et Potassæ Tartras,* 1864. *Sodæ Potassio-Tartras,* Lond. *Seignette's Salt, Rochelle Salt.*)

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 ($HO,KO,C_8H_4O_{10}$) 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, $HO,KO, C_8H_4O_{10} + NaOCO_2 = NaO,KO,C_8H_4O_{10} + HO, + CO_2$.

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 acetic acid. Entirely soluble in cold water. One hundred and forty-one grains heated to redness till gases cease to be evolved leave an alkaline residue, which requires for its neutralization one thousand measures of the volumetric solution of oxalic 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. 92); the yellow colour of the flame characterizes the salt as one of soda, whilst the crystalline precipitate, produced on the addition of acetic acid, cream of tartar ($HO,KO,C_8H_4O_{10}$), proves it to be a salt of potash; the precipitate is accounted for by the acetic acid removing the soda from the salt in the form of acetate of soda, and substituting for it an equivalent of water; thus, $NaO,KO,C_8H_4O_{10}+C_4H_3O_3HO=NaO,C_4H_3O_3+HO,KO,C_8H_4O_{10}$. 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.

ADULTERATIONS.—As this salt is generally sold in crystals, it is not liable to adulteration, and the volumetric test allows of none, inasmuch as 282 grains would include two equivalents of alkaline base, which would require 2000 measures of the volumetric solution.

THERAPEUTICAL EFFECTS.—A mild cooling laxative, not so active as most of the other saline cathartics, than which, however, 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 tartarated soda, and gr. xl. of bicarbonate of soda, reduced to powder and mixed, 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 tartarated soda. 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.

SULPHUR SUBLIMATUM. *Sublimed Sulphur.* (Syn.: *Flowers of Sulphur.*) S (=16) or **S** (=32.)

PHARMACEUTICAL HISTORY.—*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, and a formulary has been given for its preparation.

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, as a result 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. 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 about 240°, and between that temperature and 280° it forms a clear liquid 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.

CHARACTERS AND TESTS.—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. 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 sub-

limation (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.

THERAPEUTICAL EFFECTS.—In large doses sulphur acts as a mild cathartic, producing its effects either by stimulating the muscular coat of the intestines, or by acting specifically on the mucous membrane, 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, in which affections it seems to me to possess some specific action over the hemorrhoidal vessels, in virtue of which their calibre is reduced, and the symptoms thereby ameliorated; it also is used with advantage in stricture or other painful affections of the rectum. Whilst a large portion of it passes off by the bowels, that some of it is absorbed cannot be doubted, Ebenhard having detected it in the chyle, lymphatics, &c. That it is also eliminated by the skin is evidenced by the blackening of articles of silver on the persons of those taking it, due to the formation of sulphide of silver. 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 acid tartrate 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."

PREPARATIONS.—Confectio Sulphuris; Sulphur Præcipitatum; Unguentum Sulphuris.

PREPARATIONS IN WHICH IT IS USED.—Emplastrum Ammoniaci cum Hydrargyro; Emplastrum Hydrargyri.

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 ℥ss. to ℥j.

SULPHUR PRÆCIPITATUM. *Precipitated Sulphur.* (Syn.: *Lac Sulphuris.*)

PREPARATION.—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 hyposulphite 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 and from the excess of hydrochloric acid employed in its manufacture, by diligent elutriation, which process is continued so long as the washings redden blue litmus paper, or 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 the inconvenience of 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 AND TESTS.—A greyish-yellow soft powder free from grittiness, and from the smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid. Entirely volatilized by heat; under the microscope it is seen to consist of opaque globules, without any admixture of crystalline matter. Otherwise it corresponds with sublimed sulphur.

ADULTERATIONS.—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 USES.—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.

TAMARINDUS. *Tamarind.* (The preserved pulp of the fruit of Tamarindus Indica, *Linn., Woodv. Med. Bot.* plate 166. 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; branches, numerous, spreading; leaves abruptly pinnate, alternate; leaflets 12-15 pair, small, oblong, obtuse, entire, glabrous; 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 imbedded 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*).

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 sub-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.

CHARACTERS AND TEST.—A brown, sweetish, subacid pulp, preserved in sugar, containing strong fibres, and brown shining seeds, each enclosed in a membranous coat. A piece of bright iron, left in contact with the pulp for an hour, does not exhibit any deposit of copper.

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, after a time 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.

PREPARATION.—Confectio Sennæ, 9 parts to 75 (which see, p. 213).

INCOMPATIBLES.—The salts of potash; alkaline carbonates; lime water; tartar emetic; and the acetates of lead.

TEREBINTHINÆ OLEUM. *Oil of turpentine* (described in the division *Anthelmintics*, p. 61), 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, Neligan used it for years with very great success (See *Dublin Journal of Medical Science*, vol. xxviii. p. 189).

DOSE AND MODE OF ADMINISTRATION.—The dose of oil of turpentine as a cathartic is from f℥ij. to f℥ij., either given by the mouth in the form of emulsion, or in the form of enema. (See also *Anthelmintics, Diuretics, Epispastics*, and *General Stimulants*.)

* VIOLA. *The fresh petals of the Viola odorata.* An indige-

nous plant; belonging to the Natural family *Violaceæ*, and to the Linnæan class and order *Pentandria Monogynia*.

BOTANICAL CHARACTERS.—A perennial herb with a sarmentose, sometimes branched, rhizome, knotted with the remains of the old petioles and stipules; leaves radical, broadly cordate, crenate, pubescent, or nearly glabrous, furnished with narrow-lanceolate entire stipules; peduncles solitary, one-flowered, as long as the petioles, with a pair of small bracts about their middle; sepals 5, produced at the base beyond their insertion; corolla irregular, of 5 petals, the lowest calcarate, bluish-purple or white; stamens 5, with very short filaments, the anthers cohering in a ring round the ovary, the two lowest with spurs; style single; stigma hooked or thickened; ovary 1-celled, many ovuled, placentæ parietal; capsule opening in three valves.

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 syrup of violets.

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 into 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 to a greater or lesser extent, either by simply killing it, or 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. Here it may be generally stated that their principal use is to destroy tissues which are inordinately developed, though normal in composition; to destroy growths of diseased structures; to convert poisoned into healthy wounds; to open abscesses, more especially so those which are chronic; and in cases of diseased bones or joints to establish suppurative surfaces. Some years ago attention was 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 were 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. In more modern times attention has been again directed to the use, on more or less of theoretical grounds, of several special caustics in the treatment of malignant diseases; under their respective headings more particular allusion will be made to this subject in the present chapter.

ACIDUM ACETICUM GLACIALE. *Glacial Acetic Acid.* Syn.: *Acidum Aceticum*, Edin. (Concentrated acetic acid, corresponding to at least 84 per cent. of anhydrous acid, $C_4H_3O_3$ (=51) or $\mathbf{C_4H_6O_3}$ (=102.) In the present edition of the British Pharmacopœia no directions are given us for the manufacture of this acid, but it can be conveniently prepared as follows:—

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, $NaO,C_4H_3O_3 + SO_3HO = NaO,SO_3 + HO,C_4H_3O_3$. 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, $Am + KOIO_5 + 5SO_2 = AmI + KOSO_3 + 4SO_3$. 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, $MnO_2 + SO_2 = MnOSO_3$.

CHARACTERS AND TESTS.—It crystallises when cooled to 34°, and remains crystalline until the temperature rises to above 48°. Specific gravity, 1·065 to 1·066, and this is increased by adding ten per cent. of water. At the mean temperature of the air it is a colourless liquid, with a pungent acetous odour. 60 grains by weight mixed with a fluid ounce of distilled water require for neutralisation at least 990 grain-measures of the volumetric solution of soda. If a fluid drachm of it mixed with half an ounce of distilled water and half a drachm of pure hydrochloric acid be put into a small flask with a few pieces of granulated zinc, and while the effervescence continues a slip of bibulous paper wetted with solution of subacetate of lead be suspended in the upper part of the flask above the liquid for about five minutes, the paper will not become discoloured.

To this property of producing crystals at a low temperature it owes its 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. Should it discolour a slip of paper moistened with a solution of subacetate of lead under the conditions stated in the pharmacopœial test, the presence of sulphurous acid is to be inferred; the explanation of this test is that by the action of hydrochloric acid upon zinc hydrogen is evolved, thus:—

$Zn+HCl=ZnCl+H$. Were sulphurous acid present, the hydrogen would resolve it into water and sulphuretted hydrogen, thus:— $SO_2+3H=2HO+SH$. The sulphuretted hydrogen thus generated would of course then darken the paper moistened with the solution of subacetate of lead.

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 that purpose. I shall therefore reserve further observations on this point for that preparation, which see. The pharmacopœial authorities have directed its use in the creasote mixture, with the object of ensuring the solubility of the creasote. (See p. 103.)

PREPARATIONS IN WHICH GLACIAL ACETIC ACID IS USED. Acetum Cantharidis; Mistura Creasoti.

ACIDUM ACETICUM. *Acetic Acid.* (An acid liquid prepared from wood by destructive distillation and subsequent purification. 100 parts by weight contain 33 parts of the acetic acid $HO,C_4H_3O_3$ (=60) or $\mathbf{HC_2H_3O_2}$ (=60), corresponding to 28 parts of anhydrous acetic acid, $C_4H_3O_3$ (=51) or $\mathbf{C_4H_6O_3}$ (=102).

PREPARATION.—By the destructive distillation of wood in closed vessels we have many products resulting, viz. tar, creasote, empyreumatic 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, $CaO,C_4H_3O_3+NaO,SO_3=CaO,SO_3+NaO,C_4H_3O_3$. 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, the sulphuric acid uniting with the soda to form sulphate of soda, and the acetic acid distilling over, thus, $NaO,C_4H_3O_3+SO_3HO=NaO,SO_3+C_4H_3O_3HO$.

CHARACTER AND TESTS.—A colourless liquid having a strong acid reaction and a pungent odour. Specific gravity 1·044. 182 grains by weight require for neutralisation 1000 grain-measures of the volumetric solution of soda. It leaves no residue when evaporated, and gives no precipitate with sulphuretted hydrogen, chloride of barium, or nitrate of silver. If a fluid drachm of it mixed with half an ounce of distilled water and half a drachm of pure hydrochloric acid be put into a small flask with a few pieces of granulated zinc, and while the effervescence continues a slip of bibulous paper wetted with solution of subacetate of lead be suspended in the upper part of the flask above the liquid for about five minutes, the paper will not become discoloured.

This acid corresponds in strength with the Acetic Acid of commerce or Purified Pyroligneous Acid of the Dublin Pharmacopœia. It is rather weaker than the acid described under the same

name in the London Pharmacopœia, and only about one third the strength of that ordered in the Edinburgh Pharmacopœia. 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 under the conditions stated the slip of bibulous paper moistened with the solution of subacetate of lead be darkened, sulphurous acid is present. This latter test has been already explained (see p. 231).

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. Recently its use has been suggested by Dr. Broadbent and others in the treatment of cancerous tumours, either for the purpose of producing their disintegration, and ultimate disappearance by absorption, or with the view of causing destruction of the growth and its removal from the system by sloughing. How it is proposed to effect this is by the injection into the substance of the malignant growth, with the assistance of a fine subcutaneous injection syringe, of about thirty minims of a dilute acid (one part of acetic acid to one part or one part and a half of water). The principle upon which this practice is founded is that cancer-cells within the living organization should undergo the same changes with acetic acid that they do on the microscopic slide. Several cases so treated are brought forward in support of this plan of treatment, but as yet I am not convinced of its value; in cases of primary cancer, susceptible of removal by operative interference, it never should be preferred to the more radical treatment; in secondary cancer, irremoveable by the knife, it may prove of use, although in cases in which I employed it, it fell far short of my hopes. Dr. Barclay has drawn attention to its power of allaying the pain of cancer when locally applied, holding an intermediate rank in this respect between citric and carbolic acids; the latter, in addition to its superiority as a local anesthetic, should also be preferred in consequence of its greater power as a deodorizer. (See also *Epispastics and General Stimulants.)*

PREPARATIONS CONTAINING FREE ACETIC ACID.—Acetum, 4·6 per cent. of Anhydrous Acetic Acid; Acetum Cantharidis; Acetum Scillæ; Acidum Aceticum Glaciale, eighty-four per cent.; Anhydrous Acid; Acidum Aceticum, twenty-eight per cent.; Acidum Aceticum dilutum, 3·6 per cent.; Extractum Colchici Aceticum;

Linimentum Terebinthinæ Aceticum, one volume acetic acid in three; Liquor Epispasticus, one volume acetic acid in five; Mistura Creasoti; Oxymel Scillæ; Syrupus Scillæ.

ACIDUM HYDROCHLORICUM.—*Hydrochloric Acid.* (Syn.: *Acidum Muriaticum Purum,* Edin. and Dub. *Spirits of Salts.* Hydrochloric acid gas, HCl (=36·5) or **HCl** (=36·5), dissolved in water, and forming 31·8 per cent. by weight of the solution. It may be obtained by the following process):—

PREPARATION.—Take of chloride of sodium, dried, forty-eight ounces; sulphuric acid, forty-four fluid ounces; water, thirty-six fluid ounces; distilled water, fifty fluid ounces. Pour the sulphuric acid slowly into thirty-two ounces of the water, and when the mixture has cooled, add it to 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 wash-bottle, furnished with a safety tube, and containing the remaining four ounces of the water; then, applying heat to the flask, conduct the disengaged gas through the wash-bottle into a second bottle containing the distilled water, by means of a bent tube dipping about half an inch below the surface, and let the process be continued until the product measures sixty-six ounces, or the liquid has acquired a specific gravity of 1·16. The bottle containing the distilled water must be kept cool during the whole operation.

EXPLANATION OF PROCESS.—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, $NaCl+2SO_3HO=(NaO,HO,2SO_3)+HO+HCl$. 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 AND TESTS.—A nearly colourless and strongly acid liquid, emitting white vapours having a pungent odour. Specify gravity 1·16. When evaporated to dryness, it leaves no residue. It gives with nitrate of silver a curdy white precipitate, soluble in excess of ammonia, insoluble in nitric acid. 114·8 grains by weight, mixed with half an ounce of distilled water, require for neutralisation 1000 grain measures of the volumetric solution of soda. When diluted with four times its volume of distilled water it gives no precipitate with solution of chloride of barium or with sulphuretted hydrogen, and does not tarnish or alter the colour of bright copper foil when boiled with it. If a fluid drachm of it mixed with half an ounce of distilled water be put into a small flask with a few pieces of granulated zinc, and while the effervescence continues a slip of bibulous paper wetted with solution of subacetate of lead be suspended in the upper part of the flask above the liquid for about five minutes, the paper will not become discoloured.

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, $AgO,NO_5+HCl=HONO_5+AgCl$. Its solution in ammonia is due to the formation of ammonio-chloride of silver, thus, $AgCl+2NH_4O=AgCl,2NH_3+2HO$. 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. 108). Were lead, derivable from the employment of vessels of this metal in its manufacture, or arsenic, a possible impurity in the sulphuric acid 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). Sulphurous acid, if present, will be detected by the slip of bibulous paper moistened with the solution of subacetate of lead, and employed as directed, (see p. 231). 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 colour of a dilute solution of sulphate of indigo.

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 phagedenic 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 soap, and magnesia or its carbonate, combined with demulcent or emollient drinks.

PREPARATIONS CONTAINING FREE HYDROCHLORIC ACID.—Acidum

Hydrochloricum Dilutum ; Acidum Nitro-hydrochloricum Dilutum ; Liquor Antimonii Chloridi ; Liquor Arsenici Hydrochloricus ; Liquor Morphiæ Hydrochloratis.

ACIDUM NITRICUM. *Nitric Acid.* (Syn. : *Aquafortis.*) An acid prepared from nitrate of potash or nitrate of soda by distillation with sulphuric acid and water, and containing seventy per cent. by weight of the nitric acid, HO,NO_5 (=63) or $\mathbf{HNO_3}$, (=63) corresponding to 60 per cent. of anhydrous nitric acid, NO_5 (=54) or $\mathbf{N_2O_5}$. (=108). No specific directions are contained in the Pharmacopœia for the manufacture of this acid; the following process, however, will give a satisfactory result.

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 disengaged, the sulphuric acid uniting with the potash to form sulphate of potash, and the nitric acid distilling over. To facilitate the extrication 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 should be 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 AND TESTS.—A colourless liquid, having a specific gravity of 1·42. When exposed to the air it emits an acrid corrosive vapour. If it be poured over copper filings dense red vapours are immediately formed, but if the acid be mixed with an equal volume of water, and then added to the copper, it gives off a colourless gas, which acquires an orange-red colour as it mixes with the air, and which, if it be introduced into a solution of sulphate of iron, communicates to it a dark purple or brown colour. The boiling point of the acid is 250°. If submitted to distillation the product continues uniform throughout the process. It leaves no residue when evaporated to dryness. Diluted with six times its volume of distilled water it gives no precipitate with chloride of barium or nitrate of silver. 90 grains by weight of it mixed with half an ounce of distilled water require for neutralisation 1000 grain-measures of the volumetric solution of soda.

When pure, nitric acid should be colourless, but the commercial acid is always of a more or less yellowish colour, due to 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, strong nitric acid becomes deoxidized, and again assumes an orange yellow colour, due to the development in it of this acid. The pharmacopœial acid is the monohydrated

acid associated with three atoms of water ($HONO_5+3HO$). This is generally looked upon by chemists as a *definite* hydrate, and is remarkable for being the strongest acid upon which light exerts no decomposing action. The *colourless* gas produced when diluted 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. 112). 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. 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 the nitrate of potash of commerce is frequently 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 p. 234). This acid corresponds in strength with the nitric acid of the London Pharmacopœia; it is weaker by one-fourth (by weight) than that of the British Pharmacopœia, 1864, and the Edinburgh and Dublin Pharmacopœias.

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.

PREPARATIONS CONTAINING FREE NITRIC ACID.—Acidum Nitricum Dilutum; Acidum Nitro-Hydrochloricum Dilutum; Liquor Ferri Pernitratis; Liquor Hydrargyri Nitratis Acidus; Unguentum Hydrargyri Nitratis.

* 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.

EXPLANATION OF PROCESS.—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, one atom of nitric acid, operating upon three atoms of hydrochloric acid, robs it of three equivalents of hydrogen at the expense of three atoms of its own oxygen, to form three equivalents of water, by which it is itself reduced to the state of nitric oxide gas, and three atoms of chlorine are set free; so that the resulting solution is a mixture of undecomposed nitric and muriatic acids, charged with chlorine, nitric oxide gas, and water. The production of these latter three is expressed in the following equation, $3HCl + NO_5 = 3Cl + NO_2 + 3HO$. 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, in virtue of the chlorine which it holds in solution, 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 phagedena, 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, p. 89, in the division *Astringents*) possesses powerful caustic properties, destroying the animal tissues wherever it is brought into 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; Syme employs saw-dust, Ricord charcoal, instead, they state with good results. (See also *Epispastics.*)

ACIDUM SULPHUROSUM. *Sulphurous Acid.* Sulphurous acid gas, SO_2 (=32) or $\mathbf{SO}_2$ (=64), dissolved in water, and constituting 9·2 per cent. by weight of the solution.

PREPARATION.—Take of sulphuric acid, four fluid ounces; wood charcoal, broken into small pieces, one ounce; water, two fluid ounces; distilled water, twenty fluid ounces. Put the charcoal and sulphuric acid into a glass flask, connected by a glass tube with a wash-bottle containing the two ounces of water, whence a second tube leads into a pint bottle containing the distilled water, to the bottom of which the gas-delivery tube should pass. Apply heat to the flask until gas is evolved, which is to be conducted through the water in the wash-bottle, and then into the distilled water, the latter being kept cold, and the process being continued until the bubbles of gas pass through the solution undiminished in size. The product should be kept in a stoppered bottle 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, $2SO_3HO+C=2HO+CO_2+2SO_2$.

CHEMICAL PROPERTIES.—This is a solution of sulphurous acid gas in water. The gas itself is colourless; of a 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.

CHARACTERS AND TESTS.—A colourless liquid with a pungent sulphurous odour. Specific gravity 1·04. 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. 34.7 grains by weight of it mixed with an ounce of distilled water and a little mucilage of starch do not acquire a permanent blue colour with the volumetric solution of iodine, until 1000 grain-measures of the latter have been added. 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 thousand 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 the per-centage of the sulphurous acid present in the solution. One thousand measures being equal to gr. 3·2, and this amount having been demonstrated by the test to be present in 34·7 grains by weight of the solution, how much per cent. of sulphurous acid is present in the solution? Answer, 9·2 per cent., or, in round numbers, 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 sarcinæ ventriculi, in which cases, however, I infinitely prefer either the hyposulphite or

sulphite of soda (see pp. 214, 219). 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.

AMMONIÆ LIQUOR FORTIOR. (Syn.: *Ammoniæ Aqua Fortior, Concentrated Aqueous Solution of Ammonia. Strong solution of Ammonia.*) This preparation has been already described in the division *Antacids* (see p. 3).

THERAPEUTICAL USES.—As a caustic it has been only used locally, in the bites of rabid animals, venomous snakes and insects, having been first introduced for that purpose by the celebrated English physician Mead, and subsequently used by Jussieu for the same purpose. In these cases also its employment internally has been attended with advantage. (See also *Epispastics*.)

LIQUOR ANTIMONII CHLORIDI. *Solution of Chloride of Antimony.* (Syn.: *Liquor Antimonii Terchloridi. Butter of Antimony.*)

PREPARATION.—Take of black antimony, one pound; hydrochloric acid, four pints. Place the black 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 black antimony (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 AND TESTS.—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-coloured. The specific gravity of the solution is 1·47. One fluid drachm of it 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 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, which 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 of antimony, 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*. 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, $AgO,NO_5 + HCl = AgCl + HO,NO_5$. 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 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. 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 precipi-

tate 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.

THERAPEUTICAL 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 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.

PREPARATION IN WHICH SOLUTION OF CHLORIDE OF ANTIMONY IS USED.—Antimonii Oxidum.

ARGENTI NITRAS. *Nitrate of Silver.* (Syn.: *Caustic; Lunar Caustic.*) AgO,NO_5 (=170) or $\mathbf{AgNO_3}$ (=170).

PREPARATION.—Take of purified silver, three ounces; nitric acid, two fluid ounces and a half; distilled water, five 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 crystallise; pour off the liquor, and again evaporate and crystallise. 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 capsule of platinum or thin porcelain, and pour the melted salt into proper moulds. Nitrate of silver must be preserved in bottles carefully stoppered.

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 are to obviate the *blackening* of the salt, due to a partial reduction of the nitrate, resulting from contact

with organic matter; and, according to many authorities, from exposure to solar light. Mr. Scanlan, however, states that 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 AND TESTS.—In colourless tabular crystals, the primary form of which is the right rhombic prism; or in white cylindrical rods; soluble in distilled water, and in rectified spirit. The solution 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. 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.

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 (see p. 235) is a property shared by it in common with other of the salts of silver, such as the cyanide and oxalate; independent 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 *nitrates*.

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.

THERAPEUTICAL 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 caustic potash produces a *slough*, which, if anything can abort the disease, should 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; being in this latter disease one of our sheet anchors. Its introduction into the eye is 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 colour 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.

PREPARATION IN WHICH NITRATE OF SILVER IS USED.—Argenti Oxidum.

ACIDUM ARSENIOSUM. *Arsenious Acid.* (Syn. : *Arsenicum Album*, Edin. *White Oxide of Arsenic. Arsenic.* AsO_3 (=99) or $\mathbf{As_2O_3}$ (=198). (An anhydrous acid, obtained by roasting arsenical ores, and purified by sublimation.) Arsenious acid is procured 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 should be refined by sublimation for the purpose of freeing it from earthy matters, such as sulphate and carbonate of lime, very frequently present in it. No such process is given in the Pharmacopœia, but it can be effectually carried out in the following manner.

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 AND TESTS.—Occurs as a heavy white powder, or in sublimed masses which usually present a stratified appearance caused by the existence of separate layers differing from each other in degrees of opacity. When slowly sublimed in a glass tube it forms minute brilliant and transparent octahedral 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 by nitric acid. Sprinkled on a red-hot coal, it emits an alliaceous odour. It is entirely volatilised at a temperature not exceeding 400°. Four grains of it dissolved in boiling water with eight grains of bicarbonate of soda, discharge the colour of 808 grain-measures of the volumetric solution of iodine.

The reactions that ensue upon the addition of the volumetric test are these: when iodine is added to a solution of arsenious acid, this latter is converted into arsenic acid, two equivalents of the water being resolved into its elements, the two oxygens uniting with the arsenious, to convert it into arsenic acid, and the two hydrogens uniting with two equivalents of iodine to form two equivalents of hydriodic acid: thus, $AsO_3 + 2I + 2HO = AsO_5 + 2HI$, both of which are colourless; so it is evident that as long as any arsenious acid is present in the solution, the volumetric solution will continue to be decolourized. The use of the soda is to insure the solubility of the sparingly soluble arsenious acid, converting it into an arsenite of soda, with which, however, the reactions are the same as those described, thus, $2NaO,AsO_3 + 2HO + 2I = 2NaO,AsO_5 + 2HI$. The volumetric test is so constructed that each 1000 grain-measures of this solution contain the one-tenth of an equivalent of iodine, but as each equivalent of arsenious acid requires two equivalents of iodine, it is evident that 1000 measures of the volumetric solution is only equivalent to the half of the tenth of an equivalent of arsenious acid (4·95), 1000 grain-measures, therefore, would require for its colour being discharged, gr. 4·95 of arsenious acid to be present, and as a consequence gr. 4 of arsenious acid will decolourize but 808 grain-measures of the volumetric solution. The rest of the characters and tests will be understood by referring to the remarks under the head of Chemical History.

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.

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 regu-

lar octahedrons. 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 arsenious acid; in this case the carbon deoxidizes the arsenious acid, forming carbonic oxide gas and metallic arsenic, thus, $AsO_3 + 3C = 3CO + As$. 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 ammonio-nitrate of silver ($AgO,2NH_3,NO_5HO$) 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, and free ammonia, held in solution, thus, $2(AgO, 2NH_3,NO_5HO) + AsO_3 = 2AgO,AsO_3 + 2NH_4ONO_5 + 2NH_3$. Although this precipitate is soluble in ammonia, yet the quantity set free by the reactions that occur in this test is perfectly unequal to dissolving it. Grass-green with ammonio-sulphate of copper, *arsenite of copper* ($2CuO,AsO_3$) *(Scheele's green)*. In this test the ammonio-sulphate of copper ($CuO, 2NH_3,SO_3HO$) 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 and free ammonia are held in solution, thus, $2(CuO,2NH_3,SO_3HO) + AsO_3 = 2CuO,AsO_3 + 2NH_4OSO_3 + 2NH_3$. 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 the 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 ammonio-nitrate of silver and of ammonio-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 copper 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, $AsO_3+6Cu+3HCl=3Cu_2Cl+3HO+As$. Were there no arsenious acid present in the solution, the hydrochloric acid would have no action upon the metallic copper. This, in fact, being a case of predisposing affinity.

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.

THERAPEUTICAL 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 round, 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*, FRERE 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, eight parts; dragon's blood, twenty-two parts; and cinnabar, seventy 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.

PREPARATIONS IN WHICH ARSENIOUS ACID IS USED.—Liquor Arsenicalis, four grains in one fluid ounce; Liquor Arsenici Hydrochloricus, four grains in one fluid ounce.

PREPARATIONS OF ARSENIC ACID.—Ferri Arsenias, Sodæ Arsenias, Sodæ Arseniatis Liquor.

* CUPRI SUBACETAS. (Syn. : *Ærugo. Subacetate of Copper; Verdigris; Impure Diacetate of Copper. Diacetate of Copper.*) $2CuO,C_4H_3O_3,6HO = 184{\cdot}5$, or $\mathbf{Cu\,2(C_2H_3O_2),CuO+6H_2O} = 369$.

PREPARATION.—This salt is not now contained in the Pharmacopœia, but is obtained by placing plates of copper in contact with the fermenting marc of the grape, or with cloths dipped in vinegar. The Dublin College directed this article to be prepared for medical use by taking a convenient quantity of subacetate of copper, reducing it to powder by careful trituration in a porcelain mortar, and separating 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 colour *(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 complete solubility in sulphuric or hydrochloric acid.

THERAPEUTICAL 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. 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. It may be used externally 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, gr. cccl.; 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.

* CUPRI CARBONAS. *Carbonate of Copper.* $2CuO,CO_2HO=110{\cdot}5$, or $\mathbf{Cu_2CO_4+H_2O=221}$.

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.* $CuONO_5+3HO=120{\cdot}75$, or $\mathbf{CuN_2O_6+3H_2O=241{\cdot}5}$.

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; of a styptic, caustic, and corrosive taste; and of a cupreous smell.

CHEMICAL PROPERTIES.—Recognized as a salt of copper by the tests already given for that metal (see p. 105), and as one of nitric acid by its characteristics (see p. 236).

THERAPEUTICAL USES.—It 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 twenty-four or thirty-six hours, a lotion in the proportion of one grain 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, p. 104, 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) or **HgO** (=216).

PREPARATION.—Take of mercury, by weight, eight ounces; nitric acid, four fluid ounces and a half; 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, $Hg_2ONO_5 = 2HgO + NO_4$. 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 AND TESTS.—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. 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.

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 with solution of ammonia is the *hydrargyrum ammoniatum* (which see).

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.: *Unguentum Hydrargyri Nitrico-oxidi*, Lond. *Red Precipitate Ointment.*) (Take of Red Oxide of mercury, in very fine powder, sixty-two grains; yellow wax, a quarter of an ounce; oil of almonds, three quarters of an ounce. Melt the wax at a gentle heat, mix the oil with it, and when the

mixture is nearly cold, add the oxide of mercury, and mix the whole thoroughly together.)

HYDRARGYRI NITRATIS LIQUOR ACIDUS. *Acid Solution of Nitrate of Mercury.* (Nitrate of Mercury, HgO,NO_5(=162), or $\mathbf{HgN_2O_6}$ (=324) in solution in Nitric Acid.)

PREPARATION.—Take of mercury, four ounces; nitric acid, five fluid ounces; distilled water, one fluid ounce and a half. 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 three atoms of peroxide of mercury, which unite with the other three atoms of nitric acid to form three atoms of nitrate of mercury, which are held in solution by the excess of nitric acid employed. This equation explains the reaction, $3Hg+4NO_5=NO_2+3HgONO_5$.

CHARACTERS AND TESTS.—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. 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.

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 (see p. 112). 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, $Hg_2ONO_5+HCl=Hg_2Cl+HO+NO_5$.

THERAPEUTICAL USES.—A 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 produced by a single application to the ulcerated neck of the womb.

POTASSÆ BICHROMAS. *Bichromate of Potash.* $KO,2CrO_3$ (=147·5) or $\mathbf{K_2Cr_2O_7}$ (=295). No directions are given in the Pharmacopœia for the manufacture of this salt; it may, however, be prepared as follows.

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. The oxide of iron is gotten rid of by being converted, through the agency of another portion of the nitric acid of the nitrate of potash, into sesquioxide of iron (Fe_2O_3), which is insoluble.

CHARACTERS AND TESTS.—In large red, transparent, four-sided tables; anhydrous; fuses below redness; at a higher temperature is decomposed, yielding green oxide of chromium and yellow chromate of potash, which may be separated by dissolving the latter in water. The bichromate dissolved in water gives a yellowish-white precipitate with chloride of barium *(chromate of baryta)*, and a purplish red precipitate with nitrate of silver *(chromate of silver)*, and both these precipitates are soluble in diluted nitric acid. The solution also when digested with sulphuric acid and rectified spirit acquires an emerald green colour.

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-eight 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 makes good tinder, and 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 (see p. 62) and in preparing the volumetrical solution of bichromate of potash. (See *Supplementary Agents.*)

POTASSA CAUSTICA. *Caustic Potash.* (Syn.: *Potassæ Hydras*, Lond. *Potassa*, Ed. *Potassa Fusa, Lapis Infernalis.*) (Hydrate of potash, KO,HO (=56) or **KHO** (=56), containing some impurities.)

PREPARATION.—Take of solution of potash, two pints. Boil down the solution of potash 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 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 occasionally are greyish or bluish; inodorous; having a very acrid alkaline taste. Specific gravity, 1·8.

CHEMICAL PROPERTIES.—Caustic potash is composed of 1 equivalent of potassium, 1 of oxygen, and 1 of water (KOHO); exposed to the air it deliquesces rapidly, soon becomes liquid, and, attracting carbonic acid at the same time, it is converted into the carbonate of potash. 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 p. 27). 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.

CHARACTERS AND TESTS.—In hard white pencils, very deliquescent, powerfully alkaline and corrosive. A watery solution acidulated by nitric acid gives a yellow precipitate with perchloride of platinum, and only scanty white precipitates with nitrate of silver and chloride of barium. Fifty-six grains dissolved in water leave only a trace of sediment, and require for neutralisation at least 900 grain-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. 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*. Were it a perfectly pure salt, the 56 grains (its chemical equivalent) would require for neutralization 1000 grain measures of the volumetric solution.

THERAPEUTICAL 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 affected 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 is 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. 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. In cases of poisoning with caustic potash, the best antidotes are vinegar, lemon-juice, or the fixed oils. 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.

* *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 three to four lines in diameter and from one to two 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 pariêtes 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 alcohol and applied to the part it is wished to cauterize.

PREPARATION CONTAINING CAUSTIC POTASH.—Liquor Potassæ, twenty-seven grains in one fluid ounce.

PREPARATION IN WHICH CAUSTIC POTASH IS USED.—Potassæ Permanganas.

Soda Caustica. *Caustic Soda.* (Hydrate of Soda, NaO,HO (=40) or **NaHO** (=40) with some impurities.)

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 warmed glass rod solidifies on cooling. Pour the fluid on a clean silver or iron plate, or into moulds, and, as soon as it has solidified, break it in pieces, and preserve it in stoppered green-glass bottles.

CHEMICAL HISTORY.—The chemical history of caustic soda may be considered as being identical with that of liquor sodæ (p. 34) in every respect save that one preparation is in the solid, the other in the fluid form. I shall therefore refer the reader to that preparation for further information, contenting myself with observing that the volumetric test, as given below in the tests, admits of some impurity, inasmuch as the forty grains (its chemical equivalent) would, if absolutely pure, require 1000 grain-measures of the volumetric solution of oxalic acid for neutralization, instead of 900.

CHARACTERS AND TESTS.—Hard and greyish-white, very alkaline and corrosive. It imparts a yellow colour to flame, and its solution in water acidulated by nitric acid gives only scanty white precipitates with nitrate of silver and chloride of barium. Forty grains dissolved in water leave scarcely any sediment, and require for neutralization about 900 grain-measures of the volumetric solution of oxalic acid.

THERAPEUTICAL USES.—This preparation is preferred by some surgeons as a caustic to potassa fusa, in consequence of its not being so deliquescent; my experience of it, however, is that it is not so powerful, though a more manageable caustic than potassa fusa.

* *London Paste.* (Take equal parts of caustic soda and freshly prepared quick-lime, rub them up quickly together in a porcelain mortar, add sufficient absolute alcohol to make a paste, and keep in a wide mouthed glass stoppered bottle.) This paste has been introduced to notice by Dr. Morell Mackenzie, as the most suitable application

for the destruction of enlarged tonsils. It is to be applied as a coating to their surface, left in contact for a few seconds, and then neutralized by mopping out the throat with vinegar. I have used it in such cases with advantage; it does not give much pain, unless the patient drinks water immediately after its application. The employment of alcohol instead of spirit in making it into a paste is essential, inasmuch as the water in the spirit, by partially slaking the alkaline bases, would impair their caustic properties.

PREPARATION CONTAINING CAUSTIC SODA.—Liquor Sodæ, 18·8 grains in one fluid ounce. (See p. 34.)

ZINCI CHLORIDUM. *Chloride of Zinc.* (Syn.: *Butter of Zinc.*) ZnCl (=68) or $\mathbf{ZnCl_2}$ (=136.)

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, in which the iron, which by the action of the hydrochloric acid had been converted into chloride of iron ($Fe+HCl=FeCl+H$), is by the subsequent addition of the chlorine converted into perchloride of iron ($2FeCl+Cl=Fe_2Cl_3$). This salt, on the addition of the carbonate of zinc, is converted into peroxide of iron *(the brown precipitate)*, chloride of zinc and carbonic acid, thus, $Fe_2Cl_3+(ZnO,CO_2+2ZnO+3HO)=Fe_2O_3+3ZnCl+CO_2+3HO$. The peroxide of iron is caught on the filter, the carbonic acid escapes, and the chloride of zinc is recovered by subsequent evaporation.

PHYSICAL PROPERTIES.—In solid pieces; snow white; inodorous; having a strongly styptic metallic taste; very deliquescent.

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.

CHARACTERS AND TESTS.—Colourless opaque rods or tablets, very deliquescent and caustic; soluble almost entirely in water, alcohol, and ether. The watery solution is precipitated white by sulphide of ammonium, and nitrate of silver; but, if first acidulated with hydrochloric acid, it is not affected by sulphuretted hydrogen. Its watery solution is not affected by chloride of barium or oxalate of ammonia, and is not tinged blue by the yellow or red prussiate of potash. 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_43FeCy_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.

THERAPEUTICAL 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 hæmatodes, 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: and the employment of a strong solution of it to the entire surface of the wound, after ablation of the breast for cancer, has been suggested by Mr. De Morgan with the view of destroying, and thereby correcting the tendency to a recurrence of the disease, any nuclei that may have escaped the knife, or that may have accidentally been dispersed during the operation. When so applied, the change its colour produces on the blood is interesting to observe, apparently thickening it, and giving it a pinkish creamy appearance. We have already thus employed it in several operative cases in the Meath Hospital, and I regret to have to add that my experience of it is not at all as favourable as I could wish it to be. On the first day of this year (1867) I assisted Mr. Collis in removing a breast, and in spite of the diligent application of this solution to the wound, the disease re-appeared in less

than five months. In a similar case in which I assisted Mr. Smyly the result was the same; and Mr. Porter has told me of a case occurring in his practice where the result was similar. 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.

MODE OF APPLICATION.—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 260, for the preparation of pencils of caustic potash.

LIQUOR ZINCI CHLORIDI. *Solution of Chloride of Zinc.*

PREPARATION.—Take of granulated zinc, one pound; hydrochloric acid, forty-four fluid ounces; solution of chlorine, a sufficiency; carbonate of zinc, half an ounce or a sufficiency; distilled water, one pint. Mix the hydrochloric acid and water in a porcelain dish, add the zinc, and apply a gentle heat to promote the action until gas is no longer evolved. Boil for half an hour, supplying the water lost by evaporation, and allow the product to cool. Filter it into a bottle and add 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 the liquid into a porcelain basin, and evaporate until it is reduced to the bulk of two pints.

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 chlorine is to free the zinc from iron; how it effects this as well as the rest of the process will be understood by reference to p. 262.

THERAPEUTICAL USES.—This solution 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. It has occasionally happened that cases of poisoning have occurred by the drinking of this solution; such cases almost invariably are of accidental origin, the solution of chloride of zinc having been given in mistake for fluid magnesia, &c. Sir Philip Crampton, on one, if not two occasions, nearly lost his life by such a mistake. The best treatment under such circumstances is the administration of the alkaline carbonates, followed up by bland mucilaginous drinks.

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, or 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 case 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 diaphoretics, the value of which should not on account of its hydropathic origin be overlooked, inasmuch as *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, and 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.

LIQUOR AMMONIÆ ACETATIS. *Solution of Acetate of Ammonia.* (Acetate of ammonia, $NH_4O,C_4H_3O_3$(=77) or $\mathbf{NH_4C_2H_3O_2}$, (=77) dissolved in water.)

PREPARATION.—Take of acetic acid, ten fluid ounces; carbonate of ammonia, three ounces and a quarter or a sufficiency; distilled water, two pints and a half. Reduce the carbonate of ammonia to powder, and add it gradually to the acetic acid, until a neutral solution is formed, then add the water.

EXPLANATION OF PROCESS.—On adding carbonate of ammonia to acetic acid effervescence occurs, due to the escape of the carbonic acid of the ammoniacal salt, and the union of its base with the acetic acid to form acetate of ammonia, thus, $2NH_4O,3CO_2 + 2C_4H_3O_3 = 2(NH_4O,C_4H_3O_3) + 3CO_2$. The acetate of ammonia dissolved in water constitutes the pharmacopœial preparation, which purports to be the analogue of a long established and favorite medicine, "Mindererus' spirit," so called after the name of the physician who first suggested its use. 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 Pharmacopœia of 1864, where we found substituted for it strong solution of ammonia, and for the vinegar, acetic acid. The feeling that actuated this change was no doubt twofold; first, that no matter which method be pursued, the chemical composition of the resulting salt is still the same; and second, the practical difficulty 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. 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. 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.

PHYSICAL PROPERTIES.—A transparent colourless liquid, with a very faint acetous odour, and a cooling, saline, disagreeable taste.

CHEMICAL PROPERTIES.—This is a solution of acetate of ammonia ($NH_4O,C_4H_3O_3$). This 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, $NH_4O,C_4H_3O_3+SO_3=NH_4O,SO_3+C_4H_3O_3$. 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, $NH_4O,C_4H_3O_3+KO=KO,C_4H_3O_3+NH_4O$. The present pharmacopœial preparation nearly corresponds with Liquor Ammoniæ Acetatis, Lond. and Edin. ; it is about one-third stronger than the Dub., and only one-fifth the strength of Liquor Ammoniæ Acetatis, British Pharmacopœia, 1864.

ADULTERATIONS.—This solution seldom if ever contains any impurity; nevertheless tests may be 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 of the acids, the former by chloride of barium, the latter by nitrate of silver. The solution should be perfectly colourless. 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 the form of sixty grains 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℥ij. to f℥vj., repeated every fifth or sixth hour.

* *Diaphoretic Mixture.* (Liquor of acetate of ammonia, f℥ij.; simple syrup, f℥j.; orange flower water, f℥j.; camphor mixture, to 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.

LIQUOR AMMONIÆ CITRATIS. *Solution of Citrate of Ammonia.* (Citrate of Ammonia, $3NH_4O,C_{12}H_5O_{11}$(=243) or $\mathbf{3NH_4.C_6H_5O_7}$, (=243) dissolved in water.

PREPARATION.—Take of citric acid, three ounces; strong solution of ammonia, two fluid ounces and three quarters, or a sufficiency; distilled water, one pint. Dissolve the citric acid in the water, and add the solution of ammonia until the liquid is neutral to test papers.

EXPLANATION OF PROCESS.—When citric acid and strong solution of ammonia are brought into contact, the case resolves itself into one of simple chemical union, it being only necessary to bear in mind that citric acid being a tribasic acid, each atom of it will require three atoms of base for saturation, thus, $3NH_4O + C_{12}H_5O_{11} = 3NH_4O,C_{12}H_5O_{11}$.

PHYSICAL PROPERTIES.—A transparent, colourless, inodorous solution, of a mawkish alkaline taste.

CHEMICAL PROPERTIES.—It is a solution of neutral citrate of ammonia ($3NH_4O+C_{12}H_5O_{11}$) in water. This salt cannot be ob-

tained in a solid form, as on the application of heat a portion of the ammonia is at once driven off from its solution and an acid salt appears.

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 supersaturate this amount of sesquicarbonate will, of course, depend on its richness in citric acid, but may be stated to be on an average three ounces and a half. Dose of this mixture, one ounce every three hours.

DOSE AND MODE OF ADMINISTRATION.—f℥ij. to f℥ss. every third or fourth hour.

INCOMPATIBLES.—The acids; most salts; and alkalies and their carbonates.

ANTIMONII OXIDUM. *Oxide of Antimony.* SbO_3 (=146) or Sb_2O_3 (=292).

PREPARATION.—Take of solution of chloride of antimony, sixteen fluid ounces; carbonate of soda, six ounces; water, two gallons; distilled water, a sufficiency. Pour the antimonial solution into the water, mix thoroughly, let the precipitate settle, 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. Add now 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 242.)

PHYSICAL PROPERTIES.—A heavy white powder, sometimes semi-crystalline; inodorous, and perfectly tasteless when pure.

CHARACTERS AND TESTS.—A greyish-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. It dissolves entirely when boiled with an excess of the acid tartrate of potash.

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, not however subliming, 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. 242.

ADULTERATIONS.—Not liable to any; that it has been properly prepared is shown by the tests of the Pharmacopœia. Did it, on being fused, yield a sublimate, it would most probably be arsenious acid, recognizable by the tests already given, pp. 249–250; 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 it has been used as a diaphoretic in the same cases as James's 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. j. to gr. v.; 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 better still in the form of powder.

PREPARATIONS IN WHICH OXIDE OF ANTIMONY IS USED.—Antimonium Tartaratum; Pulvis Antimonialis, one part in three.

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 the ingredients of which it is composed are 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 which for years subsequently was adopted was 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 $\frac{1}{2}$ to $2\frac{1}{2}$ 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 powder, and of antimonial powder 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.

ANTIMONIUM NIGRUM. *Black Antimony.* Syn.: *Prepared Sulphuret of Antimony,* 1864. (Native sulphide of antimony, SbS_3 (=138) or Sb_2S_3, (=276) purified from siliceous matter by fusion, and afterwards reduced to fine powder.)

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.

CHEMICAL PROPERTIES.—It is composed of one equivalent of antimony and 3 of sulphur, (SbS_3), 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, $SbS_3 + 3HCl = SbCl_3 + 3SH$.

CHARACTERS AND TESTS.—A greyish-black crystalline powder. It dissolves almost entirely in boiling hydrochloric acid, evolving sulphuretted hydrogen.

ADULTERATIONS.—Although not liable to sophistication, 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 249), 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 the Pharmacopœia.

PREPARATIONS IN WHICH BLACK ANTIMONY IS USED.—Antimonium Sulphuratum, Liquor Antimonii Chloridi.

ANTIMONIUM SULPHURATUM. Syn.: *Antimonii Oxysulphuretum*, Lond. *Antimonii Sulphuretum Aureum*, Edin. *Antimonii Sulphuretum Præcipitatum*, Dub. (Sulphide of antimony, SbS_3 or $\mathbf{Sb_2S_3}$, with a small and variable amount of oxide of antimony, SbO_3 or $\mathbf{Sb_2O_3}$.)

PREPARATION.—Take of black antimony, ten ounces; solution of soda, four pints and a half; diluted sulphuric acid; distilled water, of each a sufficiency. Mix the black 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 diluted 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.

CHEMICAL PROPERTIES.—According to Wittstein its chemical composition is two of antimony and five 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, see p. 204; with the aid of heat it is nearly all dissolved by solutions of the alkalies.

CHARACTERS AND TESTS.—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. Boiled in water with acid tartrate of potash, the resulting solution is precipitated orange red with sulphuretted hydrogen. Sixty grains of this preparation, dissolved in hydrochloric acid and dropped into water, give a white precipitate, which, when washed and dried, weighs about fifty-three grains.

ADULTERATIONS.—This preparation often contains oxide of iron and sulphur, and is frequently coloured with Brazil-wood or red Saunder's-wood; all these impurities are readily detected by the pharmacopœial 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 Hydrargyri Subchloridi Composita. Compound Pill of Subchloride of Mercury. (Syn.: *Pilula Calomelanos Composita. Compound Pill of Calomel.*) (Take of subchloride of mercury, one ounce; sulphurated antimony, one ounce; guaiacum resin, in powder, two ounces; castor oil, one fluid ounce. Triturate the subchloride of mercury with the antimony, then add the guaiacum 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. *Antimonium Tartarizatum,* Edin. and Dub. *Emetic Tartar.* $KO,SbO_3,C_8H_4O_{10}+2HO$ (343) or $\mathbf{KSbC_4H_4O_7H_2O}$. (=343). (A tartrate of potash and antimony.)

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 acid 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 crystallise. 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, $C_8H_4O_{10}$). 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, $SbO_3 + HO,KO,C_8H_4O_{10} = HO + SbO_3KO,C_8H_4O_{10}$. 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 octahedrons with a rhombic base. It is inodorous, but in large quantities has a styptic, nauseous, metallic taste.

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 it yields *Antimoniuretted Hydrogen* (already described, p. 250).

CHARACTERS AND TESTS.—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, soluble in excess, and which is not formed if tartaric acid be previously added. 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 impu-

rities 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 contraindicated in diseases attended with gastric irritation. The best antidotes in cases of poisoning by tartar emetic are tannic acid and preparations containing it, subsequently followed up by appropriate antiphlogistic remedies. (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 has been used as a substitute for James's powder:—Tartar emetic, gr. j.; sulphate of potash, in fine powder, gr. xx.; mix. Dose, gr. ij. to gr. iij. every hour.

PREPARATIONS.—Unguentum Antimonii Tartarati, one part in five; Vinum Antimoniale, two grains in one fluid ounce.

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. x. to min. xx., 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 vege-

tables 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.*

DULCAMARA. *Dulcamara.* (Syn.: *Bitter-sweet, woody Nightshade.*) (The dried young branches of Solanum Dulcamara, *Linn.* Bitter-sweet. *Woodv. Med. Bot.* plate 33. 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.—Stem shrubby at the base, with climbing or straggling branches; leaves petiolate, ovate or ovate-lanceolate, cordate at the base, upper ones auricled, hastate; flowers in loose cymes on lateral peduncles, shorter than the leaves, small, blue; calyx of 5 sepals; corolla rotate, 5-lobed; anthers nearly sessile, closed in an erect cone round the style, opening by pores; ovary 2-celled with axile placentæ; fruit a *nuculanium* or *uva* (often misnamed a berry); seeds numerous.

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 which are 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 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

* Although strictly speaking chemically incompatible with the preparations of cinchona, Dr. Robert 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.

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. *Guaiacum Wood.* (The wood of Guaiacum officinale, *Linn.* ; *Steph. and Church. Med. Bot.* plate 90. (Syn.: *Lignum Vitæ.*) Imported from St. Domingo and Jamaica, and reduced by the turning lathe to the form of a coarse powder or small chips.)

GUAIACI RESINA. *Guaiacum Resin.* (The resin of Guaiacum officinale, *Linn.* 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 opposite, evergreen, abruptly pinnate; leaflets 2-4 pairs, obovate, entire, glabrous, and shining ; flowers, pale-blue, in clusters in the axillæ of the upper leaves ; calyx 5-partite, obtuse ; corolla of 5 petals ; stamens 10 ; ovary compressed, by abortion 2-celled, style short ; 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.

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. 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 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 raw potato a blue colour is produced on exposure to the air. Guaiacum resin is fused by heat. According to M. Deville its composition is $C_{12}H_8O_6$.

CHARACTERS OF THE RESIN.—In large masses of a brownish or greenish-brown colour; fractured surface resinous, translucent at the edges. A solution in rectified spirit strikes a clear blue colour when applied to the inner surface of a paring of raw potato.

ADULTERATIONS.—Various resinous substances are frequently mixed with, or substituted for guaiacum 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 inflammation 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 275.)

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, one quarter of an ounce to one pint.

PREPARATIONS OF THE RESIN.—Mistura Guaiaci, eleven grains in one fluid ounce; Pilula Hydrargyri Subchloridi Composita, one part in two and a half (see p. 275); Tinctura Guaiaci Ammoniata, eighty-eight grains in one fluid ounce.

Mistura Guaiaci. Guaiacum Mixture. (Take of guaiacum resin, in powder, half an ounce; sugar, half an ounce; gum Acacia, powdered, a quarter of an ounce; cinnamon water, one pint. Triturate the guaiacum 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 Guaiacum. (Take of guaiacum resin, in powder, four ounces; aromatic spirit of ammonia, a sufficiency. Macerate the guaiacum in fifteen fluid ounces of the aromatic spirit of ammonia for seven days in a well-closed vessel with occasional agitation, 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.* (Guaiacum turnings, ℥iij.; sassafras, rasped, ℥j.; liquorice root, bruised, ℥j.; raisins, ℥ij.; water, Oviij.; boil the guaiacum 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 guaiacum, 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.

MEZEREI CORTEX. *Mazereon Bark.* (The dried bark of Daphne Mezereum, *Linn.*, Mezereon; *Steph. and Church. Med. Bot.* plate 65. Or of Daphne Laureola, *Linn.*, Spurge Laurel; *Eng. Bot.* vol. ii. plate 119.) 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; perianth single, tube hairy, limb 4-fid; stamens 8, inserted on the tube of the perianth; 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 seems to have been removed as well from the branches as from the roots. Now apparently the Pharmacopœia permits 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. ; boiled down to f℥xx., and strain.) This decoction has been omitted from the Pharmacopœia.

PREPARATIONS.—Decoctum Sarsæ Compositum, sixty grains to one pint (see p. 288) ; Extractum Mezerei Æthereum (see *Epispastics*).

POTASSÆ CITRAS. *Citrate of Potash.* $3KO,C_{12}H_5O_{11}(=306)$, or $\mathbf{K_3C_6H_5O_7}(=306)$.

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 act being *tribasic*) ; its carbonic acid escapes, and citrate of potash is held in the solution, from which by crystallization it can be recovered ; thus $3KOCO_2 + C_{12}H_5O_{11} = 3KO,C_{12}H_5O_{11} + 3CO_2$.

CHARACTERS AND TESTS.—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 perchloride of platinum. 102 grains heated to redness till gases cease to be evolved leave an alkaline residue, which requires for exact neutralization 1000 grain-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 the action of the mineral on the vegetable acid (see pp. 92, 194). The solution resulting on the addition of chloride of calcium contains citrate 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 (see p. 27.) 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 may administer 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 COMPOSITUS. *Powder of Ipecacuan and Opium.* (Syn.: *Pulvis Ipecacuanhæ cum Opio*, 1864. *Dover's Powder.*)

PREPARATION.—Take of ipecacuanha, in powder, half an ounce; opium, in powder, half an ounce; sulphate of potash, four ounces; mix them thoroughly, pass the powder through a fine sieve and finally rub it lightly in a mortar. 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, in virtue of its extreme hardness, of triturating and intimately mixing together the other two ingredients. Sugar of milk being more agreeable to the taste would equally well discharge this duty, 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. Prout speaks highly of its value in diabetes, in which opinion I fully coincide; in calculous diseases it frequently proves of great service; Graves pointed out its value in checking the profuse perspirations of hectic, a few grains given at bedtime frequently succeeding when other remedies have failed. The treatment appears strange, and it is difficult to account for its modus operandi, but the fact remains, as I myself have had occasion to observe.

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

PREPARATION.—Pilula Ipecacuanhæ cum Scilla, three parts in seven.

SARSÆ RADIX. *Jamaica Sarsaparilla.* (The dried root of Smilax officinalis, *Humb. and Bonpl.* Native of Central America, imported from Jamaica.) It has been lately 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; leaves ovate-oblong, acute, cordiform, 5-7 nerved, coriaceous, smooth, and furnished with stipular tendrils; 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 numerous 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 that of 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 it was formerly 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 sasaparillas; 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 given 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 as an alterative in various forms of cachectic complaints, such as chronic rheumatism, abscesses, &c., has been highly praised by numerous practitioners. In the first and second editions of this work Neligan 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.

PREPARATIONS.—Decoctum Sarsæ, two ounces and a half to one pint; Decoctum Sarsæ Compositum, two ounces and a half to

one pint; Extractum Sarsæ Liquidum, one pound to eight fluid ounces.

Decoctum Sarsæ. Decoction of Sarsaparilla. (Take of Jamaica sarsaparilla, cut transversely, two ounces and a half; boiling distilled water, one and a half pint. Digest the sarsaparilla in the water for an hour, then boil for ten minutes in a covered vessel, cool and strain, pouring distilled water if required over the contents of the strainer, or otherwise making the strained product measure a pint.) *Dose,* 2 to 10 fluid ounces, three times a day.

Decoctum Sarsæ Compositum. Compound Decoction of Sarsaparilla. (Take of Jamaica sarsaparilla, cut transversely, two and a half ounces; sassafras root in chips, guaiacum wood turnings, fresh liquorice root bruised, each a quarter of an ounce; mezereon bark sixty grains; boiling distilled water, one and a half pint. Digest the solid ingredients in the water for an hour, then boil for ten minutes in a covered vessel; cool and strain, pouring distilled water, if required, over the contents of the strainer, or otherwise making the strained product measure a pint.) *Dose,* 2 to 10 fluid ounces three times a day. The old *Decoction of Sweet Woods.*

Extractum Sarsæ Liquidum. Liquid Extract of Sarsaparilla. (Take of Jamaica sarsaparilla, cut transversely, one pound; distilled water, at 160°, fourteen pints; rectified spirit, one fluid ounce. Digest 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 of this extract should be about 1·095. It is employed 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. cccl x.; 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 RADIX. *Sassafras Root.* (The dried root of Sassafras officinale, *Nees*; *Laurineæ, Woodv. Med. Bot.* plate 31 *(Laurus Sassafras).* 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, alternate leaves, petiolate, varying in form and size, but often three-lobed, smooth above, downy beneath; flowers, dicœcious, yellow, appearing before the leaves; perianth 6-partite, membranous, segments equal; male flowers with 9 stamens in three whorls, the inner whorl furnished with double stalked glands at the base; female flowers with as many sterile stamens as the male; fruit succulent, of a rich blue colour, surrounded by the torn unchanged calyx.

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 $1\frac{1}{2}$ 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 analyzed 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, a quarter of an ounce to one pint (see p. 288).

CHAPTER VII.

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 more 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, when introduced into the stomach, the watery particles of the blood are removed, partly by diuresis resulting on their action upon the kidneys, dependent on the partial imbibition of the denser by the thinner fluid, partly by purgation, resulting on the passage of the thinner to dilute the denser 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.

SPIRITUS ÆTHERIS NITROSI. *Spirit of Nitrous Ether.* Syn.: *Spiritus Ætheris Nitrici, Lond., Edin. Sweet Spirits of Nitre.* (A spirituous solution containing nitrous ether, C_4H_5O,NO_3 (=75) or $\mathbf{C_2H_5NO_2}$ (=75).

PREPARATION.—Take of nitric acid, three fluid ounces; sulphuric acid, two fluid ounces; copper, in fine wire, (about No. 25) two ounces; rectified spirit, a sufficiency. To one pint of the spirit add gradually the sulphuric acid, stirring them together; then add, in the same way, two and a half fluid ounces of the nitric acid. Put the mixture into a retort or other suitable apparatus, into which the copper has been introduced, and to which a thermometer is fitted. Attach now an efficient condenser, and applying a gentle heat, let the spirit distil at a temperature commencing at 170° and rising to 175°, but not exceeding 180°, until twelve fluid ounces have passed over and been collected in a bottle kept cool, if necessary, with ice-cold water; then withdraw the heat, and having allowed the contents of the retort to cool, introduce the remaining half ounce of nitric acid, and resume the distillation as before, until the distilled product has been increased to 15 fluid ounces. Mix this with two pints of the rectified spirit or as much as will make the product correspond to the tests of specific gravity and percentage of ether separated by chloride of calcium. Preserve it in well-closed vessels.

EXPLANATION OF PROCESS.—Various formulæ at different times have been suggested for obtaining this preparation, which as a domestic remedy has a very large consumption indeed. Originally suggested by Raymond Lully, it subsequently was brought into prominent notice by Basil Valentine, and from that time to the present has enjoyed great popularity; previous to the appearance of the British Pharmacopœia, 1864, it was prepared by the action of nitric acid upon rectified spirit, and as the result of the reactions that ensued, nitrous ether, together with some spirit, was first distilled over, and this was subsequently reduced to the strength of sweet spirits of nitre by the addition of rectified spirit. So prepared, the sweet spirit of nitre was a most varying compound, in many instances not containing a trace of nitrous ether; to remedy which condition of affairs a process was introduced into the British Pharmacopœia, 1864, to procure it by the action of sulphuric acid upon rectified spirit and nitrite of soda, in virtue of which ether would be developed from the spirit (see *Ether*) and nitrous acid (NO_3) from the nitrite of soda, and the two distilling over along with some of the spirit unacted upon would constitute sweet spirit of nitre. From many causes, but especially in consequence of the difficulty experienced in getting in commerce nitrite of soda of sufficiently good quality, this process never gave satisfaction, and now we have in the Pharmacopœia the present process, which was originally suggested by Mr. Redwood, and which to a certain extent is founded upon that of Kopp. By the action of the nitric acid upon the alcohol contained in the rectified spirit it is converted into ether, and the nitric acid into nitrous acid, thus, $2C_4H_6O_2+NO_5=2C_4H_5O+NO_3+2HO$. By the action of another portion of the nitric acid upon the copper we have two atoms of oxide of copper formed and more nitrous acid, thus, $2Cu+NO_5=2CuO+NO_3$. The nitrous acid and ether distil over together as nitrous ether, and the oxide of copper is converted into sulphate of copper by the sulphuric acid. Towards the close of the process it becomes necessary to add an additional quantity of nitric acid, as by the quantity at first employed all the materials are not disposed of. The great objects aimed at in this process are efficiency and economy.

CHEMICAL PROPERTIES.—This preparation is a mixture of nitrous ether and rectified spirit 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.

CHARACTERS AND TESTS.—Transparent and nearly colourless, with a very slight tinge of yellow, mobile, inflammable, of a peculiar penetrating apple-like odour, and sweetish cooling sharp taste. Specific gravity, 0·845. It effervesces feebly or not at all, when shaken with a little bicarbonate of soda. When agitated with solution of sulphate of iron and a few drops of sulphuric acid it becomes deep olive-brown or black. If it be agitated with twice its volume of saturated solution of chloride of calcium in a closed tube, two per cent. of its original volume will separate in the form of nitrous ether and rise to the surface of the mixture.

ADULTERATIONS.—Spirit of nitrous ether often contains free nitrous acid, frequently from originally being badly prepared, and possibly 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 colour 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 carbonated alkali we recognize any free acid; and by the chloride of calcium we estimate the amount of nitrous ether present in any sample. The two per cent. required by the pharmacopœial authorities to be yielded by the officinal preparation, indicates that ten per cent. of nitrous ether is present in the sample examined, inasmuch as eight per cent. will always remain unseparated. 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. 112.

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 nitrous 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. every second or third hour ; it is best given in water or in camphor mixture.

* *Diuretic Potion*, SWEDIAUR. (Spirit of nitrous 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. to ℥j. two or three times a day in water.

INCOMPATIBLES.—Sulphate of iron ; alkaline and earthy carbonates ; and tincture of guaiacum.

BUCHU FOLIA. *Buchu Leaves.* (The dried leaves of, 1. Barosma betulina, *Bartling. Berg u. Schmidt, Off. Gewächse, plate* 1. *f.*— 2. Barosma crenulata, *Hooker. Bot. Mag.* vol. lxii. plate 3413— 3. Barosma serratifolia, *Willd. Enum. Bot. Mag. (Diosma serratifolia)*, vol. xiii. plate 456. 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; calyx 5-parted, enclosing at its base a disk with a short rim ; petals, 5 ; stamens, 10, the outer 5 are opposite, the petals barren and petaloid, the inner 5 are longer and subulate ; style as long as the petals ; stigma 5-lobed ; fruit of 5 cocci, covered with glandular dots at the back ; all the species have a heavy odour, and are distinguished chiefly by differences in the characters of the leaves, colour of the flowers, &c.

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.

PREPARATIONS.—Infusum Buchu, one ounce to one pint; Tinctura Buchu, two ounces and a half to one pint.

Infusum Buchu. Infusion of Buchu. (Take of buchu leaves, bruised, half an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) Dose, one to four fluid ounces three or four times daily.

Tinctura Buchu. Tincture of Buchu. (Take of buchu leaves, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the buchu for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, one to two fluid drachms three or four times daily in any suitable menstruum.

INCOMPATIBLES.—The sesquisalts of iron ; and the astringent vegetables.

CAMBOGIA. The diuretic properties of gamboge have been incidentally noticed at page 159 ; and a formula given for its administration; it is not, however, used in this country as a diuretic, although recognized as an excellent purgative in dropsical cases, and when given with that intention I have found it promote the operation of diuretic medicines.

CANTHARIS. *Cantharides.* (Cantharis vesicatoria, *De Geer, Hist. des Insectes.* (Syn.: *Meloë vesicatorius, Lytta Vesicatoria, Blistering Beetle, Spanish Flies.*) The Beetle, dried; collected chiefly in Hungary.) These belong to the class *Insecta*, and to the order *Coleoptera.*

NATURAL HISTORY.—The cantharis vesicatoria, or blistering beetle, 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 insect 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 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.

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, ad-

vantage 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.

CHARACTERS AND TESTS.—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. 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. 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.

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.—Acetum Cantharidis, two ounces to one pint; Charta Epispastica; Emplastrum Calefaciens, one part in twenty-four, nearly; Emplastrum Cantharidis, one part in three; Liquor Epispasticus, one ounce to two and a half fluid ounces; Unguentum Cantharidis, one part to seven, nearly (for all these preparations see *Epispastics*); Tinctura Cantharidis, five and a half grains to one fluid ounce.

Tinctura Cantharidis. Tincture of Cantharides. (Take of cantharides, in coarse powder, a quarter of an ounce; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation, strain, press, filter, 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.

DIGITALIS FOLIA. *Digitalis Leaf.* (The dried leaf of digitalis purpurea, *Linn.* Purple Foxglove. *Woodv. Med. Bot.* plate 24. Collected from wild indigenous plants, 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.—Root biennial, sometimes becoming perennial; flowering-stem erect, three to four feet high, with a purplish hue; leaves large, veiny, ovate-lanceolate, crenate, downy, purplish on their under surface; flowers numerous, purple, spotted within, drooping, in very long spikes; calyx 5-partite, four of the segments are broad and leafy, the fifth (upper one) is narrow and more acute; corolla campanulate, inflated beneath, *limb* somewhat bilabiate, upper lip scarcely divided, lower lip with ovate, rounded segments; stamens 4, didynamous, inserted on the corolla; capsule ovate, 2-celled, many-seeded, 2-valved, septicidal.

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 sesquisalts of iron produce a dark, and solution of gelatine 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 long 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.

PREPARATIONS.—Digitalinum, see *Sedatives;* Infusum Digitalis, three grains in one fluid ounce; Tinctura Digitalis, fifty-four grains and a half to one fluid ounce.

Infusum Digitalis. Infusion of Digitalis. (Take of digitalis leaves, 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 leaves in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the digitalis for forty-eight hours with fifteen ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit; afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient 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. *Oil of Juniper.* (The oil distilled in Britain from the unripe fruit of Juniperus communis, *Linn. Woodv. Med. Bot.*, plate 95. *Common Juniper.* Indigenous; belonging to the Natural family *Coniferæ* (*Pinaceæ*, Lindley), and to the Linnæan class and order *Diœcia Polyandria.* Formerly the fruit *(fructus baccæ)*, and the tops *(cacumina)* were officinal.

BOTANICAL CHARACTERS.—A bushy shrub from two to eight feet high, evergreen, usually diœcious; leaves, 3 in each whorl, linear, keeled, mucronate; flowers in cones, appearing in May, axillary, small; fruit, a fleshy cone *(galbulus)*, often misnamed a berry, 3-seeded, requiring two seasons to arrive at maturity.

PREPARATION.—The tops are cut in spring before the plant flowers, and the fruit is 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 Hamburg, 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 either colourless or of a very pale-greenish yellow. It has the peculiar odour and taste of the fruit 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 fruit contains besides, resin, sugar, gum, wax and some salts of lime. The tops and fruit 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 fruit is best prescribed in the form of infusion. The tops are at present scarcely ever employed.

*Oleum Juniperi. Oil of Juniper.** This oil is generally colourless, or of a pale greenish yellow, of a sweetish odour, and warm aromatic taste. Dose, min. iij. to min. v., rubbed up with mucilage and sugar, for the purpose of suspending it in some aromatic water, and constituting what is termed an oleo-saccharum, or dissolved in spirit. It is to the presence of this oil that the spirit called *Geneva*

* 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

or *Hollands* owes its peculiar flavour, and the diuretic properties it possesses. The addition of it to diuretic pill masses is frequently attended with marked advantage, seemingly developing their diuretic properties, and directing, as it were, their action to the kidneys (see p. 301).

Spiritus Juniperi. Spirit of Juniper. (Take of English oil of juniper, one fluid ounce; rectified spirit, forty-nine fluid ounces; dissolve.) This spirit is but one-fifth the strength of the Spiritus Juniperi, *British Pharmacopœia*, 1864. It is a powerful diuretic, introduced into the pharmacopœias as a substitute for *Geneva*. Dose, min. xx. to f℥j. Generally used as an adjunct to stimulating diuretic mixtures.

* *Infusum Juniperi.* (Take of juniper fruit, bruised, one ounce; boiling water, half a pint, infuse for one 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.

PAREIRÆ RADIX. *Pareira Root.* (The dried root of Cissampelos Pareira, *Linn. Woodv. Med. Bot.*, plate 82. 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.—A climbing shrub, diœcious, with a

---

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 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."

woody branching root; leaves peltate, subcordate, smooth above, 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), ℥ss. to ℥j.

PREPARATIONS.—Decoctum Pareiræ, one ounce and a half to one pint; Extractum Pareiræ; Extractum Pareiræ Liquidum, one ounce to one fluid ounce.

Decoctum Pareiræ. Decoction of Pareira. (Take of pareira root, sliced, one ounce and a half; distilled water, one pint. Boil for fifteen minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) Dose, f℥ij. to f℥iv. thrice a day. This is a good form for administering pareira; it may with advantage be fortified by the addition of some of the liquid extract.

Extractum Pareiræ. Extract of Pareira. (Take of pareira root, in coarse powder, one pound; boiling distilled water, one gallon, or a sufficiency. Digest the pareira with a pint of the water for twenty-four hours, then pack in a percolator, and, adding more of the water, allow the liquor slowly to pass until a gallon has been collected, or the pareira is exhausted. Evaporate the liquor by

a water-bath until the extract has acquired a suitable consistence for forming pills.) Dose, ten to thirty grains; rarely given in the pilular form; generally rubbed up with the decoction to fortify it.

Extractum Pareiræ Liquidum. Liquid Extract of Pareira. (Take of pareira root, in coarse powder, one pound; boiling distilled water, one gallon, or a sufficiency; rectified spirit, three fluid ounces. Digest the pareira with a pint of the water for twenty-four hours, then pack in a percolator, and adding more of the water, allow the liquor slowly to pass until a gallon has been collected, or 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, f3j. to f3ij. This is a valuable preparation. It is advantageously ordered as an addition to the decoction.

INCOMPATIBLES.—The sesquisalts of iron; the acetate of lead; and tincture of iodine.

POTASSÆ ACETAS. *Acetate of Potash* (described p. 191 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 was very highly recommended for the treatment of psoriasis, lepra, and eczema, by the late 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 p. 195 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 acid tartrate 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 acid tartrate of potash 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) or $\mathbf{KNO_3}$ (=101.) (Nitrate of potash of commerce, purified, if necessary, by crystallisation from solution in distilled water.)

PREPARATION.—Nitrate of potash is an article of commerce; 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.

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 AND TESTS.—In white crystalline masses or fragments of 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 wire it evolves ruddy fumes. Its solution, acidulated with hydrochloric acid, gives a yellow precipitate with perchloride of platinum. Its solution is not affected by chloride of barium or nitrate of silver.

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 fumes produced when sulphuric acid and copper wire are added to it, 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 237). The yellow precipitate with perchloride of platinum proves it to be a salt of potash (see p. 27). 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.

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 (as the case may be either sulphate of baryta or chloride of silver) in a solution of the salt in distilled water.

THERAPEUTICAL EFFECTS.—In large doses, from ℥j. to ℥ij., 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. (Syn.: *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, which are shortly petiolate, coriaceous, serrate, 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 affec-

tions. 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.* (The sliced and dried bulb of Urginea Scilla, *Steinheil. Woodv. Med. Bot. (Scilla maritima)* plate 118. From the Mediterranean coasts.) Squill, or the *Sea Onion*, a name by which it is popularly known, is 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, twelve to eighteen inches long; perianth of six divisions, coloured and spreading; stamens 6, shorter than the perianth; ovary 3-parted, glandular and melliferous at the apex; style smooth, simple; stigma 3-lobed; capsule 3-cornered, 3-celled; seeds numerous, flattened, with a membranous testa.

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, unless thoroughly dried and carefully preserved, 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 ten 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 pulverisable 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 or whitish papery membranes; internally it is composed of thick, fleshy, concentric scales, of a pale rose-colour. Two varieties of this drug are found in commerce, the one white, the other of a reddish colour. In England the white kind, obtained

from Malta, is considered to be the best. In France the red variety is generally used, being imported into that country from Spain. In Austria the red variety is employed in the recent state, obtained from Apulia; but the dried scales and the powder are made from the white. It has generally been considered doubtful whether these varieties of squill both come from the *Urginea scilla* of Steinheil, or are derived from different plants. Schroff is of opinion that they belong to the same plant. He found the white variety growing on the Acropolis at Corinth, 800 feet above the sea-level. The bulb differed slightly in form from that of the red kind, being more flattened and not so pear-shaped, but there was no doubt that it belonged to the *Urginea scilla*. Schroff thinks that the differences in colour depend on variations in the conditions under which the plant grows, the white form occurring especially in elevated situations, at a distance from the sea, and when the plant is exposed to sunshine and the bulb is not deeply imbedded in the soil. It had been supposed that the white variety might be derived from the innermost scales of the ordinary red bulb, these losing their colour during the process of drying. He shows, however, that this opinion is without foundation. On the contrary, a kind of dried squill, which is sold in Vienna as derived from the *red* variety, and is of a dirty white colour, belongs really to the white variety. It contains none of the cells filled with red pigment which are found in the true red squill. 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. 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. The well-known acridity of squills, so remarkable in the fresh root, is probably due to the raphides which are so abundant in this plant, and which have very fine points. For, if the juice be filtered, it no longer causes any irritation, although no constituent is removed except the crystals. On the other hand, if the fresh juice be washed with water until it is perfectly tasteless, it will deposit a number of these crystals, and by them the same irritation of the skin may be produced as by the fresh juice itself. It is said that the acrid principle is dissipated by drying the bulb. But if the dried scales are softened with water and rubbed over the surface of the skin, they give rise to just the same effects as when the recent juice is brought into contact

with the same part. The crystals are found by Schroff to be composed of oxalate of lime, and not of the citrate or tartrate, as had been asserted. 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 gelatine, 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. Schroff's experiments confirm the general opinion that squill acts especially on the urinary and on the respiratory organs. The kidneys were found engorged, and the urine was increased in quantity, or even contained blood. The more abundant the acrid principle in the extract, the more were the lungs found to be affected. He thinks that the medicines of which the action approaches nearest to that of squill are colchicum and helleborus. He says that it does not exhibit that specific action on the heart which belongs to digitalis. Concerning this point, however, Drs. Fagge and Stevenson both state that the *Scilla maritima* produces effects in the frog which are undistinguishable from those of digitaline. As a diuretic 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. There has been much difference of opinion whether the outer or the inner scales of the bulb should be preferred for medicinal purposes. Schroff has made a series of experiments on rabbits which lead to the conclusion that the activity of the scales increases from the centre outwards, those close to the axis being entirely devoid of acridity, and in fact quite inert. It had been supposed that the outermost dry scales are valueless. But Schroff shows that, although they yield but a small quantity of extract, this is more powerful than that derived from any other part of the bulb. All these differences, however, are less marked in the white variety of the drug. With reference to the relative value of the two kinds, he finds that the red is greatly more active. It yields a considerably larger quantity of extract both with alcohol and with water. In all cases a greater amount of alcoholic than of aqueous extract is obtained from the squill. Schroff advises that the outer two-thirds of the scales should be used in making extracts of squill, those belonging to the inner third of the bulb being rejected. (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.—Acetum Scillæ, two ounces and a half to one pint, nearly; Oxymel Scillæ (see *Emetics*); Pilula Ipecacuanhæ cum Scilla, one part in seven (see *Expectorants*); Pilula Scillæ Composita, one ounce and a quarter to six ounces, nearly (see *Expectorants*); Syrupus Scillæ (see *Emetics*); Tinctura Scillæ, two ounces and a half to one pint.

Acetum Scillæ. Vinegar of Squill. Take of Squill, bruised, two ounces and a half; Diluted Acetic Acid, one pint; Proof Spirit, one fluid ounce and a half. Macerate the squill in the acetic acid for seven days, then strain with expression, add the spirit to the strained liquor, and filter.) Dose, f3ss. to f3j. in some aromatic or distilled water, or in combination with some of our vegetable diuretic remedies. This, in my opinion, is the best form for securing the *diuretic* effects of squill. It is used in the preparation of the oxymel and syrup of squill.

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 in fifteen ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards 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. to min. xxx. An excellent addition to infusion of digitalis or decoction of broom-tops.

INCOMPATIBLES.—The alkalies; and the sesquisalts of iron.

SCOPARII CACUMINA. *Broom Tops.* (The fresh and dried tops of Sarothamnus Scoparius, *Wimmer.* *(Spartium Scoparium.)* Plate 89, *Woodv. Med. Bot.* From indigenous plants.) 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, smooth, prominently angled green branches; leaves ternate, stalked, upper ones sessile and often simple; leaflets obovato-oblong; flowers single or in pairs, in the axils of the old leaves, forming handsome racemes, large, and of a bright yellow colour; calyx 2-lipped, upper lip with 2, the lower lip with 3 small teeth; corolla papilionaceous; vexillum large, broadly ovate, keel obtuse; stamens monadelphous, tube split above; style very long and spirally incurved; legume flat, 1½ to 2 inches long, hairy along the margin only; seeds numerous, attached to a line within the edge of the pod.

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 two peculiar substances, one volatile, the other fixed; the volatile base he has called *Spartein*, and states that it seems to possess narcotic properties; the fixed principle is 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 diuretic 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, and each year's experience inclines me still more to entertain this opinion. The officinal preparations also are very generally employed as vehicles for other 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. I, however, have been so satisfied with the preparation hereafter described that I have not used scoparin, and, consequently, cannot speak of it from personal experience.

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, one ounce ; distilled water, one pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) Dose, two to four fluid ounces.

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 in a cool place.) A most valuable preparation, greatly to be depended upon, inasmuch as we have the broom tops directed to be used in the state of greatest efficiency. Dose, one to two fluid drachms.

SODÆ ACETAS. *Acetate of Soda.* $NaO,C_4H_3O_3+6HO$ (=136) or $\mathbf{NaC_2H_3O_2.3H_2O}$ (=136).

PREPARATION.—Take of crystallized carbonate of soda of com-

merce, 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 the 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.

CHARACTERS AND TESTS.—In transparent colourless crystals, soluble in water, forming a solution neutral to test paper. The solution 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° 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 only mentioned in the Pharmacopœia with a view to its pharmaceutical employment, its dose even not being mentioned.

DOSE, MODE OF ADMINISTRATION, AND INCOMPATIBLES.—Same as those of acetate of potash.

PREPARATIONS IN WHICH ACETATE OF SODA IS USED.—Ferri Arsenias; Ferri Phosphas ; Syrupus Ferri Phosphatis.

SODÆ BIBORAS. *Borax* (described p. 142 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.* (The turpentine obtained by incision from the stem of Abies balsamea, *Aiton*,

Hort. Kew. Balm of Gilead Fir. *Lambert, Pinus* (*Pinus balsamea*), plate 31. From Canada.) 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; monœcious; stem about forty feet high; leaves solitary, flat, emarginate, subpectinate, suberect 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, or 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.

PREPARATIONS.—Charta Epispastica, and Collodium Flexile.

TEREBINTHINÆ OLEUM. *Oil of Turpentine* (described p. 61 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, whether by mouth or rectum, in small doses *insufficiently suspended*, 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 be any tendency to inflammatory action. It is frequently employed with much benefit in gleet, 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 Archipelago, and of Syria; it belongs to the Natural family *Anacardiaceæ*, and to the Linnæan class and order *Diœcia Pentandria.*

BOTANICAL CHARACTERS.—Stem thirty to thirty-five feet high; leaves imparipinnate, leaflets about 7, ovato-lanceolate, rounded at the base, acute, mucronate; young leaves reddish—old ones dark green; flowers diœcious, apetalous, in compound amentaceous 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 a 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, Strasburg 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.* $C_2H_4N_2O_2=60$.

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 is 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 = $C_2H_4N_2O_2$, = 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 nitrogen and 2 of oxygen, ($C_2H_4N_2O_2$). 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.

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 carbonate 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 for the practitioner, unless familiar with its use, to prefer to it some one or other of the emetics hereafter described.

Ammoniæ Carbonas. *Carbonate of Ammonia* (described p. 8. 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 brochitis 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. (See, also, *Antacids* and *General Stimulants*.)

ANTIMONIUM TARTARATUM. *Tartar Emetic* (described p. 275, in the division *Diaphoretics*), administered in doses of one or two 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 has been recommended 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 nowadays superseded by that of anæsthetic agents. 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. 277). 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 *Diaphoretics*, *Epispastics*, *Expectorants*, and *Sedatives*.)

CUPRI SULPHAS. *Sulphate of Copper* (described, p. 104, 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. (See also *Caustics* and *Tonics*.)

IPECACUANHA. *Ipecacuanha.* (The dried root of Cephaëlis Ipecacuanha, *DC.; Steph. and Church. Med. Bot.* plate 62. 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, annulated, generally simple, flexuous, from 4–6 inches long, and about as thick as a small goose-quill; stem shrubby, ascending, 2 to 3 feet long, emitting runners; leaves opposite, ovato-lanceolate, 4 to 8, placed at the end of the stem and branches; stipules interpetiolar, membranous at the base and cleft into setaceous segments; flowers white, in terminal, pendulous heads, involucre 1-leafed, spreading, deeply divided into from 4 to 6 obovate segments; fruit a fleshy black berry, 2-celled, 2-seeded.

PREPARATION.—The roots are gathered at all seasons of the year, cut from the stems, dried in the sun, and packed in small 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. Ipecacuanha 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 *ipecacuanhic 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 ipecacuanha roots are frequently substituted for the true root, especially on the Continent, 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 ipecacuanha 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, produc-

ing 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. R.—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 much depression of 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.

PREPARATIONS.—Pilula Conii Composita, (see *Sedatives*) one part in six; Pilula Ipecacuanhæ cum Scilla, one part in sixteen and a half, nearly; Pulvis Ipecacuanhæ Compositus, one part in ten, (see p. 284); Trochisci Ipecacuanhæ, a quarter of a grain in each lozenge; Trochisci Morphiæ et Ipecacuanhæ, one-twelfth of a grain in each lozenge; Vinum Ipecacuanhæ, twenty-two grains to one fluid ounce.

Pilula Conii Composita. Compound Pill of Hemlock. (Take of extract of hemlock, two ounces and a half; ipecacuanha, in powder, half an ounce; treacle a sufficiency.) Mix the extract of hemlock and ipecacuanha, and add sufficient treacle to form a pill-mass. Dose, 5 to 10 grains.

Pilula Ipecacuanhæ cum Scilla. Pill of Ipecacuanha with Squill. (Take of compound powder of ipecacuanha, three ounces; squill, in powder, ammoniacum, in powder, of each one ounce; treacle a sufficiency. Mix the powders and beat into a mass with the treacle.) Dose, 5 to 10 grains.

Trochisci Ipecacuanhæ. Ipecacuanha Lozenges. (Take of ipecacuanha, in powder, one hundred and eighty grains; refined sugar, in powder, twenty-five ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; distilled water, one fluid ounce, or a sufficiency. Mix the powders and add the mucilage and water to form a proper mass. Divide into 720 lozenges and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains a quarter of a grain of ipecacuanha. Dose, 1 to 3 lozenges.

Trochisci Morphiæ et Ipecacuanhæ. Morphia and Ipecacuanha Lozenges. (Take of hydrochlorate of morphia, twenty grains; ipecacuanha, in fine powder, sixty grains; tincture of tolu, half a fluid ounce; refined sugar, in powder, twenty-four ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, a sufficiency; distilled water, half a fluid ounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with two fluid ounces of the mucilage; then add the ipecacuanha, gum, and sugar, previously mixed, and more mucilage if necessary, to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia, and one-twelfth of a grain of ipecacuanha. Dose, 1 to 6 lozenges.

Vinum Ipecacuanhæ. Wine of Ipecacuanha. (Take of ipecacuanha, bruised, one ounce; sherry, one pint. Macerate for seven days with occasional agitation, strain, press, and filter; then add sufficient sherry to make one pint.) As an emetic, very generally employed for children, in doses of from min. xx. to f℥j.; seldom for adults; for them its dose would be from f℥ij. to f℥iv. By long keeping it throws down a deposit, which formerly was considered to be inert, but which in reality is a mixture of crystals of cream of tartar, yielded by the wine employed in its manufacture, and of a granular mass, ipecacuanhate of emetina.

* *Syrupus Ipecacuanhæ.* (Ipecacuanha in coarse powder, ℥iv.; rectified spirit, Oj.; proof spirit, and water, of each, f℥xiv.; syrup, Ovij.; digest the ipecacuanha 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, p. 308, 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 preparations of squill usually employed as emetics are the following:—

Oxymel Scillæ. Oxymel of Squill. (Take of vinegar of squill, one pint; clarified honey, two pounds. Mix and evaporate by a water-bath until the product when cold shall have a specific gravity 1·32.) Dose, as an emetic for adults, a half to one fluid ounce.

Syrupus Scillæ. Syrup of Squill. (Take of vinegar of squill, one pint; refined sugar, two pounds and a half. Dissolve with the aid of heat.) Dose, as an emetic for adults, a half to one fluid ounce. Dose, as an emetic for children, f℥j. every quarter of an hour until vomiting is produced.

* *Syrupus Scillæ Compositus*, UNITED STATES PHARMACOPŒIA. (Squill, bruised; senega, bruised, of each, ℥iv.; tartar emetic, gr. xlviij.; water, Oiv.; sugar, ℔ijss.; 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, as an emetic for adults, f℥ij. to f℥ss.; for children, f℥ss. to f℥j.

SINAPIS. *Mustard.* (The seeds of Sinapis nigra, *Linn.*, and Sinapis alba, *Linn., Eng. Bot.* plates 969 and 1677; also the seeds reduced to powder, mixed.) These are indigenous plants, belonging to the Natural family *Cruciferæ* (*Brassicaceæ*, Lindley), and to the Linnæan class and order *Tetradynamia Siliquosa.*

BOTANICAL CHARACTERS.—*Sinapis Nigra.* Annual; stem 3 to 4 feet high; lower leaves large, lyrate, rough, upper ones linear-lanceolate, entire, glabrous; flowers yellow; calyx spreading, tetramerous; corolla tetramerous, cruciform; siliqua, with a very short

sterile beak, quadrangular ; seeds dark brown. *Sinapis Alba* is distinguished by the siliqua having a long one-seeded beak, and by the seeds being yellow.

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.

CHARACTERS OF THE POWDER.—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. 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 cool 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 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 the 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.

PREPARATIONS.—Cataplasma Sinapis; Oleum Sinapis. (See *Epispastics.*)

VIOLA ODORATA. The root of this plant (which has been de-

scribed, p. 227, in the division *Cathartics*), though not officinal in the British Pharmacopœia, 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 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. 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; when an anemic condition prevails, chalybeates are indicated; 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. When, however, the diseased condition is corrected, a combination of general remedies with emmenagogues, as of the preparation of iron with those of ergot of rye in the treatment of anemic amenorrhœa, frequently proves of great service. 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.* (The dried stigmas and part of the style of Crocus sativus, *Linn.; Steph. and Church. Med. Bot.* plate 101. Imported from Spain, France, and Italy.) 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.—Underground stem, a round cormus, which is clothed with slender anastomosing fibres, and furnished with fibrous rootlets; leaves linear, with a white central stripe; flowers, appearing in September and October, light purple with red veins; spathæ double; style single, stigmas 3, linear, protruded, drooping, fragrant.

PREPARATION.—Early in the morning the flowers are gathered just as they are about to expand, the stigmas with part of the style picked out, and the rest of the flower thrown away; the stigmas are then spread loosely on white paper, and dried on a small kiln of a peculiar construction. Formerly the over-ripe or injured stigmas were dried under pressure between folds of paper, when they constituted what was called *Cake Saffron,* now rarely met with.

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 stigmas 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 stigmas 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.

CHARACTERS.—Thread-like styles, each terminated by three long orange-brown stigmas, broadest at the summit. Has a powerful aromatic odour. Rubbed on the wet finger it leaves an intense orange yellow tint. 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. Professor Bentley has drawn attention to an adulteration which seems not previously to have been noticed, the admixture of the stamens of the crocus with the style and stigmas. This can be detected by stirring up the suspected specimen with a glass rod in water ; on being allowed to rest the entire mass will float, and the difference in colour will distinguish them, the style and stigmas being of an orange-yellow, the stamens of a pale-yellow colour ; the odour of a specimen so adulterated will not be so penetrating and aromatic as that of the genuine article. 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, for which purposes with many practitioners it is a great favorite. 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 is possessed of diaphoretic properties, and thereby favours the production of the eruption.

DOSE AND MODE OF ADMINISTRATION.—In substance, gr. xij. to gr. lx.

PREPARATION.—Tinctura Croci, one ounce to one pint.

PREPARATIONS IN WHICH IT IS USED.—Decoctum Aloes Compositum, three grains to one fluid ounce; Pilula Aloes et Myrrhæ, one part in twelve; Pulvis Cretæ Aromaticus, one part in fifteen, nearly; Tinctura Cinchonæ Composita, sixty grains to one pint ; Tinctura Opii Ammoniata, one hundred and eighty grains to one pint; Tinctura Rhei, a quarter of an ounce to one pint.

Tinctura Croci. Tincture of Saffron. (Take of saffron, one ounce ; proof spirit, one pint. Macerate the saffron for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to

make one pint.) Dose, f3ss. to f3j.; only used for flavouring and colouring more active medicines.

* *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, f3ss. to f3j. Chiefly used for flavouring and colouring purposes, for which however it is very efficient; a smaller quantity of this syrup, in consequence of its heavy taste and smell, being more effectual than larger doses of many of our other flavouring syrups. Its non-introduction into the Pharmacopœia is strange to me, inasmuch as it is in very general use.

ERGOTA. *Ergot.* (The sclerotium (compact mycelium or spawn) of Claviceps purpurea, *Tulasne,* produced within the paleæ of the common rye, Secale cereale, *Linn.; Steph. and Church. Med. Bot.* plate 113.) Much difference of opinion exists as to what this substance really is; the latest and best authorities agree that it is the mycelium of a peculiar species of fungus (*Spermoedia 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, pinkish within, solid, frangible, fracture short, odour faintly marked, but strong if the powder be triturated with solution of potash.

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; 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, pulverize 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 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. (See p. 106.)

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 clots, hydatids, or polypi; to promote the lochial discharge; and to check leucorrhœa, or hemorrhage from the womb; all of which effects are the results of augumented 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 beneficial 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 subsequently lost although born alive); in one instance in twenty, in a second in twenty-five 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 Gènerales de Medecine*, 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 freshly 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. Dr. Beatty's practice is to have four hundred and eighty grains of freshly powdered ergot divided into sixty-grain doses, and each dose wrapped in metallic paper, the metallic surface being kept inside next the powder, and the whole covered with common paper. One of these packets is a very small and light addition to the weight and bulk of a common pocket-case, which I presume every practitioner carries about with him, and with it he is prepared for every emergency that may require the use of the drug. An infusion is readily made by pouring four or five ounces of boiling water on the powder, which, with the addition of a lump of white sugar, and a tablespoonful of sherry wine, makes a very palateable mixture. This may be given in two or three doses as required. I have not, he adds, for many years gone out night or day without my dose of ergot in my pocket, and I advise all other practitioners to adopt the same rule. The convenience of this, compared with the alternative of putting a bottle of one of the fluid preparations in the pocket every time one goes out, is too evident to require further comment.

PREPARATIONS.—Extractum Ergotæ Liquidum, one ounce to one fluid ounce; Infusum Ergotæ, eleven grains to one fluid ounce; Tinctura Ergotæ, one hundred and nine grains to one fluid ounce.

Extractum Ergotæ Liquidum. Liquid Extract of Ergot. (Take of ergot, in coarse powder, one pound; ether, one pint, or a sufficiency; 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 soil by passing the washed ether slowly 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 by the heat of a water-bath to nine fluid ounces; 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 the 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, in coarse powder, five ounces; proof spirit, one pint. Macerate the ergot for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the 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. (See p. 106.)

RUTA GRAVEOLENS. *Rue* (described p. 71 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.

SABINÆ CACUMINA. *Savin Tops.* (The fresh and dried tops of Juniperus Sabina, *Linn.; Woodv. Med. Bot.*, plate 94. 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 ; diœcious ; leaves very small, ovate, pointed, densely imbricated, erect ; it flowers in April or May, and ripens its fruit, a dark purple *galbulus* or fleshy cone (misnamed berry) about the size of a currant, in autumn.

CHARACTERS.—Twigs densely covered with minute imbricated appressed leaves in four rows ; odour strong, peculiar, and unpleasant ; taste acrid, bitter, resinous, and disagreeable.

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 most often resorted to criminally, for the purpose of producing abortion, but this result cannot be effected except at the risk of the life of the mother. In cases of poisoning with savin, emetics should be at first employed to remove the poison from the stomach ; and afterwards opiates and demulcents, to be followed by general antiphlogistic treatment. (See also *Epispastics.*)

DOSE AND MODE OF ADMINISTRATION.—In powder, a bad form, the dose is from gr. v. to gr. xv.

PREPARATIONS.—Oleum Sabinæ, from fresh plant; Tinctura Sabinæ, two and a half ounces, dried, to one pint; Ungentum Sabinæ, eight ounces, fresh, to nineteen ounces.

Oleum Sabinæ. Oil of Savin. (The oil distilled in Britain 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.

Tinctura Sabinæ. Tincture of Savin. (Take of savin tops, dried and coarsely powdered, two ounces and a half; proof spirit, one pint. Macerate the savin for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, twenty minims to one fluid drachm.

* *Infusum Sabinæ* (fresh savin tops, gr. lx.; boiling water, f℥viiiss.; macerate for one hour in a covered vessel and strain.) Dose, f℥ss. to f℥j.

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 sensitive surfaces of the body from the action of acrid matter, and consequently from the injurious effects which might result therefrom. This division of medicinal 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.

ACACIÆ GUMMI. *Gum Acacia.* (A gummy exudation from the stems of one or more undetermined species of Acacia, *Linn.*) 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.—The species of the genus Acacia which yield gum are thorny shrubs or trees, with compound, equally-bipinnate leaves, polygamous flowers, crowded into globose or oblong spikes, of a yellow, white, or, rarely, red colour, and a leguminous fruit, which is more or less moniliform.

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.

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 composition 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, strongly if kept some time.

CHARACTERS AND TESTS.—In spheroidal tears usually from half an inch to an inch in length, nearly colourless, and opaque from numerous minute cracks, or in fragments with shining surfaces; brittle; bland and mucilaginous in taste; insoluble in alcohol, but soluble in water. The aqueous solution forms with subacetate of lead an opaque white jelly. If an aqueous solution of iodine be added to the powder, or to a solution formed with boiling water and cooled, there is no appearance of a violet or blue colour.

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.

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.

PREPARATIONS CONTAINING GUM ACACIA.—Mistura Cretæ, one part in thirty-four (see p. 14); Mistura Guaiaci, one part in eighty-five (see p. 281); Mucilago Acaciæ, one part in two and a half; Pulvis Amygdalæ Compositus, one part in thirteen (see p. 342); Pulvis Tragacanthæ Compositus, one part in six; in all the Trochisci.

Mucilago Acaciæ. Mucilage of Gum Acacia. (Take of gum acacia, in small pieces, four ounces; distilled water, six fluid ounces. Put the gum and water into a covered earthen jar, and stir them frequently until the gum is dissolved. If necessary strain the solution through muslin.) 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. Mucilage enters into the composition of all the lozenges in the Pharmacopœia save those of opium, and 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.

INCOMPATIBLES.—Alcohol; ether; ammonia; acetate of lead; borax; and the mineral acids.

ADEPS PRÆPARATUS. *Prepared Lard.* Syn.: *Axungia*, Edin. (The purified fat of the hog, Sus scrofa, *Linn.*)

PREPARATION.—Take of the internal fat of the abdomen of the hog, perfectly fresh, fourteen pounds. Remove as much of the membranes as possible, cut the fat into small pieces, put it into a suitable vessel with about four gallons of cold water, and, while a current of water is running through the vessel, break up the masses of fat with the hands, exposing every part to the water, so that whatever is soluble may be thus dissolved and carried away. Afterwards collect the washed fat on a sieve or in a cloth, drain away as much as possible of the water; liquefy the fat at a heat not exceeding 212°, and strain through flannel, pressing the residue while hot, then put it into a pan heated by steam and keep it at a temperature a little but not much above 212°, stirring it continually until it becomes clear and entirely free from water; finally strain it through flannel.

PHYSICAL PROPERTIES.—Lard is a white, solid, fatty matter, with a very faint odour, and a mild sweetish taste. Specific gravity,

·881. As sold for general use, it 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 last edition of 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.

CHARACTERS AND TESTS.—A soft white fatty substance, melting at about 100°. 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, and is not rendered blue by the addition of solution of iodine.

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 the distilled water with which it has been boiled, on being filtered, yield a precipitate with nitrate of silver, we should infer the presence of salt, whilst the presence of some amylaceous impurity is to be inferred if it be rendered blue by solution of iodine.

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.

PREPARATIONS.—Adeps Benzoatus. Unguentum Simplex.

PREPARATIONS IN WHICH IT IS USED.—Unguentum Aconitiæ; Unguentum Atropiæ; Unguentum Belladonnæ; Unguentum Hydrargyri; Unguentum Hydrargyri Nitratis; Unguentum Hydrargyri Subchloridi; Unguentum Iodidi; Unguentum Potassæ Sulphuratæ; Unguentum Potassii Iodidi; Unguentum Sabinæ; Unguentum Sulphuris Iodidi; Unguentum Terebinthinæ; Unguentum Veratriæ.

Adeps Benzoatus. Benzoated Lard. (Take of prepared lard, one pound; Benzoin, reduced to coarse powder, one hundred and sixty grains. Melt the lard by the heat of a water-bath, add the benzoin, and, frequently stirring them together, continue the application of heat for two hours; finally remove the residual benzoin by straining.) The addition of the benzoin is made with the view of preventing the lard becoming rancid, which otherwise it is apt to do. It is used in the following preparations:—Suppositoria Acidi Tannici (see p. 120); Suppositoria Hydrargyri; Suppositoria Morphiæ; Suppositoria Plumbi Composita (see p. 132); Unguentum Gallæ (see p. 117); Unguentum Plumbi Acetatis (see p. 133); Unguentum Sulphuris; Unguentum Zinci.

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 constantly while it cools.) A very frequently employed ointment, used for dressing blistered surfaces, it being very generally substituted for spermaceti ointment for these purposes. It is also used as a basis for more potent medicines; it enters into the following preparations:—Unguentum Antimonii Tartarati; Unguentum Cadmii Iodidi; Unguentum Creasoti (see p. 103); Unguentum Elemi; Unguentum Hydrargyri Ammoniati; Unguentum Hydrargyri Iodidi Rubri; Unguentum Plumbi Carbonatis (see p. 135); Unguentum Plumbi Iodidi.

AMYGDALA AMARA. *Bitter Almond.* (The seed of the bitter almond tree, Amygdalus communis, *var.* amara, *DC.* Brought chiefly from Mogadore.)

AMYGDALA DULCIS. *Sweet Almond.* (The seed of the sweet almond tree, Amygdalus communis, *var.* dulcis, *DC.; Woodv. Med. Bot.* plate 83. Cultivated about Malaga.) 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 oblong-lanceolate, 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; calyx, campanulate, 5-cleft; corolla of 5 ovate, irregularly notched, rose-red petals; stamens numerous, perigynous; ovary free; 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.

PHYSICAL PROPERTIES.—Sweet almonds vary in size from half an inch to above an inch in length, and are about three-eighths 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. Bitter almonds are imported from Mogadore.

CHARACTERS.—*Of the Bitter Almond.*—Resembles the sweet almond in appearance, but is rather broader and shorter; has a bitter taste, and when rubbed with a little

water, emits a characteristic odour.—*Of the Sweet Almond.*—Above an inch in length, lanceolate, acute, with a clear cinnamon-brown seed-coat, and a bland sweetish nutty-flavoured kernel. Does not evolve the odour of bitter almonds when bruised with water.

CHEMICAL PROPERTIES.—Sweet almonds consist of fixed oil, emulsin, uncrystallizable 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 is of a highly poisonous character, and which will be more particularly described hereafter (see *Sedatives*).

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, as an ingredient in some soaps, and in many of the ointments.

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 sweet almonds, eight ounces; refined sugar, in powder, four ounces; gum acacia, in powder, one ounce. Steep the almonds in warm 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.) This powder is only introduced into the Pharmacopœia with the view of making the preparation immediately preceding it. For reasons that will be understood on reference to the remarks under the head of chemical properties, care is to be taken to use sweet and not bitter almonds.

Oleum Amygdalæ. Almond Oil. (The oil expressed from bitter and sweet almonds.) This oil is of pale yellow colour; nearly inodorous or having a nutty odour, with a bland oleaginous taste. In the Pharmacopœia no formula is given for making the fixed oil, and correctly so, inasmuch as it is an article of commerce. 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 lbs. 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 *oleïne*, 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. As already stated it is only used externally, and enters into the following preparations. Unguentum Cetacei; Unguentum Hydrargyri Oxidi Rubri (see p. 255); Unguentum Plumbi Subacetatis Compositum (see p. 136); Unguentum Simplex (see p. 341), and the preparations containing it.

* *Ceratum Galeni. Cold Cream.* 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.) 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*, NELIGAN. (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.

AMYLUM. *Starch.* (The starch procured from the seeds of common wheat, Triticum vulgare, *Villars.*) *Starch, Wheaten starch.* The common wheat, *Triticum vulgare*, 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; spike composed of a number of solitary, closely sessile spikelets, the edges of the glumes being next the axis of the spike; glumes 2, similar to the paleæ; fruit (a *caryopsis*, or 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.

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 composition 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 gum perfectly soluble in water 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.

CHARACTERS AND TESTS.—In white columnar masses. When rubbed in a Wedgwood mortar with a little cold distilled water, it is neither acid nor alkaline to test-paper, and the filtered liquid does not become blue on the addition of solution of iodine. Mixed with boiling water and cooled, it gives a deep blue colour with iodine.

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 USES.—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. It is employed in the following preparations:—Glycerinum Amyli, one part in eleven by weight; Mucilago Amyli, twelve grains to one fluid ounce; Pulvis Tragacanthæ compositus, one part in six.

Glycerinum Amyli. Glycerine of Starch. (Take of starch, one ounce; glycerine, eight fluid ounces. Rub them together until they are intimately mixed, then transfer the mixture to a porcelain dish, and apply a heat gradually raised to 240°, stirring it constantly until the starch particles are completely broken and a translucent jelly is formed.) This preparation, which is about the consistence of an ointment, has been long used on the Continent, but has been only recently introduced into this country by Mr. Schacht of Clifton, under the name of "Plasma." It is intended to replace ointments as a menstruum for applying medicinal substances to the skin where an oily basis is objectionable, being more cleanly, and not liable to become rancid. In this city it does not seem to have met with the attention it deserves.

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 the rectum into the system; in such cases the bulk of the enema should not exceed four ounces. It enters into the composition of the following enemas:—Enema Aloes (see p. 156); Enema Magnesiæ Sulphatis (see p. 184); Enema Opii; Enema Terebinthinæ (see p. 62).

* 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 *Gramineæ*, and to the Linnæan class and order *Triandria Digynia*.

BOTANICAL CHARACTERS.—Root annual; culm from 2 to 3 feet high; leaves linear, acute; flowers glumaceous, disposed in loose, terminal, somewhat pendant panicles; spikelets drooping, of 3 scabrous florets, the two upper ones awnless and often imperfect, lower floret furnished with a long awn; fruit (a *caryopsis*) 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, which, if not contraindicated, may be agreeably flavoured by the addition of lemon-juice and sugar. If a larger proportion of the coarsely ground meal be used, it is called *porridge* or *stirabout;* 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*.

BOTANICAL CHARACTERS.—Root tuberous, fleshy, with oblong cylindrical fangs; stems deep red, 5–6 feet high; leaves ovate-oblong, smooth, green with purplish edges; flowers in a compact, few-flowered raceme, each flower invested with obovate, obtuse, pink bracts about as long as the ovary; corolla unequal, scarcely lip-shaped in any segment; stamens petaloid, one with half an anther on the edge; style straight, flat, and nearly free; ovary inferior, 3-celled, many-seeded; fruit membranous, 3-valved, with a deciduous granular surface.

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 (which see).

CARBO LIGNI. *Wood Charcoal.* (Wood charred by exposure to a red heat without access of air.)

PREPARATION.—Wood-charcoal is obtained by burning billets of wood, the access of air being prevented as much as possible. It is only mentioned as a commercial article in the Pharmacopœia, being prepared on the large scale for various uses in the arts, particularly for the manufacture of gunpowder. Various kinds of wood are employed in its preparation; but for medical use, for some fancied superiority, the wood of the poplar is preferred; during the combustion, the oxygen and hydrogen of the wood are driven off, whilst its carbon remains behind, associated with some saline alkaline matter, principally carbonates of potash and lime.

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. When burned at a high temperature with free access of air, it leaves not more than two per cent. of ash.

THERAPEUTICAL USES.—I have introduced the description of charcoal into the present chapter, as being about the most convenient one in which I could discuss its properties. Its physiological effects are of so unmarked a character, that the remedial effects it produces must be looked upon as being due to purely mechanical causes. Antacid properties have been attributed to it in virtue of the alkaline basis it contains, but these are of so trifling an amount, that we cannot justly attribute its remedial powers to their presence. In medicine, until a comparatively recent period, it was but 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 purpose 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. Abroad 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 come into vogue 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; I have often found its effects most beneficial in such cases, as it frequently affords instantaneous relief, but unfortunately only of a temporary character. I cannot divest my mind of the idea that its undoubted efficacy in relieving extreme flatulent distension, is intimately associated with its unquestioned power of largely absorbing gases, when brought into contact with them; if this be so, the drier it is administered the better. Its value in gastrodynia and other painful affections of the stomach, I am inclined to attribute to the mechanical protection it gives the inner coat of the stomach, being deposited on its surface, and preventing contact of food with its sensitive mucous membrane; if this view be correct, it is evident that the finer the form of powder in which it is used the more efficacious will it be. 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.

DOSE AND MODE OF ADMINISTRATION.—In painful affections of the stomach, and in flatulent distension, teaspoonful doses of the freshly prepared charcoal, swallowed dry, and in as fine powder as procurable; Belloc's Charcoal will generally be found a satisfactory preparation. For the treatment of foul, fetid ulcers, the pharmacopœial poultice will be found of service. For hygienic purposes, thrown into ash-pits, sewers, night-chairs, &c., its use is had recourse to with benefit, for the purpose of absorbing their noisome odours.

Cataplasma Carbonis. Charcoal Poultice. (Take of wood charcoal, in powder, half an ounce; crumb of bread, two ounces; linseed meal, one ounce and a half; boiling water, ten fluid ounces. Macerate the bread in the water for ten minutes 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.)

CERA ALBA. *White Wax.* (Yellow wax bleached by exposure to moisture, air, and light.)

CERA FLAVA. *Yellow Wax.* (The prepared honeycomb of the Hive Bee, Apis mellifica, *Linn.*) 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 it from impurities; in this state it consti-

tutes yellow wax. White wax is procured from this, by melting and agitating it with water, and finally bleaching it in thin ribbons in the open air; the process being repeated until it loses all colour and odour.

PHYSICAL PROPERTIES.—*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. *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.

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.

CHARACTERS.—*Of white wax.* Hard, nearly white, translucent. Not unctuous to the touch; does not melt under 150°. *Of yellow wax.*—Firm, breaking with a granular fracture, yellowish, having an agreeable honey-like odour. 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.

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.

PREPARATIONS OF WHITE WAX.—Charta Epispastica; Suppositoria Acidi Tannici (see p. 120); Suppositoria Hydrargyri; Suppositoria Morphiæ; Suppositoria Plumbi Composita (see p. 132); Unguentum Cetacei (see p. 350); Unguentum Plumbi Subacetatis Compositum (see p. 136); Unguentum Simplex (see p. 341).

PREPARATIONS OF YELLOW WAX.—Emplastrum Calefaciens; Emplastrum Cantharidis; Emplastrum Cerati Saponis; Emplastrum Galbani (see p. 69); Emplastrum Picis; Unguentum Cantharidis; Unguentum Hydrargyri Compositum; Unguentum Hydrargyri Oxidi Rubri (see p. 255); Unguentum Picis Liquidæ; Unguentum Resinæ; Unguentum Sabinæ; Unguentum Terebinthinæ.

CETACEUM. *Spermaceti.* (Nearly pure cetine, obtained, mixed with oil, from the head of the Sperm Whale, Physeter macrocephalus, *Linn.*, inhabiting the Pacific and Indian oceans. It is separated from the oil by filtration and pressure, and afterwards purified.) *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 AND TESTS.—Crystalline, pearly-white, glistening, translucent, with little taste or odour, reducible to powder by the action of a little rectified spirit. Scarcely unctuous to the touch; does not melt under 100°.

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.

CHEMICAL PROPERTIES.—It is composed of *cetine* and a small quantity of 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.

PREPARATIONS.—Charta Epispastica; Unguentum Cetacei.

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 while it cools.) An emollient and cooling application to raw and blistered surfaces, for which, however, the simple ointment is frequently substituted; they can be easily distinguished by their physical appearances.

* 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 Natural family *Cucurbitaceæ*, and to the Linnæan class and order *Monœcia Syngenesia*.

BOTANICAL CHARACTERS.—An annual trailing herb; monœcious; leaves angular, somewhat lobed; fruit a cylindrical, scabrous *pepo* (Linnæus).

THERAPEUTICAL USES.—This plant is only used for pharmaceutical purposes to form a basis for more potent medicines in the treatment of cutaneous affections. I have found cucumber pomade or ointment a valuable cooling application in many cutaneous affections of an irritable character. 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 put 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 pearly 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.

FARINA TRITICI. *Wheaten Flour.* (The grain of wheat, Triticum vulgare, *Villars*, ground and sifted.) See also *Amylum*, p. 343.

THERAPEUTICAL USES.—Flour is employed in medicine for dusting excoriated, erysipelatous, or burned parts. In the form of bread it is used for making poultices and as a basis for making pills; but as bread always contains salt, it should not be employed for this latter purpose with substances which are decomposed by chloride of sodium, as the salts of silver, &c. In the form of *toast*, infused in water, it is employed in making a grateful drink in slight febrile attacks.

PREPARATION.—Cataplasma Fermenti.

FICUS. *Fig.* (The dried fruit of Ficus Carica, *Linn.; Steph and Church. Med. Bot.* plate 154. 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, palmately 3-5 lobed leaves; stipules deciduous; inflorescence a *Cœnanthium*, consisting of a number of pedicellated unisexual flowers, inclosed in a hollow, turbinate, fleshy, green receptacle, which is nearly closed at the apex; male flowers near the umbilicus, perianth usually 3-lobed, stamems 3; female flowers, perianth 5-lobed, ovary free or semi-adnate, style 1, stigmas 2; fruit a *Syconus* (Henfrey), composed of dry, 1-seeded pericarps, immersed in fleshy pulp, derived from the ripened perianths, enclosed in the reddish-green or deep purple receptacle.

CHARACTERS.—Compressed fruits, soft, but tough, brown, covered with a saccharine efflorescence, containing a viscid sweet pulp, and numerous small hard pericarps.

PHYSICAL PROPERTIES.—Figs consist of the fleshy, pyriform receptacle, containing within numerous, small, crustaceous pericarps. 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. Roasted figs are applied to gum-boils to promote suppuration. They enter into the composition of the *confection of senna* (12 parts to 75) of the Pharmacopœia.

GLYCERINUM. *Glycerine.* (A sweet principle, $C_6H_8O_6$ or $\mathbf{C_3H_8O_3}$, obtained from fats and fixed oils, and containing a small percentage of water.)

PREPARATION.—Glycerine is only mentioned as a commercial article in the Pharmacopœia. It is formed in the preparation of the Emplastrum Lithargyri 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 slaked and made into a milk with $2\frac{1}{2}$ 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 an excess of water." Nearly all the glycerine, however, that is at present met with in the English markets, 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 clear colourless fluid, oily to the touch, without odour, of a sweet taste; freely soluble in water and in alcohol. When decomposed by heat it evolves intensely irritating vapours. Specific gravity 1·25.

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 advantageously 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. Some years ago, Mr. Schacht of Clifton, in imitation of our continental neighbours, proposed to substitute a mixture of glycerine and starch, in the proportion of a fluid ounce of the former to sixty grains of the latter, rubbed up together in the cold and then heated gradually to about 240° F., constantly stirring, for fats in the preparation of ointments and cerates. In the present edition of the Pharmacopœia this suggestion has been carried out and the glycerinum amyli introduced (see p. 345), but the hygrometric nature of the compound is in my opinion a great drawback upon its otherwise valuable properties when so used.

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 a sixteenth to an eighth part.

PREPARATIONS.—Glycerinum Acidi Carbolici (see p. 88); Glycerinum Acidi Gallici (see p. 123); Glycerinum Acidi Tannici (see p. 120) Glycerinum Amyli (see p. 345); Glycerinum Boracis (see p. 143) ; Linimentum Potassii Iodidi cum Sapone.

GLYCYRRHIZÆ RADIX. *Liquorice Root.* (The root or underground stem, fresh and dried, of Glycyrrhiza glabra, *Linn.; Steph. and Church. Med. Bot.* plate 134. 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.—Rhizome, long, creeping, succulent ; flowering stem, erect, smooth, 4 to 5 feet high ; leaves imparipinnate, exstipulate ; leaflets ovate, retuse, yellowish ; flowers axillary, racemose, papilionaceous, bluish or purplish ; stamens diadelphous; legume ovato-oblong, smooth, 3–4 seeded.

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.

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. Digested with water it yields a solution which gives a precipitate with diluted sulphuric acid.

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 a greyish-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 *glycyrrhizine*, albumen, fecula, *asparagin*, 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*.

PREPARATIONS.—Confectio Terebinthinæ (see p. 62), one part in four, nearly; Decoctum Sarsæ Compositum (see p. 288), quarter ounce to one pint; Extractum Glycirrhizæ; Infusum Lini, hundred and twenty grains to one pint; Pilula Hydrargyri, one part in six; Pilula Ferri Iodidi, one part in two and three-quarters, nearly.

Extractum Glycyrrhizæ. Extract of Liquorice. (Take of liquorice root, in coarse powder, one pound; distilled water, four pints. Macerate the liquorice root with two pints of the water for twelve hours, strain, and press; again macerate the pressed marc with the remainder of the water for six hours, strain and press. Mix the strained liquors, heat them to 212°, and strain through flannel; then evaporate by a water-bath until the extract is of a proper consistence for forming pills.) 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. It is employed in the following preparations. Confectio Sennæ (see p. 213), one part in ninety-four, nearly; Decoctum Aloes Compositum, (see p. 156), one ounce in thirty fluid ounces; Mistura Sennæ Composita

(see p. 213), half an ounce in one pint; Tinctura Aloes (see p. 157), one ounce and a half to one pint; Trochisci Opii.

* *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. *Cotton Wool.* (The hairs of the seed of various species of Gossypium, *Linn.*, carded.) 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.—*Gossypium Herbaceum* is a biennial or triennial plant ; 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 3- to 5-celled, ovate, pointed, about the size of a walnut, 3- to 5-valved, loculicidal : 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.

PREPARATION.—Pyroxylin.

GUN COTTON. *Pyroxylin.*

PREPARATION.—Take of cotton, one ounce ; sulphuric acid and nitric acid, of each, 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.

EXPLANATION OF PROCESS.—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 this formulary for pyroxylin ($C_{36}H_{22}8(NO_4)O_{30}$) 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 above to gun cotton. The part the sulphuric acid seems to play in the process is to dehydrate the nitric acid, thereby rendering it stronger.

TESTS.—It should be readily soluble in a mixture of ether and rectified spirit; and should leave no residue when exploded by heat.

CHEMICAL PROPERTIES.—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 and concentrated sulphuric acid, 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 former edition of the British 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 occurred of giving us a formulary for the preparation of pyroxylin instead of xyloidine. Provision has been made in the present edition to guard against this error, by employing nitric acid of the density 1·420. This latter gun-cotton, dissolved in sulphuric ether, constitutes *Collodium*, an adhesive compound that has been proposed for the reunion of recent incised wounds.

Collodium. Collodion. (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 well-corked bottle.) It is a colourless, highly inflammable liquid, with an ethereal odour; it dries rapidly upon exposure to the air, and leaves a thin transparent film, insoluble in water or rectified spirit 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 in cases of wounds 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. Pharmaceutically it is employed in the preparation of collodium flexile.

Collodium Flexile. Flexible Collodion. (Take of collodion, six fluid ounces; canada balsam, one hundred and twenty grains; castor oil, one fluid drachm. Mix, and keep in a well-corked bottle.) It is used in the same class of cases as collodium, over which it possesses the advantage of not so readily cracking after being some time applied to the surface.

HEMIDESMI RADIX. *Hemidesmus Root.* (The dried root of Hemidesmus indicus, *DC.*; *Wight, Icon. Plant. Ind. Orient.* vol. ii. plate 594. 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; very variable in size and shape; flowers small, greenish-purple, in axillary racemes.

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.

CHARACTERS.—Yellowish-brown, cylindrical, tortuous, furrowed and with annular cracks, having a fragrant odour, and a very agreeable flavour.

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. The syrup, however, in which the root exists in the proportion of one ounce to ten ounces and a half, is the only form in which it is used in these countries.

Syrupus Hemidesmi. Syrup of Hemidesmus. (Take of hemidesmus root, 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 DECORTICATUM. *Pearl Barley.* (The husked seeds of Hordeum distichon, *Linn.* Cultivated in Britain.) 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.—Culms 3 to 4 feet high, glaucous, furrowed; leaves alternate, lanceolate, acute; spikelets 3 together, sessile, on alternate notches of a simple spike; the lateral spikelets

containing male flowers, awnless; the central spikelets hermaphrodite, arranged in two vertical rows, awned (Kunth).

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, round, 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.—Pearl 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. Barley-water is a favourite diet drink, of great use in a variety of affections. I have found it of service as an agreeable vehicle for liquor potassæ and tincture of hyoscyamus in the treatment of the ardor urinæ of gonorrhœa.

DOSE AND MODE OF ADMINISTRATION.—Either of the following preparations may be employed for the foregoing purposes; the plain decoction being used for drinks and injections, and the mixture for a soothing drink.

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 the washed barley with the distilled water for twenty minutes in a covered vessel, and strain.) This preparation, well known as barley water, is always a domestic preparation, being made by boiling one ounce of pearl barley in a quart of water until the barley is soft, skimming as it boils, straining through a sieve, and sweetening to taste. As a diet drink the addition of lemon-peel makes this very agreeable.

* *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.) Used as a diet drink, the flavouring ingredients of which may be altered to suit each individual taste.

LINI SEMINA. *Linseed.* (The seeds of Linum usitatissimum, *Linn.; Woodv. Med. Bot.* plate 3. Cultivated in Britain.)

OLEUM LINI. *Linseed Oil.* (The oil expressed without heat from linseed.)

LINI FARINA. *Linseed Meal.* (The cake of linseed from which the oil has been pressed, reduced to powder.)

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 alternate, distant, narrow-lanceolate, entire, acute; flowers large, purplish-blue, in a terminal corymbose panicle; capsule globular, 5-celled, each cell almost completely divided into two 1-seeded loculi by a partition; seeds ovate, acute, flattened, shining.

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.—*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 an oleaginous, slightly sub-acrid, and 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, in inflammatory conditions of the bladder and urethra, 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. Linseed-oil mixed with lime-water may be used as an application to recent burns.

DOSE AND MODE OF ADMINISTRATION.—For internal exhibition the infusion is used ; externally, the poultice is employed. The

following are the officinal preparations :—Farina Lini, Infusum Lini, sixteen grains to one fluid ounce ; Cataplasma Lini, Cataplasma Carbonis (see p. 348), Cataplasma Conii, Cataplasma Sinapis, Cataplasma Sodæ Chloratæ.

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 gradually with the water, constantly stirring, then add the oil.) 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 under ordinary circumstances should be applied directly to the surface without the intervention of a fold of linen or muslin ; but where the part to which it is to be applied is covered with hair, a single fold of thin muslin prevents its unpleasant adherence.

Infusum 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.) *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.

* 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 jointed 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; perianth unequal, stamens petaloid, one with half an anther on its edge; ovary 3-celled, inferior; ovules solitary.

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 269.)

OLIVÆ OLEUM. *Olive Oil* (described p. 188, 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 VITELLUS. *Yolk of Egg.* (The yolk of the egg of Gallus Banckiva : *var.* domesticus, *Temminck.*) *The domestic fowl* (Gallus domesticus, *Temminck*), belonging to the class *Aves*, order *Gallinæ*, is a bird too well known to require description.

THERAPEUTICAL USES.—Eggs are a mild and nutritious article of diet, and as such in various forms 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.

PREPARATION.—Mistura Spiritus Vini Gallici.

SACCHARUM PURIFICATUM. *Refined Sugar.* $C_{24}H_{22}O_{22}$, or $\mathbf{C_{12}H_{22}O_{11}}$. (Pure cane sugar prepared from the juice of the stem of Saccharum Officinarum, *Linn.; Nees, Plant. Med.* plates 33, 34, 35. From plants cultivated in the West Indies and other tropical countries.)

THERIACA. *Treacle.* Syn.: *Sacchari Fœx, Lond. Molasses.* (The uncrystallised 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 *Gramineæ*, and to the Linnæan class and order *Triandria Digynia.*

BOTANICAL CHARACTERS.—Culm solid, jointed, juicy, from 6 to 12 feet high, coloured ; leaves flat, in 2 rows, sheathing at the base ; spikelets all fertile, arranged in pairs, forming a terminal panicle from 2 to 4 feet long, of a silver-grey colour, from the long soft hairs that surround the triandrous flowers.

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 these countries: 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 loaves, known in commerce as lump-sugar.—*Of Treacle.*—A thick brown fermentable syrup, very sweet; not crystallizing by rest or evaporation. Specific gravity about 1·40.

TESTS.—*Of Treacle.*—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. It is snow white, dry, scentless, and intensely and purely sweet.

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 $C_{24}H_{22}O_{22}$. 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, a quality which renders its addition to pill masses of great value in preventing their becoming hard.

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 its 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 sugar*—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.

PREPARATIONS OF SUGAR.—Confectio Rosæ Caninæ; Confectio Rosæ Gallicæ; Confectio Sennæ; Ferri Carbonas Saccharata; Liquor Calcis Saccharatus; Mistura Ferri Composita; Mistura Guaiaci; Pilula Ferri Iodidi; Pulvis Cretæ Aromaticus; Pulvis Amygdalæ Compositus; Pulvis Tragacanthæ Compositus; Suppositoria Morphiæ; all the Syrups and Lozenges.

PREPARATIONS OF TREACLE.—Pilula Assafœtidæ Composita; Pilula Conii Composita; Pilula Ipecacuanhæ et Scilla; Pilula Rhei Composita; Pilula Scillæ Composita.

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.) Employed solely as a flavouring adjunct to mixtures, and to suspend the insoluble substances in aqueous vehicles. It is used in the following preparations :—Mistura Cretæ; Mistura Creasoti; Pilula Cambogiæ Composita; Syrupus Aurantii; Syrupus Zingiberis.

SACCHARUM LACTIS. *Sugar of Milk.* $C_{24}H_{24}O_{24}$, or $\mathbf{C_{12}H_{24}O_{12}}$. (A crystallised sugar, obtained from the whey of milk by evaporation.)

PREPARATION.—Introduced into the last edition of the Dublin Pharmacopœia as an article of the Materia Medica. No formula is given in the present Pharmacopœia either for its manufacture, but 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 it 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 the trituration and intimate admixture of which, in consequence of its grittiness and hardness, it is admirably suited. It is employed by the homeopathists as an excipient for their globules and powders almost exclusively.

* SAGO. *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. It has been ascertained that various species of the palm tribe yield the sago of commerce; the finest is procured from *Sagus farinifera, Sagus genuina* (*Sagus Rumphii,* Blume), and *Saguerus Rumphii,* 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; it is also procured from the *Cycas circinalis* and *revoluta,* from the *Areca oleracea,* the *Phœnix farinifera,* the *Arenga saccharifera,* &c. The greater portion of sago is produced by the *Sagus Rumphii,* which belongs to the Natural family *Palmaceæ,* and to the Linnæan class and order *Monœcia Hexandria.*

BOTANICAL CHARACTERS.—*Sagus Rumphii* is one of the smallest trees of its family, seldom exceeding 30 feet in height; the trunk is of considerable diameter, erect, cylindrical, covered with the remains of the old leaf-stalks and terminated by a crown of very large, pinnate leaves; flowers hermaphrodite or polygamous, in much-branched spadices, enclosed by many incomplete spathes; petioles, rachides, and spathes prickly, the prickles scattered or confluent; fruit somewhat globose, depressed on both sides *(Blume).*

PREPARATION.—The tree before reaching maturity or producing its fruit is 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 resem-

bles 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.*

BOTANICAL CHARACTERS.—Root tuberous, with two fleshy divisions; stem herbaceous, about a foot high; leaves broad, often marked with purple spots; flowers in a lax, oblong spike, purple; perianth superior, irregular, the labellum 3-lobed, somewhat crenate, the middle lobe emarginate; spur obtuse, rather longer than the inferior ovary.

PREPARATION.—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.

PHYSICAL PROPERTIES.—In small masses of an irregular oval shape, hard and horny, of a yellowish colour, semi-transparent; nearly odourless; and of a slight mucilaginous taste. In consequence of its hardness it is not easily pulverized, unless it be first softened by maceration in cold water, and then rapidly dried, when it can be reduced to powder.

CHEMICAL PROPERTIES.—Salep contains a large quantity of gum —insoluble in cold but soluble in boiling water *(bassorin)*, minute quantities of saline matter, and a trace of fecula.

THERAPEUTICAL USES.—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.

SAMBUCI FLORES. *Elder Flowers.* (The fresh flowers of Sambucus nigra, *Linn.; Woodv. Med. Bot.*, plate 76. From indigenous plants.) A small, indigenous tree, belonging to the Natural family *Caprifoliaceæ*, and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—A small tree or shrub, with the stem and branches full of pith; leaves opposite, imparipinnate; leaflets 5–7, ovate, serrate or laciniate; cymes broad, with five principal branches, destitute of bracts; calyx adnate to the ovary, with five small teeth; corolla with a short tube and five spreading segments; stamens 5, inserted at the base of the corolla; fruit succulent, containing 3, rarely 4, woody endocarps (stones), each containing a single seed.

CHARACTERS.—Flowers, small, white, fragrant, crowded in large cymes.

THERAPEUTICAL EFFECTS.—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. Physiological effects have been attributed to other portions of this plant, such as the berries, which are stated to be diaphoretic and aperient, and have occasionally been employed in gouty, rheumatic, and syphilitic affections. To the inner bark have been ascribed emetic and hydragogue cathartic effects, but in this country it is never employed with such views, the use even of the officinal preparation being confined to that of a cosmetic.

Aqua Sambuci. Elder Flower Water. (Take of fresh elder flowers, separated from the stalks, ten pounds; or an equivalent quantity of the flowers preserved while fresh with common salt; water, two gallons; distil one gallon.) Principally used as a popular cosmetic. If employed internally as a vehicle for more active medicines, its dose will be from f℥ss.; to f℥j.

* *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.

SEVUM PRÆPARATUM. *Prepared Suet.* The internal fat of the abdomen of the sheep, Ovis Aries, *Linn.* purified by melting and straining. The sheep belongs to the class *Mammalia*, and order *Ruminantia.*

PREPARATION.—The fat, *adeps ovillus*, is selected from the neighbourhood of the kidneys, melted, and strained to separate the membranes.

CHARACTERS.—White, smooth, almost scentless; fusible at 103°.

THERAPEUTICAL USES.—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. Finely granulated and boiled with milk flavoured with cinnamon it enjoys a popular reputation as a diet drink in phthisis; so employed I have occasionally fancied that its use was attended with some benefit.

PREPARATIONS IN WHICH IT IS USED.—Emplastrum Cantharidis; Unguentum Hydrargyri.

* 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, fleshy, containing an acrid, milky, poisonous juice; stem about six feet high, shrubby; leaves with long petioles, palmately 5- to 7-partite; flowers axillary, racemose, monœcious.

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.* (A gummy exudation from the stems of Astragalus verus, *Olivier, Voy., D.C.; Nees, Plant. Med.,* plate 329; and possibly other species. Collected in Asia Minor.) Several species of 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; branches covered with spines, the remains of former petioles; leaves pinnate; leaflets 8 to 9 pairs, linear, hispid; flowers papilionaceous; stamens diadelphous; legume nearly divided into 2 cells by a partition originating from the dorsal suture.

PREPARATIONS.—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. After maceration in cold water the fluid portion is not precipitated by the addition of rectified spirit.

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.

CHEMICAL PROPERTIES.—It is composed of 57 per cent. of soluble gum *(tragacanthine* 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.

PREPARATIONS.—Confectio Opii, one part in a hundred and twenty; Mucilago Tragacanthæ, sixty grains to ten fluid ounces; Pulvis Opii Compositus, one part in thirty; Pulvis Tragacanthæ Compositus, one part in six.

Pulvis Tragacanthæ Compositus. Compound Powder of Tragacanth. (Take of tragacanth, in powder, gum acacia, in powder, starch, in powder, of each, 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.

Mucilago Tragacanthæ. Mucilage of Tragacanth. (Take of tragacanth, in powder, sixty grains; distilled water, ten fluid ounces. To the water contained in a pint bottle add the tragacanth, agitate briskly for a few minutes, and again, at short intervals, until the tragacanth is perfectly diffused and finally has formed a mucilage.) Dose, f℥ss. to f℥j. Used for suspending more active but insoluble medicines. It has also been used for the purpose of excluding the air from burns.

UVÆ. *Raisins.* (The ripe fruit of Vitis Vinifera *Linn.*, the Grape Vine. *Woodv. Med. Bot.* plate 195. 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, dentate; tendrils opposite the leaves, solitary, spiral; flowers, very small, greenish, in pendant racemes opposite to the leaves; calyx 5-toothed; petals 5, cohering at the apex, separating at the base, and dropping off like a calyptra; stamens 5; fruit *(Uva)*, succulent, globose, usually 4-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 nd 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 "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

aken 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.

PREPARATIONS IN WHICH RAISINS ARE USED.—Tinctura Cardamomi Composita; Tinctura Sennæ.

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 378). The character of the integument must also be taken into consideration, as the finer the skin is, the more susceptible will it be of the action of this class of remedies.

Acidum Sulphuricum (described already, p. 89, 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. 91). 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,* pp. 3, 241.) 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 inflammation; 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; 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, shaking them together until a clear solution is formed.) 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 vaporised 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 p. 275, 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, forbid 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 so 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 p. 297 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. Graves suggested their employment in arthritic rheumatism, after the first inflammatory symptoms had been abated by the use of leeches, and Dr. Davies recommends their use over the affected joints in the very commencement of the disease. My own experience corroborates his as to their great value under such circumstances. To excite the system generally, they are applied in the comatose stages of typhoid fever or pestilential cholera, and in apoplectic affections. When used with this intention they should not be left on more than two hours, and should be applied successively to different portions of the body, constituting what Graves termed *flying blisters;* so applied over the heart and epigastrium, the effects following their use are occasionally very remarkable. 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 are employed with much advantage in chronic inflammatory diseases as powerful counter-irritants, forming what is termed a perpetual blister. 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. Pregnant women also bears blisters badly, great constitutional irritation occasionally following their employment under such circumstances.

Acetum Cantharidis. Vinegar of Cantharides. (Take of cantharides in powder, two ounces; glacial acetic acid, two fluid ounces; acetic acid, eighteen fluid ounces, or a sufficiency. Mix thirteen fluid ounces of the acetic acid with the glacial acetic acid, and digest the cantharides in this mixture for two hours at a temperature of 200°; then transfer the ingredients, after they have cooled, to a percolator, and when the liquid ceases to pass pour five fluid ounces of acetic acid over the residuum in the apparatus. As soon as the percolation is complete, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient acetic acid to make one pint.) This preparation is rather stronger than the Acetum Cantharidis of the London Pharmacopœia. It is less active than the preparations ordered under the same name in the Edinburgh and Dublin Pharmacopœias. It is very frequently 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.

Charta Epispastica. Blistering Paper. (Take of white wax, four ounces; spermaceti, one ounce and a half; olive oil, two fluid ounces; resin, three quarters of an ounce; Canada balsam, a quarter of an ounce; cantharides, in powder, one ounce; distilled water, six fluid ounces. Digest all the ingredients, except the Canada balsam, in a water bath for two hours, stirring them constantly, then strain, and separate the plaster from the watery liquid. Mix the Canada balsam with the plaster melted in a shallow vessel, and pass strips of paper over the surface of the hot liquid, so that one surface of the paper shall receive a thin coating of plaster. It may be convenient to employ paper ruled so as to indicate divisions each of which is one square inch.) Intended as an officinal substitute for Albespeyre's papers; which however have gotten such a hold upon public opinion, and are such very admirable preparations, that I doubt their being supplanted by the pharmacopœial preparation.

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 water bath till reduced to one-third. Then add the other ingredients, and melt in a water bath, stirring

well until the whole is thoroughly mixed.) Rubefacient ; in very general use, spread on leather or stout paper, and worn over the chest for some days, in chronic pulmonary affections.

Emplastrum Cantharidis. Cantharides Plaster. (Take of cantharides, in 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 water bath, and add the resin previously melted, then introduce the cantharides, mix the whole thoroughly, and continue to stir the mixture while it is allowed to cool.) 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.*

Liquor Epispasticus. Blistering Liquid. Syn. : *Linimentum Cantharidis. Liniment of Cantharides,* 1864. (Take of cantharides, in powder, eight ounces ; acetic acid, four fluid ounces ; ether, a sufficiency. Mix the cantharides and acetic acid ; pack them in a percolator, and at the expiration of twenty-four hours pour ether

over the contents of the percolator, and allow it to pass slowly through till twenty fluid ounces are obtained. Keep it in a stoppered bottle.) This is a useful preparation; applied with a camel's-hair pencil two or three times over any place we may desire to blister, it rapidly produces vesication. Its name has been very properly changed, inasmuch as it never should be used as a liniment.

Unguentum Cantharidis. Ointment of Cantharides. (Take of cantharides, one ounce; yellow wax, one ounce; olive oil, six fluid ounces. Infuse the cantharides in the oil, in a covered vessel, for twelve hours, then place the vessel in boiling water for fifteen minutes, strain through muslin with strong pressure, add the product to the wax previously melted, and stir constantly while the mixture cools.) Used to keep issues open, and also to produce counter-irritation.

* *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, ℥ss.; 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 con-

cretes 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, $3\frac{3}{4}$; olive oil, $2\frac{1}{4}$; oil of chocolate, 3; spermaceti, $2\frac{1}{4}$; turpentine, $\frac{3}{4}$; 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.

CAPSICI FRUCTUS. *Capsicum Fruit.* (The dried ripe fruit of Capsicum fastigiatum, *Blume, Bijdr.; Wight, Icones Plant. Ind. Orient.* vol. iv. plate 1617. Imported from Zanzibar, 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, acuminate, sometimes hairy on the veins underneath, placed on long foot-stalks in irregular order; flowers white, axillary, solitary; fruit oblong, conical, juiceless, scarlet or yellow, pendulous: it is often termed a pod, or a berry, but it is more properly named a nuculanium or uva.

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 crystallised. 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 p. 168 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. From its diligent and continued employment I have seen decided good effects follow in the treatment of asthma. 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. 378). 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. This will be found far cheaper than the officinal formulary and quite as efficacious. 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 the counter-irritant.

Linimentum Crotonis. Liniment of Croton Oil. (Take of croton oil, one fluid ounce; oil of cajuput; rectified spirit, of each three fluid ounces and a half. Mix.) This constitutes a very elegant, but very expensive liniment; it is of a fine green colour, perfectly transparent, and very efficacious as an epispastic.

* 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 genus is characterized by its monœcious heads of flowers surrounded by an involucrum of one leaf with five divisions, which have externally 5 glands alternating with them; male flowers, several in each head, consisting of a single stamen without a perianth; female flowers, one in each head, supported on a long stalk, ovary, 3-lobed, 3-celled; capsule separating into 3 1-seeded cocci which dehisce at the ventral suture.

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 employed in medicine.

IPECACUANHA (described p. 320, 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 48 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, ʒij.; 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 p. 282, 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.

Extractum Mezerei Æthereum. Ethereal Extract of Mezereon. (Take of mezereon bark, cut small, one pound; rectified spirit, eight pints; ether, one pint. Macerate the mezereon in six pints of the spirit for three days with frequent agitation; strain and press. To the residue of the mezereon add the remainder of the spirit, and again macerate for three days with frequent agitation; strain and press. Mix and filter the strained liquors; recover the greater part of the spirit by distillation, evaporate what remains to the consistence of a soft extract; put this into a stoppered bottle with the ether, and macerate for twenty-four hours, shaking them frequently. Decant the ethereal solution; recover part of the ether by distillation, and evaporate what remains to the consistence of a soft extract.) A very expensive extract, and one with which we could very well dispense; introduced into the Pharmacopœia only with the view of being employed in the preparation of the Linimentum Sinapis Compositum, eight grains in one fluid ounce.

* 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.* The Artemesia moxa 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 it 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 an 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 considered 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 p. 71, 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 p. 335, 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 385) may be preferred for that purpose: one part of powdered savin combined with two parts of finely powdered alum form 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 Indian-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 259).

SINAPIS. *Mustard* (described p. 324, 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*, 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, to produce counter-irritation. 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 be 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 a sinapism 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.)

Linimentum Sinapis Compositum. Compound Liniment of Mustard. (Take of oil of mustard, one fluid drachm; ethereal extract of mezereon, forty grains; camphor, one hundred and twenty grains; castor oil, five fluid drachms; rectified spirit, four fluid ounces. Dissolve the extract of mezereon and camphor in the spirit, and add the oil of mustard and castor oil.) A good epispastic liniment, suited for employment in cases of muscular rheumatic pains, &c. Its expense is its great drawback.

* 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 p. 61, 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 soft soap, two ounces; camphor, one ounce; oil of turpentine, sixteen fluid ounces. Dissolve the camphor in the oil of turpentine, then add the soap, rubbing them together until they are thoroughly mixed.) A very useful epispastic liniment.

Linimentum Terebinthinæ Aceticum. Liniment of Turpentine and Acetic Acid. (Take of oil of turpentine, acetic acid, liniment of camphor, of each one fluid ounce. Mix.) An officinal imitation of St. John Long's liniment. I prefer the original formulary.

* *Linimentum Terebinthinæ ut Kentish. Kentish's Turpentine Liniment.* (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 tupentine, 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.; rose 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 the late 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 the 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 BENZOICUM. *Benzoic Acid.* (Syn. *Flowers of Benjamin.*) $HO,C_{14}H_5O_3$ (=122) or $\mathbf{HC_7H_5O_2}$ (=122.) (A crystalline acid obtained from benzoin, and prepared by sublimation.) No directions are given for the preparation of this acid in the Pharmacopœia; it is, however, readily obtained in the following manner.

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, eighteeen 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 the 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.

EXPLANATION OF PROCESS.—In this process, originally suggested by Mohr, the benzoic acid is simply sublimed from the benzoin; whether the acid exists ready formed in the gum, or is developed by the heat employed, will be discussed under the head of benzoin.

PHYSICAL PROPERTIES.—In the form of soft, elastic, pearl-white, satiny crystals or scales, having a very aromatic odour, resembling that of benzoin, and an acid penetrating taste. Specific gravity, 0·667.

CHEMICAL PROPERTIES.—Its composition is $C_{14}H_5O_3$, combined in the crystalline state with one equivalent of water. It is permanent in the 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. Benzoic 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.

CHARACTERS AND TESTS.—In light feathery crystalline plates and needles, which are flexible, nearly colourless, and have an agreeable aromatic odour, resembling that of benzoin. It is sparingly soluble in water, but is readily dissolved by rectified spirit; soluble also in solutions of the caustic alkalies and of lime, and it is precipitated from these on the addition of hydrochloric acid unless the solution be very dilute. It melts at 248°, and boils at 462°. When heated to the last-named temperature, it passes off in vapour, leaving only a slight 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, benzoic acid is scarcely ever employed in the present day, except pharmaceutically in preparing the *Ammoniæ Benzoas*, the *Tinctura Opii Ammoniata*, and the *Tinctura Opii Camphorata*. 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, rheumatism, and calculous disorders. In a case of uric acid gravel, in which I employed benzoic 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 benzoic 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 benzoic acid in its passage through the system abstracting the elements of gelatine sugar, *glycocoll* ($C_4H_5NO_4$), and becoming thereby converted into hippuric acid ($C_{18}H_9NO_6$) and water, thus, $HOC_{14}H_5O_3 + C_4H_5NO_4 = C_{18}H_9NO_6 = 2HO$. 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 benzoic acid cannot be regarded as a remedy for uric acid disease.

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.

PREPARATIONS.—Ammoniæ Benzoas; Tinctura Camphoræ Composita, two grains in one fluid ounce; Tinctura Opii Ammoniata, nine grains in one fluid ounce.

ANTIMONIUM TARTARATUM. *Tartar Emetic* (described p. 275, in the division *Diaphoretics*), administered in small doses from 1-16 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.* (A balsam obtained from Myroxylon Pereiræ, *Klotzsch*, *Pharm. Journ.* vol. x. page 282, plate (*Myrospermum of Sonsonate*). It exudes from the trunk of the tree after the bark has been scorched and removed. From Salvador in Central America.) 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 Sonsonate 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 in accordance with a happy suggestion of the late Dr. Royle has now been named Myroxylon 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, the former geographical position assigned to it.

BOTANICAL CHARACTERS.—A lofty, handsome, branching tree, with a smooth, thick, very resinous bark; leaves, alternate, imparipinnate, consisting of eleven leaflets, which are ovate, blunt, and downy on their midrib and petiole, and which exhibit in lines parallel with the primary veins, round and linear pellucid spots; flowers, white, in axillary racemes; fruit a samaroid 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 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 Sansonate, 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.

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 *cinnameine*, 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.

CHARACTERS.—A reddish-brown or nearly black liquid, translucent in thin films; having the consistence of syrup, a balsamic odour, and an acrid slightly bitter taste; soluble in five parts of rectified spirit. 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.* (A balsam obtained from Myroxylon Toluifera, *HBK.* It exudes from the trunk of the tree after incisions have been made into the bark. From 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.—A tall tree, which differs from the Myroxylon Pereiræ in the characters of the leaves, the leaflets being thin, membranous, obovate, lengthened, and acuminate at the apex, the terminal leaflets being larger than the lateral ones.

PREPARATIONS.—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.

PREPARATIONS.—Syrupus Tolutanus, one ounce and a quarter to three pounds; Tinctura Benzoini Composita (see p. 399), eleven grains to one fluid ounce; Tinctura Tolutana, fifty-four grains and a half to one fluid ounce.

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, f3ij. to f3ss.; merely used as a very agreeable 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, a sufficiency. Macerate the balsam of tolu in fifteen fluid ounces of the spirit, in a closed vessel, with occasional agitation, for six hours, or until the balsam is dissolved; then filter, and add sufficient rectified spirit to make one pint); it is precipitated when added to water, but may be suspended in water by means of mucilage or syrup. Dose, 20 to 40 minims. Tincture of Tolu enters into the following preparations :—Trochisci Acidi Tannici; Trochisci Morphiæ; Trochisci Morphiæ et Ipecacuanhæ; Trochisci Opii.

BENZOINUM. *Benzoin.* (A balsamic resin obtained from Styrax Benzoin, *DC. Phil. Trans.* vol. lxxvii. plate 12. It is procured by making incisions into the bark of the tree, and allowing the liquid that exudes to concrete by exposure to the air. 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, oval-oblong, entire, acuminate, tomentose beneath; flowers in compound axillary racemes, nearly as long as the leaves; corolla, grey, of 5 petals, often connate at the base.

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. Each tree furnishes about three pounds of benzoin annually, and continues to do so for ten or twelve years; the produce of the first three years is whiter and purer than that subsequently

obtained, and is called *head* benzoin, the produce of the succeeding years is called *belly* benzoin; finally the tree is cut down, split open, and the billets deprived by scraping of any adhering benzoin, which goes by the name of *foot* benzoin; the figures 105, 45, 18, shew the relative commercial value of these three varieties of benzoin.

CHARACTERS.—In lumps consisting of agglutinated tears, or of a brownish mottled mass, with or without white tears embedded in it; has little taste, but an agreeable odour; gives off when heated fumes of benzoic acid, is soluble in rectified spirit, and in solution of potash.

PHYSICAL PROPERTIES.—Benzoin 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. Benzoin 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 benzoic acid, with a trace of volatile oil, aromatic extract, etc. (Kopp.) It has been questioned whether the benzoic acid exists as a primary constituent of gum benzoin, or whether it is formed during the progress of the different processes suggested for obtaining it, inasmuch as gum benzoin exhausted of its benzoic acid by treating it with a solution of bicarbonate of soda, in which it is very soluble, will yield benzoic acid on being subjected to sublimation. Benzoin is permanent in the air; heated it fuses and benzoic acid is sublimed; it is inflammable, and burns with a fuliginous flame, and an agreeable odour. It is partly soluble in alcohol, ether, and acetic acid; boiling distilled water dissolves out the benzoic acid.

THERAPEUTICAL EFFECTS.—Benzoin 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 inadmissable in inflammatory cases.

DOSE AND MODE OF ADMINISTRATION.—It is not used in the solid state. Lately benzoin 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.

PREPARATIONS.—Acidum Benzoicum (see p. 394); Adeps Benzoatus (see p. 340), ten grains to one ounce; Tinctura Benzoini Composita, forty-four grains to one fluid ounce.

Tinctura Benzoini Composita. Compound Tincture of Benzoin. (Take of benzoin, 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 in a closed vessel, with occasional agitation, then filter, and add sufficient rectified spirit if required to make one pint.) A stimulating expectorant, but very rarely indeed employed now-a-days with that view. Dose, f3ss. to f3ij. 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 same 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. $\frac{1}{4}$th to gr. j. *Pilula Conii Composita*, gr. v. to gr. x. *Pilula Ipecacuanhæ cum Scilla.* (The *compound ipecacuan pill* of the former London Pharmacopœia. A useful stimulating expectorant in habitual cough affecting the old and debilitated.) Gr. v. three or four times a day. Every four grains contain about a quarter of a grain each of ipecacuan and opium. *Trochisci Ipecacuanhæ; Trochisci Morphiæ et Ipecacuanhæ*, one or two at intervals. *Vinum Ipecacuanhæ*, min. v. to min. xx. *Syrupus Ipecacuanhæ*, f3j. to f3ij. For the formulæ of all these preparations, see p. 323.

LOBELIA. *Lobelia.* (The dried flowering herb of Lobelia inflata, *Linn. Berg u. Schmidt Off. Gewachse*, plate 1 *a*. 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, angular stem; leaves, scattered, alternate, oblong, serrato-dentate, hairy; flowers, pale blue, in terminal racemes; capsules ovoid, inflated.

PREPARATION.—The entire herb is collected in the end of August, 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 *Lobelein*; 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, in its effects closely resembling those produced by tobacco on persons unaccustomed to its use, 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 much 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, in the so-called hay fever, 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. In cases of poisoning with lobelia, the most active stimulants, both internal and external, should be employed.

DOSE AND MODE OF ADMINISTRATION.—Lobelia may be given in powder, in which form I have generally 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. Few medicines vary so much in the effects it produces on different individuals, some being seriously affected by very small doses, whilst others appear to possess a singular immunity from its action, large doses producing upon them little apparent effect. In all cases, therefore, it is prudent to commence with small doses, which, however, can be gradually increased until a decided impression is produced upon the system.

PREPARATIONS.—Tinctura Lobeliæ, fifty-four grains and a half to one fluid ounce; Tinctura Lobeliæ Ætherea, fifty-four grains and a half to one fluid ounce.

Tinctura Lobeliæ. Tincture of Lobelia. (Take of lobelia, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the lobelia for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, ten minims to half a fluid drachm.

Tinctura Lobeliæ Ætherea. Ethereal Tincture of Lobelia. (Take of lobelia, in coarse powder, two ounces and a half; spirit of ether, one pint. Macerate for seven days in a closed vessel, with occasional agitation; then strain, press, filter, 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.

* 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.—Stem, erect, about a foot and a half high, with spreading branches, the entire plant hoary with white thick pubescence or woolliness; leaves, orbicular-ovate, dentate or crenate, wrinkled; flowers, small, white, in crowded whorls; calyx with 10 small hooked teeth; upper lip of the corolla narrow, erect, and 2-cleft.

PROPERTIES.—The whole plant has a peculiar aromatic odour, and a very bitter balsamic taste. Its properties depend on a 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 it 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 sesquisalts of iron, ipecacuanha, and tartar emetic.

SCILLA. *Squill* (described p. 308, 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 therefore be 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 salt, the tincture of squill is to be preferred to the syrup, inasmuch as the 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 (see p. 324) 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 (see p. 311) 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 powder, one ounce and a quarter; ginger in powder, ammoniacum in powder, hard soap in powder, of each one ounce; treacle, by weight, two ounces, or a sufficiency. Mix the powders, add the treacle, and beat into a uniform mass.) Dose gr. v. to gr. xv. in chronic catarrh and asthma. It spoils by keeping.

SENEGÆ RADIX. *Senega Root.* (The dried root of Polygala Senega, *Linn. Steph. and Church Med. Bot.* plate 103. 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, the upper ones acuminate; flowers, small, white, in spiked racemes; alæ of the calyx, orbicular, white, with green veins; 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. It seems to possess marked effects over the secretions, increasing notably those of the salivary glands, producing in some instances a troublesome salivation. Diuretic and emmenagogue properties have also been attributed to it, but it is very rarely employed nowadays with these objects in view.

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.

PREPARATIONS.—Infusum Senegæ, one ounce to one pint; Tinctura Senegæ, two ounces and a half to one pint.

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℥j. to f℥ij.

Tinctura Senegæ. Tincture of Senega. (Take of senega root, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the senega for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) This preparation was introduced for the first time into our pharmacopœias in the Pharmacopœia of 1864; I look upon it as a most valuable addition to our remedial agents. It should be given in doses of from f℥ss. to f℥ij. in conjunction with the infusion of senega.

STYRAX PRÆPARATUS. *Prepared Storax.* (A balsam obtained from the bark of Liquidambar orientale, *Miller's Dict. Pharm. Journ.* vol. xvi. page 462, plate. 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, on the authority of Mr. Hanbury, to be the produce of the *Liquidambar officinale,* which also belongs to the Natural family *Styracaceæ.*

BOTANICAL CHARACTERS.—A small tree; stem, from 15 to 25 feet high, branching at the top; leaves, alternate, ovate, villous beneath; flowers, white, in small racemes of from 3 to 5 flowers, shorter than the leaf; corolla, white, externally hoary, with 6-7 segments; 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 described in the Pharmacopœia as being 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 resemblance 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 benzoyle.

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 benzoyle ($C_{14}H_5O_2+H$) is due to the development of oxygen gas from the bichromate of potash by the action upon it of the sulphuric acid (see p. 77), 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 benzoin; 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 Benzoin Composita* of the Pharmacopœia (see p. 399).

CHAPTER XIV.

NARCOTICS.

(Anodynes ; Hypnotics ; Soporifics.)

NARCOTICS may be defined as 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 former, 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 *exhausting* 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 stupefying 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 of the influence of narcotics than individuals of mature age.

BELLADONNÆ FOLIA. *Belladonna Leaves.* (The fresh leaves, with the branches to which they are attached, of Deadly Nightshade, Atropa Belladonna, *Linn.;* also the leaves separated from

the branches and carefully dried; gathered from wild or cultivated British plants when the fruit has begun to form. *Flor. Lond.* fasc. v. plate 16.)

BELLADONNÆ RADIX. *Belladonna Root.* (The dried root of Atropa Belladonna, *Linn.* Cultivated in Britain or imported from Germany.) Belladonna, *Common Dwale,* or *Deadly Nightshade,* is an indigenous plant, belonging to the Natural family *Solanaceæ,* and to the Linnæan class and order *Pentandria Monogynia.*

BOTANICAL CHARACTERS.—Root, perennial, fleshy; stems 3–4 feet high, herbaceous; leaves, ovate, acute, entire, smooth, some very large, and frequently placed in pairs of unequal sizes; flowers, axillary, on short peduncles, drooping; calyx, deeply 5-lobed; corolla, pale, purplish-blue, nearly an inch long, with 5 short, broad lobes; 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.—*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.

PHYSICAL PROPERTIES.—Belladonna root is from one to two inches in diameter, and a foot or more in length; it 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 principally on a peculiar principle which has been named *atropia;* an alkaloid of which the chemical history will be presently 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. In addition to these Luebekind has announced the existence of another principle, *belladonnine,* to which probably may be attributed a portion of its physiological effects, and notably those presently to be alluded to as being produced by belladonna over the throat; two grains, according to Luebekind, producing extreme heat of throat and constriction of the larynx. 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 dry-

ness and constriction of the throat, accompanied with thirst and ineffectual efforts to vomit, vertigo, delirium, usually of a gay or mirthful character, excessive dilatation of the pupils, and consequent imperfect vision, convulsions, paralysis, and then coma, which is followed by death, unless active treatment be immediately employed. The impairment of vision is, as first pointed out by Muller, undoubtedly of a presbyopic character, and not by any means due to diminished sensibility of the retina; inasmuch as patients suffering from it and unable to see near objects, can see them perfectly by using convex spectacles *(magnifiers)* suited for presbyopic individuals. In medicinal doses it operates as an anodyne and calmative, diminishing pain and over-excitement of the nervous system, occasionally producing an eruption of the skin somewhat resembling that of scarlatina; and if the dose be pressed, dilatation of the pupil and dryness and redness of the fauces. 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; this nerve appearing, according to the experiments of Brodie and Claude Bernard, to preside over the secretions of the mucous membrane of these parts. 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 these seeming to be more efficacious than opium, to which, however, for the purpose of allaying *internal* pain, it is far inferior. 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 last most troublesome affection 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. In consequence of the cutaneous eruption and the affection of the throat it occasionally produces, at the suggestion of Hahneman, acting upon the celebrated principle originally enunciated by him that *similia similibus curantur*, 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 also, to some extent, tends to confirm 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 investigations on this subject may be cited those of Bayle, in which a record is given of 2,227 children and adults who had been subjected to the prophylactic treatment, of these 1,948 escaped the disease, 79 were attacked by it. 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; the remarkable experiment of Dusturberg, who gave belladonna to all the members of every family under his care (except one in each family) during an epidemic of scarlatina, and, as the result, he states that the excepted individual took the scarlatina, whilst all the rest escaped ; 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* strongly opposing the idea of its prophylactic character, and bringing forward numerous instances in which it was so employed, but with complete failure. His paper on the subject, in vol. xv. of the *British and Foreign Medico-Chirurgical Review*, merits attentive perusal by all who desire to master this most important subject. The great difficulty in solving the question in the affirmative, lies in the capricious character of the disease; every physician of any experience being able to produce numerous examples of but one member in a family being attacked, and that without the employment of any prophylactic measure whatever; whilst the numerous failures that must be admitted even by the most ardent supporters of its prophylactic virtues, tend to destroy our confidence in its value as a prophylactic agent. It is true that an occasional failure should not be considered fatal to its pretensions, inasmuch as we not unfrequently meet with cases of small-pox in the persons of those who were efficiently vaccinated. I, myself, treated a patient for small-pox, who had been vaccinated, and subsequently got small-pox in his youth, and was now again labouring under the disease, but that circumstance has not shaken my belief in the powerfully preservative character of vaccination, and so might reason the advocates of the prophylactic powers of belladonna, but I am afraid that in this latter case the authentic instances of repeated failures are far too numerous to allow them that loop-hole for escape. Belladonna, applied externally in the neighbourhood of the eye, causes, after the lapse of a few hours, dilatation of the pupil unattended with any permanent 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 be examined with greater facility. Various theories have been advanced to account for the dilatation of the pupil produced by belladonna and other mydriatic agents; none of these, however, are perfectly satisfactory. Muller ascribes their action to the paralytic influence they exert over the ciliary nerves; Wharton Jones to the narcotic influence which they produce over the fifth nerve, whereby the general sensibility of the retina is impaired, whilst Adams considers that their operation is confined to the radiating fibres of the iris. 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 of copper.

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.

PREPARATIONS OF THE LEAVES.—Extractum Belladonnæ, about four parts from one hundred; Tinctura Belladonnæ, one ounce to one pint.

PREPARATIONS OF THE ROOT.—Atropia; Linimentum Belladonnæ, one ounce to one fluid ounce.

Emplastrum Belladonnæ. Belladonna Plaster. (Take of extract of belladonna, resin plaster, of each, three ounces; rectified spirit, six fluid ounces. Rub the extract and spirit together in a mortar, and when the insoluble matter has subsided, decant the clear solution, remove the spirit by distillation or evaporation, and mix the alcoholic extract thus obtained with the resin plaster melted by the heat of a water-bath, continuing the heat until with constant stirring the plaster has acquired a suitable consistence.) Frequently applied over the seat of painful affections, being, for instance, an admirable local application in cases of neuralgic pains; applied over the sacrum, it gives relief in dysmenorrhœa; and over the region of the heart, in cases of tumultuous action, its use is also attended with some advantage.

Extractum Belladonnæ. Extract of Belladonna. (Take of the fresh leaves and young branches of belladonna, 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 suitable consistence for forming pills.) Dose gr. $\frac{1}{4}$ 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

application, and the slowness of its action. In spasms 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 in my opinion is more than doubtful. It has been also applied to the os uteri in protracted labour caused by rigidity, I believe with equally equivocal results.

Linimentum Belladonnæ. Liniment of Belladonna. (Take of belladonna root, in coarse powder, twenty ounces; camphor, one ounce; rectified spirit, a sufficiency. Moisten the belladonna with some of the spirit, and macerate in a closed vessel for three days: then transfer to a percolator, and adding more spirit percolate slowly into a receiver containing the camphor, until the product measures one pint.) A very great improvement, so far as physical appearance goes, on the muddy looking liniments formerly made by rubbing up the extract of belladonna with various menstrua. But, for therapeutic value, my experience rather inclines me to prefer the latter method of employing belladonna as a liniment.

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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the products, 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, mın. x. to min. xxx.; f℥j. to f℥iv. added to f℥iv. of water, or of any liniment, may be used as a lotion or liniment.

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.) A capital local application 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.) Perhaps the very best form for the internal exhibition of belladonna. 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

ATROPIA. *Atropia.* $C_{34}H_{23}NO_6$ or $\mathbf{C_{17}H_{23}NO_3}$. An alkaloid

obtained from Belladonna. It may be obtained by the following process :—

PREPARATION.—Take of belladonna root, recently dried, and in coarse powder, two pounds ; rectified spirit, ten pints ; slaked lime, one ounce ; diluted sulphuric acid, carbonate of potash, of each a sufficiency ; chloroform, three fluid ounces ; purified animal charcoal, a sufficiency ; distilled water, ten fluid ounces. Macerate the root in four pints of the spirit, for twenty-four hours, with frequent stirring. Transfer to a displacement apparatus, and exhaust the root with the remainder of the spirit by slow percolation. Add the lime to the tincture placed in a bottle, and shake them occasionally several times. Filter, add the diluted sulphuric acid in very feeble excess to the filtrate, 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 liquor 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 neutralise 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) ; on the addition of the lime a malate of lime is formed, and the atropia is set free, and caught on the filter, and is converted into sulphate of atropia on the subsequent addition of the sulphuric acid ; on the first addition of carbonate of potash a yellowish resinous substance *(Belladonnine ?)* 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 agency 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 AND TESTS.—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 leaves no ash when burned with free access of air. It is an active poison.

THERAPEUTICAL USES.—The alkaloid atropia has not been given internally in medicine even in very minute doses, in consequence of its highly poisonous action. 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 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 sometimes lasting for 4 or 5 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 rarely producing pain or 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. In addition to the officinal preparations described below, atropine papers and atropine gelatine are now prepared—preparations which are infinitely more convenient and which fulfil every indication required of atropia in ophthalmic practice; they are simply paper or gelatine saturated with atropia. A minute portion of either introduced into the eye, rapidly dilates the pupil. The gelatine preparation is to be preferred to the atropine paper, inasmuch as it is dissolved in the secretions of the eye, and consequently will not require to be subsequently removed as does the paper.

PREPARATIONS.—Atropiæ Liquor, four grains in one fluid ounce; Atropiæ Sulphas; Atropiæ Sulphatis Liquor, four grains in one fluid ounce; Atropiæ Unguentum, eight grains in one ounce.

Liquor Atropiæ. Solution of Atropia. (Take of atropia, four grains; rectified spirit, one fluid drachm; distilled water, seven fluid drachms. Dissolve the atropia in the spirit, and add this gradually to the water, shaking them together.) An officinal substitute for Wilde's solutions. Both of these solutions, however, occasionally give rise to great pain when dropped into the eye.

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.

---

* *Dublin Quarterly Journal of Medical Science*, New Series, vol. 2, page 553, 1846.

ATROPIÆ SULPHAS. *Sulphate of Atropia.*

PREPARATION.—Take of atropia, one hundred and twenty grains; distilled water, four fluid drachms; diluted sulphuric acid, a sufficiency. Mix the atropia with the water, and add the acid gradually, stirring them together until the alkaloid is dissolved and the solution is neutral. Evaporate it to dryness at a temperature not exceeding 100°.

EXPLANATION OF PROCESS.—A simple case of chemical union between the sulphuric acid and the atropia, resulting in the production of the salt.

CHARACTERS AND TESTS.—A colourless powder, soluble in water, forming a solution which is neutral to test paper, and when applied to the eye dilates the pupil as the solution of atropia does. It leaves no ash when burned with free access of air.

THERAPEUTICAL USES.—This salt is only intended for external application. It is a powerful poison, and therefore should never be administered internally. Externally it may be employed under the same circumstances as atropia itself, over which it possesses the advantage of being far more soluble.

PREPARATION.—Liquor Atropiæ Sulphatis, four grains in one fluid ounce.

Liquor Atropiæ Sulphatis. Solution of Sulphate of Atropia. (Take of sulphate of atropia, four grains; distilled water, one fluid ounce. Dissolve.) Intended to be employed as a substitute for the preceding solution of atropia, over which it possesses the advantage of being just as efficient a mydriatic agent, without producing pain. All these solutions, however, in my opinion will be eventually superseded by the atropine paper or gelatine previously described.

CANNABIS INDICA. *Indian Hemp.* (The dried flowering tops of the female plants of Cannabis sativa, *Linn.* Hemp. *Berg. u. Schmidt, Off. Gewächse, plate xix. b.* For medicinal use that which is grown in India, and from which the resin has not been removed, is alone to be employed.) 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.—Stem, branching from the base, annual, 3–5 feet high, erect, angular; leaves, digitately divided, supported on long weak petioles, segments 5, linear-oblong, acuminate, serrate; stipules subulate; flowers, diœcious; males:—perianth 5-partite, imbricated; stamens, 5; females:—perianth (bract?) 1-leaved, acuminate, rolled round the ovary; fruit, 1-celled, 2-valved.

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.

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* 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 of *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

* 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.

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. Previous to the appearance of its narcotic effects, it produces strange feelings of exhilaration—remarkable increase of appetite, and in some instances strong aphrodisiac propensities develop themselves. In its narcotic effects it differs from opium in not causing constipation, and in not impairing the appetite for food, but, on the contrary, as already stated, rendering those under its influence voracious. With the object of obtaining relief in a severe neuralgic attack, Neligan took a full dose of the ethereal tincture some years ago for two nights in succession with the most decided beneficial results; on each night, although he obtained almost immediate relief from pain, he was the subject of singular hallucinations which proved quite satisfactorily to himself 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 employed with great success in the treatment of sciatica, neuralgic pains, and of chronic rheumatism; in chorea Indian hemp occasionally produces relief, which, however, is but of a temporary character; and it has been employed with varying success in tetanus, in some instances effecting a complete cure, and in several cases where it eventually failed in curing the patient, affording a mitigation of his sufferings. In hydrophobia, also, it has afforded temporary relief, but, as with all other medicines employed in this terrible disease, has failed in effecting a permanent cure. 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. The attempt to get out of the window in this case was not attributable to a suicidal motive, but to that peculiar feeling of exhilaration of spirits already alluded to as evinced by persons under the influence of Indian hemp, which is sometimes so intensified as to lead the individuals to imagine themselves possessed of an ethereal nature, and to be independent of material support. A most distinguished Materia Medica scholar, author of a justly popular work on the subject, informed me that he, himself, experienced a similar sensation whilst labouring under the influence of hachish. I have derived excellent effects from the administration of the tincture of Indian hemp in the nervous depression and palpitations 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 greater part of the spirit, and evaporate what remains by a water-bath to the consistence of a soft extract.) 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. gra-

dually 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 f3j. contains nearly two grains and three-fourths of a grain of the extract. Dose, min. x. to f3ss. 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.

HYOSCYAMI FOLIA. *Hyoscyamus Leaves.* (The fresh leaves, with the branches to which they are attached, of Hyoscyamus niger, *Linn.*; also the leaves separated from the branches and carefully dried; gathered from wild or cultivated British biennial plants, when about two-thirds of the flowers are expanded. *Steph. and Church. Med. Bot.* plate 9.) Hyoscyamus or *Henbane* is 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, slightly decurrent, dentato-sinuate; flowers, nearly sessile, arranged in unilateral leafy spikes, 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. The fresh juice, dropped into the eye, dilates the pupil.

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, with marked dilation of the pupil, followed by sopor, 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 spas-

modic 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, hæmorrhoidal 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. 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.

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 are the preparations which, 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 suitable consistence for forming pills.) Dose, gr. ij. to gr. x. in the form of pill. Frequently and beneficially added to purgative pill masses to correct griping.

Tinctura Hyoscyami. Tincture of Hyoscyamus. (Take of hyoscyamus leaves, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the hyoscyamus for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, ½ to 1 fluid drachm.

* *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 414), potash and soda, but not their carbonates or bicarbonates.

LACTUCA. *Lettuce.* (The flowering herb of Lactuca virosa, *Linn.*) The Lactuca sativa, and Lactuca virosa, both abound in a milky juice which is known by the name of *Lactucarium, Lettuce opium*, or *garden opium*. 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 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; flower-heads, small, yellow, in panicles; beak as long as the much compressed black achene. *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; flower-heads, pale yellow, small, in terminal corymbs.

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 extract ordered in it being evidently intended as its representative. The 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 neu-

tral 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, though in a much minor degree, 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. A combination of it with ipecacuanha is frequently found of service in the troublesome hacking cough so often associated with this disease. Lactucarium has been also employed as a narcotic in febrile and inflammatory affections, in rheumatism, in arthritis, and in nervous disorders, where from any cause opium is contra-indicated.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xx. in the form of pill.

Extractum Lactucæ. Extract of Lettuce. (Take of the flowering herb of lettuce, 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 suitable consistence for forming pills.) The officinal substitute for lactucarium. Dose, 5 to 20 grains.

LUPULUS. *Hop.* (The dried strobiles of the female plant of Humulus Lupulus, *Linn. Steph. and Church. Med. Bot.* plate 41. Cultivated in England.) Scarcely indigenous, probably introduced from Holland; but now extensively used in England; 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, sca-

brous; leaves petiolate, opposite, 3–5 lobed, serrated, veiny, rough; flowers, diœcious, greenish-yellow; male-flowers:—perianth, 5-partite; stamens, 5; anthers with two pores at the apex; female-flowers:—in catkins, the scales concave, entire, single-flowered; perianth, none; embryo, spiral.

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.—Strobiles of a greenish-yellow colour, with minute yellow grains (Lupuline) adherent to the base of the scales. 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 as a 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 not unfrequently 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.

PREPARATIONS.—Extractum Lupuli; Infusum Lupuli, half an ounce to ten fluid ounces; Tinctura Lupuli, two ounces and a half to one pint.

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, press out 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° until it has acquired a suitable consistence for forming pills.) Dose, 5 to 15 grains.

Infusum Lupuli. Infusion of Hop. (Take of hop, 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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, ½ to 2 fluid drachms.

INCOMPATIBLES.—Mineral acids; and the salts of iron, lead, mercury, and silver.

PAPAVERIS CAPSULÆ. *Poppy Capsules.* (The nearly ripe dried capsules of the white poppy, Papaver somniferum, *Linn.*, *Woodv. Med. Bot.*, plate 185. Cultivated in Britain.) The Papaver somniferum was 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, alter-

nate, 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; stamens, numerous; ovary, inferior, compound, 1-celled, with parietal placentæ; style, none; stigma, radiate and sessile; capsules, obovate or globose, smooth, many-seeded; seeds, small, roundish or reniform, oily.

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. 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. 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, the amount of which will depend upon their condition when collected, and the length of time which they may have been kept; 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, two ounces; distilled water, one pint and a half. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) This is one of our most favourite anodyne stupes. I approve of there being no directions given to reject the *seeds*, as was done in the Pharmacopœia of 1864, 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.

Extractum Papaveris. Extract of Poppies. (Take of poppy capsules, dried, freed from the seeds, and coarsely powdered, one pound; rectified spirit, two ounces; boiling distilled water, a sufficiency Mix the poppy capsules with two pints of the water, and infuse for twenty-four hours, stirring them frequently; then pack them in a percolator, and adding more of the water allow the liquor slowly to pass until about a gallon has been collected, or the poppies

are exhausted. Evaporate the liquor by a water-bath until it is reduced to a pint, and, when cold, add the spirit. Let the mixture stand for twenty-four hours, then separate the clear liquor by filtration, and evaporate this by a water-bath until the extract has acquired a suitable consistence for forming pills.) In this preparation the seeds are correctly desired to be rejected. It was not in the Pharmacopœia of 1864, although in both the London and Edinburgh pharmacopœias, and also in rather general use. It is mildly anodyne and hypnotic in its action, being generally considered as less likely than opium to produce after constitutional disturbances. Its dose is from 2 to 5 grains.

Syrupus Papaveris. Syrup of Poppies. (Take of poppy capsules, dried, freed from the seeds, and coarsely powdered, thirty-six ounces; rectified spirit, sixteen fluid ounces; refined sugar, four pounds; boiling distilled water, a sufficiency. Mix the poppy capsules with four pints of the water, and infuse for twenty-four hours, stirring them frequently; then pack them in a percolator, and adding more of the water allow the liquor slowly to pass until about two gallons have been collected or the poppies are exhausted. Evaporate the liquor by a water-bath until it is reduced to three pints. When quite cold, add the spirit, let the mixture stand for twelve hours, 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. For it is also frequently substituted a syrup 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.

OPIUM. *Opium.* (The juice inspissated by spontaneous evaporation, obtained by incision from the unripe capsules of the poppy, Papaver somniferum, *Linn.*, grown in Asia Minor.) The Papaver somniferum has been already described (see p. 427).

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 have been removed, which is done just before they would have fallen off naturally, and which petals are made use of in a manner presently to be described, between the 20th of February and 25th of March in each year, 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 with instruments like concave trowels, which are called *seetooahs*, and deposited in earthen or wooden vessels, in which it is assiduously stirred until the different collections made are thoroughly incorporated, water or saliva being sometimes added to keep up the moisture, the latter of which is supposed by the natives to prevent fermentation. After the capsules are exhausted of their opium, they are collected, and from the seeds an oil is expressed, which is used for domestic purposes, and the remaining cake is used for food for cattle, or for very poor people, or employed to make poultices. The stems and leaves are left standing until dried by the hot winds of April and May, when they are reduced to a coarse powder, called *poppy trash*, which is subsequently used for packing the opium, When fresh collected, the juice presents the appearance of a wet pinkish granular mass, from which exudes a dark fluid called *pussewah*, which is employed at a later period in the manufacture of the opium. The opium is concentrated without heat, usually by daily exposure for about three weeks to the air, but not to the sun; and when it arrives at what is termed *standard consistence*, it is brought to the factory, and its preparation for the market completed there. By standard consistence is understood a sample of opium, which when subjected to a heat of 200° F. until everything volatile is driven off, will leave 70 per cent. of residue. Whether it is of standard consistence is tested in two ways—first by a native examiner called a *purkhea*, who plunges his hand into the sample, and who by long experience has gotten such a *tactus eruditus* that he can at once detect all grosser impurities, and ascertain with an amazing approach to accuracy the consistence of the sample. It is now brought to the laboratory, and tested there; but if any discrepancy exist between the reports of the chemists and of the purkhea, the latter is generally found to be correct. If the opium be of standard consistence, it is now fit for what is technically termed *caking;* if it be not, it is left in shallow drawers, and occasionally stirred, until by spontaneous evaporation it acquires the proper consistence. Caking is effected by placing a number of what are termed *leaves* in a brass cup, so as to form a bed in which is placed the opium; these leaves are agglutinated together by a thick stuff called *lewah*, composed of the pussewah previously mentioned and of the inferior kinds of opium; the opium being worked up into a globular form, is covered on all sides by the leaves, which are then glued together with the lewah, rolled in poppy trash, and baked by exposure to the direct influence of the sun. The leaves employed in this process are made from the petals of the poppy itself, by spreading them one over the other, extending them from the centre to the circumference, until they form circular cakes about from twelve to fourteen inches

in diameter, and about the sixteenth of an inch in thickness. The petals are made to cohere, by placing them on circular shallow vessels, moderately heated, when their glutinous juice exudes, which serves to cement the next layer, which in their turn exude their juice, and so on until the cake is completed. These cakes are what are called *leaves* in the opium factories. One of the most remarkable facts connected with the manufacture of opium, and which is full of therapeutical significance, is the very slight narcotic effect produced by the opium over those employed in its manufacture. The native purkhea with his hands and arms immersed in the opium for nine hours daily, complains of no other effect than that which might fairly be attributed to physical exhaustion; and so with every other person employed in the factory. For a fuller account of the method of preparing opium in India for exportation, I must refer my readers to the most interesting and instructive account given us of it by Dr. Eatwell, abstracts of which will be found in the *Pharmaceutical Journal* for 1852.

CHARACTERS.—Irregular lumps, weighing from four ounces to two pounds; enveloped in the remains of poppy leaves, and generally covered with the chaffy fruits of a species of rumex; when fresh, plastic, tearing with irregular, slightly moist, chesnut-brown surface, shining when rubbed smooth with the finger, having a peculiar odour and 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 manu-

factured 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 at 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 HISTORY.—No drug in the entire list of the Materia Medica has had its chemical history investigated with greater zeal than opium. Since the year 1803, when its chemical properties were first investigated by Derosne, up to the present year it has occupied the attention of various chemists of celebrity, each of whom in his turn has contributed more or less to our present knowledge of its very complex composition. Amongst those who have directed their attention to its chemical analysis, and who have added to the list of its constituents, may be mentioned the names of Derosne, Sertürner, Robiquet, Pelletier, Couerbe, Merck, Hin-

terberger, the Messrs. Smith, Dublanc; each of whom has established the existence of some one or other of the principles at present recognized as existing in opium; whilst Bucholz, Seguin, Braconnot, Buchner, Pfendler, Schindler, Biltz, Mulder, with many others, have published more or less elaborate analyses of its composition. Whilst recognizing it to be a very complex substance, containing several distinct principles, I think that too much caution cannot be exercised in guarding against the error of considering every product resulting from the action upon it of chemical reagents to be a distinct principle originally existing in the opium examined. The following table exhibits the more generally recognized of the principles of opium, their per-centage, the date of their discovery, and the name of their discoverer.

Name.	Per-centage.	Discoverer.	Date.
Narcotine ...	From 6 to 8 per cent.	Derosne ...	1804
Morphine ...	From 6 to 15 per cent.	Sertürner ...	1804
Codeine ...	Less than 1 per cent.	Robiquet ...	1833
Narceine ...	———	Pelletier ...	1833
Pseudomorphine (?)	———	Pelletier ...	1835
Thebaine ...	Less than 1 per cent.	Pelletier & Couerbe	1835
Papaverine ...	Less than 1 per cent.	Merck ...	1840
Opianine ...	———	Hinterberger ...	1851
Cryptopia ...	A trace	T. and H. Smith	1867
Meconic Acid ...	From 6 to 8 per cent.	Sertürner ...	1804
Oily Acid (Opium Fat)	———	Pelletier ...	1833
Opium Resin ...	———	Pelletier ...	1833
Meconin ...	———	Dublanc ...	1833
Porphyroxin (?) ...	———	Merck ...	1837
Thebolactic Acid ...	———	T. and H. Smith	1862

Of these several substances the first nine are alkaloids, two are acids (meconic and thebolactic acids), and the remainder are neutral. In addition to them, however, are also found in opium caoutchouc (from four to five per cent.); gum; albumen; its odorous principle (probably a volatile oil, but which never yet has been isolated); sulphuric acid, lignin, extractive matter, and numerous salts of inorganic bases. The constituents of opium are partially soluble in water, either warm or cold, about a third, consisting chiefly of a dark viscid substance resembling caoutchouc and of narcotin, being left undissolved; 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 matter. In toxicological investigations it sometimes becomes necessary to establish the presence or non-presence of opium. For full particulars upon this most important subject, I must refer my readers to works specially devoted

to medical jurisprudence, here I must content myself with stating that the tests usually are directed to establishing the presence of two of the principles of opium, its morphia and its meconic acid. To detect these we must add to the filtered liquor a solution of acetate of lead, when if it contain opium, meconate of lead will be precipitated, and acetate of morphia together with the excess used of acetate of lead will be held in solution. The meconate of lead so obtained is now to be suspended in water, and decomposed either by the addition of sulphuric acid, which will precipitate the lead in the form of sulphate of lead, setting free the meconic acid, which will be held in solution ; or a stream of sulphuretted hydrogen gas is to be passed through the solution in which is suspended the meconate of lead, whereby it will be decomposed, sulphide of lead being precipitated, and meconic acid set free; in this latter case, the solution should be gently heated, so as to expel any excess of sulphuretted hydrogen that may be present in the mixture. In whichever manner the meconic acid is liberated it can be separated from the precipitate by filtration, and on the addition of a solution of perchloride of iron, will strike with it a blood-red colour; with the ammoniated copper, a green colour; and will yield a white precipitate with solutions of nitrate of silver, of chloride of barium, and of acetate of lead. By these proceedings the presence of meconic acid will be established : it now remains but to demonstrate that of morphia also ; this can be done by taking the solution from which the meconic acid had been obtained, and which it will be observed is a mixed solution of acetate of morphia and of acetate of lead; through this is to be passed a stream of sulphuretted hydrogen, which will precipitate the lead in the form of sulphide. The mixture is now to be heated to expel the excess of sulphuretted hydrogen gas employed, and a portion of the resulting solution treated with nitric acid, which will strike a red colour with the morphia; another portion of the solution is to be treated with iodic acid, which will produce with the morphia a reddish-brown colour, and the iodic acid itself being deoxidized, iodine will be set free, which will strike with starch the characteristic blue colour; on the addition of a solution of tannic acid to another portion of the solution, tannate of morphia will be precipitated ; whilst on the cautious addition of solution of ammonia to another portion of the solution, a precipitate, soluble in an excess of the reagent, will be thrown down; this precipitate is morphia, which will be coloured red, subsequently becoming yellow, with nitric acid, and which will be coloured blue on the addition of sesquichloride of iron. Of the different substances enumerated in the preceding table as existing in opium, the one of principal importance in relation to medicine is *morphia*, which, with its salts, will be presently described. As to the chemical characteristics of the other constituents of opium, it would be evidently foreign to the scope of this work to enter upon such details; for these I must refer my readers to any modern standard work upon chemistry; but in order to give the student a bird's eye view

TABULAR VIEW OF THE PRINCIPAL CHARACTERS OF THE CRYSTALLINE PRINCIPLES OF OPIUM.

Characters.	Morphia.	Papaverina.*	Codeia.	Narcotina.	Thebaina.	Narceine.	Meconine.
Taste	Very bitter	Slightly bitter	Bitter	Insipid; the salts bitter	Rather acrid and metallic	Slightly bitter	Rather acrid.
Fusibility	Fusible	... ? ...	Fusible at 302°	Fusible at 338°	Fusible at 226°	Fusible at 198°	Fusible at 194°.
Ditto in Boiling Water	Infusible	... ? ...	Fusible	... ...	... ...	Fusible	Fusible.
Solubility in — *Cold Water*	Insoluble, or nearly so	Insoluble	Soluble in 80 pts.	Insoluble	Very slightly soluble	Soluble in 375 pts.	Soluble in 266 pts.
Solubility in — *Boiling Water*	Soluble in 100 pts		Soluble in 17 pts.	Very slightly soluble		Soluble in 230 pts.	Soluble in 19 pts.
Solubility in — *Cold Alcohol*	Soluble in 40 pts	Sparingly soluble	Very soluble	Soluble in 100 parts	Soluble in 10 pts.	Soluble	Soluble.
Solubility in — *Boiling Alcohol*	Ditto in 30 parts	Soluble		Readily soluble	Still more soluble	More soluble	Soluble.
Solubility in — *Cold Ether*	Scarcely soluble	Sparingly soluble			Very soluble	Insoluble	Soluble.
Solubility in — *Potash or Soda Ley*	Soluble	Soluble	Insoluble in the cold ley	Insoluble, or nearly so	Insoluble unless the ley be very concentrated	... ...	Soluble.
Basic quality — *Action on Test Paper*	Alkaline	Alkaline	Alkaline	Neutral	Alkaline	Neutral	Neutral.
Basic quality — *Salifiability*	Salifiable	Salifiable	Salifiable	Salifiable	Salifiable	Not salifiable	Not salifiable.
Action of Nitric Acid	Reddened: solution red ...	Dissolves it without change of colour	Solution not red	Made yellow: solution yellow	Gives it a resinous appearance and dissolves it	Coloured blue by dilute acid	Solution yellow.
Coloured blue by Hydroch. Acid	... Not ...	... Not ...	... Not ...	... Not ...	... Not ...	Coloured blue	... Not.
Ditto by Sesquichloride of Iron	Coloured blue	... ? ...	... Not ...	... Not ...	... Not ...	... Not ...	... Not.
Coloured blue by Iodine	... Not ...	... Not ...	... Not ...	... Not ...	... Not ...	Coloured blue	... Not.
Decomposes Iodic Acid	Decomposes Iodic acid ...	... ? ...	... Not ...	... Not ...	... Not ...	... Not ...	... Not.
Precipitated by Infusion of Nutgalls	Precipitated	... ? ...	Precipitated	Precipitated	... ? ...	... ? ...	... ?
When fused reddened by Chl. Gas	... Not ...	... Not ...	... Not ...	... Not ...	... Not ...	... Not ...	Blood-red.
Water of Crystallization	2 atoms	... ? ...	2 atoms	3 or 4 per cent.	1 atom	... ? ...	None.

* Particularly characterised by the deep blue colour developed on the addition of strong sulphuric acid.

of the subject, I have taken the liberty of introducing on the other side, with some slight modifications, a tabular conspectus of the more important of them, originally compiled by the late distinguished pharmaceutist Pereira. The principal alteration which will be observed in the table is the omission from it of pseudomorphia, an alleged alkaloid, the existence of which is much doubted by chemists of the present day, and the substitution in its place of papaverina.

TEST.—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 diluted hydrochloric acid, evaporate it to the bulk of half an ounce, and let it cool. Neutralise 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 grosser impurities which exist in opium may be detected by a careful physical examination: such as moisture, sand, stones, leaves, woody fibre, charcoal, cowdung, pieces of metal, seeds, &c. Flour can be readily detected by the iodine test, besides which, on keeping it usually betrays itself; opium so adulterated, on being kept for some time, souring and spoiling. In addition to these, the juices of various plants are added to it, as of the prickly pear; extracts of tobacco, stramonium, and of Indian hemp; and the pulp of the tamarind and of the bael fruit; consequently, 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 Pharmacopœial test, 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 further on, on the mode of preparation of the hydrochlorate of morphia.

PHYSIOLOGICAL 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 the earlier stages the pulse is quick and full, at a later stage slow and full, and just before death, quick, feeble, and irregular. All the secretions are more or less arrested, save those of the skin, the patient generally being bathed in a cold clammy sweat. In poisoning by opium two distinct stages may be recognized; the first, that in which the patient though plunged in profound sleep can still be roused, this is the stage of *stupor* or *sopor;* the second that in which he cannot be roused, the stage of *coma.* In such cases the practitioner may experience some difficulty in distinguishing between the coma produced by opium, apoplexy, or alcoholic drinks; the history of the case in the first instance will materially assist him, and in its absence he will be in a great measure conducted to a correct diagnosis by the smell of the patient's breath, the odour of opium being unmistakeable. 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, and very remarkably so by habit. This is 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 Quincey 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. The tissue also to which the preparations of opium are applied will materially influence their effects; thus I believe that opium or its preparations applied to the unbroken cuticle produces but little if any physiological effect; and this opinion, founded on rather extensive clinical observations, is still further corroborated by the all but negative effects produced on those engaged in its manufacture (see page 431). When applied to any portion of the mucous membrane lining the alimentary canal, its effects are developed with energy, being nearly as active when introduced into the rectum as when into the stomach (see observations on the enema opii). When applied to a blistered surface, *i.e.*, when used *epidermically*, or when introduced by injection into the cellular tissue, *i.e.*, when used *hypodermically*, its anodyne effects are promptly developed; more promptly, however, in the latter case, which will frequently succeed when every other method of introducing opium into the system has failed. 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 principally manifested.

THERAPEUTICAL USES.—The special uses of opium 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 delirum 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 small-pox 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 contra-indicated. 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 Sir D. 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, as after capital operations, severe wounds, &c.; *in senile gangrene,* administered in full doses, as from one to three grains of crude opium every sixth hour, it is our best remedy; whilst *in cancer, in painful ulcerations,* and *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; and have consequently, of late years, employed it extensively in their treatment, in the wards of the Meath Hospital; occasionally I have been compelled to suspend its administration in consequence of the supervention of a curious symptom to follow the exhibition of opium, viz., diarrhœa. In *phagedenic ulcerations* we have no drug on which equal dependence can be placed. In *obstinate constipation,* after every effort to unload the bowels by means of powerful purgatives has failed, the employment of opium, in one or two grain doses every second hour, has in some instances succeeded in my hands. It has been also found a most useful adjunct to regulated 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 method 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.

Of the alkaloids found in opium, morphia, codeia, and narcotina are those which have been principally the subject of therapeutic investigation. For the particulars connected with morphia and its salts I must refer the reader further on to their respective headings. *Codeia* for many years past 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, in which statement my experience of it does not incline me to coincide. Since the appearance of the last edition of this work I have submitted codeia to a rather extended clinical examination, as the result of which I am induced to consider it as possessed of about one-third the narcotic power of morphia. As to its therapeutic value, I hold it in very high estimation. I have found it of great service in allaying troublesome coughs; and in severe rheumatism, I know nothing which certainly for a time so effectually relieves suffering, without any attendant disadvantage. I generally give it in from one to two grain doses, in the form of draught or pill at night. *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. The following table exhibits, at one glance, so far as we know them at present, the physiological effects of the principal substances contained in opium.

Substances.	Composition.	Medical Properties.
Morphia ...	$C_{34}H_{19}NO_6$	Narcotic
Codeia ...	$C_{36}H_{21}NO_6$	Narcotic
Narcotina ...	$C_{44}H_{23}NO_{14}$	Bitter, resembling Quina
Thebaina ...	$C_{38}H_{21}NO_6$	Stimulant, resembling Strychnia
Papaverina ...	$C_{40}H_{21}NO_8$	Slightly narcotic
Narcein ...	$C_{46}H_{29}NO_{18}$	Inert
Meconin ...	$C_{10}H_5O_4$	Inert
Meconic Acid ...	$C_{14}HO_{11}$	Inert

In cases of poisoning with opium or its alkaloids, 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, should be administered; and if all other remedies fail, artificial respiration and galvanic shocks made use of, the assidous application of which has in some almost hopeless instances restored life; in one successful case on record, artificial respiration was kept up for more than 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.

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.—Confectio Opii, one part in forty, nearly; Emplastrum Opii, one part in ten; Enema Opii, half a fluid drachm tincture to two fluid ounces; Extractum Opii, about one part from two; Extractum Opii Liquidum, twenty-two grains extract in one fluid ounce, nearly; Linimentum Opii, one volume tincture in two volumes; Morphiæ Acetas, about one part from eight or ten; Morphiæ Acetatis Liquor, four grains acetate in one fluid ounce; Morphiæ Hydrochloras, about one part from eight or ten; Morphiæ Hydrochloratis Liquor, four grains hydrochlorate in one fluid ounce; Pilula Ipecacuanhæ cum Scilla, one part in sixteen and a half, nearly (see p. 323); Pilula Plumbi cum Opio, one part in eight (see p. 132); Pilula Saponis Composita, one part in six, nearly; Pulvis Cretæ Aromaticus cum Opio, one part in forty (see p. 104); Pulvis Ipecacuanhæ Compositus, one part in ten (see p. 284); Pulvis Kino Compositus, one part in twenty (see p. 126); Pulvis Opii Compositus, one part in ten; Tinctura Camphoræ Composita, two grains to one fluid ounce; Tinctura Opii, thirty-three grains to one fluid ounce, nearly; Tinctura Opii Ammoniata, five grains to one fluid ounce; Trochisci Opii, one-tenth grain in each; Unguentum Gallæ cum Opio, thirty-two grains to one ounce (see p. 117); Vinum Opii, twenty-two grains extract in one fluid ounce, nearly.

Confectio Opii. Confection of Opium. (Take of compound powder of opium, one hundred and ninety-two grains; syrup, one fluid ounce. Mix.) The present confection is the representative of the ancient *Philonium*, stated to have been first invented by Philo, a physician, who lived in the time of Augustus. It possesses all the anodyne properties of opium, together with carminative effects

in virtue of its other ingredients, which make it a useful preparation in painful colic, diarrhœa, &c. Dose, gr. v. to gr. xx.

Emplastrum Opii. Opium Plaster. (Take of opium, in fine powder, one ounce; resin plaster, nine ounces. Melt the resin plaster by means of a water-bath; then add the opium by degrees, and mix thoroughly.) Applied as a local remedy in painful affections. Reference to what has been already written on the effects of opium when applied to the unbroken skin (see p.p. 431, 438), will show that such an application as the present can be attended with but little benefit.

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 residue of 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 until the extract has acquired a suitable consistence for forming pills.) By maceration in water the active ingredients of opium are separated from those which are inert, and a purer and consequently a more active preparation is procured. A good sample of opium will yield from sixty to seventy per cent. of its weight of extract; for practical purposes, therefore, two grains of this extract should be equal to about three grains of crude opium. Dose, gr. ss. to gr. ij. It is employed in the following preparations —Extractum Opii Liquidum, one ounce to one pint; Trochisci Opii, one-tenth of a grain in each lozenge; Vinum Opii, one ounce in one pint.

Extractum Opii Liquidum. Liquid Extract of Opium. (Take of extract of opium, one ounce; distilled water, sixteen fluid ounces; rectified spirit, four fluid ounces. Macerate the extract of opium in the water for an hour, stirring frequently; then add the spirit, and

filter. The product should measure one pint.) Pereira states that he was assured by Mr. Battley that the only ingredients he used in his *Liquor Opii Sedativus* were water, opium, and heat; and suggested a formulary similar to the present pharmacopœial one, as likely to prove an analogue for Battley's sedative, a very general favorite in professional as well as public estimation. In its anodyne effect the liquid extract is in every respect equal to the tincture of opium, whilst it produces less constitutional disturbance, such as head-ache, loss of appetite, etc. It contains but 22 grains of opium, nearly, in one fluid ounce; a strength which when contrasted with that of the tincture of opium (gr. xxxiij to f℥j.), would seem as if it were a weaker preparation; but the discrepancy is more apparent than real, when we bear in mind that the liquid extract and the wine of opium, the strength of which also is 22 grains of opium to the ounce, are made with the extract of opium, whilst the tincture is made of crude opium, so that the quantities ordered in each case are in strict accordance with the relative therapeutical effects of opium and its extract (*i.e.* as two is to three). Dose, min. x. to min. xl.

Linimentum Opii. Liniment of Opium. (Take of tincture of opium, liniment of soap, of each, two fluid ounces. Mix.) Intended as a local embrocation over the seat of deep seated pain. Reference to what has been already written upon the local effects of opium when applied to the unbroken skin, will shew that we should not expect much benefit from the use of this liniment (see pp. 431, 438).

Pilula Saponis Composita. Compound Pill of Soap. Syn.—*Pilula Opii*—1864. (Take of opium, in powder, half an ounce; hard soap, in powder, two ounces; distilled water, a sufficiency. Mix the opium and soap, and beat into a mass with the water.) This is a convenient preparation for ordering opium in the pilular form, under a name, by which it is unlikely to be recognised by the public; each five grains contains *quam proxime* one grain of opium. Dose, gr. iij. to v.

Pulvis Opii Compositus. Compound Powder of Opium. (Take of opium, in powder, one ounce and a half; black pepper, in powder, two ounces; ginger, in powder, five ounces; caraway fruit, in powder, six ounces; tragacanth, in powder, half an ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.) This powder nearly represents the dry ingredients of *Confectio Opii, Lond.* of which it constitutes 1 part in 4, nearly (see page 442). Dose, gr. ij. to gr. v.

Tinctura Camphoræ Composita. Compound Tincture of Camphor. Syn.: *Tinctura Camphoræ cum Opio*, 1864. *Tinctura Opii Camphorata*, Edin. Dub. *Paregoric Elixir.* (Take of opium, in coarse powder; benzoic acid, of each, forty grains; camphor, thirty grains; oil of anise, half a fluid drachm; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional

agitation, then filter, and add sufficient proof spirit to make one pint.) A favourite remedy in chronic catarrh and bronchitis; the oil of anise is an important ingredient, experiment having demonstrated that without it it is not so effectual. *Powell's balsam of aniseed* is an empirical imitation of it, which at present enjoys a high position in popular estimation. Dose, min. xx. to f℥ij.

Tinctura Opii. Tincture of Opium. Syn.: *Laudanum. Tinctura Thebaica.* (Take of opium, in coarse powder, one ounce and a half; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation, then strain, press, filter, and add sufficient proof spirit to make one pint.) This perhaps is the most generally employed of all the preparations of opium; it produces the effects of opium more rapidly than when the drug is given in the solid form, besides which, minimum doses can be more easily and with greater accuracy adjusted in the fluid than in the solid form, an important consideration when prescribing for patients of tender years. It is stated in the Pharmacopœia to contain the soluble matter of 33 grains of opium, nearly, in one fluid ounce, a quantity equivalent to one grain of opium in fourteen minims and a half, or in round numbers, one fluid drachm of it would be equivalent to something more than four grains of crude opium (in reality gr. $4\frac{1}{8}$). Now is this so? Few questions have been more mooted than this, and few authorities agree upon the point. My opinion is that one fluid drachm of laudanum does not represent the physiological effects capable of being produced by four grains of crude opium. In other words, I should be sorry to substitute four grains of crude opium in a case in which I should not hesitate to give a fluid drachm of laudanum. Pereira states that he has frequently recovered morphia from the dregs remaining after the manufacture of laudanum; if this be so, it is evident that the spirit could not have exhausted the opium, and that the resulting laudanum could not represent the entire of the physiological effects produced by the amount of opium originally employed in its manufacture. My own clinical experience rather inclines me to believe that 20 minims of laudanum represent the therapeutic value of one grain of crude opium. For the sake of uniformity of therapeutic effect, also, the directions in the Pharmacopœia to decant the laudanum from its dregs after the completion of the process, should be strictly attended to, as I have seen preparations which have become far more active by being left in contact with the opium in the store bottle, a little being only drawn off at a time, until what finally was removed resembled very much in viscidity and strength the black drop; this fact corroborates Pereira's statement as to recovering morphia from the dregs. Dose, min. v. to xl. It is used in the following pharmacopœial preparations: Enema Opii; Linimentum Opii.

Tinctura Opii Ammoniata. Ammoniated Tincture of Opium. (Take of opium, in coarse powder, one hundred grains; saffron, cut small, benzoic acid, of each one hundred and eighty grains; oil of

anise, one fluid drachm; strong solution of ammonia, four fluid ounces; rectified spirit; sixteen fluid ounces. Macerate for seven days in a well-closed vessel, with occasional agitation, then strain, press, filter, and add sufficient rectified spirit to make one pint.) This preparation is called in Scotland *Scotch Paregoric*; it is used as an anodyne and antispasmodic. The pharmacopœial preparation contains the active matter of five grains of opium in the fluid ounce. Dose, a half to 1 fluid drachm.

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 acacia, in powder, two ounces; extract of liquorice, six ounces; 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 extract of opium, one ounce; cinnamon bark, bruised; cloves, bruised, of each, seventy-five grains; sherry, one pint. Macerate for seven days in a closed vessel, with occasional agitation, and filter.) 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 that in the Pharmacopœia of 1864 in containing *aromatics*, an important difference in the opinion of many ophthalmic surgeons, some preferring wine of opium containing aromatics, others, wine of opium prepared as in the last edition of the Pharmacopœia, simply by macerating one ounce and a half of crude opium in a pint of sherry for seven days, then straining, expressing, and filtering; my own experience leads me to prefer Ware's original formula, wine of opium prepared with aromatics. It contains 22 grains of extract of opium, nearly, in 1 fluid ounce, and is about $\frac{1}{4}$ stronger than Vinum Opii of the *British Pharmacopœia*, 1864, and also of the *Edinburgh* and *Dublin Pharmacopœias*. It is about 1-5th weaker than Vinum Opii, *Lond.*, and corresponds in strength with Extractum Opii Liquidum, and virtually with tincture of opium, at least so far as therapeutical value goes (see *Extractum Opii Liquidum*). Dose, min. x. to min. xl.

* *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 grains (L.), four grains (E.), 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.

* *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 to raw surfaces, 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, ʒiss.; saffron, ʒss.; boil to a proper consistence, then add of pure sugar, ʒiv.; 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, ʒiij.; distilled water, fʒxxx.; boil for two minutes, let it cool and filter; then add of rectified spirit, fʒvj.; 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.

* 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 hydrochlorate 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.* $C_{34}H_{19}NO_6,C_4H_3O_3 + HO(=345)$ or $\mathbf{C_{17}H_{19}NO_3,C_2H_4O_2(=345)}$.

PREPARATION.—Take of hydrochlorate of morphia, two ounces; solution of ammonia, acetic acid, of each, a sufficiency; distilled water. Dissolve the hydrochlorate of morphia in one pint of distilled water, and add solution of ammonia until the morphia is precipitated and the liquid rendered slightly alkaline. Collect the precipitate on a filter, wash it with distilled water, then having transferred it to a porcelain dish, add four ounces of distilled water and a sufficient quantity of acetic acid to neutralise and dissolve it. Evaporate the solution by the heat of a water-bath until it concretes on cooling. Lastly, dry the salt with a gentle heat, and reduce it to powder.

EXPLANATION OF PROCESS.—The first step in this process is to decompose the hydrochlorate of morphia by the action of ammonia, in virtue of which we have hydrochlorate of ammonia formed, which is held in solution, and the morphia precipitated; this latter, saturated with acetic acid, constitutes the acetate of morphia.

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, one of morphia, and one of water. 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.

CHARACTERS AND TESTS.—A white powder, soluble in water and in spirit. From its solution potash throws down a precipitate which is dissolved by excess of the alkali. It is affected by nitric acid and perchloride of iron in the same way as hydrochlorate of morphia is. When sulphuric acid is added to the salt acetous vapours are evolved.

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 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. $\frac{1}{8}$th. to gr. ss. in pill, or in solution as follows :—

Liquor Morphiæ Acetatis. Solution of Acetate of Morphia. (Take of acetate of morphia, four grains; diluted acetic acid, eight minims; rectified spirit, two fluid drachms; distilled water, six fluid drachms. Mix the acid, the spirit, and the water, and dissolve the acetate of morphia in the mixture.) This solution contains half a grain of acetate of morphia in each fluid drachm, which is but half as much morphia as the liquor morphiæ acetatis, *Lond.* Dose, ten to sixty minims.

* *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 fourth of a grain of the acetate, and can be advantageously employed as a substitute for the 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. $C_{34}H_{19}NO_6,HCl+6HO$ (=375·5) or $\mathbf{C_{17}H_{19}NO_3,HCl,3H_2O}$ (=375·5). It may be obtained by the following process :—

PREPARATION.—Take of opium, sliced, one pound; chloride of calcium, three fourths of an ounce; purified animal charcoal, one fourth of an ounce; diluted hydrochloric acid, two fluid ounces or a sufficiency; solution of ammonia; distilled water, of each, 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 in 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 diluted 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 back 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.

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.

CHARACTERS AND TESTS.—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. 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 quantity of precipitate indicated as the result of the addition of the ammonia, being in accordance with the chemical equivalents of the salt.

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 follow 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 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 have been already considered when treating of that drug. We prefer their use to that of opium, where the drug itself is apt to disagree; where 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, or hypodermically, 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 with creasote 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 first suggested many years ago by the late Mr. Rynd, of this city, and is manufactured by Messrs. Weiss, of London, and is to be had at the establishment of Messrs. Fannin in this city; but the operation 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. $\frac{1}{4}$th 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. may 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 injection by means of the instrument already alluded to, or 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.

PREPARATIONS.—Liquor Morphiæ Hydrochloratis, one grain in two fluid drachms; Suppositoria Morphiæ, half a grain in each suppository; Trochisci Morphiæ, one thirty-sixth of a grain in each lozenge; Trochisci Morphiæ et Ipecacuanhæ, one thirty-sixth of a grain of morphia in each lozenge (see p. 323).

Liquor Morphiæ Hydrochloratis. Solution of Hydrochlorate of Morphiæ. (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 but half as much morphia as Liquor Morphiæ Hydrochloratis, *Lond.* Each drachm contains half a grain of hydrochlorate of morphia; it is very nearly of 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, six grains; benzoated lard, sixty-four grains; white wax, twenty grains; oil of theobroma, ninety grains. Melt the wax and oil of theobroma with a gentle heat, then add the hydrochlorate of morphia and benzoated lard, previously rubbed together in a mortar, and mix all the ingredients thoroughly. Pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository, which will contain half a grain of hydrochlorate of morphia.) These suppositories differ from those contained in the Pharmacopœia of 1864, in containing a larger proportion of morphia; their strength at present is half a grain of morphia in each, formerly they contained but a quarter of

a grain in each. They are advantageously used in painful affections of the pelvic viscera, and to produce the general anodyne effects of morphia, when the stomach is intolerant of medicines.

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 acacia, in powder, one ounce; mucilage of gum acacia, a sufficiency; 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 two fluid ounces of the mucilage; then add the gum and sugar, previously mixed, and more mucilage, if necessary to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains one thirty-sixth 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.

* *Syrupus Morphiæ Muriatis,* D. Syrup of the Muriate of Morphia. (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. $\frac{1}{4}$ of muriate of morphia; it was meant as a substitute for the syrup of white poppy, and may be used as such (which see p. 429).

* MORPHIÆ SULPHAS. *Sulphate of Morphia.* ($C_{34}H_{19}NO_6SO_3$, $6HO=379$.) This salt, not often used in this country, bears a high character in America, where it is officinal.

PREPARATION.—It is prepared by mixing morphia with distilled water, and adding diluted sulphuric acid till it is saturated and dissolved. The solution is then evaporated on a water-bath, so that it may crystallize on cooling.

CHARACTERS.—It occurs in snow-white feathery crystals soluble in cold water, and still more so in boiling water, requiring but twice their weight of the latter for their solution. In other respects sulphate of morphia may be recognized as a salt of sulphuric acid, by the tests for that acid, and as one of morphia by its presenting the characteristics of that alkaloid.

THERAPEUTICAL USES AND DOSE.—In its therapeutical effects it resembles the salt of morphia already described, and its dose is the same as that of the muriate, over which it does not seem to me to possess any advantage.

INCOMPATIBLES.—Alkalies and alkaline earths; most earthy and metallic salts, and astringent vegetable infusions and decoctions.

RHŒADOS PETALA. *Red-Poppy Petals.* (The fresh petals of

Papaver Rhœas, *Linn.*; *Woodv. Med. Bot.*, plate 186. 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; petals broad, deep scarlet, with a dark eye; capsules, glabrous, nearly globose, with ten or more stigmatic rays.

CHARACTERS.—Of a scarlet colour and heavy poppy odour.

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, infuse 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 the loss in the process, so that the product shall weigh three pounds ten ounces. It 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. Dose, one to two fluid drachms.

STRAMONII FOLIA. *Stramonium Leaves.* (The dried leaves of Datura Stramonium, *Linn.*, Thorn Apple. *Woodv. Med. Bot.*, plate 124. Collected from plants in flower, cultivated in Britain.)

STRAMONII SEMINA. *Stramonium Seeds.* (The ripe seeds of Datura Stramonium, *Linn.*) Stramonium, known also as *Thorn Apple, Devil's Apple, Apple of Peru,* or *Jamestown weed,* is an indigenous plant, 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, petiolate, ovate, angulato-sinuate, glabrous; flowers, axillary, large, erect, white; fruit, an ovate capsule, erect, clothed with numerous nearly equal spines, 4–celled at the base, 2–celled at the summit, 4–valved, many seeded.

PREPARATION.—The whole herb should be collected when the plant is in flower, and carefully dried as quicky as possible with a gentle heat. The leaves should be removed from the stem and branches, which latter 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, which is 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 smell.

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 ; the following formulary has been assigned to it, $C_{34}H_{23}NO_6$, which reference to *atropia* will show to be isomeric with its composition, but its exact chemical composition has not been as yet determined. 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 practised 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, prominent amongst which are dilatation of the pupil, dimness of vision, vertigo, delirium, convulsive motions of the muscular system, with marked rigidity, coma, and finally death. 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, in 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, in old standing chronic coughs and catarrhs, and in emphysema of the lungs; 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, in asthma and other allied diseases, as a substitute for stramonium. My own experience is, however, that it possesses little (if any) 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. In poisoning with stramonium, the same treatment should be employed as in poisoning with belladonna.

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 either by itself or mixed with ordinary tobacco, but the patient should be directed to allow an interval of at least three minutes to intervene between each five or six inhalations of the smoke, whether a common pipe or a stramonium cigar be employed; and the effects caused by it must be carefully watched. Although one gentleman who employed it with great benefit under my directions to relieve a spasmodic asthma, frequently smoked a pipe full at a time without any intermission, and without any bad effect whatsoever, still such a practice is full of hazard.

PREPARATIONS.—Extractum Stramonii; Tinctura Stramonii, fifty-four grains and a half to one fluid ounce.

Extractum Stramonii. Extract of Stramonium. (Take of stramonium seeds, in coarse powder, one pound; ether, one pint or a sufficiency; distilled water, proof spirit, of each a sufficiency. Shake the ether in a bottle with half a pint of the

water, and after separation decant the ether. Pack the stramonium in a percolator and free it from its oil by passing the washed ether slowly through it. Having removed and rejected the ethereal solution, pour the spirit over the residue of the stramonium in the percolator and allow it to pass through slowly until the powder is exhausted. Distil off most of the spirit from the tincture and evaporate the residue by a water-bath until the extract has acquired a suitable consistence for forming pills.) This is the preparation of stramonium I am most in the habit of employing. I have found a combination of it with sulphate of quinine and blue pill, of great value in the treatment of facial neuralgia. Dose, $\frac{1}{4}$ grain to $\frac{1}{2}$ grain.

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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, 10 to 30 minims.

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. 414.)

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 caloric required for the evaporation of the fluid employed as the refrigerant agent being supplied by the surface with which it is brought into contact, whereby the temperature of the inflamed part must necessarily be lowered. When lotions are used with this object in view, they should be applied on single folds of linen, whereby evaporation is facilitated, and a continuous supply of the liquid should be kept up, which can be done by suspending a bottle containing the lotion at some distance above the inflamed part, immersing in it some chandler's wick, in such a manner as to allow it to reach from the bottle to the inflamed part; in this manner a continuous supply is kept up, the bottle being emptied of its contents by capillary attraction. The principal use of refrigerants employed internally 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 p. 84, 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 (see p. 87), 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.* $3HO,C_{12}H_5O_{11}+2HO(=210)$ or $\mathbf{H_3C_6H_5O_7,H_2O}(=210)$. A crystalline acid prepared from lemon-juice, or from the juice of the fruit of Citrus Limetta, *Risso*, the Lime. It may be obtained by the following process:—

PREPARATION.—Take of lemon-juice, four pints; prepared chalk, four ounces and a half; sulphuric acid, two fluid ounces and a half; distilled water, a sufficiency. Heat the lemon-juice to its boiling point, and 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 it colourless. Mix the deposit with a pint of distilled water, and gradually add the sulphuric acid, previously diluted with a pint and a half of distilled water. Boil gently for half an hour, keeping the mixture constantly stirred. Separate the acid solution by filtration, wash the insoluble matter with a little distilled water, and add the washings to the solution. Concentrate this solution to the density of 1·21, then allow it to cool, and after twenty-four hours decant the liquor from the crystals of sulphate of lime which will have formed; further concentrate the liquor until a film forms on its surface, and set it aside to cool and crystallize. Purify the crystals if necessary by recrystallization.

EXPLANATION OF PROCESS.—On the addition of the chalk to the lemon-juice the chalk 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, $3CaOCO_2+C_{12}H_5O_{11}=3CaO,C_{12}H_5O_{11}+3CO_2$. 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 concen-

trating 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. In the Pharmacopœia of 1864 the lemon-juice was first mixed with yeast, and let to stand for two days at a temperature between 60° and 70° F., with the object of setting up a fermenting process, in virtue of which the saccharine matter present in the lemon-juice was gotten rid of in the form of alcohol and of carbonic acid.

PHYSICAL PROPERTIES.—Citric acid crystallizes in transparent, colourless, regular rhomboidal prisms, terminated by four trapezoidal faces. They are inodourous, but have an agreeable, purely acid taste. Specific gravity, 1·617.

CHEMICAL PROPERTIES.—Crystallized commercial citric acid consists of $C_{12}H_5O_{11},3HO+2HO$, 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 75 parts of cold, or 50 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, this salt being soluble in cold but not in boiling water.

CHARACTERS AND TESTS.—In colourless crystals, of which the right rhombic prism is the primary form; very soluble in water, less soluble in rectified spirit, and insoluble in pure ether. The crystals dissolve in three-fourths of their weight of cold, and in half their weight of boiling water. The diluted aqueous solution has an agreeable acid taste. When the solution is made by dissolving thirty-four grains of the acid in one ounce of the water, it resembles lemon-juice in strength and in the nature of its acid properties, and, like lemon-juice, it undergoes decomposition and becomes mouldy by keeping. The aqueous solution is not darkened by sulphuretted hydrogen, gives no precipitate when added in excess to solution of acetate of potash, or of chloride of barium, and if sparingly added to cold lime-water it does not render it turbid. The crystals leave no ash when burned with free access of air. Seventy grains of the acid dissolved in distilled water are neutralized by 1000 grain-measures of the volumetric solution of soda.

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 thousand measures of the solution requiring but seventy 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 and effervescing drinks in febrile affections, but fresh lemon-juice should be preferred whenever it can be obtained. In its other physiological effects, though in a very much minor degree, it resembles lemon-juice (which see).

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. 17 of it are equivalent to half a fluid ounce of good fresh lemon-juice, and will saturate gr. 14·42 of carbonate of ammonia, gr. 24·25 of bicarbonate and gr. 19·43 of carbonate of potash, gr. 20·40 of bicarbonate, and gr. 34·73 of carbonate of soda, and gr. 11·59 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 the 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. Still occasion might arise when, in the absence of lemon-juice, it would be found a useful formulary. Dose, f℥ij. to f℥j.; one ounce contains nearly a scruple of citric acid.

* *Pulveres Effervescentes Citrati*, D. (Take of crystals of citric acid, nine drachms; bicarbonate of soda, eleven drachms; or, bicarbonate of potash, thirteen drachms. 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 PURIFICATUM. *Oxalic Acid, Purified.* $2HO,C_4O_6+4HO$ or $\mathbf{H_2C_2O_4,2H_2O}$. Commercial oxalic acid is prepared on a large scale 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 reagent.

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.

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 350° 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 solutions 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*. In poisoning with this acid, chalk, whiting, or magnesia, suspended in water, or better still in 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 disagreeable or 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.

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.

ACIDUM TARTARICUM. *Tartaric Acid.* $2HO,C_8H_4O_{10}(=150)$, or $\mathbf{H_2C_4H_4O_6}(=150)$. A crystalline acid prepared from the acid tartrate of potash. It may be obtained by the following process:—

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 acid 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 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 crystallise. 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 ($HO,KO,C_8H_4O_{10}$). This, on the addition of the carbonate of lime, is converted into the tartrate of potash ($2KO,C_8H_4O_{10}$), and tartrate of lime ($2CaO,C_8H_4O_{10}$), with the escape of carbonic acid and the loss of two atoms of water; thus,

$2(HO,KO,C_8H_4O_{10})+2CaOCO_2=2KO,C_8H_4O_{10}+2CaO,C_8H_4O_{10}+2CO_2+2HO$. Of these two salts, tartrate of lime precipitates, and the tartrate of the 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, $2KO,C_8H_4O_{10}+2CaCl=2CaO,C_8H_4O_{10}+2KCl$. 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, $2CaO,C_8H_4O_{10}+2HOSO_3=2CaOSO_3+2HO,C_8H_4O_{10}$. The subsequent steps of the process require no explanation.

PHYSICAL PROPERTIES.—Tartaric acid occurs in white, semitransparent crystals of considerable size, the primary form of which is the oblique 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.

CHARACTERS AND TESTS.—In colourless crystals the primary form of which is the oblique rhombic prism. It has a strongly acid taste and is readily soluble in water and in rectified spirit. When to either solution, not too much diluted, a little acetate of potash is added, a white crystalline precipitate is formed. Seventy-five grains of crystallized tartaric acid dissolved in water require for neutralization 1000 grain-measures of the volumetric solution of soda. An aqueous solution of the acid 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 thousand 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. 222).

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. 20 of crystallized tartaric acid are saturated by gr. 15·73 of carbonate of ammonia, or gr. 26·66 of bicarbonate of potash, or gr. 21·33 of carbonate of potash, or gr. 22·40 of bicarbonate of soda, or gr. 38·13 of carbonate of soda, or gr. 12·73 of carbonate of magnesia.

* *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 (usually considered to be compound on account of the double articulation between the petiole and both the axis and lamina), oval, acute, entire, shining, coriaceous, on elongated winged petioles ; flowers, large, white, axillary, 2–6 on a common peduncle, fragrant ; fruit (the well-known orange), a *hesperidium*, consisting of a leathery rind (epicarp), in the outer portion of which are the glandular receptacles which contain the volatile oil, and a many-celled endocarp which encloses the seeds immersed in a sweet pulp.

PHYSICAL PROPERTIES.—The fruit of the orange tree is too well known to require description.

CHEMICAL PROPERTIES.—Orange-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.* (The outer part of the rind of the fresh fruit of Citrus Limonum, *DC.; Steph. and Church. Med. Bot. (Citrus Medica)*, plate 92. Lemons are 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 freshly expressed juice of the ripe fruit of Citrus Limonum, *DC.*) Lemons are natives of the same countries, and belonging to the same botanical classification as the *Citrus aurantium*, described in the preceding article.

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, a hesperidium, ovoid, terminated with an elongated knob, the rind loaded with oil vesicles, and the pulp acid.

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. It contains a volatile oil, a peculiar principle termed *Hesperidin*, a bitter principle *Aurantiin*, and traces of gallic acid. 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, the hesperidin residing in the inner white portion. The peel 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, as well as from Sicily. 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*. *Lemon Juice* consists of 1·77 per cent. of citric acid, 0·72 of gum, malic acid, phosphoric acid, 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-stoppered bottles.

CHARACTERS.—*Of the Juice.*—A slightly turbid yellowish liquor, possessing a sharp acid taste, and grateful odour. Average specific gravity, 1·039. Average quantity of citric acid in 1 fluid ounce, 32·5 grains.—*Of the Oil.*—Colour pale yellow, odour agreeable, taste warm and bitter.

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 hæmorrhages of an acute character. In *scurvy*, as originally pointed out by Sir Gilbert Blane, lemon juice as well as lime juice is of the greatest value, acting as efficiently as a preventive of this terrible scourge of our marine service, as a cure for it when unfortunately it breaks out. Its undoubted value in such cases is attributed by Professor Morgan to the presence in it of phosphoric acid (which see in chapter on *Tonics*). Its use has been advocated in diarrhœa and dysentery, strong evidence having been advanced in favor of its great value in such cases. Waring states that he has seen the pain, vomiting, and purging following over-doses of croton oil seeds, at once checked by draughts of lime juice. In the obstinate vomiting of pregnancy it occasionally succeeds when everything else has failed. 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. Topically lemon juice has been employed with advantage to allay the intolerable itching so constant an attendant on *pruritus ani et scroti*. Oil of lemons is an aromatic stimulant, used internally, in doses of from one to three minims only, to give an agreeable flavour to other medicines. 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, half an ounce of lemon juice of average quality saturating gr. 13·71 of carbonate of ammonia; gr. 23·21 of bicarbonate, and gr. 18·57 of carbonate of potash; gr. 19·46 of bicarbonate, and gr. 33·50 of carbonate of soda. So that, for all practical purposes, we will secure a solution, which, if it be not neutral, certainly will not have an excess of alkali, by ordering in eight ounces of water either ʒj. ℈ij. of carbonate of ammonia, or ʒiij. of bicarbonate of potash, or ʒij. ℈j. of carbonate of potash, or ʒijss. of bicarbonate of soda, or ʒiv. ℈j. of carbonate of soda, with directions that two tablespoonfuls of the alkaline mixture shall be taken with one of lemon juice. Of all these effervescing mixtures, that made with the bicarbonate of potash is the most agreeable; that with the carbonate of soda the most disagreeable.

PREPARATIONS.—*Of the Peel.*—Infusum Aurantii Compositum, one hundred and twenty grains to one pint; Infusum Gentianæ Compositum, half an ounce to one pint; Oleum Limonis; Syrupus Limonis, one ounce to one pound and three quarters; Tinctura Limonis, two ounces and a half to one pint.—*Of the Oil.*—Linimentum Potassii Iodidi cum Sapone, one fluid drachm to fourteen ounces; Spiritus Ammoniæ Aromaticus, six fluid drachms in seven pints.—*Of the Juice.*—Syrupus Limonis, one pint to three pounds and a half.

Syrupus Limonis. Syrup of Lemons. (Take of fresh lemon peel, two ounces; lemon juice strained, one pint; refined sugar, two pounds and a quarter. Heat the lemon juice to the boiling point, and, having put it into a covered vessel with the lemon-peel, let them stand until they are cold, then filter, and dissolve the sugar in the filtered liquid with a gentle heat. The product should weigh three pounds and a half, and should have the specific gravity 1·34.) 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, fʒj. to fʒij.

Tinctura Limonis. Tincture of Lemon Peel. (Take of fresh lemon peel, sliced thin, two ounces and a half; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation; strain, press, and filter; then add sufficient proof spirit to make one pint.) Dose, fʒss. to fʒij.; an agreeable adjunct to other medicines.

* *Artificial Lemon Juice.*—MACNAMARA. (Citric acid, gr. cxl; syrup, fʒij.; mucilage, fʒij.; oil of lemons, min. iv.; water, fʒiiiss. 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 this remedy depends. The quantity of citric acid directed is slightly in excess of what is generally met with as the average in lemon juice. This, in the Pharmacopœia, under the head of *lemon juice,* is stated to be about 32·5 grains of citric acid in the ounce of lemon juice; whilst, under the head of *citric acid,* thirty-four grains of citric acid dissolved in an ounce of water are stated to resemble lemon juice in strength.

INCOMPATIBLES.—The mineral and vegetable acids; and lime water.

MORI SUCCUS. *Mulberry Juice.* (The juice of the ripe fruit of Morus nigra, *Linn. Steph. and Church. Med. Bot.*, plate 39.) 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, ovate, lobed, or unequally dentate; flowers, monœcious, greenish, in small roundish unisexual catkins; fruit (a *sorosis),* 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 it 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) or $\mathbf{KClO_3}$(=122·5). May be obtained by the following process.

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 chloride 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; on heating it, six equivalents of oxygen gas are given off, the salt itself becoming converted into chloride of potassium thus, $KOClO_5=6O+KCl$. This produces with nitrate of silver a white

precipitate (chloride of silver), and with bichloride of platinum a yellow precipitate (potassio bichloride of platinum, see p. 27).

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 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 in the system, 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 organization; 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 ulcerations of the cheek in children, and in these affections, administered internally, and applied locally, 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. To one valuable property possessed by it, my attention has been drawn by my friend Dr. O'Dwyer, of this city—viz. its power of modifying the action of mercury upon the system, and preventing its running riot; enabling us thus to administer this most important medicine in cases calling for its exhibition, where, however, otherwise we dare not venture on its administration.

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 p. 306 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 the late Dr. Jerome Morgan, of this city, was long 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 contraindicated 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. When 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.

ROSÆ CANINÆ FRUCTUS. *Fruit of the Dog Rose. Hips.* (The ripe fruit of the Dog Rose, Rosa Canina, *Linn.*, and other in-

digenous allied species.) 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.—A small shrub with a surculose woody rootstock; branches, varying in denseness, usually glabrous and furnished with curved or hooked prickles; leaves, imparipinnate, leaflets, 5–7, ovate, serrate, glabrous or downy on the under surface; flowers, pink or white, sweet-scented, 1–4 at the ends of the branches; calyx-tube, contracted at the apex, one or more of the segments pinnatisect; petals, 5; stamens, numerous, perigynous; ovaries, simple, enclosed in the tube of the calyx; styles, free; fruit, a *Cynarrhodum* consisting of the hollow, fleshy, scarlet, tube of the calyx inclosing the achenes.

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, and rub the pulp through a sieve; then 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. It enters into the preparation of the pilula quiniæ (one part in four).

CHAPTER XVI.

SEDATIVES OR CONTRA-STIMULANTS.

(Calmatives.)

SEDATIVES are medicines which directly and primarily tranquillize the vital powers without inducing any previous or 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 its employment as an anæsthetic agent was first suggested by Sir James Y. Simpson of

Edinburgh; and that of *Amylene*, first described in this book in the last edition, though only employed very recently, is falling rapidly into disuse.

* ACIDUM CARBONICUM. *Carbonic Acid* ($CO_2=22$). This gaseous acid, not directly 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.

PREPARATION.—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).

THERAPEUTICAL USES.—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.

TOXICOLOGICAL HISTORY.—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 ought it be entered. We have also natural reservoirs of this gas—the *Valley of Poisons* in Java, the

Grotto del Cane at Naples: 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, in fact 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, the electro-magnetic current, and artificial respiration. Occasionally it becomes our duty to superintend the removal of parties so asphyxiated from vats, &c.; this may be done by covering the mouths 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 sufficiently long stout rope ought to be fastened to the parties descending, to facilitate their extrication, should they also succumb to the deleterious influences of the gas.

ACIDUM HYDROCYANICUM DILUTUM. *Diluted Hydrocyanic Acid.* (Syn.: *Prussic Acid, Zootic Acid.* Hydrocyanic acid, $HC_2N(=27)$ or **HCN**$(=27)$, dissolved in water, and constituting 2 per cent. by weight of the solution.)

PREPARATION.—Take of yellow prussiate of potash, two ounces and a quarter; sulphuric acid, one fluid ounce; distilled water, thirty fluid ounces, or a sufficiency. Dissolve the prussiate of potash in ten ounces of the water, then add the sulphuric acid, previously diluted with four ounces of the water and cooled. Put the solution into a flask or other suitable apparatus of glass or earthenware, to which are attached a condenser and a receiver arranged for distillation; and having put eight ounces of distilled water into the receiver, and provided efficient means for keeping the condenser and receiver cold, apply heat to the flask, until by slow distillation the liquid in the receiver is increased to seventeen fluid ounces. Add to this three ounces of distilled water, or as much as may be sufficient to bring the acid to the required strength, so that 100 grains (or 110 minims) of it, precipitated with a solution of nitrate of silver, shall yield ten grains of dry cyanide of silver.

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.

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 $Fe_2Cl_3+3(NH_4,CyS_2)=3NH_4Cl+Fe_2,3CyS_2$.

CHARACTERS AND TESTS.—A colourless liquid with a peculiar odour. Specific gravity 0·997. It only slightly and transiently reddens litmus paper. A fluid drachm of it evaporated in a platinum dish leaves no fixed residue. Treated with a minute quantity of a mixed solution of sulphate and persulphate of iron, afterwards with potash, and finally acidulated with hydrochloric acid, it forms Prussian blue. It gives no precipitate with chloride of barium, but with nitrate of silver it gives a white precipitate entirely soluble in boiling concentrated nitric acid. 270 grains of it rendered alkaline by the addition of solution of soda require 1000 grain-measures of the volumetric solution of nitrate of silver to be added, before a permanent precipitate begins to form, which corresponds to two per cent. of the real 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 easily 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. 270 grains by weight require a thousand grain measures of the volumetric solution of nitrate of silver, a quantity that represents the tenth of an equivalent in grains of nitrate of silver (17 grains), which is equivalent to the tenth of an equivalent in grains of absolute prussic acid (2·7 grains); but inasmuch as an equal amount of prussic acid has been consumed in the formation of the cyanide of sodium, it is evident that each tenth of an equivalent of nitrate of silver thus consumed is in reality equal to 5·4 grains of prussic acid, an amount which corresponds to a strength of 2 per cent. of absolute prussic acid, inasmuch as 270 : 5·4 :: 100 : 2. The pharmacopœial acid containing but two per cent. of anhydrous acid is consequently only a little more than half the strength of that formerly officinal in the Edinburgh Pharmacopœia, but corresponds in strength with that which was officinal in the Dublin and London Pharmacopœias. The presence of any fixed impurity is indicated by the solution not being entirely vaporizable 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 quietness 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 excited action of the heart, in angina pectoris, 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 Neligan saw with Sir W. 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. 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 f℥j. 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 these remedies 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.

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 which 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 f℥ij. 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.

ACONITI FOLIA. *Aconite Leaves.* (The fresh leaves and flowering tops of Aconitum Napellus, *Linn.* (Syn. : *Wolfsbane. Monkshood.*) Gathered when about one-third of the flowers are expanded, from plants cultivated in Britain. *Woodv. Med. Bot.*, plate 6.)

ACONITI RADIX. *Aconite Root.* (The dried root of Aconitum Napellus, *Linn.; Pharm. Journ.* vol. xv. p. 452, plate. Imported from Germany, or cultivated in Britain, and collected in the winter or early spring before the leaves have appeared.) Until within the past few years it had not been accurately ascertained which species of the genus *Aconitum* was employed by Störck, who was the first to use it as a medicine. The present 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 numerous cylindrical fleshy fibres arising from it; stems simple, 2–6 feet high; leaves palmately divided into 5 cuneate pinnatisect segments; flowers blue, on a cylindrical simple raceme, deeply hairy, with an irregular petaloid calyx, the upper sepal of which is helmet shaped, *follicles* 3, often slightly united at the base.

MODE OF PREPARATION.—The root should be dug up immediately before the appearance of the leaves, 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 leaves and flowers.*—Leaves smooth, palmate, divided into five deeply cut wedge-shaped segments; exciting slowly, when chewed, a sensation of tingling. Flowers numerous, irregular, deep blue, in dense racemes.—*Of the root.*—Usually from one to three inches long, not thicker than the finger at the crown, tapering, blackish-brown, internally whitish. A minute portion, cautiously chewed, causes prolonged tingling and numbness.

PHYSICAL PROPERTIES.—Aconite root has a faintly 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. Although all parts of the monkshood are possessed of medicinal activity, yet they vary in intensity, the root being most active, next the seeds, then the leaves, next the flowers, and, last of all, the fruit and stem.

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 $C_{30}H_{47}NO_7$), 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 presently described. 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 very marked 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. In erysipelas it was held in high estimation by Liston; and Graves found its external application of use in painful sprains. It has been also administered in the treatment of many other diseases, but in none of them has its efficacy been so 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. In cases of poisoning with monkshood, or its alkaloid, 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.

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, or as directed in some one or other of the following preparations.

PREPARATIONS.—*Of the leaves.*—Extractum Aconiti.—*Of the root.*—Aconitia (the active principle, see next article); Linimentum Aconiti, one ounce to one fluid ounce ; Tinctura Aconiti, fifty-four grains and a half to one fluid ounce.

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 suitable consistence for forming pills.) Dose, half a grain to two grains.

Linimentum Aconiti. Liniment of Aconite. (Take of aconite root, in coarse powder, twenty ounces; camphor, one ounce; rectified spirit, a sufficiency. Moisten the aconite with some of the spirit, and macerate in a closed vessel for three days; then transfer to a percolator, and adding more spirit percolate slowly into a receiver containing the camphor, until the product measures 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 coarse powder, two ounces and a half; rectified spirit, one pint. Macerate the aconite root for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally: then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) This Tincture has but one-fourth of the strength of Tinctura Aconiti, *Dub.*, and but one-third that of the Tinctura Aconiti, *Lond.* In prescribing it, it should always be borne in mind that it is a powerful poison. A tincture is met with in our shops, known as Fleming's tincture, which is far more powerful than the pharmacopœial preparation, sixteen ounces troy of the root being macerated for four days in sixteen ounces of spirit, the materials then transferred to a percolator, and sufficient rectified spirit added to recover twenty-four ounces of the tincture. Applied externally as an embrocation in painful neuralgic affections, Fleming's tincture frequently proves of signal service; but, for internal exhibition I prefer the pharmacopœial formulary, the dose of which is from five minims, cautiously increased up to fifteen minims.

ACONITIA. *Aconitia.* (An alkaloid obtained from Aconite.)

PREPARATION.—Take of aconite root, in coarse powder, fourteen pounds; rectified spirit, distilled water, solution of ammonia, pure ether, diluted sulphuric acid, of each 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 pure 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 the monkshood in combination with aconitic acid; by digestion with rectified spirit the root is exhausted of this salt as well as of its resinous matter, and by the distillation and evaporation directed, the spirit is gotten rid of, the aconitate of aconitia and the resin being left behind; these are separated by the action of the water, it dissolving out the alkaloidal salt, leaving the resin behind. The aqueous solution of aconitate of aconitia now 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 AND TESTS.—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, neutralising 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, leaving no residue when burned with free access of air. When rubbed on the skin it causes a tingling sensation, followed by prolonged numbness. It is a very active poison.

PROPERTIES.—*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. 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.

THERAPEUTICAL USES.—Aconitia 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 preparations of monkshood (considering its highly poisonous properties and enormous price) to warrant its employment as a medicinal agent. It cannot be administered

internally with safety—when perfectly pure the fiftieth part of a grain having endangered life.

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 Aconitiæ,* TURNBULL. (Aconitia, gr. viij.; rectified spirit, f℥ij.; dissolve.) Applied externally by means of a small sponge. It need scarcely be added that it should be used with extreme caution, as it is a deadly poison.

* AMYGDALÆ AMARÆ OLEUM. *Volatile Oil of Bitter Almonds.* The bitter almond tree has been described p. 341, 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 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 to a pulp

in a mortar. 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, develope 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, it 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 *benzoic acid*, *benzoin*, *benzimide*, and *hydruret 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 hydruret 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 medicinal 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. It is very extensively used for flavouring purposes by cooks and confectioners. Should symptoms of poisoning arise from its use the treatment will be the same as that for poisoning by prussic acid (see p. 482).

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 Fousel oil (see page 76, *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 fousel 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 fousel 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 particularly *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 is 102° F.; it should produce no action on potassium plunged into it ; nor be coloured by caustic potash ; and should not 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 than 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.

PREPARATION.—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 *nitro-benzole*, 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.

CHARACTERS.—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. Anilene 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 in medicine. 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.

THERAPEUTICAL EFFECTS.—According to Dr. Duckworth, a cat to which thirty minims of anilene 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 anilene furnished by the blood in all directions, and by the brain. The sulphate of anilene 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.

DOSE AND MODE OF ADMINISTRATION.—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. Dose, gr. j. to gr. iij.

ANTIMONIUM TARTARATUM. *Tartar emetic* (described, p. 275, 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,

of orchitis, 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.

THERAPEUTICAL EFFECTS.—Within the past few years Sir James Y. Simpson has introduced the salts of cerium 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 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.

DOSE AND MODE OF ADMINISTRATION.—The oxalate may be administered either in the form of powder or pill; its dose is from one to three grains.

CHLOROFORMUM. *Chloroform.* C_2HCl_3(=119·5). or **$CHCl_3$** (=119·5) (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 ($CaOClO+CaCl$); 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, $2(C_4H_6O_2) + 8CaOClO = C_4HO_2Cl_3 + CaO + 9HO + 5CaCl + 2(CaO,C_2HO_3)$. 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,

$2(C_4H_6O_2)+8CaOClO=C_2HCl_3+5CaCl+8HO+3\,(CaO,C_2HO_3)$; 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, $CaO,C_2HO_3 + CaOClO+CaO = 2(CaOCO_2)+ CaCl+HO$. 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 now removes the acids; the chloride of calcium the water; and, on distillation, the chloroform is delivered perfectly pure.

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_2HCl_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. That the vapour of chloroform can be absorbed by the atmospheric air is well known, but that the quantity of chloroform vapour which will saturate a given amount of atmospheric air varies with the temperature of the air is not so generally known. Snow gives a table of these several saturating points, which shows that as the temperature of the air rises, so does its capacity for absorbing the vapour of chloroform; thus at 40° F., 100 cubic inches of a saturated atmosphere will be composed of six of chloroform and 96 of air, whilst at 90° F., 100 cubic inches of a saturated atmosphere will be composed of sixty-five of air and thirty-five of chloroform vapour. 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; strychnia, 20·19; cinchona, 4·31; and of morphia, 0·57."—*Brand 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.

CHARACTERS AND TESTS.—A limpid colourless liquid, of an agreeable ethereal odour, and sweet taste. Dissolves in alcohol and ether in all proportions, and slightly in water, communicating to it a sweetish taste. Burns, though not readily, with a green and smoky flame. Specific gravity, 1·49. It is not coloured by agitation with sulphuric acid, and leaves no residue and no unpleasant odour after evaporation.

ADULTERATIONS.—A good 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. 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. In the Pharmacopœial directions for the purification of chloroform, it will be seen that sulphuric acid is directed to be employed; so long as the chloroform is impure, after being agitated with an equal volume of colourless sulphuric acid, and on being allowed to stand until the two fluids separate, at the point of contact a dark ring will be observed, which disappears upon the chloroform becoming perfectly pure, at this stage also, if the chloroform be tested with the sulphuric acid in a tube, it will exhibit a well marked convex surface downwards, where it lies upon the acid, an appearance which will not present itself until we get rid of the oily impurities 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, *exhibited internally* in the fluid form as a sedative, chloroform has been more or less used on the Continent and in America, but was very little employed in this country. The chief diseases in which it has been administered with benefit are asthma, spasmodic cough, and cancerous and other painful affections; in cancer it was 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 distinguished 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 either the spiritus chloroformi or 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 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, and even when it produced its effects after the most to be desired fashion, that its taste and odour hung about the patient for days after 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 Sir James Y. 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 varying 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, in some instances the patient going into a state of profound insensibility in the most imperceptible manner possible without the slightest trouble to the person administering it, but in the majority of cases, and especially so in robust individuals, a period of excitement precedes the anæsthetic stage, laughing, talking, struggling, &c. The patient frequently talking in foreign languages, but never in any instance to my knowledge, not even in that of the most abandoned characters, making use of obscene language. The stage of insensibility is marked by slight stertorous breathing, muscular relaxation, and fixing of the eyes, which are generally turned upwards with their pupils slightly contracted, unless, indeed, the effects of the chloroform have been pushed to an extreme, unnecessary, and undesirable extent, when the pupils become dilated. 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, and in the majority of instances without any unpleasant after consequences ; occasionally, however, the patient will complain of slight giddiness and headache, which, however, rapidly disappear. The circulation is somewhat affected during the induction of anæsthesia, at the commencement of the inhalation being increased both in volume and frequency ; but as the effects of the chloroform are more fully developed, the strength of the pulse becomes generally diminished, while its frequency is still slightly increased, though not nearly so much so as in the earlier stages of the inhalation. The anæsthetic condition may be kept up for hours with impunity, as is often done in parturient females, 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 purposes for which it is specially used require to be shortly noticed, namely, the prevention of pain during surgical operations, the alleviation of pain during paroxysmal attacks of it in disease, and in child-birth ; so that we can advantageously consider its employment under these three heads—its *surgical*, its *medical*, and its *obstetrical* value. At first much opposition was given to the employment of anæsthetic agents for the induction of insensibility during surgical operations, and the occurrence of an occasional fatal case, even where chloroform had been administered 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—the great majority of fatal cases occurring during its administration having taken place where chloroform has been exhibited for to relieve the pain of some trifling operation, such as tooth extraction, &c. Why this should be so, is, I believe, explained by the fact of sufficient attention not having been paid to keeping the patient in the recumbent posture during its administration. 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, it is an important item in the *taxis*, and when employed as such, in case of failure should only be a preliminary step to operation, the surgeon at once proceeding to relieve the stricture, without allowing the patient to recover from the state of anæsthesia, inasmuch as it is manifestly uncalled for to subject the patient to a second risk from the administration of chloroform; 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 does the production of anæsthesia seem to be contra-indicated, 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. But with proper precautions even under these circumstances, its use is attended with the greatest advantage. I have on more than one occasion administered it to patients undergoing operations for the removal of the upper jaw, keeping them for forty or fifty minutes in a state of complete unconsciousness, without any unpleasant consequence ensuing.

In the practice of medicine chloroform has been employed with the view of producing anæsthesia, with varying, but for the time most favourable, results in the treatment of tetanus, delirium tremens, hysteria, chorea, neuralgia, and such like painful affections, and in relieving the exacerbations of pain in cancer and other malignant diseases; it has also been had recourse to in hydrophobia, but although the spasms and suffering are thereby temporarily alleviated, no decided impression is made on the fatal progress of the disease. We occasionally meet with cases of intense pain, where the suffering is so great as to prevent anodyne medicines developing their beneficial effects. In such cases the exhibition of the vapour of chloroform arrests the pain, and admits of time for the anodyne to act. In such cases I have frequently succeeded in procuring for the sufferer several hours of comfortable sleep, by first giving a full dose of opium, and then controlling the pain by the anæsthetic action of chloroform. In relieving the agony attendant

upon the passage of gall stones, as also of renal calculi, I know of no medicine so valuable. 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 little 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.

It is, however, to the use of chloroform in midwifery that most opposition has been given, and since it was first employed by Sir James Simpson, a fierce controversy has raged between obstetrical practitioners on the subject, the opponents founding their objections upon two grounds—medical and scriptural—stating with reference to the first, that, in addition to its other possible ill effects, it predisposes to hemorrhage after delivery; and, with reference to the second, that pain is laid down by the law as woman's penalty for original sin. Scripture authority, however, has been brought to bear on both sides of this latter question. But as I am not myself a practitioner in midwifery, and consequently cannot speak from personal experience, nor yet a theologian, I wish merely to deal with facts. In Edinburgh chloroform is employed—to speak in general terms—in *every case* of labour, natural or preternatural, and with safety to both mother and child, its anæsthetic effects being pressed during the pains, and withheld during the intervals; 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 not be justified in incurring merely to relieve pain. 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

* Page 220.

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. With reference to what, after all, is the most important portion of the question, its tendency to favor flooding after delivery, Dr. Beatty, with many other authorities, entertains no doubt but that it is open to this charge; he has shown us, however, how we can divest it of this serious drawback (by preceding its use with that of ergot of rye) in his valuable *Contributions to Medicine and Midwifery*, p. 190.

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 (now a rather extended one) agrees with that of Snow—that no matter whether it be disease of brain, lung, heart, or of the large blood-vessels, 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;—a most valuable practical hint for which the profession is indebted to my

friend Mr. Fleming of this city. In addition to these, however, other circumstances require consideration; one of these which modifies the action of chloroform has not hitherto been alluded to, for the simple reason that the contingency requiring its consideration does not frequently arise. I allude to the influence that habit might exercise over its power of inducing anæsthesia. In one case which was under my care this question was to a certain extent solved; it was that of a lady dying in excruciating agony of cancer of the uterus; the only medicine that could relieve the intensity of her sufferings was the inhalation of chloroform, of which at last her constitution got such a tolerance that she consumed daily from 12 to 16 ounces. That some was wasted may be admitted, but the amount of waste was reduced to a minimum by the employment of Skinner's pipette and mask. The other circumstance modifying the anæsthetic action of chloroform, the influence exercised by race, deserves special consideration. It had been long observed that race to a certain extent modifies the action of medicines, but up to the present, so far as I am aware, no observations have been placed on record in connexion with chloroform upon this subject; therefore I feel peculiar pleasure in submitting for my readers' consideration a *resumé* of the careful observations of so acute an observer as Dr. Lyons of this city upon this point. As the result of a wide experience in the Crimea, where it will be remembered he was pathologist in chief to the British forces, Dr. Lyons specially remarks on the very great variety which appears to be observable in regard to the readiness or the contrary with which the system lends itself to the influence of chloroform, partially due to individual idiosyncracy, and on a larger scale probably to national peculiarity of nervous temperament. Thus some persons will be found to sink quickly and silently into the anæsthetic state, while others first exhibit a condition of high excitement, with wild and occasionally furious gesticulations and efforts to free themselves from all control—shouts, curses, and every species of angry vociferation being exhibited in one set of cases, while in another, rambling, silly, and incoherent attempts at narrative, description, or conversation, intermixed with peals of laughter, mark the stage of excitement. A return to the use of a native though long unused patois or language is a characteristic often noticeable. Taken in order of susceptibility the Turks and the Russian prisoners, gentle and docile to a degree little in keeping with the popular notion of the wild soldier of the fierce Tartar horde, quickly and readily inhaled the soothing vapor, and with hardly an exception fell silently, in the space of a few minutes, into a state of complete and profound anæsthesia, which lasted till all the stages of the most formidable capital operations of the field were fully completed. In the Russian, then, it may be stated the exhibition of chloroform was immediate in its effects, entirely and perfectly successful in annihilating all sense of pain, and opera-

tions however difficult were facilitated and expedited. The phlegmatic, blue-eyed, fair-haired Englishman of Saxon type next deserves mention. His susceptibility to chloroform was not so quickly exhibited nor so quietly accomplished as in the case of the Russ; but yet in general the vapour was borne without struggles against its inhalation, anæsthetic sleep was induced after a moderate interval, and was usually complete to the end of the operation. The Sardinian may be stated to occupy an intermediate place between the ready susceptibility of the Turk, the Russ, and the Saxon Englishman, *pur sang*, on the one hand, and the more vivacious, mercurial, and nervously excitable temperaments of the French and Irish specimens of the great Celtic brotherhood. Resistance to inhalation, with more or less occasional excitement in gesture and language, marked the exhibition of chloroform in the North Italian, but was never so extreme or attended with such violent demonstrations and such infinite trouble to the operator as in the French or Irish. In the French, of whom the agile Zouave might be taken as a type, the inhalation of the vapour was very often resisted after the first effort or two, a stage of struggles with wild excitement, rambling, incoherent, and boisterous talk, often in patois, with shouts, laughter, or curses, very frequently ensued, and it was not till after a protracted interval that anæsthesia was finally induced, and then was hardly ever so profound or so prolonged as in the Turk, the Russ, or the Englishman. It is to the Hibernian Celt, however, that we must refer for the most marked exhibition of all the phenomena of chloroformic excitement, and its wildest demonstrations. Inhalation was stoutly resisted, and when partially effected, soon gave evidence of its exciting and intoxicating effects by furious struggles, curses "both loud and deep," anger in one case, risible excitement in another, and finally a voluble outpouring of the native Irish marked by the rich brogue of the southern, or the harder clang of the northern Irishman. The amount of time consumed in such cases before the patient was reduced to a condition of anæsthetic quiet was in many instances very great, and became the source of infinite trouble, but what was of far more consequence, entailed irremediable suffering and loss of life on those whose wounds could not be attended to in time. The Scotch Celt exhibited in but a partial degree the excitement so marked in his Irish brother. The duration of this stage of chloroform intoxication varies much, and is sometimes prolonged to a period that, as Dr. Lyons observes, renders the employment of the drug a serious drawback to the comfort if not the safety to life of other sufferers, when as in time of war many have to be operated on, and the number of surgeons and assistants is limited. It is questionable whether under such circumstances chloroform should be employed at all. Dr. Lyons states that after the memorable engagements which terminated in the fall of Sebastopol, the time necessarily consumed in the administration of chloroform led to the loss of many lives, in the cases of individuals whom it was found impossible to operate upon within the period in which primary amputation is admissible.

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.

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 of gum tragacanth, or of Irish moss as proposed by the late Professor Osborne, but which does not answer as well as either of the gums. In consequence of the volatility of chloroform, it should be always prescribed in draughts. *Anæsthesia* is usually produced by the inhalation of the vapour emanating from f3j. to f3ij. It is effectually and safely administered in the manner first proposed by Sir J. Y. Simpson, namely, by pouring the chloroform into the hollow of a handkerchief folded in the form of an inverted cone; at first f3ss. 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 anæs-

thetic purposes. The chief points to be attended to are—1st. That the patient should be lying on his back with the head slightly raised. I have designedly put this point first, as I consider the recumbent position a *sine qua non* for the safe exhibition of chloroform. Should the necessities of the operation require the patient to be sitting up, he should be first anæsthetised in the recumbent position, and then be raised up to any required extent. 2nd. That he should be permitted at first to breathe atmospheric air freely mixed with the chloroform, which is effected by at first only dropping a few minims through the pipette on the Skinners' inhaler, which as the anæsthesia is developed can be increased in number, and by not bringing the chloroform too close to the mouth and nose at once. At this period the party administering the chloroform should bear in mind the effect temperature has in modifying the amount of vapour of chloroform that the atmospheric air will take up. At 60° F. an atmosphere *half* saturated with chloroform vapour will contain 6 per cent. of chloroform vapour, whilst at 80° F. an atmosphere half saturated with chloroform vapour, will contain 13 per cent. or more than double the amount, of chloroform vapour (see p. 495). 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; we can secure this point by directing the last meal to be given some three or four hours previous to the exhibition of the chloroform: should unfortunately emesis occur during its exhibition, the patient should be turned on his side, and his mouth directed downwards so as to facilitate the ejection of the contents of the stomach, otherwise a portion of the vomited matter might get into the windpipe and produce speedy death by asphyxia. 5th. That in public operations, as in hospitals, the patient should, if possible, be anæsthetized before being introduced into the theatre; the excitement consequent on facing a crowd frequently opposing the successful administration of chloroform. In all cases the party administering the chloroform should devote his entire and undivided attention to his patient. From inattention to this point, more than once have I seen a patient's life jeopardized. Every article of clothing (tight strings, &c.) that would embarrass the patient's breathing should be removed; on no account should any pressure on the chest or abdomen be permitted; and perfect silence should be enforced during its exhibition; this, however, need not prevent us allowing the patient himself to talk, inasmuch as encouraging him to talk facilitates his coming more rapidly under the influence of the chloroform, a fact first pointed out to me by my colleague, Dr. Wharton. There is but one other remark which I have to make to those inex-

perienced 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. For *external* use the chloroform liniment of the Pharmacopœia answers admirably, one part of it mixed with three parts of the belladonna liniment, forms an admirable embrocation for lumbago and other muscular pains; or from min. xx. to f℥j. may be added to ℥j of some mild ointment. 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.)

PREPARATIONS.—Linimentum Chloroformi, one volume in two; Spiritus Chloroformi, one volume in twenty; Tinctura Chloroformi Composita, one volume in ten.

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.* Chloric ether, however, is a much stronger preparation, containing seven parts of spirit to one of chloroform. At present in the majority of the medical establishments in this city, the two preparations are kept, a fact which prescribers should bear in mind, inasmuch as in Dublin chloric ether and spirit of chloroform are not synonymous terms. In prescribing it in combination, its remarkably sweet taste should be borne in mind, rendering the addition of syrup unnecessary, in fact its principal use is as a flavoring agent—the intense sweetness, as well as the amount of dilution of the spirit, preventing us ordering a sufficient quantity to produce

the physiological effects of chloroform to any appreciable extent. Dose, min. xx. to f3j.

Tinctura Chloroformi Composita. Compound Tincture of Chloroform. (Take of Chloroform, two fluid ounces; rectified spirit, eight fluid ounces; compound tincture of cardamoms, ten fluid ounces. Mix.) A most unnecessary addition to our Pharmacopœial preparations, the preceding preparation answering every purpose, with which also we could order the tincture of cardamoms, when we thought it desirable. Dose, 20 to 60 minims.

* *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.

* *Liquor Chloroformi Compositus.* (Chloroform, four fluid ounces; ether, one fluid ounce; rectified spirit, four fluid ounces; treacle, four fluid ounces; extract of liquorice, two ounces and a half; muriate of morphia, eight grains; oil of peppermint, sixteen minims; syrup, seventeen ounces and a half; prussic acid, (B. P.) two ounces; dissolve the muriate of morphia and the oil of peppermint in the rectified spirit, mix the chloroform and ether with this solution, dissolve the extract of liquorice in the syrup, and add the treacle; shake these two solutions together and add the prussic acid.) I have copied this formulary from my friend Mr. Squire's excellent *Companion to the British Pharmacopœia*, where it is given on his authority as the analogue of *Chlorodyne;* a medicine at present in great vogue in popular estimation: whilst admitting that most probably it very nearly approaches in composition this well known and well advertised nostrum, still in my opinion an important ingredient, Indian hemp, is omitted, as from my observations of its clinical effects, I entertain no doubt of its containing it in some one or other of its forms. The dose of this solution is the same as that of chlorodyne, viz., from five to twenty minims.

CONII FOLIA. *Hemlock Leaves.* (The fresh leaves and young branches of Spotted Hemlock, Conium Maculatum, *Linn. Flor. Lond.* plate 17, fasc. ii.; also the leaves separated from the branches and carefully dried; gathered from wild British plants when the fruit begins to form.

CONII FRUCTUS. *Hemlock Fruit.* (The dried ripe fruit of Conium Maculatum, *Linn.*, Spotted Hemlock.) Hemlock is an indigenous plant 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, the upper ones gradually smaller and less divided; 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 three leaflets on one side; fruit *(cremocarp)* 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 light. For medicinal purposes they should be kept in well-stopped opaque bottles 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 decompound, smooth, arising from a smooth stem with dark purple spots; dried leaves of a full green colour and characteristic odour. The leaf rubbed with solution of potash gives out strongly the odour of conia.—*Of the Fruit.*—Broadly ovate, compressed laterally; half-fruit, with five waved or crenated ridges. Reduced to powder and rubbed with solution of potash, they give out strongly the odour of conia.

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 (conein* 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 *hydra-*

ted 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.¼; 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. Conia has been occasionally 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. It has therefore been but little employed in medicine as yet. In the present Pharmacopœia it is employed in the form of vapour; conia being liberated in virtue of the process ordered. For internal exhibition the dose of the alkaloid, or of 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. Fresh hemlock leaves have been employed externally in the form of cataplasm or ointment to cancerous and painful ulcerations, and to tender glandular enlargements, in which class of cases their use is frequently followed by much relief. 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. In cases of poisoning with hemlock, the same treatment should be followed as in poisoning with monkshood (see page 485).

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 Conii; Extractum Conii; Pilula Conii Composita (see p. 323); Succus Conii; Vapor Coniæ.—*Of the Seeds.*—Tinctura Conii, fifty-four grains and a half to one fluid ounce.

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, with constant 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 suitable consistence for forming pills.) 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 preparation which I almost invariably use. It 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 by Neligan more than twenty years since, which is perfectly good. Dose, min. xx. gradually increased to f3j. 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. Tincture of Hemlock. Syn.: *Tinctura Conii Fructus*, 1864. (Take of hemlock fruit, bruised, two ounces and a half; proof spirit, one pint. Macerate the hemlock fruit for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the 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.

Vapor Coniæ. Inhalation of Conia. (Take of extract of hemlock, sixty grains; solution of potash, one fluid drachm; distilled water, ten fluid drachms. Mix. Put 20 minims of the mixture on a sponge, in a suitable apparatus, so that the vapour of hot water passing over it may be inhaled.) This is one of a class of preparations that I cannot avoid thinking had been much better left to extemporaneous prescription. By the action of the solution of potash upon the hemlock, its volatile alkaloid, conia, is evolved, and on being respired, will produce its sedative effects; it may prove of use in allaying troublesome cough, and paroxysms of asthmatic breathing &c.

* *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.

INCOMPATIBLES.—The caustic alkalies; the vegetable acids; and vegetable astringents.

CREASOTUM. *Creasote* (described p. 101, in the division *Astringents*) when given in poisonous doses, appears, from the observations of Dr. Rose Cormick, 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 which came under my notice 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 102), 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.

DIGITALINUM. *Digitalin.* Digitalin is the active principle of the Digitalis Purpurea which has been already described (p. 299) in the division *Diuretics,* but inasmuch as digitalinum acts principally, if not only, as a sedative, I have preferred noticing here the mode of preparation and properties of that substance.

PREPARATION.—Take of digitalis leaf, in coarse powder, forty ounces; rectified spirit, distilled water, acetic acid, purified animal charcoal, solution of ammonia, tannic acid, oxide of lead in fine powder, pure ether, of each a sufficiency. Digest the digitalis with a gallon of the spirit, for twenty-four hours, at a temperature of 120°, then put them into a percolator, and when the tincture has ceased to drop, pour a gallon of spirits on the contents of the percolator, and allow it slowly to percolate through. 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 with five ounces of distilled water, to which half an ounce of acetic acid has been previously added, and digest the solution thus formed with a quarter of an ounce of purified animal charcoal, then filter and dilute the filtrate with distilled water until it measures a pint. Add solution of ammonia nearly to neutralization, and afterwards add one hundred and sixty grains of tannic acid dissolved in three ounces of distilled water. Wash the precipitate that will be formed with a little distilled water; mix it with a small quantity of the spirit, and a quarter of an ounce of the oxide of lead, and rub them together in a mortar. Place the mixture in a flask, and add to it four ounces of the spirit; then raise the temperature to 160°, and keep it at this heat for about an hour; then add a quarter of an ounce of purified animal charcoal; put it on a filter, and from the filtrate carefully drive off the spirit by the heat of a water-bath. Lastly, wash the residue repeatedly with pure 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, charcoal, 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.

CHEMICAL HISTORY.—The analysis of digitalis has been conducted of late years most carefully by M.M Homolle and Quevenne, and they have described in it four neutral principles—digital*ine,* digital*in,* digitalo*se,* 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 pure ether the inert principle is removed, and the digitalinum being insoluble in pure ether is left behind comparatively pure. 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 AND TESTS.—In porous mammillated masses or small scales, white, inodorous, and intensely bitter; readily soluble in spirit, but almost insoluble in water and in pure 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 leaves no residue when burned with free access of air. It powerfully irritates the nostrils, and is an active poison.

THERAPEUTICAL EFFECTS.—I propose here to consider not only the sedative effects produced by digitalin, but also those produced by digitalis itself. Digitalis, administered in large doses, acts as a narcotico-acrid poison, producing giddiness, great debility, stupor, slow, feeble, and intermitting 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 reduced action of the heart itself. In a previous chapter I have discussed the diuretic effects produced by digitalis—here I have only to consider its sedative properties; but it has been remarked by many observers that these two physiological effects are incompatible with each other's existence—in fact they consider diuresis as the true medicinal action of digitalis, and that it is only when pushed beyond that point that its sedative properties are developed, as an indication of its toxic influence. Withering long since remarked that when digitalis commenced to sicken and depress the patient, it lost its diuretic effects. The effect of digitalis in reducing the volume and frequency of the pulse is best exhibited in the recumbent posture—it then frequently reduces the pulse from 100 or 90 down to 50 or 40. Dr. Baildon, in his own person, observed that under the influence of digitalis his pulse was reduced from 110 to 40; whilst beating 40 in the recumbent position, by sitting up he raised it to 72, and on standing up it rose to 100. These observations, which have been verified by myself and many others, may, to a certain extent, be explained by the influence exercised under every condition by position upon the pulse; but this consideration will not fully account for the marked changes in it, some of which must be attributed to the influence of the digitalis; and these clinical facts are what induce me to incline to the opinion that digitalis enfeebles the heart's action, so that when the blood has to be propelled at a disadvantage, as in the erect posture, the heart tries to compensate for diminished power by increased rapidity of

action ; and this difference according to position in the beats of the pulse will also account for some observers, such as Saunders, asserting that digitalis increases the frequency of its beats. 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 to be relied on as an antiphlogistic 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. Whilst all observers agree that digitalis reduces cardiac action, they are by no means agreed as to how this is effected—many holding that it is by weakening its action—in fact, by exercising over it a direct debilitating effect ; whilst Dr. Fuller, and some others, assert that it is by acting as a stimulant to the muscular structure of the heart, that it allays its irritability and moderates its action. This latter view is, to a certain extent, supported by experiments on animals, in which, when poisoned by digitalis, the heart is not found flaccid and distended with blood, but on the contrary empty, and in a state of firm tonic contraction. Digitalis 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 Neligan saw with Sir Dominic 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. The late Dr. Jones, of Jersey, employed digitalis extensively in the treatment of delirium tremens, his attention having been first drawn to its value in this disease, by an ounce of the tincture having been given in mistake to one of his patients labouring under this affection; instead of proving fatal, as he expected, he found, on his arrival, his patient considerably better. From that time he invariably treated his cases of delirium tremens with digitalis, giving, as the first dose, half an ounce of the tincture, which, if it did not tranquillize the patient, was repeated in four hours. Did this fail (which rarely happened), in four hours more he gave a third dose, but this only consisted of two drachms. When the symptoms partake of the character of acute mania, I coincide in this plan of treatment, but not otherwise. 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. *Digitalin* 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. Its action is principally, if not altogether, sedative, being in a very minor degree, if at all, diuretic. 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 that 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 digitalin causes nausea and obstinate vomiting, which last for many hours. In cases of poisoning with foxglove or with digitalin the treatment must vary according as to whether the symptoms arise from one large over-dose, 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*, which is by far the most usual course, cases of poisoning by large doses being comparatively rare, 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.

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 (see p. 300), f℥ij. to f℥ij.; of the tincture (see p. 301), min. x. to f℥iss. These doses have been much exceeded, but in my opinion at great hazard. The dose of *digitalin* is from one-sixtieth to one-thirtieth 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, in proportion to their years, better than adults. It has also been used endermically over the region of the heart, a blistered surface being dressed either with an ointment containing digitalis, or a few grains of the powder sprinkled over the denuded surface. So used it frequently reduces, both in force and frequency, tumultuous action of the heart.

* *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; and rubbed over the heart in cases of tumultuous action of that organ.

* *Succus Digitalis.* (Prepared in the same manner as *Succus Conii*, see page 511.) Dose, min. x. to f℥j.

* *Granules of Digitalin.* (Digitalin, gr. xx.; powdered white sugar, ℥j.; mucilage, sufficient to make 1000 granules.) Each granule contains a fiftieth of a grain of digitalin. Dose; one, gradually and very cautiously increased to five.

LAUROCERASI FOLIA. *Cherry-Laurel Leaves.* (The fresh leaves of Prunus Laurocerasus, *Linn.* The common or Cherry Laurel. *Steph. and Church. Med. Bot.* plate 117.) 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.—A small evergreen tree; stem smooth, much branched, 12–18 feet high; leaves shortly petiolate, oblong-ovate, remotely serrate, 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 ratafia 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.

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, and macerate them in the water for twenty-four hours; then distil one pint of liquid. Shake the product, filter through paper, and preserve it in a stoppered bottle.) 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 479). The pharmacopœial preparation contains from one-sixth to one-seventh per cent. of prussic acid. As it loses its activity by keeping, it should be distilled fresh every year. 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 (see p. 482).

* POTASSII CYANIDUM. *Cyanide of Potassium.* (KCy=65.) (Syn. : *Cyanuret of Potassium. Hydrocyanate of Potassa.*)

PREPARATION.—Reduce proto-cyanide 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 much diminishes its activity. It should be also perfectly free from odour, as if it has any smell of prussic acid, it contains water, it 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 deliquescence 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. 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. 482).

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.

* SPIRITUS PYROXYLICUS RECTIFICATUS. *Rectified Pyroxylic Spirit.* Syn.: *Medicinal Naphtha.* Hydrated Oxide of Methyle, $C_2H_3O,HO=32$, with about 10 per cent. of water; a product of the destructive distillation of wood.

PREPARATION.—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 one 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.

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, but when pure no turbidity, 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 : sp. gr. 0·841 to 0·846. 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.

ADULTERATIONS.—Ordinary naphtha is sometimes substituted for medicinal naphtha (pyroxylic spirit), but may be readily distinguished by its smoky taste and by the physical and chemical characters 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 under certain circumstances 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.

TABACI FOLIA. *Leaf Tobacco.* (The dried leaves of Virginian

Tobacco, Nicotiana Tabacum, *Linn. Steph. and Church. Med. Bot.*, plate 37. 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, obovato-oblong, acuminate, very large, pale green; flowers, in panicles, rose-coloured; calyx tubular, campanulate; corolla hypocrateriform, tube inflated at the throat; limb 5-lobed; stamens 5; 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.

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 nicotia, and precipitates with perchloride of platinum and tincture of galls. 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.

ADULTERATIONS.—The adulterations of tobacco though commercially of moment, and very numerous, 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. 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.*)

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.

VERATRI VIRIDIS RADIX. *Green Hellebore Root.* (The dried rhizome of Veratrum Viride, *Willd.* Collected in autumn in the United States and Canada.) Syn.: *American Hellebore, Indian Poke, Poke Root, Swamp Hellebore.* An inhabitant of America, from Canada to the Carolinas, belonging to the Natural family *Melanthaceæ*, class and order *Hexandria Trigynia.*

BOTANICAL CHARACTERS.—A herb with a perennial rhizome, truncated at the apex, and furnished with numerous white or yellow radicles; stem annual, 2–3 feet high, pubescent; leaves broad, oval, curvi-nerved, acuminate, deep green, and pubescent; those at the base of the stem are the largest, they diminish gradually towards the apex where they are bract-like; flowers in terminal panicles, greenish-yellow; perianth divided into 6 oval, acute segments; stamens 6; ovary, often rudimentary, 3-lobed, 3-celled; styles 3; capsule dehiscing septicidally into 3 follicles, 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 which 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 lungs. The following comparison instituted between it and the effects produced by venesection, digitalis, tartar emetic, colchicum, aconite, and veratrum album is extracted from a pamphlet on the subject by Dr. E. Cutter, of Massachusetts, U. S.:—*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. Venesection cannot be persisted in without great hazard of prolonging the convalescence of the patient, if not weakening him for life; *Veratrum Viride* diminishes—(*a*) the fulness, force, and frequency of the pulse; (*b*) has a sedative influence upon the nervous system; (*c*) but does not reduce the nervous quality of the vital fluid, which is the objectionable, if not injurious, feature of depletion. Veratrum Viride can be employed an indefinite period with safety, and stopped, its effects speedily sub-

side. 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. *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 engaged in its study; less of a diuretic. *Tartar Emetic* 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. *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). *Aconite* is narcotic; *Veratrum Viride* is not; in the full physiological effects the mind is clear. *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 parvagum.

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, obtained by adding in excess water of caustic potash to a solution of chloride of zinc: as the result of this proceeding water and cyanide of zinc will be formed, thus $HCy + ZnO = HO + ZnCy$.

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. $\frac{1}{8}$ 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 remedial 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 a 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.

ARMORACIÆ RADIX. *Horseradish Root.* (The fresh root of Cochlearia Armoracia, *Linn.; Woodv. Med. Bot.* plate 150. Cultivated in Britain.) Indigenous, belonging to the Natural family *Cruciferæ* (*Brassicaceæ*, Lindley), and to the Linnæan class and order *Tetradynamia Siliculosa.*

BOTANICAL CHARACTERS.—Rootstock perennial, gradually tapering into a long, cylindrical, fleshy tap-root; stems about 2 feet high; leaves sinuate and toothed, glabrous but rough; the radical ones larger and on longer petioles than those on the stem; flowers small, in a racemose panicle; fruit an ovoid *silicula* without a prominent nerve; seeds several in each cell, the radicle accumbent.

CHARACTERS.—A long, cylindrical, fleshy root, half an inch to one inch in diameter, expanding at the crown into several very short stems. It is internally white, and has a pungent taste and smell.

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 Armoraciæ Compositus. (See general stimulants.)

MEZEREON (described p. 282, 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.

PYRETHRI RADIX. *Pellitory Root.* (The root of Anacyclus Pyrethrum, *De Cand.*, imported from the Levant.) 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 perennial, fusiform, fleshy, and very pungent; stems annual, numerous, procumbent, and slightly branched, pubescent; radical leaves petiolated, pinnatisect, the segments divided into linear subulate lobes; the cauline leaves are sessile and more hairy; branches bear a single *head* of florets; involucre consists of lanceolate acuminate scales, which are brown at the margin, and are arranged in few rows; receptacle convex, with oblong-obovate paleæ; florets of the ray female, sterile, and usually ligulate; florets of the disc hermaphrodite, with 5 teeth; achene flat and somewhat compressed, bordered with broad entire wings; pappus short, irregularly and minutely dentate.

CHARACTERS.—In pieces about the length and thickness of the little finger, covered with a thick brown bark, studded with black shining points. Breaks with a resinous fracture, and presents internally a radiated structure. Is inodorous when chewed; it excites a prickling sensation in the lips and tongue, and a glowing heat.

CHEMICAL PROPERTIES.—According to Parisel's analysis the acrimony of this root depends on an acrid resin, *Pyrethrin*, which exists principally in the bark and 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 affec-

tions I have employed it with some little benefit. It has been also employed in relaxation of the uvula. From gr. xxx. to gr. lx. of the root may be chewed frequently. The tincture is used by some dentists to relieve tooth-ache.

Tinctura Pyrethri. Tincture of Pellitory. (Take of pellitory root, in coarse powder, four ounces; rectified spirit, one pint. Macerate the pellitory for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) Used only as a wash for the gums 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, f℥j.; strong acetic acid, f℥x.; oil of cloves, min. xx.; oils of lavender, of rosemary, and of lemons, of each, f℥ss. Reduce the camphor to powder by trituration with the spirit; add the acid, and dissolve it, then add in the oils, and keep in a well-stoppered bottle.

THERAPEUTICAL USES.—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, one of its synonyms, *Vinegar of the Four Thieves,* having been given to it in consequence of the fact of its having been used by four rascals who, during the prevalence of the plague at Marseilles, plundered the corpses of its victims, and who, to save their lives, confessed that they escaped infection by the use of this preparation; modern experience, however, has long since dissipated this error. It is exceedingly pungent and very volatile, and should be therefore kept in well-stoppered bottles.

* ÆTHER ACETICUS. *Acetic Ether.* Not employed in this country, but officinal in most of the continental pharmacopœias.

PREPARATION.—Rectified spirit, one hundred parts; concentrated acetic acid, sixty-three parts; strong sulphuric acid, seventeen parts; mix, and distil over a sand-bath one hundred and twenty-five 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 one hundred 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. Some wines appear to owe their taste and smell to its presence in minute quantities. Specific gravity, ·860.

CHEMICAL PROPERTIES.—According to the recent chemical theo-

ries 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. It is easily volatilized, and should have no action upon either litmus or turmeric paper. 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 and antispasmodic, 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.

DOSE AND MODE OF ADMINISTRATION.—From ten to thirty minims in water, flavoured with some simple syrup. For external use the following is a satisfactory formula.

* *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, Edin. Dub.* (A volatile liquid prepared from alcohol, and containing not less than 92 per cent. by volume of pure ether, C_4H_5O or $\mathbf{C_4H_{10}O}$.)

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 with twelve fluid ounces of the spirit in a glass matrass capable of containing at least two pints, and, not 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. For this purpose use 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 rectification 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 it, 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.

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.

CHARACTERS AND TESTS.—A colourless, very volatile, and inflammable liquid, emitting a strong and characteristic odour, and boiling below 105°. Specific gravity 0·735. Fifty measures agitated with an equal volume of water are reduced to 45, by an absorption of 10 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. 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 head-ache 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 Massachusetts 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. 506). In cases of poisoning with ether, in consequence of the exhibition internally of an overdose, 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. When dangerous symptoms ensue from its employment as an anæsthetic agent, the treatment is that described under the head of chloroform (see p. 506). Externally ether has been applied with friction as a local stimulant in rheumatic and neuralgic pains. Applied externally, the action is also 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. The use of pure ether made to play on the skin by means of an instrument called the ether spray, has been introduced into surgical practice by Dr. Richardson of London, for the purpose of producing local anæsthesia. Its effect is to congeal the part, and thereby render it insensible to pain; I have used it with great success in many of the minor operations, such as the opening of abscesses, incisions of paronychias, circumcision, &c., in fact in all that class of operations which require so little time for their completion, as to render the exhibition of chloroform unjustifiable. By other surgeons, however, it has been successfully employed in more important operations, such as excision of the breast, ovariotomy, &c. Occasionally, however, my patients have loudly complained of the pain produced by the evaporation of the ether itself. Its use is attended with one other trifling drawback, its rendering the integument so tough, as to be incised with some difficulty. The exact period when anæsthesia is produced will be known to the operator by the skin becoming suddenly blanched. This application of ether, in my opinion, is a very great boon indeed to operative surgeons. It has been attempted to detract from Dr. Richardson's merit in having suggested it, by the allegation that Dr. Arnott, years back, suggested the employment of ice and other refrigerating agents, with a similar object in view; but Dr. Richardson's plan of effecting congelation is always at hand; ice, etc., is not; and the simple answer to all such detractions is, that whilst in the fullest manner acknowledging Dr. Arnott's claims to priority in recommending congelation as an efficient means of producing local anæsthesia, his method never came into general use, whilst Dr. Richardson's ether spray is in the hands of every operating surgeon, and is at the present moment, I may say, in daily requisition. In pharmacy ether is employed to extract the active principle of many medicines.

DOSE AND MODE OF ADMINISTRATION.—f3ss. to f3j.; 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. The vapour of ether differing from that of chloroform in being of very light specific gravity, requires for its inhalation that the patient should be somewhat in the erect position, and in conse-

quence of its volatility that an apparatus or ether-inhaler, of which many forms have been proposed, should be employed for its administration.

PREPARATIONS.—Æther Purus ; Collodium, six volumes in eight nearly (see p. 359) ; Collodium Flexile, six volumes in eight nearly (see p. 359) ; Liquor Epispasticus, four volumes in five nearly (see p. 381) ; Spiritus Ætheris, one volume in three.

Æther Purus. Pure Ether. (Ether, C_4H_5O or $\mathbf{C_4H_{10}O}$, free from alcohol and water.) (Take of ether, distilled water, of each, two pints; lime, recently burned, a quarter of an ounce; chloride of calcium, four ounces. Put the ether with one pint of the water into a bottle, and shake them together; allow them to remain at rest for a few minutes, and when the two liquids have separated, decant off the supernatant ether; mix this with the remainder of the water, and again after separation, decant as before. Put now the washed ether, together with the lime and chloride of calcium, into a retort to which a receiver is closely attached, let them stand for twenty-four hours, then distil with the aid of a gentle heat.) 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. Its specific gravity should not exceed 0.720. It is principally introduced for pharmaceutical purposes, being employed in the preparation of *aconitia*, in the *test* for cinchona flava, &c. but is the preparation that should be used for producing anæsthesia by congelation with the agency of Dr. Richardson's ether spray.

Spiritus Ætheris. Spirit of Ether. (Take of ether, ten fluid ounces; rectified spirit, one pint; mix.) Specific gravity, 0·809. It should 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 should separate by rest. Its uses and properties are similar to those of ether. Dose, f℥ss. to f℥ij. 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 liquid 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 last preparations, the first as being an important constituent of the second, which is in very general use, and 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 f3ss. to f3ij. 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.

ALCOHOL. *Absolute Alcohol.* ($C_4H_6O_2$ or $\mathbf{C_2H_6O}$.)

SPIRITUS RECTIFICATUS, *Rectified Spirit.* (Alcohol, $C_4H_6O_2$ or $\mathbf{C_2H_6O}$, with sixteen per cent. of water; obtained by the distillation of fermented saccharine fluids.)

SPIRITUS VINI GALLICI. *Spirit of French Wine.* Syn.: *Brandy.* (Spirit distilled from French wine. It has a peculiar flavour, and a light sherry colour derived from the cask in which it has been kept.)

SPIRITUS TENUIOR. *Proof Spirit.* I have here introduced all the varieties of spirits which are officinal in the Pharmacopœia. That many others are met with in commerce is too well known to require comment, but to do more than allude to them further on would be entirely foreign to the scope of this work.

PREPARATION.—*Of Alcohol.*—Take of rectified spirit, one pint; carbonate of potash, one ounce and a half; slaked lime, ten ounces. Put the carbonate of potash and spirit into a stoppered bottle and allow them to remain in contact for two days, frequently shaking the bottle. Expose the slaked lime to a red heat in a covered crucible for half an hour, then remove it from the fire, and, when it has cooled, immediately put the lime into a flask or retort, and add to it the spirit from which the denser aqueous solution of carbonate of potash, which will have formed a distinct stratum at the bottom of the bottle, has been carefully and completely separated. Attach a condenser to the apparatus, and allow it to remain without any external application of heat for twenty-four hours; then, applying a gentle heat, let the spirit distil until that which has passed over shall measure 1½ fluid ounce; reject this, and continue the distillation into a fresh receiver until nothing more passes at a temperature of 200°.—*Of Proof Spirit.*—Take of rectified spirit, five pints; distilled water, three pints. Mix.

EXPLANATION OF PROCESS.—In the first of these two processes, that for obtaining absolute alcohol, the rectified spirit, which is alcohol containing sixteen per cent. of water, is dehydrated by being brought first in contact with the carbonate of potash and next with the quicklime; the intense affinity these two have for water enabling us thereby to get the alcohol free from it. The first ounce and a half is rejected as containing a trace of water, and then the distillation is continued so long as anything comes over at the temperature of 200°, as that heat is not sufficiently high to separate the water from the hydrates. The second process, that for obtaining proof spirit, being one of simple dilution requires no comment.

CHEMICAL HISTORY.—Vinous fermentation, one of the principal products of which is alcohol, has been known in the remotest periods

of antiquity, and in some one form or other is familiar to the most ignorant and barbarous tribes. Any substance containing sugar, or which, such as starch, is capable of being converted into sugar, under certain conditions can be made to assume the vinous fermentation. Amongst the varieties of sugar recognized by chemists are cane-sugar (*Sucrose*=$C_{12}H_{11}O_{11}$), fruit-sugar (*Fructose*=$C_{12}H_{12}O_{12}$), and grape sugar (*Glucose*=$C_{12}H_{14}O_{14}$), of these the first ferments with some difficulty, the last with facility, but the intermediate one, fruit-sugar, with the greatest facility. But there are many reasons which induce chemists to believe that both cane and grape sugar are first changed into fruit-sugar, previous to the appearance of alcohol. I have said that under certain conditions they can be made to ferment. Pure sugar dissolved simply in water will not ferment, but the saccharine juices of vegetables contain, in addition to sugar, a nitrogenous principle, in the presence of which sugar assumes the vinous fermentation. This principle is called the *ferment*; how it influences the development of the fermenting process has not as yet been satisfactorily explained, for as the result of the process but two products have been demonstrated, alcohol and carbonic acid, and for their production the elements contained in fruit sugar are quite sufficient to account; one atom of fruit sugar being equivalent to two atoms of alcohol and four of carbonic acid, thus:— $C_{12}H_{12}O_{12}=2C_4H_6O_2+4CO_2$. The place of this natural ferment can be supplied by an artificial ferment, *yeast* or *barm*, which is a nitrogenous principle, the product of some previous fermentation. In addition to the presence of the substance that is to undergo fermentation, and of the ferment, it is also necessary that the temperature to which they are exposed should neither be too high nor too low, in fact it must range between 41° F. and 113° F.; water also, as well as atmospheric air, are essential conditions. This latter fact explains why it is that fruits do not undergo spontaneous fermentation, their integument preventing the access of air. Once the process of fermentation has been completed, the spirit can be readily recovered by distillation, and by careful rectification spirits of wine is procured, which by the preceding process yield alcohol. Brandy, rum, gin, and whiskey are spirituous liquids which contain about half their weight of alcohol, and are, therefore, nearly in the condition of proof-spirit. They are obtained by distilling fermented liquors. They chiefly consist of alcohol and water, with a very small proportion of solid matter: they owe their peculiar odours and flavours to the presence of certain oily and ethereal products of fermentation. When genuine, they are neutral, and leave only a slight residue on evaporation. *Brandy* is the result of the distillation of wine; and its qualities vary with the kind of wine from which it is obtained, and the precautions with which it is distilled. It is frequently strongly coloured with caramel.—*Rum* is distilled in the East and West Indies from a fermented mixture of molasses and water, with the skimmings of the sugar-boilers, and the lees or

spirit-wash of former distillations.—*Gin*, or *Geneva*, is prepared from different kinds of corn-spirit: it was originally largely imported from Holland, and was known as Hollands or Hollands' gin. Its flavour is derived from juniper-berries, or from the essential oil of juniper, which contributes to its diuretic quality. *Calamus aromaticus*, or sweet flag, and other flavouring articles, are occasionally used in its manufacture. The great gin-distillers sell it to the trade at about 20 per cent. over proof, but the retailers afterwards dilute and generally sweeten it. Various chemical substances are employed in its adulteration.—*Whiskey* (a term said to be derived from the Irish *usquebaugh*) is also a corn-spirit, and when illicit *(potheen)* derives its characteristic flavour from the malt used in its manufacture having been dried over peat or turf-fires; but this odour and flavour of burned turf, or peat-reek, is frequently given to raw corn-spirit by impregnating it with peat-smoke.—*Arrack*, or *Rack*, is a spirituous liquor prepared in various parts of India from the fermented juice of the cocoa-nut, and also from fermented infusion of rice. It has a peculiar flavour and odour, but in other respects closely approaches in its characters to rum. It is said that a genuine arrack may be very well imitated by dissolving 10 grains of benzoic acid in a pint of rum.

PHYSICAL PROPERTIES.—*Alcohol*, which has only a place in the Appendix to the Pharmacopœia, is a transparent colourless liquid, with a pungent, rather agreeable odour, and an acrid burning taste. *Rectified Spirit (Spirit of Wine)* is accepted as a commercial article by the pharmacopœial authorities, no directions being given us for its preparation; in its physical characters it resembles alcohol. *Proof Spirit (Spiritus Tenuior)* is directed by the pharmacopœial authorities to be prepared as already described. It receives the name of proof spirit, because it is the weakest spirit which, poured over gun-powder and ignited, will also fire the gun-powder; the water of a weaker spirit would so damp the gun-powder, as to prevent it igniting. 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.

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°.

CHARACTERS AND TESTS.—*Of Alcohol.*—Colourless and free from empyreumatic odour. Specific gravity 0·795. It is entirely volatile by heat, is not rendered turbid when mixed with water, and does not cause anhydrous sulphate of copper to assume a blue colour when left in contact with it.—*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. Specific gravity 0·838. Remains clear when diluted with distilled water. Odour and taste purely alcoholic. Four fluid ounces with thirty grain-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. Did anhydrous sulphate of copper become blue on being brought into contact with alcohol, it would indicate the presence in it of water. The rectified spirit of British commerce frequently contains fousel 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 fousel oil. The same test is applicable to both alcohol and proof spirit.

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, in extreme cases, brandy, *Spiritus Vini Gallici*, or whiskey, is usually employed, but in less urgent cases 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, spirit is frequently added to cooling and evaporating lotions. 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. 269) ; 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.

DOSE AND MODE OF ADMINISTRATION.—In low stages of 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. Mixture of Spirit of French Wine. (Take of spirit of French wine, cinnamon water, of each, four fluid ounces ; the yolks of two eggs ; refined sugar, half an ounce. Rub the yolks and sugar together, then add the cinnamon water and spirit.) This is another of the uncalled for formularies in the Pharmacopœia. I do not think it was necessary to give us directions how to make *egg-flip*, which this virtually is. It should always be a domestic preparation ; no doubt it frequently proves a most valuable as it is a most agreeable remedy. Dose, one to two fluid ounces.

* *Methylated Spirit.* (A mixture of one part of pyroxylic spirit and nine of 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 College 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.

AMMONIACUM. *Ammoniacum.* (A gum-resinous exudation from Dorema Ammoniacum, *Don, Trans. Linn. Soc.* Collected in Persia and the Punjaub.) The plant here indicated, 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 four inches in diameter, branching; leaves large, bipinnate, 2 feet long, on downy petioles, sheathing at the base; flowers white, in proliferous, racemose umbels. *Cremocarps* dorsally compressed, ridges, 3 primary, and 4 secondary, the entire enveloped in wool; vittæ 1 to each ridge, and 4 to the commissure, 2 of which are very small.

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 softened by heat; has a faint odour, and a bitter, acrid, nauseous taste. Rubbed with water it forms a nearly white 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 it 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 enlargements 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*), twelve parts in fifteen; Emplastrum Galbani (see p. 69), one part in eleven; Mistura Ammoniaci, thirteen grains and a half to one fluid ounce, nearly; Pilula Scillæ composita (see p. 323), one part in six; Pilula Ipecacuanhæ cum Scilla (see p. 323), one part in seven.

Mistura Ammoniaci. Ammoniacum Mixture. (Take of ammoniacum, in coarse powder, a quarter of an ounce; distilled water, eight fluid ounces. Triturate the ammoniacum 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 p. 5 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 p. 8, 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. iij. to gr. v. 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.

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. This preparation is stronger in spirit, and about one-half stronger in ammonia than the Spiritus Ammoniæ Aromaticus of the *Lond. Pharm.* It is of a very light straw colour, with a pungent, ammoniacal odour. It is an excellent and agreeable stimulant in fainting, hysteria, nervous debility, and flatulent colic. Dose, min. x. to f3ss. in distilled water, or in camphor mixture. It enters into the following preparations :—Tinctura Guaiaci Ammoniata, see p. 281; Tinctura Valerianæ Ammoniata, see p. 76.

AMMONII SULPHIDI LIQUOR. *Solution of Sulphide of Ammonium.* Syn: *Hydrosulphuret of Ammonia*=NH_4S,HS=(51)

PREPARATION.—Take of solution of ammonia, five fluid ounces; Put three fluid ounces of the ammonia into a bottle, and conduct into this a stream of sulphuretted hydrogen so long as the gas continues to be absorbed; then add the remainder of the ammonia, and transfer the solution to a green-glass bottle furnished with a well-ground stopper.

EXPLANATION OF PROCESS.—On passing a stream of sulphuretted

hydrogen gas into a solution of caustic ammonia, we have one equivalent of the gas decomposed, its hydrogen uniting with the oxygen of the oxide of ammonium to form water, whilst the sulphur unites with the ammonium to form the sulphide of ammonium thus :— $NH_4O+HS=HO+NH_4S$. This latter with one other atom of sulphuretted hydrogen, constitutes the preparation usually employed as a test ; the sulphuretted hydrogen gas itself is generated by the action of sulphuric acid and water upon the sulphide of iron, thus :— $FeS+SO_3HO=FeOSO_3+HS$.

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 (NH_4S,HS). 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 the Appendix 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, and was stated to possess marked depressing influence over the heart and circulation; Graves' investigations, however, prove that it is destitute of such properties, at least in medicinal doses. It has fallen most deservedly into disuse and can be well spared from the list of *medicinal* agents.

DOSE AND MODE OF ADMINISTRATION.—From min. iv. to min. vj. in one or two fluid ounces of some distilled or aromatic water.

AMMONII CHLORIDUM. *Chloride of Ammonium.* Syn : *Ammoniæ Hydrochloras*, 1864. *Ammoniæ Murias, Edin., Dub. Sal Ammoniac.* NH_4Cl. (=53·5) or $\mathbf{NH_4Cl}$ (=53·5) (May be formed by neutralising hydrochloric acid with ammonia and evaporating to dryness. It is usually prepared by sublimation.)

PREPARATION.—It is procured by manufacturers on the large scale by decomposing either the sulphate of ammonia which is formed in the manufacture of coal gas, or the carbonate of ammonia obtained by the distillation of bones. In either case the decomposing agent employed is common salt (chloride of sodium). And the result of the process is chloride of ammonium and sulphate or carbonate of soda, as the case may be.

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 AND TESTS.—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 *(white)* precipitate. When heated it volatilises 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; it 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;* under these circumstances 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 produced on the addition of nitrate of silver, is chloride of silver, thus accounted for, $NH_4Cl+AgONO_5=NH_4ONO_5+AgCl$.

THERAPEUTICAL EFFECTS.—Hydrochlorate of ammonia, although creeping into favour, 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. Neligan found it useful in some cases of adynamic fever, and in the subacute forms of laryngitis; and I have frequently tested its great value in the treatment of chronic affections of the liver, and in facial neuralgia. Sir Thomas 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. Vanoye has employed it successfully in the treatment of the enlarged prostate gland. As a topical remedy muriate of ammonia is very generally used as an ingredient in discutient lotions, being with many surgeons a favorite local remedy in recent cases of hydrocele; and no remedy with which I am acquainted has equal power with it, in promoting the reabsorption of effused blood, as so commonly met with in that well-known affection—*a black eye;* in consequence of the cold produced during its solution in water, it is also used as an external refrigerant, see p. 473. Another remark-

able, and to me, inexplicable property possessed by sal ammoniac is its efficacy in removing warts; rubbed over them three or four times daily, these unsightly excrescences will rapidly disappear. If an overdose of this salt has been taken, vomiting should be promoted by the use of tepid mucilaginous and demulcent drinks.

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 f℥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.

ANETHI FRUCTUS. *Dill Fruit.* (The fruit of Anethum Graveolens, *Linn.; Woodv. Med. Bot.* plate 159. Cultivated in England, or imported from middle and southern Europe.) A native of the South of Europe, but cultivated in England; 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. Fruit a *cremocarp*, dorsally flattened, with a flat membranous border, and five filiform ridges on each half-fruit; vittæ broad, solitary in the channels, two on the commissure.

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.

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-fruit bruised, one pound; water, two gallons. Distil one gallon.) Dose, from f℥ss. to f℥ij. as a vehicle for more active remedies.

Anethi Oleum. Oil of Dill. (The oil distilled in Britain from dill fruit.) This oil is of a pale, yellow colour; pungent odour; and acrid, sweetish taste. One to four minims, dropped on a lump of white sugar, may be used as a carminative.

ANISI OLEUM. *Oil of Anise.* (The oil distilled in Europe from the fruit of Pimpinella Anisum, *Linn.*, Anise. *Woodv. Med. Bot.*, plate 180. And the oil distilled in China from the fruit of Illicium Anisatum, *Linn.*, Star Anise. *Nees. Plant. Med.*, plate 371.) 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. Fruit (*Cremocarp*) ovate, the mericarps with five filiform, equal ridges and multivillate channels.

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.

CHARACTERS.—*Of the Oil.*—Colourless or pale yellow; with the odour of anise, and a warm sweetish taste. Concretes at 50°.

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, especially when rubbed up with liquor potassæ; 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.; of the oil, min ij. to vj. on a lump of sugar.

PREPARATIONS.—Essentia Anisi, one volume in five; Tinctura Camphoræ Composita (see p. 444), half a fluid drachm in one pint; Tinctura Opii Ammoniata (see p. 445), one fluid drachm in one pint.

Essentia Anisi. Essence of Anise. (Take of oil of anise, one fluid ounce; rectified spirit, four fluid ounces. Mix.) This essence has but half the strength of that in the last edition of the Dublin Pharmacopœia. Its dose is from 10 to 20 minims.

* *Aqua Anisi.* (Take of essence of anise, f℥ij.; distilled water, half a gallon. Mix with agitation, and filter through paper.) Dose, f℥ss. to f℥ij.

ARMORACIA. *Horse-Radish* (described p. 526, in the division *Sialogogues*) is sometimes, though rarely, used as a warm stimulant, chiefly as an adjunct to other medicines; it possesses sudorific and diuretic properties, and was formerly classed amongst the antiscorbutics, but is little employed in the present day. Taken internally it acts as a stimulant to the digestive organs, promotes the appetite slightly, expelling flatus, and is consequently a favorite concomitant with roast beef. It has been used in dropsies, rheumatism, scurvy, &c. but latterly has fallen into disuse unless for external applications. Sliced horse-radish is a useful addition in paralytic and cerebral affections 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; bitter-orange peel, cut small and bruised, of each 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.

ARNICÆ RADIX. *Arnica Root.* (The dried rhizome and rootlets of Arnica Montana, *Linn.* Syn.: *Leopard's Bane, Steph. and Church. Med. Bot.* plate 123. Collected in the mountainous parts of 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.—A perennial herb; rhizome horizontal, woody, brown, one to three inches long, with numerous fibrous rootlets; stem about a foot high, cylindrical, hairy, terminating in 1 to 3 peduncles, each bearing a single flower-head; leaves obovate, entire, those on the stem in pairs; florets of the ray in one row, ligulate, those of the disk hermaphrodite, tubular, 5-toothed; achene cylindrical, tapering to each end, ribbed and hairy.

CHARACTERS.—Rhizome 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, al-

though 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 a 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 is very rarely used in this country. I have found a tincture of the flowers prove of service in nervous head-ache. 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 have found it of so much use, as to a great extent to justify in my opinion its title to this appellation. Externally employed as a lotion the tincture enjoys an extensive popular reputation in the treatment of bruises, ecchymoses, &c.; but, so far as my experience goes, 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 coarse powder, one ounce; rectified spirit, one pint. Macerate the arnica for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) This is the preparation I most frequently employ in the cases of deranged cerebral circulation, following concussion, previously alluded to. My experience of it entitles me to speak of its value with some confidence. Dose, half to two fluid drachms.

* *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 as those in which the pharmacopœial tincture is to be prescribed.

INCOMPATIBLES.—The mineral acids; sulphate of iron; acetate of lead; and sulphate of zinc.

BALSAMUM PERUVIANUM. *Balsam of Peru* (described p. 396, 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.* (The oil distilled from the leaves of Melaleuca minor, *DC. Steph. and Church. Med. Bot. (M. Cajuputi)*, plate 84. Imported from Batavia and Singapore.) 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 alternate, elliptical, lanceolate, acute, smooth, deep green, 3–5 inches long; flowers white, in short terminal spikes; calyx urceolate, 5-partite; petals 5; stamens 30 to 40, pentadelphous at the base; anthers incumbent, with a yellow gland at the apex; capsule 3-valved.

PREPARATION.—The volatile oil is procured from the leaves by distillation; the leaves are gathered in the end of September, macerated for 24 hours in 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 the high price, and the great demand for this 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 recognized 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. It also forms a useful external rubefacient, for which purpose 3ss. may be dissolved in f℥ij. of rectified spirit; it enters into the preparation Linimentum Crotonis (see p. 384).

DOSE AND MODE OF ADMINISTRATION. Min. j. to min. x. rubbed up with sugar, or in the following form:—

Spiritus Cajuputi. Spirit of Cajuput. (Take of oil of cajuput, one fluid ounce; rectified spirit, forty-nine fluid ounces; dissolve.) Dose min. xx. to min. lx; each fifty minims contain one minim of oil. The preparation in the last edition of the British Pharmacopœia was four times as strong as the present one.

CALX CHLORATA. *Chlorinated Lime.* Syn.: *Chloride of Lime. Hypochlorite of Lime. Bleaching Powder.* (A product obtained by exposing slaked lime to the action of chlorine gas as long as the latter is absorbed. It possesses bleaching and disinfecting properties.)

PREPARATION.—Chlorinated lime is 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, $2CaO + 2Cl = CaOClO + CaCl$.

PHYSICAL PROPERTIES.—As commonly met with, this is a white or yellowish-white somewhat moist powder, with a faint odour 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, $CaO,ClO + CaCl + 2HO$. 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, and of carbonates, and of oxalates.

CHARACTERS AND TESTS.—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. 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 850 grain-measures of the volumetric solution of hyposulphite of soda, corresponding to 30 per cent. of chlorine, liberated by hydrochloric acid.

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 1000 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. 1000 grain measures of the volumetric solution being equivalent to 12·7 grains of iodine, what are 850 grain measures equal to? Answer, 10·8 grains. And 127 grains of iodine (its chemical equivalent) being equal to 35·5 grains of chlorine (its chemical equivalent) what are 10·8 grains equal to? Answer, 3·02 grains—which being multiplied by 10 would show 30·20 per cent. of chlorine present in the sample analysed, a figure closely approximating the pharmacopœial statement, 30 per cent.

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 that the fetid odour depends, as it generally does, upon the presence of sulphide of hydrogen gas, the chlorine decomposes it, forming hydrochloric acid and sulphur ; thus, $HS+Cl=HCl+S$. 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 gangrenous affections of the lungs, as well as in abscess and diseases of those organs attended with fetid expectoration, inhalation of the vapour of chlorine has been attended with benefit. 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 also 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 exist for doubting, if not for altogether denying, its powers of disinfection, properly so called. It is also used for the purpose of destroying noxious effluvia arising from the decay of animal or vegetable matter, but for this purpose it is, perhaps, inferior to the *Solution of Chlorinated Soda.* In poisoning with sulphuretted hydrogen gas 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. In poisoning with chlorinated lime itself, albuminous liquids, such as white of egg, milk, flour and water, &c. and emetics, should be given : acids must be carefully avoided.

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.

PREPARATIONS.—Liquor Calcis Chloratæ, two ounces to one pint; Vapor Chlori.

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. 60 grains by weight mixed with 20 grains of iodide of potassium dissolved in four fluid ounces of water, when acidulated with two fluid drachms of hydrochloric acid, give a red solution which requires for the discharge of its colour 500 grain-measures of the volumetric solution of hyposulphite of soda, corresponding to 13 grains of available chlorine in a fluid ounce.) The rationale of 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 6·35 grains, equivalent to 1·77 grains of chlorine in 60 grains by weight of the liquor ; therefore 480 grains by weight contain gr. 14·16 of chlorine ; but a fluid ounce of the liquor contains but 452·81 grains by weight, therefore the pharmacopœial statement (13 grains of available chlorine in a fluid ounce) is very nearly correct, inasmuch as 480 : 14·16 : : 452·81 : 13·35. This solution is that which is so generally employed for deodorizing purposes in hospitals, sick rooms, &c. ; it should be freely diluted for use, and sprinkled liberally about in every direction ; the addition of any dilute acid will intensify its action, by liberating more rapidly its chlorine.

Vapor Chlori. Inhalation of Chlorine. (Take of chlorinated lime, two ounces; water (cold), a sufficiency. Put the powder into a suitable apparatus, moisten it with the water, and let the vapour that arises be inhaled.) An unnecessary formula ; used for inhalation in the diseases mentioned above.

INCOMPATIBLES.—Sulphuric acid, and its salts; the alkalies; and all soluble carbonates and oxalates.

CAMPHORA. *Camphor.* (A concrete volatile oil obtained from the wood of Camphora Officinarum, *Nees, Laurineæ; Woodv. Med. Bot. (Laurus Camphora)*, plate 155. Imported in the crude state from China and Japan, and purified by sublimation in this country.) 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 acuminate, oval, triple-nerved, 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, where 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 AND TEST.—White, translucent, tough, and crystalline; has a powerful penetrating odour, and a pungent taste followed by a sensation of cold; floats on water; volatilises slowly at ordinary temperatures; is slightly soluble in water, but readily soluble in rectified spirit and in ether. Sublimes entirely when heated.

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 closed 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.

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 with 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 CONTAINING CAMPHOR.—Aqua Camphoræ; Linimentum Aconiti (see p. 486), twenty-two grains in one fluid ounce; Linimentum Belladonnæ (see p. 414), twenty-two grains in one fluid ounce; Linimentum Camphoræ, one in five nearly; Linimentum Camphoræ Compositum (see p. 377), fifty-four grains and a half in one fluid ounce; Linimentum Chloroformi (see p. 506); Linimentum Hydrargyri (see *Special Stimulants);* Linimentum Iodi (see *Special Stimulants),* eleven grains in one fluid ounce; Linimentum Opii (see p. 444); Linimentum Saponis, twenty-two grains in one fluid ounce; Linimentum Sinapis Compositum (see p. 389), twenty-four grains in one fluid ounce; Linimentum Terebinthinæ (see p. 390), one part in seventeen and a half, nearly; Lini-

mentum Terebinthinæ Aceticum (see p. 390); Spiritus Camphoræ, one in ten; Tinctura Camphoræ Composita (see p. 444), one grain and a half in one fluid ounce; Unguentum Plumbi Subacetatis Compositum (see p. 136); Unguentum Hydrargyri Compositum (see *Special Stimulants*), one ounce and a half in thirteen ounces and a half.

Aqua Camphoræ. Camphor Water. Syn.: *Mistura Camphoræ*, Lond., Edin., Dubl., *Camphor Mixture. Camphor Julep.* (Take of camphor, broken into pieces, half an ounce; distilled water, one gallon. Enclose the camphor in a muslin bag, and attach this to one end of a glass rod, by means of which it may be kept at the bottom of a bottle containing the distilled water, the other end of the rod terminating just below the stopper of the bottle. Having thus put the camphor into the water, close the mouth of the bottle, macerate for at least two days, and then pour off the solution when it is required.) 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. Liniment of camphor is used in the following preparations. Linimentum Chloroformi, one volume in two; Linimentum Hydrargyri, Linimentun Terebinthinæ Aceticum, one volume in three.

Linimentum Saponis. Liniment of Soap. Syn.: *Soap Liniment. Opodeldoc.* (Take of hard soap, cut small, two ounces and a half; camphor, an ounce and a quarter; 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. Macerate for seven days at a temperature not exceeding 70° with occasional agitation, and filter.) 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 Pharmacopœia, 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 slightly antacid properties.

**Unguentum Camphoræ. 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 benzoïne, 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 p. 383, 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. In delirium tremens it has been employed by Drs. Kinnear and Lawson with apparently good results, and that in cases which have resisted other more generally approved plans of treatment, and more recently Dr. Lyons, of this city, has placed on record some remarkably successful cases of its use in this affection. 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 ordinary dose of powdered capsicum is from gr. ij. to gr. viij., made into pill with crumb of bread, but in the treatment of delirium tremens much larger doses, from twenty to thirty grains, administered in the form of bolus, are required.

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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards 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℥j. 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.* (The dried capsules of the Malabar Cardamom, Elettaria Cardamomum, *Maton, Trans. Linn. Soc.* vol. x. plates 4, 5. Cultivated in Malabar. The seeds are best kept in their pericarps, from which they should be separated when required for use, the pericarpial coats being rejected.) *Fruit of Renealmia Cardamomum*, E. The various sorts of cardamoms 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 in 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 lanceolate, acuminate, 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, in sub-erect racemes, 2–3 inches long, greenish-white, with violet stripes; capsule, oval, somewhat triangular, striate, 3-celled, 3-valved.

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 pericarps.

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.—Extractum Colocynthidis Compositum (see p.

168), one part in twenty-seven nearly; Pulvis Cinnamomi Compositus (see p. 568), one part in three; Pulvis Cretæ Aromaticus (see p. 14), one part in forty-four; Tinctura Cardamomi Composita, a quarter of an ounce to one pint; Tinctura Gentianæ Composita (see *Tonics*), a quarter of an ounce to one pint; Tinctura Rhei (see p. 202), a quarter of an ounce to one pint; Vinum Aloes (see p. 157), eighty grains to one pint.

Tinctura Cardamomi Composita. Compound Tincture of Cardamoms. (Take of cardamom seeds, freed from the pericarps and bruised, a quarter of an ounce; caraway fruit, bruised, a quarter of an ounce; raisins, freed from their seeds, two ounces; cinnamon bark, bruised, half an ounce; cochineal, in powder, sixty grains; proof spirit, one pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) An agreeable carminative tincture, frequently added as a *corrigens* to other medicines. Dose, a half to two fluid drachms. It is employed in the following preparations. Decoctum Aloes Compositum (see p. 156), one volume in three and three quarters; Mistura Ferri Aromatica (see *Tonics*), three volumes in sixteen; Mistura Sennæ Composita (see p. 213), one volume in sixteen; Tinctura Chloroformi Composita (see p. 507), one volume in two.

CARUI FRUCTUS. *Caraway Fruit.* (The dried fruit of Carum Carui, *Linn.; Woodv. Med. Bot.* plate 45. Cultivated in England and Germany.) 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 pinnatisect, cut into linear segments; flowers white or pale, flesh-coloured, in dense umbels; *cremocarp* ovate-oblong, mericarps slightly curved with five equal filiform ridges, and one vitta in each channel.

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 spicy taste.

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 fruit, gr. lx. to gr. cxx.

PREPARATIONS.—Aqua Carui, one pound to one gallon; Confectio Opii (see p. 442), one part in ten, nearly; Confectio Piperis, three parts in twenty; Oleum Carui; Pulvis Opii Compositus (see p. 444), one part in two and a half; Tinctura Cardamomi Composita (see p. 559), a quarter of an ounce to one pint; Tinctura Sennæ (see p. 214), half an ounce to one pint.

Oleum Carui. Oil of Caraway. (The oil distilled in Britain from caraway fruit.) This oil is either colourless or of a pale yellow colour; it has an aromatic odour, and spicy taste. It is 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. It is used in the following preparations:—Confectio Scammonii (see p. 209), one fluid drachm in ten ounces; Pilula Aloes Barbadensis (see p. 157), one fluid drachm in four ounces.

Aqua Carui. Caraway water. (Take of caraway bruised, one pound; 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℥ss. to f℥j. 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.* (The dried unexpanded flower buds of Caryophyllus Aromaticus, *Linn.*; *Bot. Mag.* vol. liv. plates 2749, 2750. Cultivated in Penang, Bencoolen, and Amboyna. 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; tube of the calyx cylindrical, limb of 4 spreading teeth; petals 4, adhering by their points; stamens in 4 parcels inserted on the calyx; ovary 2-celled; fruit a berry.

CHARACTERS AND TESTS.—About six lines long, dark reddish-brown, plump, and heavy, 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. It emits oil when indented with the nail.

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 (Thomsdorff). 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.

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.

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

PREPARATIONS.—Infusum Aurantii Compositum, sixty grains to one pint ; Infusum Caryophylli, half an ounce to one pint ; Mistura Ferri Aromatica (see *Tonics*), a quarter of an ounce to sixteen fluid ounces ; Oleum Caryophylli ; Pulvis Cretæ Aromaticus (see p. 14), one part in thirty-two ; Vinum Opii (see p. 446), seventy-five grains to one pint.

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.

Oleum Caryophylli. Oil of Cloves. (The oil distilled in Britain from cloves.) This oil is colourless when recent, but gradually becomes reddish-brown, having the odour of cloves and a pungent spicy taste. Sinks in water. Dose, min. ij. to min. viij. ; frequently added as a carminative to pill masses. It is used in the following preparations. Confectio Scammonii (see p. 209), half a fluid drachm in ten ounces ; Pilula Colocynthidis Composita (see p. 168), twenty minims in one ounce, nearly ; Pilula Colocynthidis et Hyoscyami (see p. 168), twenty minims in one ounce and a half, nearly.

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.* The bark met with in English commerce is procured from the *Cinnamomum Cassia* (BLUME), 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; oblongo-lanceolate, triple-nerved, the nerves vanishing at the point of the leaf; petioles and younger branches silky-tomentose; flowers hermaphrodite or polygamous, white, in panicles; perianth 6-cleft, the limb deciduous; stamens, 12, three of which are abortive; anthers 4-celled; ovary 1-celled, with 1 ovule.

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.

THERAPEUTICAL EFFECTS.—Yeast is employed with advantage 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. The late Dr. Stoker, who had great experience in the treatment of fever, placed much confidence in it, stating that he had employed it in some 10,000 cases of fever during a period of thirty years experience: he remarked that:—The result of his experience was his full conviction that barm or yeast is well suited to every stage of typhus fever, in which it can be borne by the stomach : that in fever, it is, in general, easily taken alone, or with any medicine or vehicle that may be deemed advisable to join with it; but that in the worst forms of typhus fever, when it is most needed, it not only is seldom rejected by the stomach, when any other medicine could be retained, but that the patient, in such cases, often expresses a liking for it ; a fact which may possibly surprise those who judge from the nauseous and bitter taste of barm to a healthy person; but it is to be recollected how often the taste is inverted with patients in fever: thus, for example, he who had been a water-drinker will then prefer wine ; and very often, on the other hand, habitual wine-drinkers will, in high degrees of fever, greatly prefer water to their habitual beverage. Barm or yeast is moderately laxative ; often superseding repeated doses of purgatives ; if not sufficiently so, Dr Stoker sometimes combined tincture of jalap with it ; but, in other cases, if the bowels were too free, a few drops of tincture of opium were added to the dose. Thus administered, it appeared to him to correct the morbid contents of the alimentary canal, and consequently the symptoms of putrescence ; petechiæ and black loaded tongue were found, he thought, to be more effectually remedied by it than any other drug : accordingly, as already intimated, he often substituted it for bark and wine, when these remedies could not be employed on account of the complication of inflammatory symptoms, and he conjoined it with these remedies, when there was no such counter-indication. In some of the most obstinate cases of tympany that he met with in typhoid fevers, enemata of barm and assafœtida proved in his hands the most efficacious remedies. In a remarkable case of intense tympanitis, following parturition, I myself 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.

DOSE AND MODE OF ADMINISTRATION.—The dose of yeast for internal use is two tablespoonfuls every three hours; it may be given with camphor mixture or with peppermint water: given in the form of enema three or four times this amount may be exhibited.

Cataplasma Fermenti. Yeast Poultice. (Take of beer yeast, six fluid ounces; wheaten 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 principally depends upon the carbonic acid gas which it disengages.

LIQUOR CHLORI. *Solution of Chlorine.* (Chlorine gas dissolved in water.)

PREPARATION.—Take of hydrochloric acid, six fluid ounces; black oxide of manganese, in fine powder, one ounce; distilled water, thirty-four fluid ounces. Put 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 of the manganese 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 AND TESTS.—A yellowish-green liquid, smelling strongly of chlorine, and immediately discharging the colour of a dilute solution of sulphate of indigo. 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 439 grains by weight (1 fluid ounce) of this preparation, the mixed solution acquires a deep red colour, which requires for its discharge 750 grain-measures of the volumetric solution of hyposulphite of soda, corresponding to 2·66 grains of chlorine.

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. 552), 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. 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. In poisoning with chlorine water the best antidote is albumen, as white of egg, or in its absence, milk or flour.

DOSE AND MODE OF ADMINISTRATION.—Min. x. to f℥j. in 2 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.

CINNAMOMI CORTEX. *Cinnamon Bark.* (The inner bark of shoots from the truncated stocks of Cinnamomum Zeylanicum, *Breyn.; Wight, Icon. Plant. Ind. Orient.* plate 123. Imported from Ceylon, and distinguished in commerce as Ceylon Cinnamon.) 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 hermaphrodite or polygamous in terminal and axillary stalked panicles; perianth 6-cleft, the limb deciduous; stamens 12 in four circles, the inner circle composed of abortive stamens; anthers 4-celled; ovary, 1-celled with a single ovule.

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 forty-eight hours, and submitting them to distillation.

CHARACTERS.—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.

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 enclosed 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, 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 separately 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 from cassia bark which is often sold for it, by its physical properties, and by its decoction not giving a blue colour with iodine. 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.

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.—Acidum Sulphuricum Aromaticum (see p. 93), one ounce to one pint; Aqua Cinnamomi, twenty ounces to one gallon ; Decoctum Hæmatoxyli (see p. 124), sixty grains to one pint; Infusum Catechu (see p. 100), sixty grains to one pint ; Oleum Cinnamomi ; Pulvis Catechu Compositus (see p. 101), one part in ten; Pulvis Cinnamomi Compositus one part in three; Pulvis Cretæ Aromaticus (see p. 14), one part in eleven ; Pulvis Kino Compositus, (see p. 126), one part in five; Tinctura Cardamomi Composita, half an ounce to one pint; Tinctura Catechu (see p. 101), one ounce to one pint ; Tinctura Cinnamomi, two ounces and a half to one pint; Tinctura Lavandulæ Composita (see p. 577), seventy-five grains to one pint; Vinum Opii (see p. 446), seventy-five grains to one pint.

Aqua Cinnamomi. Cinnamon Water. (Take of cinnamon bark, bruised, twenty ounces; water, two gallons. Distil one

gallon.) A favourite vehicle for other medicines. Dose, one to two fluid ounces. It enters into the following preparations: Mistura Cretæ (see p. 14); Mistura Guaiaci (see p. 281); Mistura Spiritus Vini Gallici (see p. 540).

Oleum Cinnamomi. Oil of Cinnamon. (The oil distilled from cinnamon bark.) This oil is of a yellowish colour when recent, gradually becoming red, having the odour and taste of cinnamon. It sinks in water. Dose, one to five minims.

Pulvis Cinnamomi Compositus. Compound Powder of Cinnamon. Syn: *Pulvis Aromaticus*, Edin. (Take of cinnamon bark, in powder, cardamom seeds, in powder, ginger, in powder, of each, one ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.) Used as an aromatic addition to other powders. Dose, three to ten grains. It enters into the following preparations: Pilula Aloes et Ferri (see p. 115), one part in three and a half; Pilula Cambogiæ Composita (see p. 160), one part in six, nearly.

Tinctura Cinnamomi. Tincture of Cinnamon. Take of cinnamon bark, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the cinnamon for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, a half to two fluid drachms.

* 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 cordato-ovate, leathery, smooth, six inches long, and as many broad; flowers diœcious, in lateral compound racemes; drupes, 2–3, globose.

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 $C_{12}H_{14}O_5$; but more recent examination tends to prove it a salifiable base containing nitrogen. Cocculus Indicus yields its active properties to alcohol, and but very imperfectly to either cold or boiling water.

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 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, however, be used with great caution as a substitute for the drug.

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.) See next preparation.

* *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 has been judiciously omitted from the present edition of the British Pharmacopœia.

CORIANDRI FRUCTUS. *Coriander Fruit.* (The dried ripe fruit of Coriandrum Sativum, *Linn.; Woodv. Med. Bot.* plate 181. Cultivated in Britain.) 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, all bipinnate, and cut; flowers, white, often with a reddish tint, in umbels of 3 to 5 rays; cremocarp globose, 10–ribbed, rarely separating into its mericarps.

CHARACTERS.—Globular, nearly as large as white pepper, beaked, finely ribbed, yellowish-brown ; has an agreeable aromatic odour and flavour.

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 would be from gr. xxx. to gr. lx.

PREPARATIONS.—Confectio Sennæ (see p. 213), one part in twenty-five ; Mistura Gentianæ (see tonics), sixty grains to one pint ; Oleum Coriandri ; Syrupus Rhei (see p. 202); Tinctura Rhei (see p. 202), a quarter of an ounce to one pint ; Tinctura Sennæ (see p. 214), half an ounce to one pint.

Oleum Coriandri. Oil of Coriander. (The oil distilled in Britain from coriander fruit.) This oil is of a yellowish colour and has the odour of coriander. Dose, one minim to five. It is used in the preparation of the syrup of senna (see p. 213.)

ELECTRICITY. GALVANISM. MAGNETIC ELECTRICITY. These powerful agents in the treatment of disease require some short notice here, more especially as their use of late years, and in my opinion most deservedly, is becoming more general in the treatment of disease. The entire subject of the therapeutical applications of the various forms of electricity has been carefully and ably studied by M. Becquerel; and also by M. Duchenne (of Boulogne), by whom several memoirs on the subject have been published; amongst others, two in the 14th and 15th volumes of the *Dublin Quarterly Journal of Medical Science*, which will well repay an attentive perusal. In Dr. Althaus' work on Medical Electricity the reader will also get much valuable information.

PHYSIOLOGICAL EFFECTS.—These agents 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, become excited, the pulse increased in frequency, the muscles stimulated to involuntary action, and the general secretions augmented.

THERAPEUTICAL USES.—The diseases in which the various forms of electricity are 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 which I have found the electro-magnetic

current to succeed when every thing else had failed ; in the insensible stage of poisoning with opium and other narcotics ; in poisoning by anæsthetic agents; 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 good effects of any of the forms of electricity hereafter described require a long time for their development, and their 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. It should be always borne in mind, moreover, that electricity is only to be considered as an auxiliary to other modes of treatment.

MODE OF APPLICATION.—The different forms of electricity may in general be indifferently applied, but *galvanic* and *magnetic* electricity possess the advantages over common electricity 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 hori-

zontal 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 resistence 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 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.

ELEMI. *Elemi.* (A concrete resinous exudation, the botanical source of which is undetermined, but is probably Canarium Commune, *Linn.*; *Kumph. Amb.* vol. ii. plate 47. 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.

THERAPEUTICAL USES.—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.)

FŒNICULI FRUCTUS. *Fennel Fruit.* (The fruit of Fœniculum dulce, *DC.* Imported from Malta.) A native of Italy, Portugal, and other parts of southern Europe, belonging to the Natural family *Umbelliferæ (Apiaceæ*, Lindley), and to the Linnæan class and order *Pentandria Digynia.*

BOTANICAL CHARACTERS.—An annual, about one foot high, stem fistular, somewhat compressed at the base; leaves much divided, with very slender segments; flowers dark-yellow, in umbels of six to eight rays, almost destitute of involucre. Cremocarp oblong, each mericarp bearing five prominent, bluntly-keeled ridges and one vitta in each channel.

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 in the flatulent colic of infants; in the treatment of which class of affections, it enjoys a well-deserved popularity; it may be employed in the same cases as anise and caraway.

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

Aqua Fœniculi. Fennel Water. (Take of fennel fruit, bruised, one pound; 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. *Oil of Lavender.* (The oil distilled in Britain from the flowers of Lavandula vera, *DC. Woodv. Med. Bot.*

(*L. Spica*), plate 55. *Lavandula vera* is a native of the central parts of Europe, but 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. Calyx ovate-tubular, nearly equal, 13–15 ribbed; corolla bilabiate, upper lip, 2-lobed, lower lip, 3-lobed, divisions nearly equal; stamens 4, didynamous; disk concave, with 4 fleshy scales at the margin; nucules smooth, adnate to the scales of the disk. *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. The dose of the oil is from one to five minims on a lump of sugar to relieve flatulence, &c.

PREPARATIONS.—Linimentum Camphoræ Compositum, sixty minims in one pint (see p. 377); Spiritus Lavandulæ, one volume in fifty; Tinctura Lavandulæ Composita, forty-five minims in one pint.

Spiritus Lavandulæ. Spirit of Lavender. (Take of oil of lavender, one fluid ounce; rectified spirit, forty-nine fluid ounces; dissolve.) Rather a useless preparation, the next one being that generally employed. Dose, min. xxx. to f℥j.; it is but one-fifth the strength of the preparation in the last edition of the British Pharmacopœia.

Tinctura Lavandulæ Composita. Compound Tincture of Lavender. Syn.: *Spiritus Lavandulæ Compositus*, Edin. (Take of oil of lavender, one fluid drachm and a half; oil of rosemary, ten minims; cinnamon bark, bruised, nutmeg, bruised, of each a hundred and fifty grains; red sandal-wood, three hundred grains; recti-

fied spirit, two pints. Macerate the cinnamon, nutmeg, and red sandal-wood in the spirit for seven days in a closed vessel, with occasional agitation; then strain and press, dissolve the oils in the strained tincture, filter, 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. It is used for colouring purposes in the preparation of the Liquor Arsenicalis.

INCOMPATIBLES.—Sulphate of iron.

MASTICHE. *Mastich.* (A resinous exudation obtained by incision from the stem of Pistacia Lentiscus, *Linn.*, *Steph. and Church. Med. Bot.* plate 130, produced in the island of Scio.) 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.*

BOTANICAL CHARACTERS.—A tree of about 30 feet in height; leaves imparipinnate, leaflets usually 7, ovate, lanceolate, acute, mucronate, red when young, but becoming dark-green. Flowers diœcious, apetalous, in compound racemes. Fruit round, purplish, 1-celled by abortion and 1-seeded.

PREPARATION.—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.

CHARACTERS.—Small, irregular, yellowish tears, brittle, becoming soft and ductile when chewed, having a faint agreeable odour.

CHEMICAL COMPOSITION.—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 *Mastichic acid;* the second is called *Masticine,* and it is to it mastiche owes its toughness.

THERAPEUTICAL USES.—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 dinner pills, at one time famous, consisting of aloes, mastich, rose leaves, and syrup of wormwood. It may be employed, softened by chloroform, as a temporary stuffing for hollow teeth.

MENTHÆ PIPERITÆ OLEUM. *Oil of Peppermint.* (The oil distilled in Britain from fresh flowering peppermint, Mentha piperita *Linn. Woodv. Med. Bot.*, plate 169.) Mentha piperita is an indigenous plant belonging to the Natural family *Labiatæ (Lamiaceæ*, Lindley), and to the Linnæan class and order *Didynamia Gymnospermia.*

BOTANICAL CHARACTERS.—A perennial herb, with a creeping root; stem smooth, quadrangular; leaves petiolated, ovato-lanceolate, serrate, acute, generally glabrous; flowers violet-coloured, in lax, short, interrupted spikes; calyx of 5 nearly regular teeth; corolla with a short tube and a campanulate, nearly regular, 4-lobed limb; stamens 4, equal and erect; anthers 2-celled; style shortly bifid; *nucules* dry and smooth.

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.—Min. ij. to min. v. of the oil as a carminative may be dropped on sugar.

PREPARATIONS.—Aqua Menthæ Piperitæ, one fluid drachm and a half to one gallon; Essentia Menthæ Piperitæ, one volume in five; Pilula Rhei Compositus, one minim in one drachm, nearly, (see p. 202); Spiritus Menthæ Piperitæ, one volume in fifty.

Aqua Menthæ Piperitæ. Peppermint Water. (Take of 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. It enters into the preparation of the Mistura Ferri Aromatica (see *Tonics*). Dose, f℥ss. to f℥ij.

Essentia Menthæ Piperitæ. Essence of Peppermint. (Take of oil of peppermint, one fluid ounce; rectified spirit, four fluid ounces. Mix.) This essence is a new preparation in the British Pharmacopœia, being copied from the last edition of the Dublin Pharmacopœia, but it is double the strength of that preparation. Dose, ten to twenty minims.

Spiritus Menthæ Piperitæ. Spirit of Peppermint. (Take of

oil of peppermint, one fluid ounce; rectified spirit, forty-nine fluid ounces. Dissolve.) This is but one-fifth the strength of the spirit of peppermint in the Pharmacopœia of 1864; it is carminative and stimulant. Dose, a half to one fluid drachm.

* 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; the upper lobe of the corolla is much more evidently notched than in the other species of *Mentha.*

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 is $C_{10}H_8O$.

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. *Oil of Spearmint.* (The oil distilled in Britain from fresh flowering spearmint, Mentha viridis, *Linn., Woodv. Med. Bot.*, plate 170.) 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. It is distinguished from Mentha piperita by its nearly or entirely sessile leaves and more elongated slender spikes.

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.* Min. j. to min. v.

Aqua Menthæ Viridis. Spearmint Water. (Take of 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 Viridis. Infusion of Spearmint.* (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.* The kernel of the seed of Myristica officinalis, *Linn., Suppl. Steph. and Church. Med. Bot.*, plate 104. Cultivated extensively in the Banda Islands of the Malayan Archipelago. This tree (*Myristica fragrans*, Houttuyn) is a native of the Molucca Islands; belonging to the Natural family *Myristicaceæ*, and to the Linnæan class and order *Diœcia Monadelphia.*

BOTANICAL CHARACTERS.—A tree, 20–30 feet high; leaves, aromatic, oblong, acuminate, smooth, simple-nerved; flowers pale-yellow, usually diœcious, in axillary racemes; fruit pyriform, about the size of a peach, smooth, the pericarp dehiscing by two nearly equal longitudinal valves, and exposing the fleshy, much lobed, scarlet arillus *(mace)*, closely embracing the shell, within which is contained the kernel *(the nutmeg)*, consisting of the marbled *(ruminate)* oleaginous albumen *(endosperm)*, having at its base a small embryo.

CHARACTERS.—Oval 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.

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 have been 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.

PREPARATIONS.—Oleum Myristicæ; Oleum Myristicæ Expressum; Pulvis Catechu Compositus (see p. 101), 1 part in 10; Pulvis Cretæ Aromaticus (see p. 14), 1 part in 16, nearly; Spiritus Armoraciæ Compositus (see p. 548), half an ounce to 1 gallon; Tinctura Lavandulæ Composita (see p. 577), 75 grains to 1 pint.

Oleum Myristicæ. Volatile Oil of Nutmeg. (The oil distilled in Britain from nutmeg.) A colourless or straw-yellow oil, having the odour and taste of nutmegs. It is carminative in its action; its dose is from one to five minims, either dropped on sugar or added to aperient pill masses. It enters into the following preparations, Pilula Aloes Socotrinæ (see p. 157), one fluid drachm to four ounces; Spiritus Ammoniæ Aromaticus (see p. 543), four fluid drachms to seven pints; Spiritus Myristicæ, one volume in fifty.

Oleum Myristicæ Expressum. Expressed Oil of Nutmeg. Syn.: *Myristicæ Adeps*, 1864. (A concrete oil obtained by means of expression and heat from nutmegs.) This oil is of an orange colour, firm consistence, and fragrant odour like that of nutmeg, it is only used in the preparation of the Emplastrum Calefaciens (see p. 380) and of the Emplastrum Picis (see p. 586).

Spiritus Myristicæ. Spirit of Nutmeg. (Take of volatile oil

of nutmeg, one fluid ounce; rectified spirit, forty-nine fluid ounces; dissolve.) This spirit is but one-fifth the strength of the preparation of the same name in the British Pharmacopœia, 1864. It is stimulant and aromatic, and an excellent addition to cathartic mixtures to prevent griping. Dose, half to one fluid drachm. It enters into the preparation of the Mistura Ferri Composita (see *Tonics*).

PIMENTA. *Pimento.* Syn.: *Allspice.* (The dried unripe berries of the Allspice tree, Eugenia Pimenta, *DC.; Woodv. Med. Bot. (Myrtus Pimenta)*, plate 26. West Indies.) 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, glabrous and of a deep, shining green colour; flowers numerous, greenish-yellow, in terminal bunches or panicles; *berry* succulent, dark-purple when ripe, 2-seeded.

CHARACTERS.—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.

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 a 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.

PREPARATIONS.—Aqua Pimentæ, fourteen ounces to one gallon; Oleum Pimentæ, Syrupus Rhamni, see p. 198.

Aqua Pimentæ. Pimento Water. (Take of pimento, bruised, fourteen ounces; water, two gallons. Distil one gallon.) Carmina-

tive and stimulant, used in the flatulent colic of children, and as a vehicle for other medicines. Dose, f℥j. to f℥ij.

Oleum Pimentæ. Oil of Pimento. (The oil distilled in Britain from pimento.) This oil is either colourless or slightly reddish when recent, but becomes brown by age; it has the odour and taste of pimento. It sinks in water. Dose, two to five minims.

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, 7-nerved; flowers small, closely set on spadices, which are either terminal or opposite to the leaves; fruits succulent, those of each spadix cohering to each other and to the thickened axis.

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 NIGRUM. *Black Pepper.* (The dried unripe berries of Piper nigrum, *Linn.*, *Woodv.*, *Med. Bot.*, plate 187. Imported from the East 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, fleshy, indehiscent, 1-celled and 1-seeded, 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.—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.

PREPARATIONS.—Confectio Opii (see p. 442), one part in thirty-one ; Confectio Piperis, one part in ten; Pulvis Opii Compositus (see p. 444), one part in seven and a half.

Confectio Piperis. Confection of Pepper. (Take of black pepper in fine powder, two ounces; caraway fruit, 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.

PIX BURGUNDICA. *Burgundy Pitch.* (A resinous exudation from the stem of the Spruce Fir, Abies excelsa, *DC. Woodv. Med. Bot. (Pinus Abies),* plate 208. Melted and strained; imported from Switzerland.)

BOTANICAL CHARACTERS.—The abies excelsa is a tree rising from 100 to 150 feet high, with a trunk from two to five feet in diameter; leaves thickly studded, short, obscurely four cornered, often curved, dusky green in colour, shining upon the upper surface. Male aments purple and axillary ; female, purple and terminal ; fruit pendent, purple, nearly cylindrical strobiles, the scales of which are oval, pointed and ragged at the edges.

PREPARATION.—It is obtained either by removing the natural exudation of the tree, and purifying it by melting and straining, or by making incisions into, or even removing portions of the bark of the trees, and removing the pitch with iron scrapers, melting, and straining it through coarse cloths.

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, without bitterness ; free from vesicles ; gives off no water when heated.

PROPERTIES.—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 teribinthinate 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.

PREPARATIONS.—Emplastrum Ferri, (see *Tonics*), two parts in eleven; Emplastrum Picis, one part in two, nearly.

Emplastrum Picis. Pitch Plaster. (Take of burgundy pitch, twenty-six ounces ; common frankincense, thirteen ounces ; resin, yellow wax, of each, four ounces and a half; expressed oil of nutmeg, one ounce ; olive oil, water, of each, two fluid ounces. Add the oils and the water to the frankincense, Burgundy pitch, resin,

and wax, previously melted together; then, constantly stirring, evaporate to a proper consistence.) 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.

PREPARATION.—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.

PROPERTIES.—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.

THERAPEUTICAL USES.—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 rarely used otherwise than as a local stimulant in chronic cutaneous diseases.

Unguentum Picis Liquidæ. Ointment of Tar. (Take of tar, five ounces; yellow wax, two ounces. Melt the wax with a gentle heat, add the tar, and stir the mixture briskly while it cools.) Tar ointment is often used, but in my experience rarely with benefit, as a stimulant in chronic diseases of the skin.

* *Aqua Picis Liquidæ. Tar-water.* (Tar, ℔ij.; water, cong. j.; mix, stirring with a stick for a 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.

* *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. Many French pharmacologists, however, restrict the term *huile de cade (Oleum Cadinum)* to a tarry oil obtained by the dry distillation of the wood of the *Juniperus oxycedrus.*

POTASSÆ PERMANGANAS. *Permanganate of Potash.* KO, Mn_2O_7 (=158) or $\mathbf{KMnO_4}$ (=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; diluted 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. Pulverise 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 semi-fused mass. Let it cool, pulverise 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 diluted 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 AND TESTS.—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 perchloride of platinum. 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 acid.

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 27). The rationale of the 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, $10FeOSO_3 + KOMn_2O_7 + 8SO_3 = 5(Fe_2O_3 3SO_3) + 2MnOSO_3 + KOSO_3$. 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 : 43·98.

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; it is of use in 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. 553). 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 injection (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*, a statement in which my experience enables me to thoroughly corroborate him.

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 matters decompose 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, eighty grains; distilled water, one pint; 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 disinfecting 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 disinfecting 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.* Syn.: *Hepar Sulphuris*, Dub. *Potassii Sulphuretum*, Lond., Edin. *Liver of Sulphur, Sulphuret of Potassium.*

PREPARATION.—Take of carbonate of potash, in powder, ten ounces; sublimed sulphur, five ounces. 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, $4KOCO_2+10S=3KS_3+KOSO_3+4CO_2$.

CHARACTERS AND TESTS.—Solid greenish fragments, 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 perchloride of platinum, and white by chloride of barium. About three-fourths of its weight are dissolved by rectified spirit.

CHEMICAL PROPERTIES.—It is a mixture of three equivalents of tersulphuret of potassium, and one of sulphate of potash ($3KS_3+KO,SO_3$), BERZELIUS. By exposure to the air it deliquesces, attracts oxygen, and is converted into a mixture of sulphur and of successively 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, sulphuretted 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, $3KS_3+3HCl=3KCl+3HS+6S$; the yellow precipitate on the addition of perchloride of platinum proves the salt to be one of potash (see p. 27), whilst the white precipitate on the addition of chloride of barium demonstrates the presence of sulphuric acid.

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, sulphurated potash 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 conti-

tent 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 effect the scalp. In all cases of poisoning with this substance, the best antidotes are solutions of chlorinated lime or chlorinated soda, with emollient drinks.

DOSE AND MODE OF ADMINISTRATION.—For internal use, gr. iij. to gr. x. dissolved in some aromatic water and sweetened with syrup.

Unguentum Potassæ Sulphuratæ. Ointment of Sulphurated Potash. (Take of sulphurated potash, thirty grains; prepared lard, one ounce. Triturate the sulphurated potash in a porcelain mortar and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.) For scabies and other cutaneous diseases. This ointment, when used, should be recently prepared.

* *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.

INCOMPATIBLES.—The acids; and most metallic solutions.

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).*

PREPARATION.—Yellow resin is obtained when the application of heat is stopped before all the volatile oil is expelled from the pine turpentines; brown resin when the process is continued until all the oil is distilled.

CHARACTERS.—Translucent, yellowish, brittle, pulverisable, fracture shining; odour and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke.

PROPERTIES.—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.: $C_{30}H_{40}O_4$. 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.

PREPARATIONS.—Charta Epispastica (see p. 380); Emplastrum Calefaciens (see p. 380); Emplastrum Cantharidis (see p. 381); Emplastrum Hydrargyri (see *Special Stimulants*); Emplastrum Picis (see p. 586); Emplastrum Resinæ (see p. 138); Emplastrum Saponis

(see p. 138); Unguentum Resinæ; Unguentum Terebinthinæ (see p. 601).

Unguentum 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.

ROSMARINI OLEUM. *Oil of Rosemary.* (The oil distilled from the flowering tops of Rosmarinus officinalis *Linn.; Steph. and Church. Med. Bot*, plate 24.) Rosmarinus officinalis is 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; calyx ovate-campanulate, 2-lipped; corolla with a protruding tube slightly inflated at the throat, and a bilabiate limb, the upper lip erect and emarginate, the lower one 3-lobed; stamens reduced to 2, exserted; *nucules* dry and smooth.

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. The 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 (see p. 557), 1 fluid drachm in 7 fluid ounces, nearly; Spiritus Rosmarini, 1 volume in 50; Tinctura Lavandulæ Composita (see p. 577), 5 minims in 1 pint.

Spiritus Rosmarini. Spirit of Rosemary. (Take of oil of rosemary, 1 fluid ounce ; rectified spirit, 49 fluid ounces ; dissolve.) This spirit is but one-fifth the strength of the preparation of the same name in the British Pharmacopœia, 1864.

SABADILLA.—*Cevadilla* (described p. 24, 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 in the British Pharmacopœia to be followed for obtaining it, is described further on (see p. 602).

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*.

SERPENTARIÆ RADIX. *Serpentary root.* Syn. : *Virginian Snake root.* (The dried rhizome of Aristolochia Serpentaria, *Linn.; Steph. and Church. Med. Bot.* plate 180. 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.—Rhizome perennial, horizontal, short, furnished with numerous slender rootlets; stem herbaceous (several often arising from the same rhizome), about 8 or 10 inches high, slender, round, flexuose, jointed at irregular distances; leaves alternate, cordiform, acuminate, slightly pubescent; flowers solitary, on long slender jointed axillary peduncles; perianth superior, irregular, dilated at the base, and somewhat trumpet shaped above ; stamens 6–12, gynandrous ; style short and fleshy ; stigma 6-lobed; capsule 6-angled, 6-celled

CHARACTERS.—A small roundish rhizome, with a tuft of numerous slender rootlets, 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.

PREPARATIONS.—Infusum Serpentariæ, half an ounce to one pint; Tinctura Cinchonæ Composita (see *Tonics*), half an ounce to one pint; Tinctura Serpentariæ, two ounces and a half to one pint.

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 root, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the serpentary for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, ½ to 2 fluid drachms.

INCOMPATIBLES.—Acetate of lead and nitrate of silver.

SINAPIS. *Mustard. Mustard Seed* (described p. 324, 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.

Oleum Sinapis. Oil of Mustard. (The oil distilled with water from the seeds of Black Mustard, Sinapis nigra, *Linn.*, after the expression of the fixed oil.) A colourless or pale yellow oil. Specific gravity 1·015. Dissolves readily in alcohol and ether, and to a slight extent in water. Has an intensely penetrating odour and a very acrid, burning taste. Applied to the skin it produces almost instant vesication. Only used in the preparation of the Linimentum Sinapis Compositum, 1 volume in 41 (see p. 389).

SODÆ CHLORATÆ LIQUOR. *Solution of Chlorinated Soda.* (Syn.: *Solution of Chloride of Soda. Chlorinated Soda. Hypochlorite of Soda. Labarraque's disinfecting liquor.*)

PREPARATION.—Take of carbonate of soda, twelve ounces; black oxide of manganese, four ounces; hydrochloric acid, fifteen fluid ounces; distilled water, two pints. Dissolve the carbonate of soda in thirty-six fluid ounces of the distilled water, and put the solution into a glass vessel. Mix the oxide of manganese and hydrochloric acid in a glass flask with a bent tube attached by means of a cork to its mouth, apply a gentle heat, and with a suitable arrangement of apparatus cause the gas which is evolved to pass first through a wash-bottle containing four ounces of water, and then into the solution of carbonate of soda, regulating the heat so that the gas shall be slowly but constantly introduced. When the disengagement of chlorine has ceased, transfer the solution in which it has been absorbed to a stoppered bottle, and keep it in a cool dark place.

EXPLANATION OF PROCESS.—On mixing oxide of manganese with hydrochloric acid and applying a gentle heat, chlorine is evolved, in virtue of the reaction that takes place between two atoms of the acid and one of the oxide of manganese; the two hydrogens of the acid uniting with the two oxygens of the manganese to form water—one of the chlorines of the acid unites with the manganesium to form chloride of manganesium; the second atom of chlorine is set free, thus, $MnO_2 + 2HCl = 2HO + MnCl + Cl$. The chlorine so set free, 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, $4NaOCO_2 + 2Cl = 2(NaO2CO_2) + NaOClO + NaCl$.

CHARACTERS AND TESTS.—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 perchloride of platinum. Specific gravity 1·103. 70 grains by weight, 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, require for the discharge of the brown colour which the mixture assumes, 500 grain-measures of the volumetric solution of hyposulphite of soda. It is not precipitated by oxalate of ammonia.

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 distinguished 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. 27).

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, the rationale of which will be understood by reference to what has been written upon calx chlorata, p. 552, and which demonstrates the existence of 6·35 gr. of iodine, representing 1·77 gr. of chlorine in the 70 grains operated upon, 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 552). 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 may be 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. Mix the linseed meal gradually with the water, and add the solution of chlorinated soda with constant stirring.) An application to foul and gangrenous sores.

SODII CHLORIDUM. *Chloride of Sodium.* Syn: *Muriate of Soda. Common Salt.* NaCl (=58·5) or **NaCl** (=58·5).

PREPARATION.—Chloride of sodium on the large scale 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 AND TESTS.—In small white crystalline grains, or transparent cubic crystals, free from moisture, has a purely saline taste, imparts a yellow colour to flame, is soluble in water. The solution is not precipitated by perchloride 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 (NaCl). 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, thus accounted for, $NaCl + AgONO_5 = NaONO_5 + AgCl$. It is neutral to test paper.

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 producing a precipitate in its solution after the addition to it of a mixed solution of ammonia and of chloride of ammonium, 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. 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 p. 185); 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 cold and hot baths, when they are intended to act as local stimulants. Applied to the surface of the body, it is a local stimulant, producing the effects of a rubefacient. 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.

PREPARATIONS IN WHICH CHLORIDE OF SODIUM IS USED.—Acidum Hydrochloricum (see p. 234); Hydrargyri Perchloridum (see *Special Stimulants*); Hydrargyri Subchloridum (see *Special Stimulants*).

INCOMPATIBLES.—Nitrate of silver.

* STAPHISAGRIA. *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, 5- to 9-cleft, smooth on the upper, downy on the under surface; flowers purple, in lax racemes; calyx deciduous, petaloid, irregular, the upper sepal calcarate; petals 4, the 2 upper appendiculate; follicles 3.

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 165).

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 Raspeil), 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 the following ointment, 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 p. 61) 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* has long been a valuable remedy

in the wards of the Meath Hospital. The local stimulant properties of turpentine have been already considered (see page 390); 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.

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 membranes 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 recognized by several physicians, in the inter-current 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, decolorized 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.

Unguentum Terebinthinæ. Ointment of Turpentine. (Take of oil of turpentine, one fluid ounce; resin, in coarse powder, sixty grains; yellow wax, prepared lard, of each a half ounce. Melt the ingredients together by the heat of a steam or water-bath. Remove the vessel, and stir the mixture constantly until it cools.) A warm stimulating ointment occasionally employed in the treatment of burns, etc.

* *Mistura Terebinthinæ Alcoholica. Turpentine Punch.* (Take one ounce of turpentine, two ounces of brandy, eight ounces of boiling water, and sugar sufficient to sweeten. Mix.) Half of

this should be taken for a dose, to be repeated, if necessary, every third hour.

THUS AMERICANUM. *Common Frankincense.* (The concrete turpentine of Pinus Tæda, *Linn.*, the Frankincense pine, and Pinus palustris, *Miller's Dict.*, the Swamp pine, *Lambert, Pinus*, plates 16, 17, and 20. 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.

PROPERTIES.—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.

THERAPEUTICAL USES.—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.

PREPARATION.—Emplastrum Picis (see p. 586).

VERATRIA. *Veratria.* (An alkaloid obtained from Cevadilla; not quite pure.) It may be obtained by the following process:—

PREPARATION.—Take of cevadilla, two pounds; distilled water, rectified spirit, solution of ammonia, hydrochloric acid, of each 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 by the application of a gentle heat.

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 AND TESTS.—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, soluble in spirit, in ether, and in diluted acids, leaving traces of an insoluble brown resinoid matter. Heated with access of air it melts into a yellow liquid, and at length burns away, leaving no residue. 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.

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. Killinger of Glasgow. The action of cevadilla as a stimulant is similar to that of veratria, but of course much weaker. In poisoning with veratria the treatment is the same as in poisoning with Colchicum. (See p. 165.)

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 the 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 nor 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.) Used as described above.

* *Tinctura Veratriæ*, MAGENDIE. (Veratria, gr. iv.; rectified spirit, f℥j.; dissolve.) Dose, min. x. to min. xv.

* 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 polygamous, greenish-yellow, in a large spreading decompound 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 p. 602), 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—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. This class of medicines had nearly if not altogether become quite obsolete, until the appearance of some observations by Dr. Laycock, on their occasional value in the treatment of certain forms of epilepsy, dementia, and other kinds of chronic head affections, and, at his suggestion Dr. Saidler submitted his views to the test of clinical investigation in the treatment of several epileptics in the Milholme House Asylum, and so far as the reports read with an astonishing amount of success—for days the fit being warded off in several patients who had previously been liable to daily seizures. Dr. Laycock recommends their use also in hemicrania, in some forms of hallucinations, and of delirium; and in dementia. The formulary for his errhine is given below. 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. In poisoning with white hellebore, the same treatment should be used as in poisoning with colchicum (see p. 165).

* *Pulvis Sternutatorius*, LAYCOCK. (White hellebore in powder, ten grains; cinchona bark, in powder, sixty grains; mix intimately.) About ten grains of this snuff is to be placed inside the nostril, when it will excite strong sneezing for about ten minutes. To check the sneezing, should it prove excessive, wash out the nostrils by snuffing up cold water.

* *Vinum Veratri.* (White hellebore, sliced, ℥vij.; sherry wine, Oij.; macerate for seven days and filter.) Dose, min. v. to min. x.

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, a peculiar volatile oil which has not been insulated, but upon which its *bouquet* is supposed to depend, and œnanthic ether. Two principal subdivisions may be made of wines, into sparkling or effervescing wines, and into still wines ; and these may be still further subdivided into white and red wines, and also into sweet and dry wines. Sparkling wines owe their effervescing properties to the presence of carbonic acid; the wines having been bottled before the completion of the fermenting process, and the carbonic acid, liberated under pressure, becoming mechanically entangled in the wine. 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 wines 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). Whilst alcohol is undoubtedly the intoxicating element in every variety of wine, still all wines are not equally intoxicating in proportion to the amount of alcohol they contain. For instance, many of the effervescing wines are more rapid in their inebriating effects than wines richer in alcohol ; this property is generally attributed to the carbonic acid contained in them : their intoxicating effects, however, are of a more fugacious character than those of the fuller bodied wines.

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, or when there is morbid heat of the surface;

as wine often proves of great benefit when one or even both of these symptoms is present. The following rules upon this subject, laid down by Dr. Hudson in the second edition of his valuable and instructive work upon the study of fever, represent my views upon this subject so completely that I have not hesitated to reproduce them here:—With regard to the exhibition of wine, no precise rule can be laid down: some patients do not require any; some are positively injured by it; in many cases it is our great remedy, and must be given in any quantity that may be required. Above all things you should avoid giving it by routine; but as in all other forms of treatment, you should be guided by rational indications. Wine seems to fulfil three important indications in fever: (1) to sustain the cardiac and capillary circulation; (2) to exert both a stimulant and calmative action upon the cerebral hemispheres, quieting some forms of delirium by the former quality, and producing sleep by the latter; (3) to sustain vital power at the period of crisis. Besides these, its more obvious forms of operation, we believe that wine or brandy fulfils also a most important indication in many cases by retarding that increased disintegration of tissue which the decomposing action of the fever poison sets up in the organism. In accordance with the above views, wine will be found especially useful when the heart is weak, the capillary circulation languid, and the temperature uniformly low, not, however, that an average range of febrile heat is any objection to its use. In the delirium of exhaustion, or in that form of low muttering delirium resembling delirium tremens, attended with restlessness and watchfulness, and with confused perception of surrounding objects, wine calms the patient and induces sleep. The extent to which it may be administered in the first instance, and afterwards continued or increased, will depend—the first upon the condition of the patient's circulation, and the other upon the effects of the remedy. If the heart's action is feeble, the first sound weak and shortened, approaching the fœtal character, the pulse soft, weak, and compressible, wine may be prescribed freely—the more so if there is absence of any symptoms of active congestion of the brain. Your decision on this point may well be strengthened by several concurring conditions. Such are (*a*) the character of the epidemic; no one who has had long experience in fever, or who has carefully read the records of past epidemics, can doubt that in some of these wine has been more beneficial and borne in a larger quantity than in others. (*b*) The age, habits, and idiosyncracy of the patient; the child rarely needs it; the periods of adolescence and early manhood are those in which its beneficial effect is the most striking; in the aged it should generally be given from nearly the commencement, although its beneficial influence is less felt than in earlier life. As might be *a priori* expected, the temperate are the most benefited by it, and its ill effects are the most apparent in the habitual drunkard. (*c*) The desire or aversion of the patient: wine seldom disagrees with one who craves it

or agrees with those who loathe it. As a rule, the quantity requires to be increased gradually up to the period of perfect crisis, or commencing convalescence. You will do this with confidence if the above described effects upon the circulating and nervous systems are produced, if shortly after its administration the pulse becomes fuller and slower, the heat of surface more equable, and, above all, if the patient falls into a sound sleep. Under these circumstances, should the patient ask for an increased quantity, his wish may safely be indulged. But you will either withhold from the first, or afterwards withdraw wine or brandy if the patient presents the symptoms of active congestion of the brain, if, for example, the brow is hot and corrugated, if there is green vomiting, a pink sclerotic and injected conjunctiva, if the delirium is violent and impulsive, or if there is a tendency to stupor, with cutaneous hyperæsthesia, and spastic rigidity of muscles. Should these or similar symptoms come on under its administration, the pulse becoming rapid and weak in proportion to the heart's impulse, the head hot and the extremities cold, the urine pale or suppressed, the delirium violent, or a tendency to stupor manifest itself, wine or brandy should be at once withdrawn. It should be observed that, like food, wine should be given with some regard to the habits of the patient, and that in general it produces its best effects when given in the after part of the day and during the night. Like food also it should be given at moderately long intervals during the course of the fever, up to the time when its stimulant action upon the nervous system is needed from hour to hour, until the crisis be past.—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. In conclusion, I may remark that the employment of wine may be reduced to three heads: first its use as an article of daily consumption by those in health; secondly its employment by the invalid; and thirdly its use in sustaining the powers of life in acute diseases. With reference to the first of these, its habitual employment by those in health, it is unnecessary for me to say more than that I know it to be but too frequently taken far more liberally and far more frequently than the wants of the system require. For instance, in healthy youth and middle age I believe that it can be very well dispensed with altogether; but in old age I know the moderate use of it to be not only beneficial but necessary. To urge the entire abolishment of alcoholic beverages, on account of the number of wretched victims of an inordinate indulgence in them we so frequently meet with, is but to argue from their abuse to their use. I believe that when judiciously used, wine is of as great value to the mental worker, as good food is to the physical worker. And fre-

quently have I seen the worn-out exhausted mental labourer returning to his home loathing food, enabled to enjoy a hearty dinner by simply taking a glass of sherry half an hour before sitting down to his meal. In fact I entertain no doubt that wine is to the exhausted brain what food is to the exhausted body; and this strong conviction is what justifies me in asserting that the moderate use of stimulants is of service to the mental labourer, whilst I do not conceive it to be called for by the physical labourer, in whom I consider the habitual consumption of alcoholic stimulants as worse than uncalled for. 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 some 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. As to the selection of wine for the delicate and dyspeptic, no question perhaps is more frequently asked of the medical attendant than what kind of wine the patient should take. To the gouty the answer should be, in my opinion, none. To the gouty I believe every kind of wine to be gouty; pre-eminently so the red wines, such as burgundy and port; also all sweet wines, champagnes, all malt liquors, and, in a very minor degree, dry white wines and the light clarets. For the gouty the best form in which stimulants can be given is weak cold whiskey and water in moderation. For the dyspeptic, dry white wines will be found the most suitable, and for the anæmic, good sound claret; claret in my opinion possessing well-marked hæmatinic properties. When an immediate yet temporary stimulant effect is desirable, champagne is the wine to be preferred, but for permanent and decided support, so desirable in many forms of fever, no wines can compare with sound old port or madeira. Whilst thus advocating the value of wine when judiciously used in appropriate cases, it cannot be denied that the abuse of alcoholic drinks is the source of an incalculable amount of misery to the human race. The injurious effects of alcoholic drinks vary as to whether they are the result of habitual intemperance, or are brought on by one immoderate and excessive indulgence in their use, in which latter case they may produce effects closely resembling and occasionally as fatal as those brought on by the strongest of our narcotic poisons, and which require for their treatment as active measures. The stomach should at once be emptied either by the aid of emetics as of the stomach-pump, and vo-

miting should be kept up as long as the rejected matter retains an alcoholic odour. Coffee should then be freely administered; if signs of venous congestion about the head present themselves, leeches must be applied to the temples and behind the ears, and cold affusion to the head. In such cases the exhibition of Mindirerus' spirit has also been found a useful addition to the treatment (see p. 269). A longer continued habit of intemperance but too frequently terminates in chronic alcoholismus or in delirium tremens. As the consideration of these subjects would be entirely foreign to the scope of this work, I shall merely content myself with remarking that either one or other of these maladies is a sure sequence upon the too prevalent habit of tippling and dram drinking at irregular times during the day before dinner, a pernicious custom more likely to be followed by one or other of these diseases than even excessive *after* dinner potations.

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.

PREPARATIONS.—Vinum Aloes (see p. 157); Vinum Antimoniale (see p. 277); Vinum Colchici (see p. 166); Vinum Ferri (see *Tonics*); Vinum Ipecacuanhæ (see p. 323); Vinum Opii (see p. 446); Vinum Rhei (see p. 202).

ZINGIBER. *Ginger.* (The scraped and dried rhizome of Zingiber officinale, *Roscoe, Trans. Linn. Soc., Woodv. Med. Bot.* plate 11 (*Amomum Zingiber*). 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.—Rhizome biennial, tuberous, articulated, creeping; stem annual, 2 or 3 feet high, cylindrical, invested with the smooth sheaths of the leaves; leaves sub-sessile, linear-lanceolate, smooth, membraneous; flowers yellowish with purple 3-lobed lips, in cone shaped, radical or rarely terminal, solitary spikes; fruit a 3-celled capsule; seeds numerous, arillate, mostly abortive.

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.—Irregular lobed decorticated pieces, three or four inches long, sub-compressed, yellowish 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 irritation of the urinary organs or 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.

PREPARATIONS.—Confectio Opii (see p. 442), one part in twelve nearly; Confectio Scammonii (see p. 209), one part in six, nearly; Infusum Sennæ (see p. 213), sixty grains to one pint; Pilula Scillæ Composita (see p. 403), one part in six and a quarter; Pulvis Cinnamomi Compositus (see p. 569), one part in three; Pulvis Jalapæ Compositus (see p. 180), one part in fifteen; Pulvis Opii Compositus (see p. 444), one part in three; Pulvis Rhei Compositus (see p. 202), one part in nine; Pulvis Scammonii Compositus (see p. 210), one part in eight; Syrupus Rhamni (see p. 198); Syrupus Zingiberis; Tinctura Zingiberis, two ounces and a half to one pint; Tinctura Zingiberis Fortior, ten ounces to one pint; Vinum Aloes (see p. 157), forty grains to one pint.

Syrupus Zingiberis. Syrup of Ginger. (Take of strong tincture of ginger, six fluid drachms; syrup, nineteen fluid ounces. Mix with agitation.) An agreeable carminative addition to purgative mixtures or cordial draughts. Dose, 1 fluid drachm.

Tinctura Zingiberis. Tincture of Ginger. (Take of ginger, in coarse powder, two ounces and a half; rectified spirit, one pint. Macerate the ginger for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percola-

tion with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) Dose, 15 minims to 1 fluid drachm.

Tinctura Zingiberis Fortior. Strong Tincture of Ginger. Syn: *Essence of Ginger.* (Take of ginger, in fine powder, ten ounces; rectified spirit, a sufficiency. Pack the ginger tightly in a percolator, and pour over it carefully half a pint of the spirit. At the expiration of two hours add more spirit, and let it percolate slowly until one pint of tincture has been collected.) Dose, four to twenty drops on a lump of sugar, in cases of flatulent colic, &c. It is used in making the syrup of ginger.

CHAPTER XIX.

SPECIAL STIMULANTS.

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 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 remedial 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 the previous classes of medicines, but the articles contained in this chapter could not, 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 Dientagynia.*

BOTANICAL CHARACTERS.—A tall stately plant, stem herbaceous,

6 to 8 feet high, root perennial; leaves large, ternate, leaflets ovate-oblong, incisely toothed; flowers white, small, racemose; calyx of 4 white deciduous sepals; petals minute, abortive, shorter than the numerous stamens; pistil simple, with a nearly sessile stigma; follicle globose-ovate, glabrous.

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 colour; 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 colouring matter, green colouring 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. Hildrith 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 Sir James Y. 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, and I have therefore 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.* (Take of the root, bruised, one ounce; water, one pint; boil for ten minutes, and filter.) Dose, f℥j. to f℥ij.

* *Tinctura Actææ.* (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 it 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 the 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. Neligan employed it very extensively with excellent effect, chiefly in cases where other arsenical preparations 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℥ij.; spirit of angelica, f℥vj.; dissolve.) Dose, f℥j. to f℥ij. in some aromatic water.

AMMONIÆ BENZOAS. *Benzoate of Ammonia.* $NH_4O,C_{14}H_5O_3$ (= 139) or $\mathbf{NH_4C_7H_5O_2}$ (= 139).

PREPARATION.—Take of solution of ammonia, three fluid ounces or a sufficiency; benzoic acid, two ounces; distilled water, four fluid ounces. Dissolve the benzoic acid in three fluid ounces of solution of ammonia previously mixed with the water; evaporate at a gentle heat, keeping ammonia in slight excess; 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 AND TESTS.—In colourless, laminar crystals, soluble in water and in alcohol. It gives a bulky yellowish precipitate with persalts of iron. Its aqueous solution when heated with caustic potash evolves ammonia, and, if it not be too dilute, when acidulated with hydrochloric acid it gives a deposit of benzoic acid. 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, and require no explanation.

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 p. 395). 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.* $2NH_4O,HO,PO_5 (=132)$ or $2(\mathbf{NH_4})\mathbf{HPO_4} (=132)$.

PREPARATION.—Take of diluted phosphoric acid, twenty fluid ounces; strong solution of ammonia, a sufficiency. Add the ammonia to the phosphoric acid until the solution is slightly alkaline, then evaporate the liquid, adding more ammonia from time to time, so as to keep it in slight excess, and when crystals are formed, on the cooling of the solution, dry them quickly on filtering paper placed on a porous tile, and preserve them in a stoppered bottle.

EXPLANATION OF PROCESS.—A simple case of union of the acid with the base: thus, $2NH_4O + 3HO,PO_5 = 2NH_4O,HO,PO_5 + 2HO$.

CHARACTERS AND TESTS.—In transparent colourless prisms. Soluble in water, insoluble in rectified spirit. When heated with caustic potash, ammonia is evolved. The aqueous solution gives a yellow precipitate with nitrate of silver. If twenty grains of this salt be dissolved in water and solution of ammonio-sulphate of magnesia added, a crystalline precipitate falls, which, when well washed upon a filter with solution of ammonia diluted with an equal volume of water, dried, and heated to redness, leaves 16·8 grains.

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 $2NH_4O,HO,PO_4 + 2KO = 2KO,HO,PO_5 + 2NH_4O$. The canary-yellow precipitate produced on the addition of nitrate of silver is phosphate of silver (see p. 217). The *test* is directed with the view of ascertaining the percentage of phosphoric acid present; on the addition of the ammonio-sulphate of magnesia to its solution, the resulting ammoniaco-magnesian phosphate precipitates; its production is accounted for by two atoms of magnesia replacing one out of the two 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 ammonia thus set free unites with the sulphuric acid to form sulphate of ammonia, which is held in solution; this equation explains the entire reaction, $2(MgOSO_3 + NH_4OSO_3) + 2NH_4O,HO,PO_5 = (NH_4O,2MgO,PO_5) + 3NH_4OSO_3 + HOSO_3$. 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 16·8 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) or **NH_4Br** (=98).

PREPARATION.—No directions are given in the Pharmacopœia for making bromide of ammonium, but it 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 quicklime, when the base will be set free, recognizable by the tests for ammonia already described (see p. 3), and as one of bromine by the tests hereafter to be described (see Potassii Bromidum).

CHARACTERS AND TESTS.—In colourless crystals, which become slightly yellow by exposure to the air, and have a pungent saline taste. May be sublimed unchanged by the application of heat. Readily soluble in water; less soluble in spirit. A solution of the salt in water, mixed with mucilage of starch and a drop of an aqueous solution of bromine or chlorine, does not exhibit any blue colour.

ADULTERATION.—The principal sophistication to which this salt is liable is being mixed with iodide of potassium; this is provided for in the pharmacopœial test, as, were it present, on the addition of a drop of either bromine or chlorine the iodide would be decom-

posed, and its iodine set free, which would then strike a blue colour with the starch.

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 remarkably sedative effects over convulsive and irritant affections of the larynx. 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, a statement in which my experience to a great degree bears him out. In laryngoscopic examinations its preliminary employment has been found most useful in establishing a tranquil condition of the parts, and so a tolerance of the instrument. In the irritating hacking cough of phthisis its use has been occasionally found of advantage; in the last edition of this work, fully impressed with its value, I thus expressed myself: "In fact, although not officinal in our Pharmacopœia, many other preparations have found their way into it of far more equivocal prestenions." This remark has been justified by this salt having been made officinal in the present edition of the Pharmacopœia.

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 of the patient's age.

* 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.

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.—Iodine 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 Neligan used it extensively and, even in very inveterate cases, with great success. 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 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 of the highest repute in this city 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 im-

petigo, in ptyriasis, etc. Its efficacy in these obstinate affections is acknowledged to be now so well established, that it was admitted into the last edition of the Dublin—although, in my opinion, unwisely omitted from the British—Pharmacopœia; nevertheless it is in very general use in this city, and enjoys with many practitioners a deservedly high repute. For further information on this subject, I must refer to Mr. Donovan's memoirs in the 16th, 18th, and 22nd vols. of the *Dublin Journal of Medical Science.* In my own practice, in cases where the cutaneous disease is complicated with a syphilitic taint, I must acknowledge having made many a happy hit with it. However, I have found it, in other forms of cutaneous affection, to 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 Neligan was inclined to attribute to the presence of the mercury in it, and he 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.

* AURI PULVIS. *Powder of Gold.* Au=196·5. This metal was introduced into the last edition of the London, as it is also into the British, Pharmacopœia, as a test for atropia, but none of its preparations are employed in this country in the practice of medicine. Although neither gold nor its salts are, in the strict sense of the word, officinal in the British Pharmacopœia, they are frequently administered on the Continent, and their virtues highly lauded; 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.

PREPARATION.—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.

THERAPEUTICAL EFFECTS.—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.

DOSE AND MODE OF ADMINISTRATION.—Powder of gold may be given internally in doses of gr. $\frac{1}{4}$ or gr. $\frac{1}{2}$, gradually increased to gr. iij.; it should be made into pill with conserve of roses; or administered as below, in the form of a syrup. 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.) Dose, min. v. to min. x., gradually and cautiously increased to f℥ss. or f℥j.

* *Ointment of Gold.* (Powder of gold, gr. j.; axunge, gr. xv.)

* AURI IODIDUM.—*Iodide of Gold.* $Au_2I = 520$.

PREPARATION.—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.—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 is deposited on the surface. Sesquichloride of gold is composed of two equivalents of gold and three 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. 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.

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.

* AURI PEROXYDUM.—*Peroxide of Gold. Sesqui-oxide of Gold. Auric acid.* $Au_2O_3 = 417$.

PREPARATION.—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 chesnut-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 two 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, ʒij.; divide into 60 pills.) Dose, 2 to 10 daily.

BROMUM. *Bromine.* Br=80 or **Br**=80. (A liquid non-metallic element, obtained from sea-water and from some saline springs.) Bromine was originally discovered by Balard of Montpelier, in 1826. It has been only introduced into the Pharmacopœia with the view of making the officinal bromides, and no formula is given for its preparation. The course generally pursued for obtaining it is as follows:—

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 117° F. Bromine bleaches vegetable colours like chlorine. It combines with most metals, forming with them bromides.

CHARACTERS AND TESTS.—A dark brownish-red, very volatile liquid, with a strong and disagreeable odour. Its specific gravity is 2·966. At the common temperature of the air it gives off red vapours, and at a temperature of 117° it boils. 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 farther addition of a small quantity of the bromine, does not become blue on the subsequent addition of a cold solution of starch.

ADULTERATIONS.—It may contain iodine, against which impurity the pharmacopœial test is directed; were it present on the addition of the bromine 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; latterly special physiological effects have been derived from the use of its salts, which will be more appropriately described under their several heads. In America it is largely used as a deodorizer, to purify the atmosphere of hospitals and of sick rooms where erysipelas, scarlatina, 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 of 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. 617); *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.

PHARMACOPŒIAL PREPARATIONS.—Ammonii Bromidum (see p. 617); Potassii Bromidum.

CADMII IODIDUM. *Iodide of Cadmium.* CdI (= 183) or CdI_2. (= 366) It may be formed by direct combination of iodine and cadmium in the presence of water.

EXPLANATION OF PROCESS.—In the Pharmacopœia the method of obtaining this salt is rather indicated than directed, but the process is so simple as to explain itself, it being but a case of direct union between the iodine and cadmium ($I+Cd=CdI$). By evaporation the iodide is deposited on the cooling of the liquid.

CHEMICAL HISTORY.—Cadmium, the metallic base of this salt, was discovered in 1817 by Stromeyer; it is contained in some of the ores of zinc, from which it is obtained by distillation. Being more volatile than zinc it distils over at once, combined with some zinc from which it can be separated by digestion with sulphuric acid, and by then passing through the solution a stream of sulphuretted hydrogen gas, and dissolving the precipitated sulphide of cadmium in hydrochloric acid, and converting it by the addition of carbonate of ammonia into carbonate of cadmium, mixing this with charcoal and reducing it in an earthen retort, when by the application of a low red heat the cadmium will distil over. Cadmium resembles tin in its physical appearance, but is somewhat harder; its specific gravity is from 8·60 to 8·69. At ordinary temperatures air does not act upon it, but when heated it forms an orange coloured oxide. At a low red heat it melts, and on a slight increase of heat is volatilized. Cadmium is soluble in strong hydrochloric acid, in dilute sulphuric acid, and in nitric acid; most of its salts are colourless. The salts of cadmium are precipitated yellow by sulphuretted hydrogen, and the resulting sulphide is insoluble in sulphide of ammonium. Solutions of carbonate of ammonia, potash, and soda yield with them a white precipitate insoluble in an excess of the reagent; ferrocyanide of potassium precipitates them white, and ferricyanide of potassium brownish-yellow, both precipitates being soluble in hydrochloric acid.

CHARACTERS AND TESTS.—In flat micaceous crystals, white, of a pearly lustre, which melt when heated to about 600°, forming an amber-coloured fluid. At a dull red heat violet-coloured vapours are given off. It is anhydrous and permanent in the air, freely soluble in water and in rectified spirit, and the solution reddens litmus paper. The aqueous solution gives a yellow precipitate with sulphuretted hydrogen or sulphide of ammonium, which is insoluble in excess of the latter; the solution also gives a white gelatinous precipitate with excess of solution of potash, the filtrate from which is unaffected by sulphide of ammonium. Ten grains dissolved in water, and nitrate of silver added in excess, give a precipitate which, when washed with water and afterwards with half an ounce of solution of ammonia and dried, weighs 12·5 grains.

PHYSICAL AND CHEMICAL PROPERTIES.—But little need be added to the pharmacopœial characters and tests, which when studied with what has been already written under the head of the chemical history of cadmium, will give a sufficient insight into these points; the violet coloured vapours given off by exposing the salt to a dull red heat are those of iodine; the salt having been resolved into its elements and the iodine volatilized. The precipitate yielded on the addition to its solution of nitrate of silver is iodide of silver, nitrate of cadmium being held in solution thus:—$CdI+AgONO_5=AgI+CdONO_5$, and the amount of it stated to be yielded by ten grains (gr. 12·5) is very

slightly less than what reference to the chemical equivalents would indicate.

THERAPEUTICAL USES.—According to Sir James Y. Simpson, the salts of cadmium in their therapeutical action, internally administered, bear a close resemblance to those of antimony; but they are principally used externally for their stimulant action over enlarged scrofulous glands, strumously enlarged joints, nodes, and such like affections. The idea connected with the iodide is that it will yield up its iodine to the system with greater facility than its analogous salt, the iodide of lead, besides which there will be no risk of producing with it, by saturnine impregnation of the system, the ill effects of lead. Hitherto, however, the salts of cadmium have not come into general use, and further experience is required to justify their claim upon professional confidence.

DOSE AND MODE OF ADMINISTRATION.—The iodide of cadmium is only used externally in the form of ointment diligently rubbed over the seat of disease in the class of affections already mentioned; the following is the officinal formula.

Unguentum Cadmii Iodidi. Ointment of Iodide of Cadmium. (Take of iodide of cadmium, in fine powder, sixty-two grains; simple ointment, one ounce. Mix thoroughly.) The therapeutic use of this ointment has been described above.

* CADMII SULPHAS. *Sulphate of Cadmium.* $CdOSO_3 + HO = 120$.

PREPARATION.—It can be procured by the action of diluted sulphuric acid upon the metal cadmium; the process will be expedited by the addition of a small quantity of nitric acid. The resulting solution is to be concentrated by boiling, and on cooling, the salt will crystallize out of the liquor.

PHYSICAL AND CHEMICAL CHARACTERS.—A white efflorescent salt, crystallizing in prisms; soluble in water. As a salt of cadmium it will be recognised by the chemical characters given in the preceding article for that metal, and as a salt of sulphuric acid by the insoluble precipitate thrown down from its solution by nitrate of barytes.

THERAPEUTICAL EFFECTS.—In its therapeutical history this salt bears a close resemblance to sulphate of zinc, like it being astringent in small doses, in large doses emetic. Whether it resembles sulphate of zinc in its tonic powers remains yet to be proved. In its powers over the system it is generally considered to be ten times more active than the zinc salt. M. Grimaud has ascribed to it valuable properties in the treatment of gout, rheumatism, and syphilis; but it is principally as an external application that it has been employed, it being strongly recommended for its efficiency in removing specks and opacities of the cornea, and as a general topical astringent in ophthalmic surgery.

DOSE AND MODE OF ADMINISTRATION.—For internal exhibition,

from one eighth to a quarter of a grain either in pill or solution, when we desire to produce its constitutional effects. For ophthalmic purposes, from half a grain to four grains dissolved in two ounces of rose water, or made into an ointment by rubbing it up with some simple cerate.

COPAIBA. *Copaiva.* (The oleo-resin obtained from incisions made in the trunk of Copaifera multijuga, *Hayne;* and other species of Copaifera. Chiefly from the valley of the Amazon.) The various species of the genus Copaifera from which the oleo-resin 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 6–10 pairs, coriaceous, somewhat unequal, ovato-lanceolate, acuminate, mucronate, with pellucid dots; flowers in panicles; calyx of 4 spreading small equal sepals, united at the base; corolla none; stamens 10, distinct, nearly equal; *legume* stalked, obliquely elliptical, coriaceous, 2-valved, 1-seeded.

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.

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, 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,

* 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.

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.

CHARACTERS AND TESTS.—*Of Copaiva.*—About the consistence of olive oil, light yellow, transparent, with a peculiar odour, and an acrid aromatic taste. Perfectly soluble in an equal volume of benzol. Does not become gelatinous after having been heated to 270°. Is not fluorescent.

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 Gurjun balsam would be indicated were the copaiva not perfectly soluble in an equal volume of benzol, or did it become gelatinous on being heated to 270°. 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 an 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 prevades 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 power 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 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 exterior 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 in flakes to the bottom of the vessel after a few hours rest, as albumen does.

DOSE AND MODE OF ADMINISTRATION.—Min. x. to f3j. 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 (f3ss. or 3j.) 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 oleo-resin gradually to the mucilage, the mucilage were added to the oleo-resin, 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 oleo-resin has been incorporated, some degree of dilution becomes neces-

sary. 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.—Copaiva however acts with greater certainty, and occasionally causes less disgust when given floating on a wine-glass of water to which 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. Besides which, although at first tasteless, on the capsule being dissolved in the stomach, the after-taste produced by eructations is nearly as nauseating as that of the balsam itself. To obviate this, the balsam has been enclosed in capsules made of animal membrane, the mouth of which after being filled with the balsam is sealed with gum; these are known by the name of *Savaresse's* capsules; the peculiar advantage claimed for them is that they escape solution in the stomach, and thereby those unpleasant eructations are avoided. M. Jozeau has recently proposed to administer copaiva in the form of *dragées* in the treatment of gonorrhœa; these he terms either *Copahine-*

Mège, because M. Mège was associated with him in their preparation; or *Copahine Mège ferrée*, these latter containing iron in addition to the ingredients in the copahine Mège; they are stated not to occasion nausea, sickness, or purging, and their therapeutical efficacy has now been well proved. Copahine Mège is 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 dragées are taken three times a day, and the dose increased by one every day until purging is produced. The copahine Mège ferrée is more suited for debilitated constitutions, and the more chronic stages of gonorrhœa *(gleet)*. In my experience of gonorrhœa, either form of dragée (each in the case suited for it) is the most beneficial of all the patent nostrums. 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 distilled from copaiva.) It is either colourless or pale yellow, with the odour and taste 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.* (The dried unripe fruit of Cubeba officinalis, *Miquel, Comment.; Steph. and Church. Med. Bot.* plate 175. Cultivated in Java.) 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.—A climbing perennial shrub; stem sarmentaceous, articulated, terete; leaves smooth, coriaceous, the lower ones somewhat cordate at the base, ovate, acute, the upper ones more oblong, ovate, and smaller, in the male plant 5-nerved, in the female 5–9-nerved; flowers diœcious, in solitary spikes opposite the leaves; fruit (falsely called berries) succulent, contracted into a stalk at the base, which is longer than the globose apex.

CHARACTERS.—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.

PHYSICAL PROPERTIES.—Cubebs are about the size of black pepper, wrinkled on the surface, brownish externally, whitish and oily within. The base of the fruit is contracted into a stalk, 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, on an attentive consideration of what has been already written under the head of copaiva, be acknowledged as being highly probable; 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 therefore be 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. The beneficial action of both cubebs and of copaiva in the treatment of gonorrhœa will be much intensified by confining the patient to bed, and to low diet. I have repeatedly verified the truth of this statement in the treatment of obstinate cases, both in

private and in the wards of the Meath Hospital. Cubebs have been also employed in leucorrhœa and in catarrh of the bladder, but 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 water, or in combination with copaiva.

PREPARATIONS.—Oleum Cubebæ; Tinctura Cubebæ, two ounces and a half to one pint.

Oleum Cubebæ. Oil of Cubebs. (The oil distilled in Britain from cubebs.) This oil is either colourless or pale greenish-yellow, having the peculiar odour and taste of cubebs. 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 Cubebæ. Tincture of Cubebs. (Take of cubebs, in powder, two ounces and a half; rectified spirit, one pint. Macerate the cubebs for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) This tincture is generally added to mixtures containing copaiva. Dose, f3j. to f3ij. 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 in gonorrhœa with the late Sir Philip Crampton, and I have frequently tested its great value. Dose, one powder in half a tumblerful of water every third hour.

HYDRARGYRUM. *Mercury.* Hg(=100) or **Hg**(=200.) 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; should it however not be sufficiently pure it can be easily rendered so by the following measure. 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.

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.

CHARACTERS AND TESTS.—A metal, fluid at common temperatures, brilliantly lustrous, and easily divisible into spherical globules. Volatilises at a heat below that of visible redness, leaving no 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 extremely difficult 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 571), 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 it has 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, in the majority of instances its sanitary influence in the treatment of many diseases 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. Mercurialism is most decidedly influenced by the administration of active saline cathartics, and of nauseating doses of tartar emetic previous to the exhibition of the mercury, and by keeping during its administration 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, partial or universal trembling, a small, quick, and sometimes intermitting pulse, occasional vomiting, a sense of coldness, and a 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 to 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 the mercurial preparation has been taken. In its milder forms it resembles the acute form 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. In consequence of the occasional supervention of some one or other of these untoward symptoms, as also as a result of its having been indiscriminately employed in cases or constitutions altogether unsuited for its exhibition, in which as a consequence, so far from producing beneficial results, it has aggravated all the symptoms, a strong feeling has arisen in the minds of many practitioners against its use at all, its value being decried and its banishment from our list of remedial agents urged. This in my opinion is a most insensate outcry; no one can be more alive to the injurious results attendant upon its abuse than I am, but I have too frequently witnessed its beneficial effects, when properly administered in cases suited for its exhibition, to lend myself to such views. Any one who has witnessed the almost magical beneficial effects attendant upon its exhibition in cases that have proved rebellious to all other known plans of treatment, cannot readily allow themselves to be convinced against the evidence of their senses. I could adduce many such instances were it necessary, but shall content myself with thus bearing testimony to its great value when judiciously administered and in properly selected cases.

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 they are so numerous only a very general allusion can be made to them. 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 preparations (calomel and hydrargyrum cum cretâ are those 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, in synovitis, 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 douloureux, &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 regard 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 mercury may be introduced into the system can 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, partially converted into the state of suboxide; those in which the mercury exists in the state of a protosalt; and, finally, those in which it exists in the state of a 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, twice or thrice daily, until its effects be produced; the latter can be conducted either in the dry or moist way. The moist way is much to be preferred, and 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, most frequently perhaps calomel, 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.

PREPARATIONS CONTAINING MERCURY CHIEFLY UNCOMBINED.—Hydrargyrum cum Creta (see p. 177), one part in three; Emplastrum Ammoniaci cum Hydrargyro, one part in five; Emplastrum Hydrargyri, one part in three; Linimentum Hydrargyri, one part in three; Pilula Hydrargyri (see p. 174), one part in three; Suppositoria Hydrargyri; Unguentum Hydrargyri, one part in two; Unguentum Hydrargyri Compositum, one part in four and a half.

PREPARATIONS CONTAINING COMBINED MERCURY.—Hydrargyri Iodidum Rubrum; Hydrargyri Iodidum Viride; Hydrargyri Oxidum Rubrum (see p. 254); Hydrargyri Perchloridum; Hydrargyri Subchloridum (see p. 175); Hydrargyri Sulphas; Hydrargyrum Ammoniatum; Liquor Hydrargyri Nitratis Acidus (see p. 256); Liquor Hydrargyri Perchloridi; Lotio Hydrargyri Flava; Lotio Hydrargyri Nigra; Pilula Hydrargyri Subchloridi Composita (see p. 275); Unguentum Hydrargyri Ammoniati; Unguentum Hydrargyri Iodidi Rubri; Unguentum Hydrargyri Nitratis; Unguentum Hydrargyri Oxidi Rubri (see p. 255).

Pilula Hydrargyri. Mercurial Pill. (Syn. *Blue Pill,* see page 174.) Dose, to produce the specific effects of mercury, gr. iij. to gr. v., night and morning; if it should occasion gastric irritation, a fourth of a grain of opium may be added to each pill.

Hydrargyrum cum Cretâ. Mercury with Chalk. (Syn. *Grey Powder*, see page 177.) 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 so 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 to adults 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 Hydrargyrum cum Magnesiâ.

Emplastrum Ammoniaci cum Hydrargyro. Ammoniacum and Mercury Plaster. (Take of ammoniacum, twelve ounces; mercury, three ounces; olive oil, one fluid drachm; sublimed 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 ammoniacum, previously liquefied, mixing the whole carefully.) Applied to indolent buboes, and 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 drachm; sublimed sulphur, eight grains; lead plaster, six ounces. Heat the oil and add the sulphur gradually, stirring until they unite; with this mixture triturate the mercury until globules are no longer visible, then add the lead 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, liniment of camphor, of each, 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 grain x. of mercury. It produces salivation very speedily.

Suppositoria Hydrargyri. Mercurial Suppositories. (Take of ointment of mercury, sixty grains; benzoated lard, white wax, of each, twenty grains; oil of theobroma, eighty grains. Melt the benzoated lard, wax, and oil of theobroma with a gentle heat, then add the ointment of mercury, and having mixed all the ingredients thoroughly, without applying more heat, immediately pour the mixture, before it has congealed, into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.) A new introduction into the pharmacopœias. These suppositories regularly introduced can produce the specific effects of mercury; they have been used occasionally in the treatment of ascarides; their employment in some forms of surgical affections of the rectum may be attended with advantage.

Unguentum Hydrargyri. Ointment of Mercury. (Take of mercury, prepared lard, of each, one pound; prepared suet, one ounce. Rub them 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, contending that it owes its activity to the small quantity of mercury it contains in the state of suboxide, whilst that portion of mercury it contains in the metallic state is inert; views which he supported by, in my opinion, conclusive experiments, and which induced him to suggest as a substitute for this ointment one composed of sub-oxide 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. Mercurial 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 often beneficially smeared over the inflamed surface in erysipelas. A milder ointment is generally used as a dressing to venereal sores. It enters into the following preparations: Linimentum Hydrargyri; Suppositoria Hydrargyri; Unguentum Hydrargyri Compositum.

Unguentum Hydrargyri Compositum. Compound Ointment of Mercury. (Take of ointment of mercury, six ounces; yellow wax, olive oil, of each, three ounces; camphor, one ounce and a half. Melt the wax with a gentle heat and add the oil, then, when the mixture is nearly cold, add the camphor in powder, and the ointment of mercury, and mix the whole thoroughly.) An officinal substitute for *Scott's ointment*, differing from it however in having yellow wax and olive oil substituted for the soap cerate in the original formulary; it proves an admirable application for chronic inflammation of the synovial membranes, as of the knee joint: the part having been first well washed, it should be firmly strapped with strips of lint well covered with the ointment; over these straps of adhesive plaster should be applied, and the whole protected with a well applied bandage.

* *Hydrargyrum cum Magnesiâ.* (See *Hydrargyrum cum Cretâ*, and also page 178.)

* *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.* Syn.: *Hydrargyri Ammonio-Chloridum,* Lond., Dub. *Hydragyri Præcipitatum album,* Edin. *White Precipitate.* NH_2Hg_2Cl (=251·5) or $\mathbf{NH_2HgCl}$ (=251·5)

PREPARATION.—Take of perchloride of mercury, three ounces; solution of ammonia, four fluid ounces; distilled water, three pints. Dissolve the perchloride of mercury 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 what Kane has termed *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 AND TESTS.—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. Entirely volatilised at a heat under redness.

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.

ADULTERATIONS.—I have never met with any impurity in this preparation.

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. In our chemists' shops is kept a soap containing it, called *white precipitate soap*, which has been found of great value by myself and others as an adjunct to other remedies in the treatment of syphilitic cutaneous affections. The following preparation is officinal, and that which is generally employed.

Unguentum Hydrargyri Ammoniati. Ointment of Ammoniated Mercury. Syn.: *Unguentum Hydrargyri Ammonio-Chloridi*, Lond. *Unguentum Præcipitati Albi*, Ed. (Take of ammoniated mercury, 62 grains; simple ointment, 1 ounce; mix thoroughly.) The therapeutical uses of this ointment are described above.

HYDRARGYRI IODIDUM RUBRUM. *Red Iodide of Mercury.* Syn: *Hydrargyri Biniodidum, Biniodide of Mercury*, Lond. and Edinb. HgI (=225) or $\mathbf{HgI_2}$ (=450).

PREPARATION.—Take of perchloride of mercury, four ounces; iodide of potassium, five ounces; boiling distilled water, four pints. Dissolve the perchloride of mercury 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 de-

composition, the chlorine of the perchloride of mercury 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 AND TESTS.—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. Entirely volatilised by a heat under redness.

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.

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 in 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, Neligan found it an excellent tonic in scrofulous habits. He 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 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.* Its uses have been described above.

HYDRARGYRI IODIDUM VIRIDE. *Green Iodide of Mercury.* Syn.: *Hydrargyri Iodidum,* Lond. Hg_2I (=325) or **HgI** (=325).

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 AND TESTS.—A dull green powder insoluble in water, which darkens in colour upon exposure to light. When it is shaken in a tube with ether nothing is dissolved. Gradually heated in a test tube, it yields a yellow sublimate, which upon friction, or after cooling, becomes red, while globules of metallic mercury are left in the bottom of the tube.

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 alternative 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 1-16th of a grain to half a grain, combined with dried carbonate of soda and aromatic powder. Occasionally, in consequence of it 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. 0·827, 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.

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 form 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 f℥j. 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, twelve fluid ounces; prepared lard, fifteen ounces; olive oil, thirty-two fluid ounces. Dissolve the mercury in the nitric acid with the aid of a gentle heat; 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. Keep it stirred until it is cold.

EXPLANATION OF PROCESS.—The reactions that ensue between the nitric acid and mercury have been already explained (see page 256). 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 the last edition of this work, when commenting upon the then pharmacopœial process, I remarked that "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.*" In the present edition of the British Pharmacopœia it will be seen that this point has to a certain extent been attended to. 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 oil 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 druggists' and apothecaries' shops in Dublin and is 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. When diluted with from four to six times its weight of white wax ointment, it is also a useful application 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. Dilute Citrine Ointment.* (Ointment of the nitrate of mercury, ℥j. ; lard, ℥vij. ; rub together.) This ointment should be prepared fresh for use.

* HYDRARGYRI OXYDUM NIGRUM. *Black Oxide of Mercury. Sub-oxide of Mercury.* $Hg_2O = 208$ or $\mathbf{Hg_2O} = 416$.

PREPARATION.—This oxide has been omitted from the Pharmacopœia, but the following process for its preparation will be found satisfactory :—Take of 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* (see p. 655), 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.

* HYDRARGYRI OXIDUM RUBRUM. *Red Oxide of Mercury.* Syn.: *Binoxide of Mercury. Oxide of Mercury. Peroxide of Mercury.*) HgO=108 or **HgO**=216.

PREPARATIONS.—Take of perchloride of mercury *(corrosive sublimate)*, ℥iv.; solution of potash, f℥xxviij.; distilled water, Ovj.; dissolve the perchloride in 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.

EXPLANATION OF PROCESS.—The reactions in this case are similar to those described in the last preparation, save that, inasmuch as it is the perchloride that is employed, we have the *oxide* instead of the suboxide of mercury precipitated, thus, HgCl+KO=KCl+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 p. 254, from which it is physically very different, 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 254), than which it is less caustic. It forms the active part of *yellow wash* (see *Hydrargyri Perchloridum*), which is preferred by some to black wash as an application to venereal sores.

HYDRARGYRI PERCHLORIDUM. *Perchloride of Mercury.* Syn.: *Hydrargyrum Corrosivum Sublimatum*, 1864. *Hydrargyri Bichloridum*, Lond. *Sublimatus Corrosivus*, Edin. *Sublimatum Corrosivum*, Dub. *Corrosive Sublimate.* HgCl (=135) or **Hg Cl_2** (=270)

PREPARATION.—Take of sulphate of mercury, twenty ounces; chloride of sodium, dried, sixteen 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, put the

mixture into an apparatus adapted for sublimation, and apply sufficient heat to cause vapours of perchloride of mercury to rise into the less heated part of the apparatus which has been arranged for their condensation.

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 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, $HgOSO_3 + NaCl = HgCl + NaO\,SO_3$. 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. 175). 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 AND TESTS.—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. When heated it sublimes without decomposing, or leaving any residue.

CHEMICAL PROPERTIES.—Although this salt is very generally called a bichloride, recent chemical investigations prove it to be a protochloride, its composition being HgCl; to obviate the confusion likely to arise from this varying nomenclature the Pharmacopœial authorities, most wisely in my mind, with a view to 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 $2\frac{1}{3}$ parts of cold alcohol, in $1\frac{1}{2}$ 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 solution; 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. 644). The precipitate with nitrate of silver is chloride of silver.

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. 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.

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 one 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.

PREPARATIONS IN WHICH PERCHLORIDE OF MERCURY IS USED.—Liquor Hydrargyri Perchloridi, a half grain in one fluid ounce; Lotio Hydrargyri Flava, eighteen grains to ten fluid ounces.

Liquor Hydrargyri Perchloridi. Solution of Perchloride of Mercury. Syn.: *Liquor Hydrargyri Bichloridi*, Lond. (Take of perchloride of mercury, chloride of ammonium, of each, ten grains; distilled water, one pint; dissolve.) Dose, half a fluid drachm to two fluid drachms.

Lotio Hydrargyri Flava. Yellow Mercurial Lotion. (Take of perchloride of mercury, eighteen grains; solution of lime, ten fluid ounces; mix.) Reference to what has been written (p. 651) as to the reactions occurring in the process for making red oxide of mercury (substituting in the equation lime for potash) will explain this process. Yellow wash is in some cases to be preferred to black wash in the treatment of syphilitic ulcers.

* *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 corrosive 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, etc.

HYDRARGYRI SUBCHLORIDUM. CALOMELAS.—*Calomel* (described p. 175, 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 639); 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 to 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 by 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 176). 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.

Lotio Hydrargyri Nigra. Black Mercurial Lotion. Syn. *Black Wash.* (Take of subchloride of mercury, 30 grains; solution of lime, 10 fluid ounces ; 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. The chemical reactions that occur between the ingredients have been already described when treating of the black oxide of mercury (see p. 650). It is employed with benefit in most foul and indolent sores, although not of a venereal origin.

Pilula Hydrargyri Subchloridi Composita. Compound Pill of Subchloride of Mercury. Syn.: *Compound Calomel Pill. Plummer's Pill* (see page 275). Dose as an alterative, gr. v. to gr. x.

Unguentum Hydrargyri Subchloridi, Ointment of Subchloride of Mercury. Syn.: *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 disease.

HYDRARGYRI SULPHAS. *Sulphate of Mercury.* (Syn.: *Persulphate of Mercury, Bipersulphate of Mercury.*) HgO,SO_3 (=148) or $\mathbf{HgSO_4}$ (=296)

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. Entirely volatilized by heat.

USES.—This preparation, the composition of which is HgO,SO_3, is not used in medicine. It is introduced into the Appendix to 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, ℔ij.; 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 the cinnabar is sublimed, oxide of iron or any other earthy matter being left behind ; 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 249, 250). It is sublimed by heat ; potash being added, the mercury runs into globules.

THERAPEUTICAL EFFECTS.—Cinnabar is not used as an internal remedy. It is one of the preparations of the metal occasionally 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 this 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 *Colles' candles* are the best way to employ mercurial fumigation ; one great convenience attending their employment is, that when a sufficient effect has been produced, they can be extinguished, and if not consumed, be relighted as occasion may require. To produce the specific constitutional effects of mercury, however, fumigation should be conducted in the manner already described (page 640). 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 cigars; soak them in a weak solution of nitre, and drop on each cigarette fifteen or twenty minims of the *liquor hydrargyri nitratis acidus;* then dry them; one is 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.*

BOTANICAL CHARACTERS.—A perennial herb, with cordate or reniform, dentato-crenate, smooth, succulent, and somewhat hoary leaves; flowers in simple, sessile, axillary, many-flowered umbels; involucre 4-leaved; petals entire; mericarps semi-orbiculate, compressed.

THERAPEUTICAL EFFECTS.—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.

DOSE AND MODE OF ADMINISTRATION.—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 or 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.

PREPARATION.—By acting upon peroxide of barium with hydrochloric acid a chemical reaction ensues, in virtue of which the chlorine unites with the barium to form chloride of barium, and the two oxygens so liberated 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, $BaCl+HOSO_3=BaOSO_3+HCl$. 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, $AgOSO_3 + HCl = AgCl + HOSO_3$. 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.—f3ss. to f3ss. 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 the Appendix to 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 ʒj. 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. (Take of indigo, dry and in fine powder, five grains; sulphuric acid, ten fluid ounces. Mix the indigo with a fluid drachm of 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 remainder of the acid, 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 wineglassful of infusion of arnica morning and evening.

IODUM. *Iodine.* (A non-metallic element obtained principally from the ashes of sea-weeds.) I (=127) This elementary substance

was first described in 1811 by M. Courtois of Montpelier, who recognised 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 washed 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, sulphurous acid, sulphide of hydrogen gas, and sulphur, which latter 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. Barruel 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, should 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.

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.

CHARACTERS AND TESTS.—In 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. It sublimes without leaving any residue, and the portion that 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 discoloration 1000 grain-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 552. The slender pungent crystals alluded to in the pharmacopœial 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 adopose 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 langour 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 of iodide of potassium will immediately develop this most remarkable train of 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 after tapping, with most successful results, 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. The urine is that generally selected for this purpose; 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. In poisoning with iodine, emetics should be administered, and their operation aided by the use of demulcent and amylaceous drinks, as starch, flower, &c., diffused through tepid water or milk.

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.

PREPARATIONS OF IODINE.—Cadmii Iodidum (see p. 624); Ferri Iodidum (see *Tonics*); Hydrargyri Iodidum Rubrum (see p. 645); Hydrargyri Iodidum Viride (see p. 647); Linimentum Iodi; Linimentum Potassii Iodidi cum Sapone (see p. 686); Liquor Iodi; Pilula Ferri Iodidi (see *Tonics*); Potassii Iodidum (see p. 683); Sulphuris Iodidum (see p. 687); Syrupus Ferri Iodidi (see *Tonics*); Tinctura Iodi; Unguentum Cadmii Iodidi (see p. 626); Unguentum Iodi; Unguentum Plumbi Iodidi (see p. 680); Unguentum Sulphuris Iodidi (see p. 688); Vapor Iodi.

Linimentum Iodi. Liniment of Iodine. (Take of iodine, one ounce and a quarter; iodide of potassium, half an ounce; camphor, a quarter of an ounce; rectified spirit, ten fluid ounces. Dissolve the iodine, iodide of potassium and camphor in the spirit.) This liniment is but half the strength of the Linimentum Iodi, 1864 ; the camphor is now introduced into it for the first time. This preparation is intended solely for external use; it should be applied cautiously, as it is an energetic vesicant, to produce which effect it is well suited.

Liquor Iodi. Solution of Iodine. (Take of iodine, twenty grains; iodide of potassium, thirty grains ; distilled water, one fluid ounce. Dissolve.) Another of the uncalled-for formulas in the Pharmacopœia, one which might well have been kept for extemporaneous prescription. It may be used as a substitute for the tincture for external use, or well diluted with water it may be used for the preparation of solutions such as those of Lugol, described below; but even the pharmacopœial authorities seem at a loss to know what to do with this production of theirs, as they ascribe to it no dose, nor otherwise indicate its proposed use.

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, and is used in the preparation of the Vapor Iodi.

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.

Vapor Iodi. Inhalation of Iodine. (Take of tincture of iodine, 1 fluid drachm; water, 1 fluid ounce. Mix in a suitable apparatus, and, having applied a gentle heat, let the vapour that arises be inhaled.) Another new and most uncalled for preparation, one which will always require extemporaneous prescription.

* *Iodurettted Mineral Waters*, LUGOL. (These solutions are of three strengths—No. 1 containing gr. $\frac{3}{4}$ of iodine and gr. j$\frac{1}{2}$ of iodide of potassium; No. 2. gr. j. of iodine and gr. ij. of iodide of potassium; No. 3, gr. j$\frac{1}{4}$ of iodine, gr. ij$\frac{1}{2}$ 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 for 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 was then 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.

OLEUM MORRHUÆ. *Cod-Liver Oil.* (The oil extracted from the fresh liver of the cod, Gadus Morrhua, *Linn.*, by the application of a heat not exceeding 180°.) 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.

PREPARATION.—Much of the cod-liver oil which is met with in commerce is imported from Newfoundland, and from the North of Europe, where it is prepared by exposing the livers to the sun to putrify, 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 been 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 AND TEST.—Pale yellow, with a slight fishy odour, and bland fishy taste. A drop of sulphuric acid added to a few drops of the oil on a porcelain slab developes a violet colour which soon passes to a yellowish or brownish-red.

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 choleic 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*. Subsequent to this analysis by M. de Jongh, several other chemists have investigated the subject, prominent amongst whom are M. M. Guffroy and Garreau. These chemists had noticed that the substances to which the best authorities attributed the medicinal properties of cod-liver oil, namely iodides, bromides, phosphates and ammoniacal and propylaminous salts, were more soluble in water than in oil; and as cod liver contains a larger proportion of water than oil, they formed the opinion that the waters which exude from the livers at the same time with the oil, must carry off the greater part of those constituents. Chemical analysis followed by practical observations fully confirmed these theoretical views. It has been distinctly proved that the oil contains hardly one-twentieth part of the medicinal elements existing in cod liver, and that the other nineteen-twentieths, being carried away in the waters, have hitherto been lost. By evaporation of these waters they have been reduced to the consistence of an extract, and this extract has been investigated by Professor Garreau with the following results. Ichthyoglycine, 50·000 parts; propylamine, 2·545 ; acetic, lactic, and butyric acids, 6·000 ; phosphoric acid, 2·090 ; sulphuric acid, 0·200; chlorine, 1·525 ; iodine, 0·154 ; bromine, trace ; soda, 1·170; potash, 0·211 ; magnesia, 0·366 ; lime, 0·510 ; ammonia, 2·862 ; extractive matter undetermined, gadin, &c. 10.620; water and loss, 21·847. Total 100·000 parts. It will be observed on referring to this analysis, that two somewhat novel organic substances, namely propylamine and ichthyoglycine, occupy prominent places in this table. The former, as well as several of the inorganic constituents, exists in cod liver oil, but in such minute quantities as generally to escape detection. Cod liver extract is not only rich in this product, but presents it in association with a substance, namely, ichthyoglycine, which, pos-

sessing as it does the properties of the hepatic glucogen of the mammalia—a body of great physiological importance, constantly found by Claude Bernard present in the muscles of healthy vigorous animals, but absent in those of animals suffering from debility or disease—constitutes a most valuable vehicle for the other active constituents.

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, contraindicate 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, however, be 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, as some physicians have suggested, that equal effects are produced by other fatty matters, whether alone or combined artificially with iodine, bromine, &c. Cod-liver oil has been employed in a great number of diseases besides phthisis, including scrofulous abscesses and caries of the bones, arthritis, rickets, strumous ophthalmia, obstinate cutaneous affections and chronic rheumatism. But it appears to be particularly useful in chronic rheumatism, its great value in which affection seems latterly to have been lost sight of since its use in phthisis has been brought so prominently into

notice. Its employment in rheumatism, however, especially in the northern latitudes, dates many years before its value in phthisical complaints had been signalised. 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 in 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 cod-fish 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 stated 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. M. Guffroy has utilized the facts ascertained by M. Garreau's analysis of the extract already alluded to when discussing the chemical history of cod-liver oil, by making them up into pills, and coating them with sugar, in fact converting them into what the French term

dragées. Each of these dragées weighs about five grains, and one of them is stated to represent the therapeutic value of a tablespoonful of the oil. Whilst regarding this as a most extravagant estimate of their value, I am free to confess that I have been agreeably surprised with their real merits. I have prescribed them extensively with decided benefit, both in the Meath Hospital and in private practice. Their being tasteless, if swallowed whole, and not crunched, adds materially to their importance as a remedial agent; latterly I have employed them almost exclusively in place of the oil. 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.* (The seeds of Strychnos Nux Vomica, *Linn. Steph. and Church. Med. Bot.*, plate 52. 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, irregularly branched, and destitute of spines or tendrils, leaves opposite, entire, oval, shining, leathery, 5-nerved; flowers in small terminal corymbs, calyx with 5 small teeth; corolla funnel-shaped, smooth within, of a greenish-yellow colour; stamens 5, inserted on the corolla, with very short filaments; ovary 2-celled, with a filiform style and capitate stigma; fruit globose, 1-celled, with a smooth, hard, orange-coloured shell and numerous discoid seeds immersed in a soft white pulp.

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-grey 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).

CHARACTERS.—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.

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; it is officinal in the British Pharmacopœia, and will be presently more minutely described (see next article). *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. Its further chemical history is so intimately associated with that of strychnia, that I shall not enter into it more fully here, but shall refer my readers to the next article for further information on this point.

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 or its alkaloid strychnia appears to act as a tonic; but in somewhat larger doses they operate as special stimulants to the medulla oblongata and spinal marrow, without affecting the sensorium. Their 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. They are very active poisons, 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, and spastic rigidity of the muscles, continuing in many cases, even after death, for a long time. In fatal cases death generally occurs within two hours from the ingestion of the poison; the most rapidly fatal case I know of was communicated to me by Mr. Porter, where it was clearly proved that the patient was dead within six minutes after taking the poisonous dose of strychnia. As medicinal agents, the principal use of nux-vomica or of strychnia is in the treatment of chronic paralytic affections; but as they do not prove equally serviceable in all forms of paralysis, and in some prove absolutely injurious, it will be necessary to state the circumstances which demand or contra-indicate their 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 or strychnia always proves injurious, unless the inflammatory action had been previously sub-

dued, or a length of time had elapsed since the effusion had taken place. They prove beneficial more frequently in general than in partial paralysis, and in paraplegia than in hemiplegia. They are, however, often of service in palsy of certain organs, as 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 they appear 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 occasionally successful in the treatment of amenorrhœa, of hypochondriasis, of dyspepsia, of gastrodynia, of prolapsus ani, of prurigo, of impotence; in the last of which affections considerable benefit will frequently follow its exhibition; but the benefit is not of a permanent character, as on the medicine being omitted the patient but too frequently becomes as bad as ever. It is remarkable that when administered in paralysis the perceptible effects, previously described, of nux-vomica, such as the twitchings, bitter taste, perspirations, etc. are principally, though not, as was at one time imagined, entirely confined to the paralysed parts. No matter how administered, great attention is requisite during the use of nux-vomica or of its alkaloids, 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 clearly prove 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 effects 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.

DOSE AND MODE OF ADMINISTRATION.—Nux-vomica may be administered in powder, in doses of gr. ij. gradually increased to gr. v.

PREPARATIONS.—Extractum Nucis Vomicæ; Strychnia (see next preparation); Tinctura Nucis Vomicæ, forty-four grains to one fluid ounce.

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 the consistence of a soft extract.) Dose, gr. ss. gradually increased to gr. iij. in the form of a 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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the 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.* $C_{42}H_{22}N_2O_4$ (=334) or $\mathbf{C_{21}H_{22}N_2O_2}$ (=334). An alkaloid prepared from Nux Vomica. It may be obtained by the following process:—

PREPARATION.—Take of nux vomica, one pound; acetate of lead, one hundred and eighty 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 con-

venient vessel; chop or slice; dry it in a water-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 in a water-bath or hot air chamber, 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 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 AND TESTS.—In right square octahedrons or prisms, colourless and inodorous; sparingly soluble in water, but communicating to it its intensely bitter taste; soluble in boiling rectified spirit, and in chloroform, but not in absolute alcohol or in ether. 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. Not coloured by nitric acid; leaves no ash when burned with free access of air. A very active poison.

CHEMICAL CHARACTERS.—*Strychnia* crystallizes in colourless minute octahedrons, 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. The play of colours described in the pharmacopœial tests as occurring on the addition of bichromate of potash is very characteristic of this alkaloid.

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.

THERAPEUTICAL EFFECTS.—These have been already considered under the head of nux vomica (which see); no difference, so far as my clinical experience goes, being to be observed in their physiological effects.

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 a 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 f3ij. 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. $\frac{1}{4}$ 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.

* PEPSINA. *Pepsine. Medicinal pepsine.* The active principle of the gastric juice in animals. Pepsine combined with starch.

PREPARATION.—The following process is 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 acidifiée)* 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 undeservedly somewhat into disuse. In many cases of impaired digestion attended with gastrodynia, acid eructations, flatulence, nausea; when portions of undigested food are found in the dejecta, giving rise to diarrhœa; in many forms of disease of the stomach itself, the preparations of pepsine hereafter described will, however, be found important auxiliaries to more special remedies.

DOSE AND MODE OF ADMINISTRATION.—Numerous preparations, solutions, wines, syrups, &c. of pepsine have had their proposers and supporters, but M. Boudault's powder, Messrs. Bullock and Loyd's *pepsina porci*, or the wine, as hereafter described, are the only ones deserving of use. Bullock and Loyd's pepsine, as the name would indicate, is prepared from the stomach of the pig. From my expe-

rience of it I consider it the most energetic of all the preparations I have hitherto met with of pepsine, two to five grains of it doing far more work than thirty of Boudault's. The powder may be given in doses of 15 grains of Boudault's, or from three to five of Bullock's preparation (which in my opinion should invariably be selected), immediately before or at 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 Pepsinæ. Wine of Pepsine,* ELLIS. (Take the stomach of a calf fresh from the butcher, cut off three or four inches of the upper or cardiac extremity, which, containing few glandular follicles, may be rejected. Slit up the stomach longitudinally, and wipe it carefully, removing as little of the clean mucus as possible; cut it up in very small pieces, and put it into a wine bottle; fill the bottle with good sound sherry, and let it remain well corked for a fortnight, when it will be fit for use.) Dose, one teaspoonful in half a wineglassful of water at or after meals. To test the goodness of a sample, Dr. Ellis directs us to warm to a blood heat a small cup of milk, to add to it a teaspoonful of the wine, when, if it be genuine, in two or three minutes the milk will become as solid as blanc mange.

PHYSOSTIGMATIS FABA. *Calabar Bean.* (The seed of the Physostigma venenosum, *Balfour, Trans. Royal Soc. Edinb.*, vol, xxii. page 305. Western Africa.) Syn.: *Physostigma Venenosum. 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 tubers 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. Hilum dark, sulcate, extending along the whole convex placental edge of the seed, other edge straight. Cotyledons pale, hypogeal.—BALFOUR.

CHARACTERS.—About the size of a very large horse-bean, with a very firm, hard, brittle, shining integument, of a brownish-red, pale-chocolate, or ash-grey colour. Irregularly kidney-shaped, with two flat sides, and a furrow running longitudinally along its convex margin, ending in an aperture near one end of the seed. Within the shell is a kernel consisting of two cotyledons, weighing on an average about 46 grains, hard, white, and pulverisable, of a taste like that of the ordinary edible leguminous seeds, without bitterness, acrimony, or aromatic flavour. It yields its virtues to alcohol and imperfectly to water.

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. Dr. T. R. Frazer, M. Giraldès, Professor Harley, and Professor Mapother, have subsequently studied its physiological effects, and as the result of their investigations we may accept it as proved that Calabar bean paralyzes striped and unstriped muscular fibre; causes dilatation of the blood vessels; augments the secretions, more especially those of the

mucous alimentary glands; contracts the pupils, and in its action is antagonistic to strychnia; in fact in all these respects it seems to modify the activity of the vaso motor nervous system. A similarity between the symptoms produced by stimulation by galvanization of the superior cervical ganglion in the lower animals, and those produced by cholera in the human subject, suggested to the mind of Professor Mapother the idea of employing Calabar bean as a remedy in this disease; an opportunity was afforded him of submitting his views to the *experimentum crucis* in the cholera wards of the Meath Hospital during the invasion of our last epidemic (1866), and so far as my observations go, I think that I am but expressing Dr. Mapother's own opinion, when I state that the subject requires still further investigation. The principal 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. For this important addition to our ophthalmic therapeutics we are indebted to Drs. Frazer, Robertson, Wells, &c. 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. 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 at first emetics, then strong coffee and diffusible stimulants.

DOSE AND MODE OF ADMINISTRATION.—1 to 4 grains of the powder either in pill or powder; or in the form of extract.

PREPARATION.—Extractum Physostigmatis.

Extractum Physostigmatis. Extract of Calabar Bean. (Take of calabar bean, in coarse powder, one pound; rectified spirit, four pints. Macerate the bean for forty-eight hours with one pint of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, add the remainder of the spirit so that it may slowly percolate through the powder. Subject the residue of the bean to pressure, adding the pressed liquid to the product of the percolation; filter, distil off most of the spirit, and evaporate what is left in the retort by a water-bath to the consistence of a soft extract.) Dose, 1-16th to 1-4th of a grain.

PLUMBI IODIDUM. *Iodide of Lead.* PbI (=230·5) or PbI_2 (=461)

PREPARATION.—Take of nitrate of lead, iodide of potassium, of each, four ounces; distilled water, a sufficiency. Dissolve the nitrate of lead, by the aid of heat, in a

pint and a half, and the iodide of potassium in half a pint of the water, and mix the solutions. Collect the precipitate on a filter, wash it with distilled water, and dry it at a gentle heat.

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 PbI.

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. 134); 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, Neligan used it with excellent results, and his increased experience confirmed the opinions he published on its efficacy in this disease, for which he was the first to propose its employment.* It is also used with occasional 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 in such cases as actively promotive of absorption as the other preparations of iodine.

DOSE AND MODE OF ADMINISTRATION.—Internally administered, gr. iij. to gr. v. made into pill with conserve of roses or extract of liquorice; externally, in the following forms.

PREPARATIONS.—Emplastrum Plumbi Iodidi, 1 part in 9; Unguentum Plumbi Iodidi, 1 part in 8.

Unguentum Plumbi Iodidi. Ointment of Iodide of Lead. (Take of iodide of lead, in fine powder, 62 grains; simple ointment,

* *Neligan on Diseases of the Skin*, by Belcher, 1866. *Neligan on Diseases of the Scalp*, 1848, p. 43; and *Dublin Quarterly Journal of Medical Science*, new series, vol. viii. p. 164.

1 ounce. Mix thoroughly.) 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.

Emplastrum Plumbi Iodidi. Iodide of Lead Plaster. (Take of iodide of lead, 1 ounce; soap plaster, resin plaster, of each, 4 ounces. Add the iodide of lead in fine powder to the plasters previously melted, and mix them intimately.) A very useful application over the seat of chronic glandular enlargements.

INCOMPATIBLES.—Sulphuric and carbonic acids; and their salts.

POTASSII BROMIDUM. *Bromide of Potassium.* KBr (=119) or **KBr** (=119) May be obtained by the following process :—

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 colourless cubical crystals, with no odour, but a pungent saline taste, readily soluble in water, less soluble in spirit. Its aqueous solution gives a white crystalline precipitate with tartaric acid. When its solution in water is mixed with a little chlorine, chloroform agitated with it, on falling to the bottom, exhibits a red colour. Ten grains require for complete decomposition 840 grain-measures of the volumetric solution of nitrate of silver. A solution of the salt mixed with mucilage of starch and a drop of an aqueous solution of bromine or chlorine does not exhibit any blue colour.

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 decre-

pitate, 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 pharmacopœial characters, is cream of tartar, indicative of its being a salt of potash, whilst the red colour assumed by the choroform is due to its having dissolved the bromine, set free from the salt on the addition of chlorine, thus, $KBr+Cl=KCl+Br$.

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, whilst admitting for it other and widely different physiological effects, 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. 618), have been in my experience most justly attributed to this salt also, and its use under precisely similar conditions has been much insisted upon. It also possesses equal effects with the bromide of ammonium in the treatment of nymphomania, priapism, ovarian excitement, &c. In the vigilia attendant upon cerebral excitement consequent upon an overwrought brain, combined with some of the preparations of hop, it is a most valuable remedy. Externally it has been employed in the form of ointment to scrofulous and indolent swellings.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. xxx. 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) or **KI** (=166) It may be obtained by the following process:—

PREPARATION.—Take of solution of potash, one gallon; iodine, twenty-nine ounces, or a sufficiency; wood charcoal, in fine powder, three ounces. 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, pulverise 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.

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 *iodureted 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.

CHARACTERS AND TESTS.—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. 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 saccharated solution 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. In the pharmacopœial tests allowance is made for the presence of a trace of this impurity; as its aqueous solution may become faintly turbid on the addition of a saccharated solution of lime. 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, $KI+2HO,C_8H_4O_{10}=KOHO,C_8H_4O_{10}+HI$. 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 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 as yet been 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 CONTAINING IODIDE OF POTASSIUM.—Linimentum Iodi (see p. 665), twenty-two grains in one fluid ounce, nearly; Linimentum Potassii Iodidi cum Sapone, fifty-four grains and a half in one fluid ounce, nearly; Liquor Iodi (see p. 665), thirty grains in one fluid ounce; Tinctura Iodi (see p. 665) five grains and a half in one fluid ounce, nearly; Unguentum Iodi Compositum (see p. 665), sixteen grains in one ounce, nearly; Unguentum Potassii Iodidi, one part in eight and three quarters, nearly.

Linimentum Potassii Iodidi cum Sapone. Liniment of Iodide of Potassium and Soap. (Take of hard soap, cut small, iodide of of potassium, of each, one ounce and a half; glycerine, one fluid ounce; oil of lemon, one fluid drachm; distilled water, ten fluid ounces.) A useful liniment in cases of enlarged glands, &c., where the external application of the iodide is likely to prove beneficial.

Unguentum Potassii Iodidi. Ointment of Iodide of Potassium. (Take of iodide of potassium, sixty-four grains; carbonate of potash, four grains; distilled water, one fluid drachm; prepared lard, one ounce. Dissolve the iodide of potassium and carbonate of potash 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. In the last edition of this work I remarked that "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;" and in the present pharmacopœial preparation this provision has been adopted by the employment of carbonate of potash, which fulfils a similar indication.

* SODII IODIDUM. *Iodide of Sodium.* NaI=150 or **NaI**=150. Syn.: *Hydriodate of Soda.* This salt is not contained in the British Pharmacopœia.

PREPARATION.—Take of iron filings, ℥iij.; distilled water, ℥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.

EXPLANATION OF PROCESS.—The first step in this process is to unite the iodine with the iron, this is effected by simply boiling them together, the iodine and iron directly uniting to form protoiodide of iron; by filtration, any excess of iron, as also the carbon, invariably present as an impurity in the iron of commerce, are gotten rid of; and on the addition to the solution of the carbonate of soda, double decomposition takes place, iodide of sodium being formed which is held in solution, and carbonate of iron which is precipitated, becoming rapidly converted into sesquioxide of iron, with escape of carbonic acid. This equation represents the decomposition that takes place in the process :—$FeI + NaOCO_2 = NaI + FeOCO_2$.

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 686).

SULPHURIS IODIDUM. *Iodide of Sulphur.* (Syn.: *Sulphur Iodatum. Iodated Sulphur.* $S_2I = 159$ or **SI** = 159.)

PREPARATION.—Take of iodine, four ounces; sublimed sulphur, one ounce. Rub them together in a wedgwood mortar until they are thoroughly mixed. Put the mix-

ture into a flask, close the orifice loosely, and apply a gentle heat so that the colour of the mass shall become gradually darkened. When the colour has become uniformly dark throughout, increase the heat so as to produce liquefaction. Then incline the flask in different directions, in order to return into the liquid any portion of the iodine which may have been condensed on the inner surface of the vessel. Lastly, withdraw the heat, and when the liquid has congealed, remove the mass by breaking the flask, reduce it to pieces, and keep these in a well-stopped bottle.

EXPLANATION OF PROCESS.—A simple case of union between the sulphur and the iodine, two atoms of sulphur uniting with one of iodine to form the salt thus, $2S+I=S_2I$.

CHARACTERS AND TESTS.—A greyish black solid substance, with a radiated crystalline appearance. It resembles iodine in smell, and in the property of staining the cuticle when applied to it. Soluble in about sixty parts of glycerine; insoluble in water, but decomposed when boiled with it. If 100 grains be thoroughly boiled with water the iodine will pass off in vapour and about 20 grains of sulphur will remain.

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. 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. Neligan's experience of it in chronic lichenoid eruptions, in the local forms of psoriasis, and in acne indurata, was very favourable.*

DOSE AND MODE OF ADMINISTRATION.—Internally administered, from gr. j. to gr. iij. three times daily in pill. Externally the following preparation may be used:—

Unguentum Sulphuris Iodidi. Ointment of Iodide of Sulphur. (Take of iodide of sulphur, 30 grains; prepared lard, 1 ounce. Triturate the iodide of sulphur in a porcelain mortar, and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.) A stronger ointment than this may be used in many cases.

INCOMPATIBLES.—Acids; acidulous and metallic salts.

---

* See *Neligan on Diseases of the Skin*, by Belcher, 1866.

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 more 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 cannot 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 saltwater 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 quinia 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 83).

ACIDUM HYDROCHLORICUM DILUTUM. *Diluted Hydrochloric Acid.* Syn.: *Acidum Muriaticum Dilutum*, Edin.

PREPARATION.—Take of hydrochloric acid, eight fluid ounces; distilled water, a sufficiency. Dilute the acid with 16 ounces of the water, then add more water, so that at a temperature of 60° it shall measure 26½ fluid ounces. Or as follows.—Take of hydrochloric acid, 3060 grains; distilled water, a sufficiency. Weigh the acid in a glass flask the capacity of which, to a mark on the neck, is one pint, then add distilled water until the mixture, at 60° temperature, after it has been shaken, measures a pint.

EXPLANATION OF PROCESS.—A simple case of dilution with distilled water of the strong acid to the required density; the process for obtaining the strong acid has been already commented upon (see p. 234). The present dilute acid agrees in strength with the corresponding acid of the Edinburgh, and is rather stronger than that of the London and Dublin Pharmacopœias.

TESTS.—Specific gravity, 1·052. 345 grains by weight (6 fluid drachms) require for neutralisation 1000 grain-measures of the volumetric solution of soda, corresponding to 10·58 per cent. of real acid. Six fluid drachms contain one equivalent or 36·5 grains of hydrochloric acid HCl or **HCl**.

THERAPEUTICAL EFFECTS.—Hydrochloric acid when properly di-

luted, 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. x. to min. xxx. It should be administered largely diluted with some bitter infusion, as of quassia, or of gentian, or it may be substituted for sulphuric acid in preparing the infusion of roses; f℥j. to f℥ij. may be added to an eight ounce gargle.

PREPARATIONS IN WHICH DILUTED HYDROCHLORIC ACID IS USED.—Liquor Morphiæ Hydrochloratis; Liquor Strychniæ.

INCOMPATIBLES.—Alkalies; tartar emetic; tartrate of potash; nitrate of silver; acetate of lead; and all carbonates and bicarbonates.

Acidum Nitricum Dilutum. *Diluted Nitric Acid.*

PREPARATION.—Take of nitric acid, 6 fluid ounces; distilled water, a sufficiency. Dilute the acid with 24 fluid ounces of the water, so that at a temperature of 60° it shall measure 31 fluid ounces. Or as follows:—Take of nitric acid, 2400 grains; distilled water, a sufficiency. Weigh the acid in a glass flask, the capacity of which, to a mark on the neck, is one pint, then add distilled water until the mixture at 60° temperature, after it has been shaken, measures a pint.

EXPLANATION OF PROCESS.—A simple case of dilution with distilled water of the strong acid to the required density; the process for obtaining the strong acid has been already commented upon (see p. 236). The present dilute acid is somewhat stronger than the corresponding acids in the Dublin, Edinburgh, or London Pharmacopœias, approaching nearer in strength that of the Dublin Pharmacopœia.

CHARACTERS AND TESTS.—Colourless. Specific gravity, 1·101. 361·3 grains by weight (6 fluid drachms) require for neutralisation 1000 grain-measures of the volumetric solution of soda, corresponding to 14·95 per cent. of anhydrous nitric acid. Six fluid drachms therefore correspond to 54 grains of the anhydrous acid (one equivalent of NO_5, or half an equivalent of N_2O_5).

THERAPEUTICAL EFFECTS.—Nitric acid, 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 dis-

eases. 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. x. to min. xxx. It may be administered in the same form as diluted hydrochloric acid; but for the treatment of secondary syphilis 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, bicarbonates, and sulphurets.

ACIDUM NITRO-HYDROCHLORICUM DILUTUM. *Diluted Nitro-Hydrochloric Acid.*

PREPARATION.—Take of nitric acid, three fluid ounces; hydrochloric acid, four fluid ounces; distilled water, twenty-five fluid ounces. Mix the acids, and allow them to remain for twenty-four hours in a bottle the mouth of which is partially closed, then add the water in successive portions, shaking the bottle after each addition, and preserve the mixture in a stoppered bottle.

EXPLANATION OF PROCESS.—The reactions that ensue on the admixture of these two acids have been already described, when commenting upon the process I have given for the preparation of the strong acid (see p. 238). The varying nature of this acid renders it almost if not quite impossible to give a satisfactory per-centage of its composition; the diluted solution here ordered appears from its saturating properties to approximate the same strength as the diluted solutions of the other mineral acids, being however somewhat stronger than they are.

CHARACTERS AND TESTS.—Colourless. Specific gravity, 1·074. 352·4 grains by weight (6 fluid drachms) require for neutralization 920 grain-measures of the volumetric solution of soda.

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 an evidence of its salutary influence.

DOSE AND MODE OF ADMINISTRATION.—Internally min. x. to min. xxx.

* *Balneum Acidi Nitro-Hydrochlorici.* Strong nitro-hydrochloric acid, f℥ivss.; water, cong. iij.; mix in a wooden vessel. This is to be used daily in the form of 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. A very convenient modification of this bath is to saturate in the acid diluted, as here directed for the bath, a swathe of linen or flannel about nine inches wide, and long enough to go twice round the body; to apply this round the waist and to cover it with a broad band of oiled silk: so worn it will keep moist for several hours, and will act as well as the bath. When employed either as a bath, or in this way, it very frequently produces a tingling or prickling sensation over the person, which is to be looked on as a satisfactory result.

* *Mistura Acidi Nitro-Hydrochlorici,* MACNAMARA. (Dilute nitric acid, f℥j.; dilute hydrochloric acid, f℥ij.; syrup of roses, f℥ss.; infusion of roses, to f℥viij.; mix.) Dose, f℥ss. to f℥j. 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. *Diluted Phosphoric Acid.* (Phosphoric acid, $3HO,PO_5$ (=98) or $\mathbf{H_3PO_4}$ (=98) dissolved in water and corresponding to 10 per cent. by weight of anhydrous phosphoric acid, PO_5 (= 71) or $\mathbf{P_2O_5}$ (= 142).

PREPARATION.—Take of phosphorus, 413 grains; nitric acid, 6 fluid ounces; distilled water, a sufficiency. Put the nitric acid diluted with eight ounces of distilled water into a tubulated retort connected with a Liebig's condenser, and having added the phosphorus, apply a gentle heat so as slowly to distil five fluid ounces of liquid. Return this to the retort, and continue the distillation, occasionally returning the distillate, until the phosphorus has entirely disappeared. Transfer the contents of the retort to a porcelain dish of hard well-enamelled ware, and evaporate the liquid until it is reduced to four fluid ounces; then transferring it to a platinum vessel, continue the evaporation until it is reduced to about two fluid ounces, and orange-coloured vapours are no longer formed. Mix it now with distilled water until when cold it measures 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 pro-

cess 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.

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 by 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. This precipitate is soluble in either ammonia or nitric acid, whereby it is distinguished from chloride of silver, which is insoluble in nitric acid. In some works on chemistry the monobasic, bibasic, and tribasic acids, with the object of briefly distinguishing them, are respectively written thus, aPO_5, bPO_5, cPO_5.

CHARACTERS AND TESTS.—A colourless liquid with a sour taste and strongly acid reaction. Specific gravity, 1.08. With ammonio-nitrate of silver it gives a canary-yellow precipitate soluble in ammonia and in diluted nitric acid. Evaporated it leaves a residue which melts at a low red heat, and upon cooling exhibits a glassy appearance. 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 solution of sulphate of iron, it does not communicate to it a dark colour. Mixed with an equal volume of solution of perchloride of mercury and heated, no precipitate is formed. 355 grains by weight of it poured upon 180 grains of oxide of lead in fine powder leave by evaporation a residue (principally phosphate of lead), which after it has been heated to dull redness weighs 215.5 grains. Six fluid drachms therefore correspond to 35·5 grains of anhydrous phosphoric acid (half an equivalent of PO_5, or a quarter of an equivalent of P_2O_5).

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. 112. Were it affected by sulphuretted hydrogen, metallic impurities would be indicated; if by chloride of barium, sulphuric acid; and if by nitrate of silver, acidulated with nitric acid, hydrochloric acid is present; whilst,

did it coagulate albumen, it would be the monobasic, not the tribasic acid. Were a precipitate formed on its being mixed with an equal volume of a solution of perchloride of mercury, and heated, it would indicate the presence of phosphorous acid, a most serious contamination. Were phosphorous acid present, the perchloride of mercury would be converted into calomel, which of course, being insoluble, would precipitate, thus, $4HgCl+2HO+PO_3=2Hg_2Cl+2HCl+PO_5$. This acid is stronger than the acid bearing the same name in the London Pharm., in the proportion of 10 to 8.7.

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. Huss 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 been suggested, on theoretical grounds, 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 kinds of food, especially those 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. In

cases of poisoning with this acid the same treatment should be followed as in poisoning with hydrochloric acid (see p. 235).

DOSE AND MODE OF ADMINISTRATION.—Min. x. to min. xxx. properly diluted.

PREPARATION CONTAINING FREE PHOSPHORIC ACID.—Syrupus Ferri Phosphatis. *Officinal Phosphates.* Ammoniæ Phosphas; Calcis Phosphas; Ferri Phosphas; Os Ustum; Sodæ Phosphas.

INCOMPATIBLES.—Lime water; calcareous salts; alkaline carbonates and bicarbonates; and strychnia.

ANTHEMIDIS FLORES. *Chamomile Flowers.* (The dried single and double flower-heads of the common chamomile, Anthemis nobilis, *Linn.; Engl. Bot.* vol. xiv. plate 980. Wild and cultivated.) Indigenous, belonging to the Natural family *Compositæ (Asteraceæ*, Lindley), and to the Linnæan class and order *Syngenesia Superflua.*

BOTANICAL CHARACTERS.—A perennial herb; stem about a foot long, procumbent; leaves bipinnate, a little downy; the segments narrow-linear and pointed; flower-heads on terminal peduncles, florets of the ray white; involucre hemispherical, the bracts, especially the inner ones, scarious on the edges; scales of the receptacle oblong, obtuse, and nearly as long as the central florets; achenes angular and almost destitute of pappus.

CHARACTERS.—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; both varieties, but especially the single, are bitter and very aromatic.

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 exceed-

ingly 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.

PREPARATIONS.—Extractum Anthemidis; Infusum Anthemidis, half an ounce to ten fluid ounces; Oleum Anthemidis.

Extractum Anthemidis. Extract of Chamomile. (Take of chamomile flowers, one pound; oil of chamomile, fifteen minims; distilled water, one gallon. Boil the chamomile with the water until the volume is reduced to one half, then strain, press, and filter. Evaporate the liquor by a water-bath until the extract is of a suitable consistence for forming pills, 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.) Dose, 1 to 4 fluid ounces. If taken warm this infusion produces vomiting.

Oleum Anthemidis. Oil of Chamomile. (The oil distilled in Britain from chamomile flowers.) This oil is of pale blue or greenish-blue colour, but on keeping gradually becomes yellow; it has the peculiar odour and aromatic taste of the flowers; its dose is from one to five minims, but the principal object in introducing it into the Pharmacopœia is for its employment in the preparation of the extract.

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.* AgCl=143·5, or **AgCl**=143·5.

PREPARATION.—This salt is readily obtained by the double decomposition of solutions of nitrate of silver and of chloride of sodium; the oxygen and nitric acid of the nitrate of silver going to the sodium of the chloride of sodium to form nitrate of soda, which is held in solution, and the chlorine going to the silver to form

chloride of silver, which is precipitated, thus :—$AgONO_5 + NaCl = NaONO_5 + AgCl$.

CHARACTERS.—When first precipitated it is white, but on exposure to light soon acquires a dark brown, almost black colour. It is insoluble in water, in nitric acid, or in alcohol, but is soluble in ammonia, 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, as is asserted, 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, which latter fact, however, is urged as an argument in favour of its substitution as a remedial agent for the nitrate. Whilst admitting that such a change does take place on the ingestion into the stomach of the nitrate of silver, I am by no means prepared to admit that the two salts are of equal therapeutic value; such an argument might as well be applied to their use for ophthalmic purposes, where we see the nitrate rapidly becoming converted into the chloride of silver; but before this decomposition is perfected, the nitrate of silver has exercised its therapeutic action. So in my opinion is it with this salt when introduced into the stomach. It is true it is converted into chloride of silver, but before that occurs it produces its specific action over the mucous membrane of that viscus.

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 p. 243 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 powerful 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 satisfactory 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 was no instance on record where the complexion had been affected by the medicine when restricted to three months' administration. The late Dr. A. T. Thompson suggested the combined use of dilute nitric acid to prevent the decomposition of the nitrate; others have suggested the substitution for it of the chloride of silver (which see) whilst 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 685). 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, recourse should be had to the usual antiphlogistic means.

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.

ARGENTI OXIDUM. *Oxide of Silver.* AgO (=116) or $\mathbf{Ag_2O}$ (=232).

PREPARATION.—Take of nitrate of silver, in crystals, ½ ounce; solution of lime, 3½ pints; distilled water, 10 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 AND TESTS.—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. Twenty-nine 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 rubbed up with ℥j. of lard.

ARSENICUM ALBUM. *Arsenious Acid. White Oxide of Arsenic. Arsenic* (described p. 247 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 taken in large doses the symptoms come on at varying periods, in some cases within a few minutes after being swallowed, in others perhaps not until the lapse of some hours. They usually commence with a burning sensation in the stomach, a feeling of faintness and nausea, followed by vomiting and purging, unquenchable thirst, heat and dryness of the throat and œsophagus, violent cramps, hiccough, coma, and death, which on the average of cases occurs in from eighteen to twenty-four hours. The period which may elapse between the ingestion of the poison and the fatal termination of the case is open to great variation; in some instances death having occurred at a very early stage, in others at a very protracted period—days having elapsed before the termination of the case. 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; emaciation; hæmoptysis; thirst; peculiar sensations of constriction about the fauces and œsophagus; irritation of the

mucous membrane of the alimentary canal; nausea; occasional vomiting; tormina; cramps; and a peculiar cutaneous eruption, *eczema arsenicale*. I have also noticed in some cases sharp headache, and frequently occurring flushings of the face, 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. Should also the urine during its administration become high coloured and scanty with deposits of lithate of ammonia, its use should no longer be persevered in; a loaded tongue, especially at the tip and edges, is also an indication that its use is beginning to disagree. So far from considering the development of these symptoms of *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 they do not occur. 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 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 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.

DOSE AND MODE OF ADMINISTRATION.—The employment of arsenic as a remedy requires great caution, and its effects must be carefully watched; 1-16 to 1-8 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 hereafter are usually preferred. Should any preparation of arsenic be prescribed for persons who are liable to derangement of the digestive organs (and indeed in every case, but essentially so in theirs) it is advisable that the dose should be always taken immediately *after* meals.

* *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 some time without producing benefit.

Each pill contains about 1-13th of a grain of arsenious acid. Dose, one or two daily.

LIQUOR ARSENICALIS. *Arsenical Solution.* Syn.: *Liquor Potassæ Arsenitis*, Lond. *Fowler's Solution. (Tasteless Ague Drop.)*

PREPARATION.—Take of arsenious acid, in powder, carbonate of potash, of each, 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.

EXPLANATION OF PROCESS.—By the action of the arsenious acid upon the carbonate of potash, its carbonic acid is expelled, and an arsenite of potash formed thus:—$2KOCO_2 + AsO_3 = 2KO,AsO_3 + 2CO_2$. The object with which the compound tincture of lavender is added is that by communicating to the arsenical solution, taste, smell, and colour, it may not be mistaken for a less dangerous medicine.

CHARACTERS AND TESTS.—A reddish liquid, alkaline to test paper, and having the odour of lavender. Specific gravity, 1·009. After being acidulated with hydrochloric acid it gives, with sulphuretted hydrogen, a yellow precipitate, which is brightest when the arsenical solution has been previously diluted. 441·5 grains by weight (1 fluid ounce) boiled for five minutes with ten grains of bicarbonate of soda and when cold diluted with six fluid ounces of water, to which a little mucilage of starch has been added, does not give with the volumetric solution of iodine a permanent blue colour until 808 grain-measures have been added; corresponding to 4 grains of arsenious acid in one fluid ounce.

CHEMICAL HISTORY.—The chemical history of arsenious acid has been already given (see p. 248), all that remains is to explain the principle upon which the pharmacopœial test is founded, which indeed has been partially discussed at p. 248, and to which I would refer my readers to enable them more thoroughly to comprehend the principles of this test. 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 thousand measures of the volumetric solution represent 4·95 grains of arsenious acid, so that 808 measures are equivalent to 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.

THERAPEUTICAL EFFECTS.—For those, which are in every respect identical with those of arsenious acid, I must refer the reader to what has been already written under its heading, Liquor Arsenicalis being but a convenient form for the internal administration of arsenious acid, inasmuch as the arsenic, in itself difficult of solution, is here presented to the system in a soluble form, and means are also afforded us by its use of measuring the dose of this highly poisonous substance with the utmost accuracy.

DOSE AND MODE OF ADMINISTRATION.—In my opinion, arsenic or any of its preparations should always be commenced in minute doses, gradually and cautiously to be increased, so of this preparation we should commence with two minims, to be increased up to ten. It should be always given in the form of draught, whereby we have a definite quantity for each dose, and run no risk of an overdose. The dose should be taken after meals. It may be administered in plain water to which some flavouring syrup or tincture has been added, but in cutaneous affections it is best administered in combination with the preparations of sarsaparilla, dulcamara, or elm bark.

* *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.

* *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. Neligan 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.

INCOMPATIBLES.—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 HYDROCHLORICUS. *Hydrochloric Solution of Arsenic.* (Syn: *De Valangin's Mineral Solution.*)

PREPARATION.—Take of arsenious acid, in powder, eighty grains; hydrochloric acid, two fluid drachms; distilled water, a sufficiency. Boil the arsenious acid with the hydrochloric acid and four ounces of the water until it is dissolved, then add distilled water to make the bulk up to one pint.

---

* See Neligan's *Treatise on Diseases of the Skin*, by Belcher, Dublin, 1866.

EXPLANATION OF PROCESS.—This preparation appears to be simply a solution of arsenious acid in hydrochloric acid; an analogous preparation was formerly contained in the London Pharmacopœia, under the name of *Liquor Arsenici Chloridi*, from which, however, as well as De Valangin's original formulary, the present preparation differs in being three times their strength. This increase in strength has in my opinion been judiciously adopted, inasmuch as it makes it correspond in strength with the liquor arsenicalis; it being obviously desirable in the case of such powerful poisons to remove as much as possible, by having them of the same strength, all risk of mistakes in compounding which otherwise might arise.

CHARACTERS AND TESTS.—A colourless liquid, having an acid reaction. Specific gravity 1·009. Sulphuretted hydrogen gives at once a bright yellow precipitate. 441·5 grains by weight (one fluid ounce) boiled for five minutes with twenty grains of bicarbonate of soda, and then diluted with six fluid ounces of distilled water to which a little mucilage of starch has been added, does not give with the volumetric solution of iodine a permanent blue colour until 808 grain-measures have been added; corresponding to 4 grains of arsenious acid in one fluid ounce.

CHEMICAL PROPERTIES.—In every important respect the chemical history of this preparation corresponds with those of the liquor arsenicalis, reference to which will also explain the pharmacopœial volumetric test.

THERAPEUTICAL EFFECTS.—By many this is preferred to any other preparation of arsenic for internal use, as being less liable to derange the digestive organs; and increased experience of its effects since the fourth edition of this book was published induced Neligan to alter the opinion then expressed, and to recommend it as a safe and useful preparation in many cases. Its special application to the several diseases likely to be benefited by its administration will be learned by reference to the therapeutical uses of white arsenic (see p. 701). Should symptoms of poisoning arise from the incautious use of either this solution or of liquor arsenicalis, they are to be treated in the manner described p. 702.

DOSE AND MODE OF ADMINISTRATION.—Min. ij. gradually and cautiously increased up to min. x. in the form of draught. The observations made upon these points when discussing Fowler's solution are also equally applicable to this preparation.

AURANTII CORTEX. *Bitter-Orange Peel.* (The dried outer part of the rind of the bitter orange, Citrus Bigaradia, *Risso, Hist. Nat. des Orang.* plate 30. From the ripe fruit imported from the south of Europe).

AQUA AURANTII FLORIS. *Orange-Flower Water.* (The distilled water of the flowers of the bitter orange tree, Citrus Bigaradia, *Risso, Hist. Nat. des Orang.* plate 30; and of the Sweet Orange tree, Citrus Aurantium, *Risso*, plates 3 and 4. Prepared mostly in France). The bitter orange tree, Citrus Brigaradia, has

only been lately separated as a distinct species from the Citrus Aurantium (described p. 466, 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.

BOTANICAL CHARACTERS.—The Citrus Bigaradia is a small tree, leaves compound, with a single, elliptical, acute or acuminate and slightly toothed terminal leaflet, which is articulated to the winged petiole. Flowers large, white, calyx somewhat urceolate, petals 5–8; stamens numerous, cohering slightly at the base; fruit (*hesperidium*) orange-coloured, roundish or somewhat elongated or depressed; rind with concave oil glands, pulp acid and bitter.

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.—*Of the Rind.*—Thin, of a dark orange colour, nearly free from the white inner part of the rind; having an aromatic bitter taste, and fragrant odour.

CHARACTERS AND TESTS.—*Of the Water.*—Nearly colourless, fragrant. 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; orange-flower water frequently contains traces of lead, which will be detected by the black colour produced on transmitting through it a stream of sulphide of hydrogen gas, if lead be present.

THERAPEUTICAL EFFECTS.—Bitter orange peel and orange-flower water are feebly tonic. They are employed in medicine principally for their agreeable flavour. Orange-flower water makes a most agreeable menstruum for the exhibition of more energetic medicines. The following preparations are officinal.

PREPARATIONS.—*Of the Rind.*—Infusum Aurantii, 1 ounce to 1 pint; Infusum Aurantii Compositum, ½ ounce to one pint; Infusum Gentianæ Compositum, 120 grains to 1 pint; Mistura Gentianæ, 60 grains to 1 pint; Spiritus Armoraciæ Compositus, 2 ounces to 1 pint; Tinctura Aurantii, 2 ounces to 1 pint; Tincturæ Cinchonæ Composita, one ounce to one pint; Tinctura Gentianæ Composita, ¾ of an ounce to one pint; Vinum Aurantii.

PREPARATION.—*Of the Water.*—Syrupus Aurantii Floris.

Infusum Aurantii. Infusion of Orange peel. (Take of bitter orange-peel, cut small, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel, for fifteen minutes, and strain.) Dose, 1 to 2 fluid ounces.

Infusum Aurantii Compositum. Compound Infusion of Orange Peel. (Take of bitter orange-peel, cut small, a quarter of an ounce; fresh lemon peel, cut small, sixty grains; cloves, bruised, thirty grains; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for a quarter of an hour, and strain.) An agreeable vehicle for more active medicines. Dose, 1 to 2 fluid ounces.

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, 1 fluid drachm. It enters into the preparation of the confectio sulphuris.

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, 1 fluid drachm.

Tinctura Aurantii. Tincture of Orange Peel. (Take of bitter orange-peel, cut small and bruised, two ounces; proof spirit, one pint. Macerate for seven days in a closed vessel with occasional agitation, then strain, press, and filter, and add sufficient proof spirit to make one pint.) A very agreeable tincture, frequently employed in virtue of its pleasant taste and carminative as well as mildly tonic properties as an adjunct to bitter mixtures. Dose, 1 to 2 fluid drachms. It enters into the following preparations, Mistura Ferri Aromatica, one volume in thirty-two; Syrupus Aurantii, one volume in eight; Tinctura Quiniæ.

Vinum Aurantii. Orange Wine.—(Wine made in Britain by the fermentation of a saccharine solution to which the fresh peel of the bitter orange has been added.) This is nothing more or less than the orange wine found in our grocers' shops. It is generally made by flavoring some of the cheaper varieties of white wine with bitter orange peel; it is consequently a vinous liquid, having a golden sherry colour, and a taste and aroma derived from the bitter orange peel. It contains about 12 per cent. of alcohol, and is but slightly acid to test paper. The sole object with which it has been made officinal in the Pharmacopœia is that it is employed in the following preparations:—Vinum Ferri Citratis; Vinum Quiniæ.

BARII CHLORIDUM. *Chloride of Barium.* (Syn.: *Barytæ Murias. Muriate of Baryta.*) $BaCl+2HO(=122)$. This salt is only retained in the Appendix to 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 oxide gas, and its sulphur uniting directly with the barium to form sulphide of barium, thus, $BaOSO_3+4C=4CO+BaS$. 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=HS+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 crystallises 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, with a solution of this salt, a heavy white precipitate, insoluble in nitric acid.

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 iron, lead, or copper; these will each be recognised 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 the chemical equivalents of the two salts, 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 very much into disuse, although even still practitioners are met with who place great confidence in it, in the treatment of cases of scrofula complicated with anemia. Its value in scrofulous diseases of the joints has been also much in-

sisted upon. My own experience of it, however, is anything but favourable; in the class of cases likely to be benefited by its administration we have at our command a variety of remedies, to say the least of them, just as efficient as it is, and the use of which is not so likely to be followed by as untoward symptoms as may ensue on the exhibition of chloride of barium. In large doses (an ounce or more) it is a narcotico-acrid poison. In poisoning with this salt the best antidotes are the soluble sulphates, as sulphate of magnesia or sulphate of soda.

DOSE AND MODE OF ADMINISTRATION.—From the eighth of a grain up to half a grain, either in the form of pill, or better still in solution, as in the following preparation. Larger doses are mentioned by other authorities, but whenever I have tried to push the dose much beyond that just mentioned, the system has shown symptoms of becoming intolerant of its exhibition.

Barii Chloridi Solutio. Solution of Chloride of Barium. (Take of chloride of barium, in crystals, one ounce; distilled water, ten ounces. Dissolve and filter.) 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, for which purpose only it has been introduced into the Appendix to the Pharmacopœia.

INCOMPATIBLES.—Sulphuric acid; sulphates; carbonates; and phosphates.

BISMUTHUM. *Bismuth.* (A crystalline metal. As met with in commerce it is generally impure.) Bismuth was first described in 1529 by Agricola; it is rather a rare metal, being, however, found in Cornwall, and also in Transylvania, in Saxony, and in Bohemia.

PREPARATION.—It is obtained by a process of fusion, in virtue of which the metal separates from its gangue, and falls to the bottom of the vessel, and whilst still in the fused state it is run into moulds. Thus obtained it is always very impure, containing foreign metals, such as iron, copper, nickel, silver, &c. in addition to metallic sulphides and arseniurets; from these to some extent it is freed on the large scale, by fusing it with one-tenth its weight of nitrate of potash.

PREPARATION.—Bismuthum Purificatum.

BISMUTHUM PURIFICATUM. *Purified Bismuth.* (Bi=210 or **Bi**=210.)

PREPARATION.—Take of bismuth, 10 ounces; nitrate of potash, in powder, 2 ounces. Put the bismuth and one ounce of the nitrate of potash into a crucible, and heat them to a temperature at which both the metal and the salt are fused. Continue the heat, constantly stirring the contents of the crucible for fifteen minutes, or until the salt has solidified into a slag over the metal. Then remove the salt, add the remainder of the nitrate of potash to the bismuth in the crucible, and repeat the process as before. Finally, pour the bismuth while fused into a suitable mould, and allow it to cool.

PHYSICAL CHARACTERS.—Metallic bismuth is of a whitish or greyish-white colour, with a distinct reddish tint pervading it. It is frequently met with in the form of iridescent cubical crystals, fusing at 507°, and expanding and crystallizing on cooling.

CHARACTERS AND TESTS.—A crystalline metal of a greyish-white colour, with a distinct roseate tinge. Specific gravity, 9·83. Dissolved in a mixture of equal volumes of nitric acid and distilled water it forms a solution which by evaporation yields colourless crystals that are decomposed on the addition of water, giving a white precipitate. If the mother liquor from which the crystals have been separated be added to solution of carbonate of ammonia, the precipitate formed and the solution are free or nearly free from colour.

CHEMICAL CHARACTERS.—Most of the soluble salts of bismuth are resolved by the action of water into a basic salt, which in consequence of its insolubility precipitates, and an acid salt, which remains in solution. From the solution of the acid salt the alkalies and their carbonates throw down white precipitates, insoluble in an excess of the reagent; these acid salts are also precipitated brownish-black by sulphide of hydrogen and by sulphide of ammonium; golden-yellow by chromate of potash; purple-brown by iodide of potassium; greenish-white by ferrocyanide, and of a darker colour by ferricyanide of potassium. It will be remembered that the solution of antimony in hydrochloric acid on being added to water throws down a white precipitate (see p. 242). In consequence of the solution of bismuth also behaving in a similar manner, some confusion might arise as to the precise nature of the metal under examination; such a doubt will be solved by tartaric acid, which will redissolve the antimonial precipitate, but not that from bismuth.

PREPARATIONS CONTAINING BISMUTH.—Bismuthi Carbonas; Bismuthi Subnitras; Liquor Bismuthi et Ammoniæ Citratis; Trochischi Bismuthi.

BISMUTHI CARBONAS. *Carbonate of Bismuth.* $2(BiO_3,CO_2)$, HO(=521) or $\mathbf{2(Bi_2CO_5),H_2O}$ (=1042).

PREPARATION.—Take of purified bismuth in small pieces, two ounces; nitric acid, four fluid ounces; carbonate of ammonia, six ounces; distilled water, a sufficiency. Mix the nitric acid with three ounces of distilled water, and add the bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and afterwards decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces, and add this in small quantities at a time to a cold filtered solution of the carbonate of ammonia in two pints of distilled water, constantly stirring the mixture as it is formed. Collect the precipitate on a calico filter, and wash it with distilled water until the washings pass tasteless. Remove now as much of the adhering water as can be separated from the precipitate by slight pressure with the hands, and finally dry the product at a temperature not exceeding 150°.

EXPLANATION OF PROCESS.—The action of nitric acid upon bismuth will be fully discussed in the next preparation; suffice it to say here that upon the nitrate of bismuth which is thereby produced

being dropped into the solution of carbonate of ammonia, a double decomposition ensues, in virtue of which carbonate of bismuth is precipitated, and nitrate of ammonia held in solution.

CHEMICAL CHARACTERS.—For these, so far as the base is concerned, see the remarks upon this subject made upon bismuthum purificatum (p. 711). The effervescence resulting on the addition of nitric acid proves it to be a carbonate.

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

IMPURITIES.—This salt may contain carbonate of lead, which were it present would be dissolved by the nitric acid, but would be precipitated again on the addition of the sulphuric acid; did it decolorize the sulphuric acid coloured with indigo, the presence of a chloride would be indicated, as it would be also did the nitric acid solution precipitate with nitrate of silver.

THERAPEUTICAL USES.—The physiological effects of this salt appear to me to be identical with those of the subnitrate of bismuth, the preparation next to be described, and which see. It was first introduced to the notice of the profession by M. Hannon of Brussels, who considers it to be in many respects superior to the subnitrate; he states that the system is more tolerant of its protracted exhibition than it is of that of the subnitrate; that it acts more as an antacid; that it does not constipate; and, finally, that it is more soluble in the gastric juice than is the subnitrate. For the first few days of its exhibition he conceives its effects to be sedative, after which it appears to him to act as a tonic.

DOSE AND MODE OF ADMINISTRATION.—In the Pharmacopœia the dose is given as from five to twenty grains, but it has been administered in far larger doses than these, so much as forty or fifty grains having been given as a dose three times a day. It should be given just before meals, either suspended in milk (an admirable vehicle for it) or in water suspended by the aid of mucilage; or it may be given in the form of bolus, rubbed up with honey or with treacle.

BISMUTHI SUBNITRAS. *Subnitrate of Bismuth.* (BiO_3,NO_5, 2HO (=306), or $\mathbf{BiNO_4H_2O}$(=306) Syn.: *Bismuthum Album*, 1864. *Bismuthi Nitras*, Lond. (*Trisnitrate of Bismuth. Magistery of Bismuth.*)

PREPARATION. Take of purified bismuth, in small pieces, two ounces; nitric acid, four fluid ounces; distilled water, a sufficiency. Mix the nitric acid with three ounces of distilled water, and add the bismuth in successive portions. When effervescence has ceased apply for ten minutes a heat approaching that of ebullition, and decant the so-

lution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces, and pour it into half a gallon of distilled water. When the precipitate which forms has subsided, decant the supernatant liquid, add half a gallon of distilled water to the precipitate, stir them well together, and after two hours decant off the liquid, collect, and drain the precipitate in a calico filter, press it with the hands, and dry it at a temperature not exceeding 150°.

EXPLANATION OF PROCESS.—When nitric acid is poured upon bismuth, the metal becomes oxidised at the expense of the acid, the 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, $4(BiO_3.3NO_5) = 3BiO_3NO_5 + BiO_3 9NO_5$. 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 AND TESTS.—A heavy white powder in minute crystalline scales, blackened by sulphuretted hydrogen; insoluble in water, but soluble in nitric acid mixed with half its volume of distilled water, forming a solution which poured into water gives a white precipitate. It forms with sulphuric acid diluted with an equal bulk of water a solution which is blackened by sulphate of iron. The nitric acid solution gives no precipitate with diluted sulphuric acid nor with solution of nitrate of silver.

CHEMICAL PROPERTIES.—The composition of this substance has been variously stated; it is very 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 112).

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 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 fifth 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, especi-

ally 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 calumba, 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 subnitrate of bismuth, 1440 grains; carbonate of magnesia, four ounces; precipitated carbonate of lime, six ounces; refined sugar, twenty-nine ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; rose water, a sufficiency. Mix the dry ingredients, then add the mucilage, and form the whole into a proper mass with rose water. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Reference to what has been written above on the dose of bismuth required to produce its special effects will show that these lozenges can be looked upon as little better than *placebos;* ten should be consumed at each time to give an efficient dose of bismuth, as each lozenge contains but two grains of subnitrate of bismuth.

LIQUOR BISMUTHI ET AMMONIÆ CITRATIS. *Solution of Citrate of Bismuth and Ammonia.*

PREPARATION.—Take of purified bismuth, 430 grains; nitric acid, two fluid ounces; citric acid, two ounces; solution of ammonia, distilled water, of each, a sufficiency. Mix the nitric acid with an ounce of distilled water, and add the bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces, then add the citric acid previously dissolved in four ounces of distilled water, and afterwards the solution of ammonia in small quantities at a time, until the precipitate formed is redissolved, and the solution is neutral or slightly alkaline to test-paper. Dilute with distilled water to the volume of one pint.

EXPLANATION OF PROCESS.—The action of nitric acid upon metallic bismuth has been already explained, see p. 713; on adding ammonia to its solution, the oxide of bismuth is precipitated, but, as will be perceived, care is taken by the previous addition of citric acid that on the addition of more ammonia the oxide so precipitated shall be redissolved, the oxide of bismuth in fact being soluble in citrate of ammonia; the nitric acid so set free is saturated by the

excess of ammonia employed, so that this solution must contain not only citrate of bismuth and ammonia, as stated in the Pharmacopœia, but also nitrate of ammonia.

CHARACTERS AND TESTS.—A colourless solution with a saline and slightly metallic taste. Specific gravity, 1·122. Neutral or slightly alkaline to test-paper; mixes with water without change; heated with solution of potash it evolves ammonia, and yields a white precipitate. Hydrochloric acid added to it gives a white precipitate which is soluble in excess of the reagent. Three fluid drachms of the solution mixed with an ounce of distilled water, and treated with sulphuretted hydrogen in excess, yield a black precipitate, which, collected, washed, and dried, weighs 9.92 grains.

PHYSICAL AND CHEMICAL CHARACTERS.—These can readily be gathered from what has already been written under the head of Bismuthum Purum, (p. 711) as also from a perusal of the pharmacopœial characters and tests, which to a certain extent explain themselves. On the addition of hydrochloric acid to the solution, the oxide of bismuth is precipitated, but being soluble in an excess of the reagent, it is redissolved on the further addition of the acid. The precipitate produced by passing the stream of sulphuretted hydrogen gas through it is sulphide of bismuth, and the amount of it so produced, as stated in the Pharmacopœia, is all but strictly in proportion to that which reference to their respective chemical equivalents would indicate; so that if it fulfils this condition, its strength will be, as stated in the Pharmacopœia, three grains of oxide of bismuth in each fluid drachm.

THERAPEUTICAL EFFECTS.—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. For it are claimed all the therapeutical effects of the carbonate and subnitrate of bismuth, with the very great additional value of presenting them in a soluble form. 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 but severe gastrodynia improving under the use of 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, in mild cases of gastrodynia I must acknowledge having derived some assistance from its employment.

DOSE AND MODE OF ADMINISTRATION.—Of the pharmacopœial preparation the dose is from half a drachm to one fluid drachm, whilst that of Schacht's Liquor Bismuthi is from one to four fluid drachms. Either preparation may be ordered in combination with one or other of our light bitter infusions, flavoured with some aromatic tincture.

INCOMPATIBLES.—Potash, soda, ammonia, and their carbonates.

CALCII CHLORIDUM. *Chloride of Calcium.* CaCl (=55·5) or **$CaCl_2$** (=111).

PREPARATION.—It may be formed by neutralising hydrochloric acid with carbonate of lime, adding a little solution of chlorinated lime and slaked lime to the solution, filtering, evaporating until it becomes solid, and finally drying the salt at about 400°.

EXPLANATION OF PROCESS.—On adding hydrochloric acid to chalk, its carbonic acid is expelled, and water and chloride of calcium are formed, thus, $CaOCO_2 + HCl = CO_2 + HO + CaCl$. The object with which the chlorinated lime and the slaked lime are 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 ; the chloride of iron would be converted into sesquichloride of iron by the chlorine yielded it by the chlorinated lime, and these two chlorides would then by the lime employed be resolved into two oxides of iron and of magnesium that would be precipitated, and chloride of calcium, thus, $Fe_2Cl_3 + MgCl + 4CaO = Fe_2O_3 + MgO + 4CaCl$. The reaction in virtue of which the chlorine is liberated has been explained at page 552.

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, CaCl + 6HO. 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.

CHARACTERS AND TESTS.—In white agglutinated masses, dry, but very deliquescent, evolves no chlorine or hypochlorous acid on the addition of hydrochloric acid, and is entirely soluble in twice its weight of water, also in alcohol. The aqueous solution is not precipitated by the addition of lime water.

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 by M. Cazenave as a remedy for lupus, eczema, and impetigo. This salt forms a principal ingredient in many mineral waters.

DOSE AND MODE OF ADMINISTRATION.—10 to 20 grains. Chloride

of calcium is always administered in solution; the following is a convenient formula :—

Solution of Chloride of Calcium. (Take of chloride of calcium, one ounce; distilled water, ten fluid ounces. Dissolve and filter.) Dose, half a drachm to two drachms. It has apparently been only introduced into the Pharmacopœia as a test, as it is only mentioned in the Appendix.

Solution (Saturated) of Chloride of Calcium. (Take of chloride of calcium, four ounces; distilled water, five fluid ounces. Dissolve and filter.) Only used as a test, being introduced for that purpose into the Appendix to the Pharmacopœia.

INCOMPATIBLES.—Sulphuric acid, and the soluble sulphates; potash and soda, and their carbonates; and carbonate of ammonia.

CALCIS PHOSPHAS. *Phosphate of Lime.* $3CaO,PO_5$ (=155) or $Ca_3P_2O_8$ (=310)

PREPARATION.—Take of bone ash, four ounces; hydrochloric acid, six fluid ounces; water, two pints; solution of ammonia, twelve fluid ounces, or a sufficiency; distilled water, 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 solution of nitrate of silver acidulated with nitric acid. Dry the washed product as 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 hydrochloric 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 chlorides 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 AND TESTS.—A light white amorphous powder, insoluble in water, but soluble without effervescence in diluted 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 sub-

sequent addition either of a little oxalate of ammonia or of perchloride of iron. Ten grains dissolve perfectly and without effervescence in diluted hydrochloric acid, and the solution yields with ammonia a white precipitate insoluble in boiling solution of potash, and weighing ten grains when washed and dried.

ADULTERATIONS.—Did effervescence ensue on its solution in nitric acid, the presence of carbonate of lime would be indicated ; and did it not remain clear on the addition to this solution of acetate of soda, that of phosphate of the sesquioxide of iron would be demonstrated. The precipitate produced on the subsequent addition of oxalate of ammonia is oxalate of lime; and of perchloride of iron, phosphate of iron; thus demonstrating the basic and acid constituents of the salt. The amount recovered from the solution of ten grains in hydrochloric acid (gr. 10) is exactly what theory would indicate; this test is in fact nothing but a repetition of the pharmacopœial process for obtaining the salt.

THERAPEUTICAL EFFECTS.—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 all but universally admitted now-a-days, the truth being that the fault lies in the want of power in the system to assimilate the phosphate supplied to it in the food, rather than in any deficiency in the supply itself. With some practitioners, however, this doctrine still prevails, and we consequently have various syrups of the phosphates, as they are termed, suggested from time to time for the treatment of such cases, in all of which are combined medicines of themselves without the phosphate of lime, capable of producing the good results claimed for this salt. At present it is principally used in pharmacy, being introduced into the Pharmacopœia for the purpose of preparing the *pulvis antimonialis*. Dose, 10 to 20 grains.

PREPARATION.—Pulvis Antimonialis, 2 parts in 3.

CALUMBÆ RADIX.—*Calumba Root.* (The root, cut transversely and dried, of Jateorrhiza Calumba, *Miers,* and J. Miersii, *Oliv.* MS. *in Flor. Trop. Afric.* ined. Cocculus Palmatus, *non DC.; Steph. and Church. Med. Bot.* plate 160. From the forests of Eastern Africa, between Ibo and the Zambezi.) 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 the male plant in panicles which are axillary and many-flowered ; while in the female plant the flowers are few, and are disposed 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 calumba 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.—Calumba 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 epigœa)*, and the root of *Frasera Walteri* (American or false calumba), have been at times sold for the true calumba 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 sesquisalt of iron, an infusion of the true root remaining unchanged by the same test. Another false calumba 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.—Calumba 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 calumba 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, calumba is an excellent remedy.

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

PREPARATIONS.—Extractum Calumbæ, about two ounces and a half from one pound; Infusum Calumbæ, one ounce to one pint; Mistura Ferri Aromatica, half an ounce to sixteen fluid ounces; Tinctura Calumbæ, two ounces and a half to one pint.

Extractum Calumbæ. Extract of Calumba. (Take of calumba root, cut small, one pound; distilled water, four pints. Macerate the calumba with two pints of the water for twelve hours, strain and press. Macerate again with the same quantity of water, strain and press as before. Mix and filter the liquors, and evaporate them by the heat of a water-bath until the extract is of suitable consistence for forming pills.) An excellent tonic extract, very advantageously used as a menstruum for other more active tonics, to give them a pilular form. Dose, two to ten grains.

Infusum Calumbæ. Infusion of Calumba. (Take of calumba root, cut small, half an ounce; cold distilled water, ten fluid ounces. Macerate in a covered vessel, for one hour, and strain.) Infusion of calumba 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, and their carbonates do not alter the colour of this infusion, and consequently may be advantageously combined with it in prescription.

Tinctura Calumbæ. Tincture of Calumba. (Take of calumba root, cut small, two ounces and a half; proof spirit, one pint. Macerate the calumba for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, half a drachm to two fluid drachms.

INCOMPATIBLES.—Tincture of iodine; nitrate of silver; and the acetates of lead.

CANELLÆ ALBÆ CORTEX. *Canella Alba Bark.* (The bark of Canella Alba, *Murray*. From the West Indies.) This, the *White Wood* or *Wild Cinnamon tree* of the West Indian islands and of South America, belongs to the Natural family *Canellaceæ*, Lindley, and to the Linnæan class and order *Dodecandria Monogynia*. This plant is referred to various orders by different authorities, and its position is scarcely yet defined; but the simplest is that of Lindley, who makes for it a provisional Natural order, *Canellaceæ*, which I have given above on his authority.

BOTANICAL CHARACTERS.—A handsome tree, 40–50 feet high; leaves, alternate, obovate, shining, coriaceous; flowers small, in clusters at the extremities of the branches; sepals 5; petals 5, glau-

cous, blue, contorted in æstivation; stamens united to form a tube, anthers 15; stigmas 3; fruit a small, bluish-black berry, generally one-celled.

CHARACTERS.—In quills or broken pieces, hard, of a yellowish-white or pale orange colour, somewhat lighter on the internal surface. It has an aromatic, clove-like odour, and an acrid peppery taste.

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. There is no officinal preparation of it, as it is only retained in the Pharmacopœia as being employed in making the wine of rhubarb. Dose, in powder, gr. x. to gr. xxx.

PREPARATION.—Vinum Rhei, see p. 202, 60 grains to 1 pint.

CASCARILLÆ CORTEX. *Cascarilla Bark.* (The bark of Croton Eluteria, *Bennett, Journ. Proceed. Linn. Soc.; Pharm. Journ.*, 2nd ser. vol. iv. p. 150, plate. 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 and densely downy beneath; flowers whitish, monœcious, in compound axillary and terminal racemes; the male flowers have 10-12 distinct stamens enclosed by a perianth of 5 divisions; the ovary is roundish; styles 3, bifid; stigmas obtuse; fruit about the size of a pea, minutely warted, 3-lobed, 3-celled.

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 lichens; 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 sesquisalts 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.

PREPARATIONS.—Infusum Cascarillæ, two ounces to one pint ; Tinctura Cascarillæ, two ounces and a half to one pint.

Infusum Cascarillæ. Infusion of Cascarilla. (Take of cascarilla bark, in coarse powder, one ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) Dose, one to two fluid ounces.

Tinctura Cascarillæ. Tincture of Cascarilla. (Take of cascarilla bark, bruised, two ounces and a half ; proof spirit, one pint. Macerate the cascarilla for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, one half to two fluid drachms.

INCOMPATIBLES.—Lime-water; salts 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 usually much branched above ; lower leaves in a radical spreading tuft, generally broadly-ovate, the upper ones are in distant pairs, from ovate to narrow-linear ; flowers handsome, rose-coloured, in corymbose panicles near the top of the stem. Calyx-segments 5, narrow-linear ; corolla with a slender tube and a spreading 5-cleft limb.

PROPERTIES.—The whole 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.

DOSE AND MODE OF ADMINISTRATION.—It is best administered 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.* (The entire lichen, Cetraria Islandica, *Acharius, Lichenogr.; Woodv. Med. Bot. (Lichen Islandicus)*, plate 205. 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, cartilagino-membranaceous, erect, tufted, laciniated, olive-brown, channelled, dentato-ciliate, the fertile lacinia very broad ; *Apothecia* orbicular, obliquely adnate with the margin of the thallus, (the lower portion being free) 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 ; taste bitter and mucilaginous. A strong decoction gelatinises 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 convalscence 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.

PREPARATION.—Decoctum Cetrariæ, one ounce to one pint.

Decoctum Cetrariæ. Decoction of Iceland Moss. (Take of Iceland moss, one ounce; distilled water, one pint. Wash the moss in cold water, to remove impurities; boil it with the distilled water for ten minutes in a covered vessel, and strain with gentle pressure while hot; then pour distilled water over the contents of the strainer until the strained product measures 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.* (The entire plant, Ophelia Chirata, *Griseb.; Wallich, Plant. Asiat.* (*Gentiana Chirata*), vol. iii. plate 252. Collected in Northern India.) 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, cordato-ovate, amplexicaul, very acute and glabrous; flowers yellow, very numerous, stalked, in terminal panicles; calyx-segments sublanceolate, acuminate; corolla rotate, 4-partite; ovary 1-celled, ovules numerous; *capsule* 2-valved, septicidal, 1-celled; seeds immersed in the usually sutural, spongy placentæ.

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 con-

sists 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.

PREPARATIONS.—Infusum Chiratæ, half an ounce to one pint; Tinctura Chiratæ, two and a half ounces to one pint.

Infusum Chiratæ. Infusion of Chiretta. (Take of chiretta, cut small, a quarter of an ounce; distilled water, at 120°, ten ounces. Infuse in a covered vessel for half an hour, and strain.) Dose, one to two fluid ounces.

Tinctura Chiratæ. Tincture of Chiretta. (Take of chiretta, cut small and bruised, two and a half ounces; proof spirit, one pint. Macerate the chiretta for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f3ss. to f3ij.

* CHONDRUS CRISPUS. *Carragheen, or Irish Moss.* This substance consists of this and many allied species (all belonging to the Natural order *Rhodospermeæ*, class *Algæ*), dried and bleached in the sun. For medicinal use it is principally gathered by the peasantry on the south-west coast of Ireland.

BOTANICAL CHARACTERS.—Frond stipitate, thickish, cartilaginous, nerveless, flat or curled, dichotomously cleft, segments wedge-shaped, very variable in breadth; apices truncate, submarginate, or cloven; axils obtuse; sori elliptical or oblong, concave on one side.

PROPERTIES.—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.

Cinchonæ Flavæ Cortex. *Yellow Cinchona Bark.* (The bark of Cinchona Calisaya, *Weddell, Hist. Nat. Quinquinas,* plates 3, 3 bis, and 28. Collected in Bolivia and Southern Peru.)

Cinchonæ Pallidæ Cortex. *Pale Cinchona bark.* (The bark of Cinchona Condaminea, *DC. vars.* chahuarguera, *Pavon,* and crispa, *Tafalla. Howard's Illustrations (Cinchona Chahuarguera and C. crispa),* plates 1 and 2. Collected about Loxa in Ecuador.)

Cinchonæ Rubræ Cortex. *Red Cinchona Bark.* (The bark of Cinchona succirubra, *Pavon, MS. Nueva Quinologia. Howard's Illustrations,* plate 9. 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 Chincon, 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 of but 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, Weddel, 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 the 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 Weddel in their native country; a full account of which, and of all else relating to so im-

portant 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 amend. 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. Thanks to the foresight of the British and Dutch governments, the genus Cinchona, which through the greed of contractors and their accomplices is fast disappearing from its native forests, has been successfully reared in India and Java. The species which has become most completely naturalised in India is the *Cinchona succirubra*. It is easy to cultivate, attains a height of 15ft. in three years, and its bark is rich in quinine, but it only thrives well at an altitude of from 4,000 to 5,000 feet above the level of the sea. In the lower regions its bark is much poorer. A recent discovery, however, offers some hopes of cultivating it to advantage on the coffee plantations situated at altitudes of about 2,300 feet. It has been found that if the trunk of the cinchona be enveloped with moss for the space of about eighteen months, its bark will become excessively thick and richer in alkaloids; and this plan may be advantageously followed, as above stated, in the coffee plantations. The *Cinchona micrantha*, which, in the Peruvian forests, where it grows wild, only contains cinchonine, acquires considerable proportions of quinidine by cultivation. The *C. Calysaya* does not thrive well either in India or Java, but the species which succeed best below the altitude of 6,000 feet are the *C. Officinalis* and the *C. Lancifolia*, generally sold under the name of *C. Pitayo*. These qualities contain as much as 11·34 per cent of alkaloidal principles, 5·85 of which are quinine. Instead of cutting down the tree, as they barbarously do in Peru, a long strip of bark is taken off, and the place covered up with moss. In this way the bark grows again, and the operation may be repeated periodically a certain number of times. But even when the tree is hewn down, if the stump be left in the ground, new shoots will spring up from it, which, in a few years, may be cut down in their turn. A most interesting account of the introduction of quinine-yielding cinchona-trees into India, and the cultivation of the Peruvian bark in our Eastern possessions, will be found in the Travels of Clements R. Markham, F.S.A.,F.R.G.S. in Peru and India, while superintending the collection of cinchona plants and seeds in South America, and their introduction into India. London: John Murray: 1862. All the varieties of cinchona belong to the natural family *Cinchonaceæ*, and to the Linnæan class and order *Pentandria Monogynia*.

BOTANICAL CHARACTERS.—Trees or tall shrubs; leaves opposite, entire, shortly petioled; stipules, ovate or oblong, foliaceous, free, deciduous; flowers white or rose coloured, in terminal corymbose panicles, very fragrant; calyx with a turbinated tube connate with

the ovary, pubescent, limb superior, 5-toothed, persistent, valvate in æstivation ; corolla salver-shaped, limb 5-cleft, valvate in æstivation ; stamens 5, 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; embryo straight in the axis of fleshy albumen.

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, Pale, and Red 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 the various sorts of cinchona bark has been given by Fée and Zenker, and an attempt has been 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 bark 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.—PALE BARK. *Cinchona pallida.* 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 then 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 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.

3rd.—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 not as yet to a certainty 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 the *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. Ex-

ternally 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 incurved 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.

* 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 many of them are 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 2,500 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 in 1848 by 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 alkoloids, 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 colour.	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, it follows that the bark, the fracture of which is *uniformly short and fibrous*, is certain to be richer in quinia, and 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. The commercial value, however, of the several officinal varieties of bark will be most accurately determined by the amount per cent. of alkaloids each will yield; the tests adopted in the Pharmacopœia for this purpose are, perhaps, as practical as any others that have been suggested; they are as follows:—

TEST.—*Cinchona Flava.*—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 percolator, and after the fluid has ceased to drop add at intervals about an ounce and a half of similarly acidulated water, or 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

filtered 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 diluted sulphuric acid.

TESTS.—*Cinchona Pallida.*—200 grains of the bark, treated in the manner directed in the test for yellow cinchona bark, with the substitution of chloroform for ether, should yield not less than 1 grain of alkaloids.

TESTS.—*Cinchona Rubra.*—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 1·5 grain 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, and 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 saunderswood* 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. 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 hæmorrhage, 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, it 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. 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 much 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. I am not aware that aricina has been employed in medicine. Most practitioners, however, are of opinion that none of the alkaloids possess the same medicinal 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. 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. The great drawback attending the administration of these large doses of quinia is their giving rise to severe headache, ringing in the ears, vertigo, deafness, flashings of light before the eyes, and other evidences of impaired vision; and in some instances, and that even occasionally when administered in small doses, wakefulness, and nausea. 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. As a general rule neither bark nor its alkaloids will agree with the system when the tongue is foul and loaded and the bowels constipated.

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 gr. xx. of the powder in a wine-glassful of port wine, very effective.

PREPARATIONS.—*Of Cinchona Flava.*—Decoctum Cinchonæ flavæ, twenty-seven grains and a half to one fluid ounce; Extractum Cin-

chonæ flavæ liquidum, one pound to four fluid ounces; Infusum Cinchonæ flavæ, twenty-two grains to one fluid ounce; Quiniæ Sulphas, Tinctura Cinchonæ flavæ, eighty-eight grains to one fluid ounce.—*Of Cinchona pallida.*—Mistura Ferri aromatica, one ounce to sixteen fluid ounces; Tinctura Cinchonæ composita, forty-four grains to one fluid ounce.

Decoctum Cinchonæ Flavæ. Decoction of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, 1¼ ounce; distilled water, 1 pint. Boil for ten minutes in a covered vessel. Strain the decoction when cold, and pour as much distilled water over the contents of the strainer as will make the strained product measure one pint.) This is one of the most generally employed of the preparations of bark. In some cases however the quantity of sediment it contains predisposes it to disagree with delicate stomachs, otherwise it is a valuable tonic. *Dose.*—1 to 2 fluid ounces.

Extractum Cinchonæ Flavæ Liquidum. Liquid Extract of Yellow Cinchona. (Take of yellow cinchona bark, in coarse powder, 1 pound; distilled water, a sufficiency; rectified spirit, 1 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 until the water ceases to dissolve any thing more. Evaporate the liquor at a temperature not exceeding 160° to a pint; then filter through the 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, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for two hours, and strain.) This is a valuable preparation of bark. In some conditions of constitution, in which the stomach becomes intolerant of it, great advantage will be gained by ordering seven ounces and a half of this infusion, and half an ounce of the compound tincture, with directions that the mixture should be filtered through bibulous paper; so treated, it becomes as clear as sherry, sits well on the stomach, and is as elegant a mixture as it is valuable. In a former edition of the Dublin Pharmacopœia an infusion of bark was prepared by maceration with cold water, 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. *Dose.*—1 to 2 fluid ounces.

Tinctura Cinchonæ Composita. Compound Tincture of Cinchona. Syn.: *Huxham's Tincture of Bark.* (Take of pale cinchona bark, in moderately fine powder, two ounces; bitter orange-

peel cut small and bruised, one ounce; serpentary root bruised, half an ounce; saffron, sixty grains; cochineal, in powder, thirty grains; proof spirit, one pint. Macerate the cinchona bark and the other solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) This, a more agreeable but less powerful tonic than the next preparation, 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, f℥j. to f℥ss.

Tinctura Cinchonæ Flavæ. Tincture of Yellow Cinchona. (Take of yellow cinchona bark, in moderately fine powder, four ounces; proof spirit, one pint. Macerate the cinchona bark for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

* *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 liquor 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 f℥j. 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, f℥ij.; and white sugar, ℥ij.) Neligan was 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.* $C_{40}H_{24}N_2O_4,HO,SO_3 + 7HO$, or $\mathbf{2(C_{20}H_{24}N_2O_2)H_2SO_4.7H_2O}$. (The sulphate of an alkaloid, prepared from yellow Cinchona bark, and from the bark of Cinchona lancifolia, *Mutis.* It may be obtained by the following process):—

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; diluted 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 diluted hydrochloric acid as will render it thoroughly moist. After maceration, with occasional stirring for twenty-four hours, place the bark in a displacement apparatus, and percolate with the diluted hydrochloric acid until the solution which drops through is nearly destitute of 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 the heat of a water-bath, gradually add the diluted 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 crystallise. 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 $1\frac{1}{2}$ to 3 per cent.

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.

CHARACTERS AND TESTS.—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. 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 ether, without the production of any crystalline matter floating on the lower of the two strata into which the agitated fluid separates on rest. 25 grains of the salt should lose 3·6 grains of water by drying at 212°.

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 should 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. It may also be administered in the form of suppository; 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.

PREPARATIONS.—Ferri et Quiniæ Citras, sixteen parts quinia in one hundred (see *Iron*); Pilula Quiniæ, three parts in four; Tinctura Quiniæ, eight grains in one fluid ounce; Vinum Quiniæ, one grain in one fluid ounce.

Pilula Quiniæ. Pill of Quinia, (Take of sulphate of quinia, sixty grains ; confection of hips, twenty grains ; mix them to a uniform mass.) Dose, two to ten grains.

Tinctura Quiniæ. Tincture of Quinia. (Take of sulphate of quinia, one hundred and sixty grains ; tincture of orange-peel, one pint. Dissolve the sulphate of quinia in the tincture with the aid of a gentle heat; then allow the solution to remain for three days in a closed vessel, shaking it occasionally; and afterwards filter.) Dose, ½ to two fluid drachms.

Vinum Quiniæ. Wine of Quinia. Syn. : *Wine of Oranges*

and Quinine. (Take of sulphate of quinia, twenty grains; citric acid, thirty grains; orange wine, one pint. Dissolve, first the citric acid, and then the sulphate of quinia, in the wine; allow the solution to remain for three days in a closed vessel, shaking it occasionally; and afterwards filter.) Dose, ½ to one fluid ounce.

* *Quiniæ Arsenis. Arsenite 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 recrystallization 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. 81.)

* *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 the sulphate.

* *Quinoidine, Amorphous Quinia, Unbleached Quinia.* 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;* it 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 weigh 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.

* *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. The salts of *Cinchonia* are prepared in a similar manner to those of quinia; their doses are the same. *Quinidia* and *Cinchonidia* also may be given in the same doses.

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.* $CuO,SO_3 + 2NH_3,HO = 122{\cdot}75$.

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. In poisoning with this salt the treatment is the same as in poisoning with sulphate of copper (see page 106).

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 the Appendix to 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 249).

INCOMPATIBLES.—Acids; potash; soda; and lime water.

CUPRI SULPHAS.—*Sulphate of Copper* (described, p. 104, 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 106).

CUSPARIÆ CORTEX. *Cusparia Bark.* (Syn.: *Angostura Bark.*) The bark of Galipea Cusparia, *DC.; Steph. and Church. Med. Bot. (Bonplandia trifoliata)*, plate 149. From tropical South America.) A native of the warmer regions of South America, belonging 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, on petioles about 1 foot long, agreeably fragrant; leaflets sessile, unequal, ovate-lanceolate, acute; flowers white, with fascicles of hairs seated on glandular bodies on the outside, in stalked, almost terminal racemes; calyx 5-toothed; corolla funnel-shaped, with a 5-cleft spreading limb; stamens 5, of which 3 or 4 are sterile; ovary superior, of 5 divisions, which are ovate and pubescent, with a single style, and 5 oblong, fleshy, green stigmas; seeds solitary in each carpel.

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 alcoholic 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.

CHARACTERS AND TEST.—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; the taste is bitter and slightly aromatic. The cut surface examined with a lens usually exhibits numerous white points or minute lines. The inner surface touched with nitric acid does not become blood-red.

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 Neligan from a druggist's in this city, labelled *Angostura bark.* Upon inquiry, he 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 greyish 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 p. 568). The vast importance of distinguishing between these two barks must plead my excuse for inserting this table, slightly modified by myself, but compiled by Pereira, and partly based upon similar ones by Guibourt and Fée, in which their leading distinctive features are contrasted.

		Angostura Bark.	*Nux Vomica (False Angostura) Bark.*
Form		Quills or flat pieces, either straight or slightly bent, pared at edges.	Quills or flat pieces, short, often very much twisted, like dried horn, arched backwards.
Odour		Disagreeable.	None, or very slight.
Taste		Bitter, afterwards somewhat acrid, persistent.	Intensely bitter, very persistent.
Hardness and Density		Bark fragile when dry, easily cut, light, tissue not very dense.	Broken or cut with difficulty; heavy, tissue compact.
Fracture		Dull and blackish.	Resinous.
Epidermoid crust		Whitish or yellowish, insipid, unchanged, or rendered but slightly orange-red by nitric acid.	Variable: sometimes a spongy rust-coloured layer; at other times whitish, prominent spots, more or less scattered or approximated. Nitric acid makes it intensely dark green or blackish.
Inner surface		Separable into laminæ; deepened by nitric acid.	Not separable into laminæ; rendered blood red by nitric acid.
Infusion of the bark prepared by digesting one part of bark in 24 parts of water.	*Tinct. of Litmus*	Blue colour destroyed.	Slightly reddened.
	Sesquichl. Iron	Flocculent, dark greyish-brown precipitate.	Clear yellowish-green liquor.
	Ferrocyanide of Potassium	No change; hydrochloric acid caused a yellow precipitate.	Slight turbidness not augmented by hydrochloric acid; liquor greenish.
	Nitric Acid	A small quantity makes the liquor cloudy; a large quantity renders it transparent deep red.	A small quantity makes the liquor clear and paler; a large quantity transparent red.

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 Cusparіæ. Infusion 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; sesquisalts of iron; nitrate of silver; and the acetates of lead.

FEL BOVINUM PURIFICATUM. *Purified Ox Bile.* (The purified gall of the Ox, Bos Taurus, *Linn.*)

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 it in a porcelain dish by the heat of a water-bath, until it acquires a suitable consistence for forming pills.

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-choleic acid* ($HO,C_{52}H_{42}NO_{11}$), and tauro-choleic acid ($HO,C_{52}H_{44}NO_{13}S_2$).

CHARACTERS AND TESTS.—A yellowish-green substance, 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. Its watery solution gives no precipitate on the addition of rectified spirit.

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.* Fe=28) (Wrought iron in the form of wire or nails free from oxide.) 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. The extraction of it from these ores constitutes a most important branch of our industrial resources, and to pretend to do more than give an outline of the process by which this is effected would obviously be altogether out of keeping with the character of this work.

PREPARATION.—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 ironstone*, by smelting in blast furnaces. The ore, mixed with coke and limestone 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 or wrought into nails, 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. In the previous pages, in discussing several of the salts of iron, I have incidentally alluded to the tests by which iron and its salts may be recognised. A general resumé of these characters here may not be out of place; and first of all it will be as well to mention the compounds which iron forms with oxygen; these are four in number, one equivalent of iron uniting with one of oxygen to form protoxide of iron, FeO; this oxide, though well recognised, and capable of uniting with acids to form salts, has never yet been insulated; two equivalents of iron uniting with three of oxygen forms the peroxide or sesquioxide of iron, Fe_2O_3; the third oxide, which seems to be a mixture of these two, or at all events an intermediate compound, is called magnetic oxide of iron, and has this composition, Fe_3O_4; the fourth oxide of iron, known by the name of ferric acid, has this composition, FeO_3, and like the protoxide has never been insulated, being always found in combination with a base; of these oxides the two that principally concern the pharmaceutical student are the protoxide and the sesquioxide; these unite with acids to form salts, proto or persalts, as they are termed, of iron. The general characters by which they may be recognized are as follows:—If the solution of the protosalt be acid, it will not be precipitated by sulphuretted hydrogen gas, but it will yield a greenish-black precipitate with the solution of sulphide of ammonium. The alkaloids throw down a whitish precipitate, readily becoming green and finally brown, the precipitate at first being the hydrated protoxide, which eventually, by absorption of oxygen, becomes sesquioxide, $2FeO+O=Fe_2O_3$. Ferrocyanide of potassium throws down a white precipitate, ferrocyanide of iron, which by the absorption of oxygen is rapidly converted into Prussian blue. Ferricyanide of potassium yields a blue precipitate, Turnbull's blue; both these reactions have been already explained at p. 113. Tincture of nutgalls produces at first no change of colour in the solution of a pure protosalt of iron, but on standing for some time, in consequence of the absorption of oxygen by the protosalt, and its conversion into a persalt, the solution darkens gradually in colour. Sulphocyanide of potassium produces no change in colour, nor any precipitate in a solution of the protosalts of iron. With the solution of the persalts of iron sulphuretted hydrogen gas gives a white precipitate, due to the conversion of the persalt into a protosalt by the gas, the gas itself being decomposed, and its sulphur deposited, thus:—$Fe_2O_3 3SO_3+HS=2FeOSO_3+HOSO_3+S$; with solution of sulphide of ammonium the persalts yield a black precipitate, sulphide of iron. The alkalies, their carbonates, and bicarbonates throw down an ochry-brown precipitate, the hydrated peroxide; ferrocyanide of potassium throws down a deep-blue precipitate, Prussian blue, the production of which has been already accounted for, see p. 108. Ferricyanide of potassium strikes a dark emerald-green colour, but produces no precipitate; tincture of galls strikes a bluish-black colour, tannate of iron; and sulphocyanide of potassium changes this solution to a blood-red colour.

THERAPEUTICAL EFFECTS.—Considerable advantage will, in my opinion, be derived from considering here, previous to entering upon the description of the several preparations of iron employed in the treatment of disease, the general physiological effects produced by iron and its salts. That iron is capable of enriching the blood corpuscles is a fact of daily observation by the medical man in any practice; how it does so is not so easily explained, whether it be by acting as a tonic, promoting appetite, enabling the invalid to assimilate an increased quantity of food in which iron is a normal element, and thereby restoring to the blood its healthy character, the iron itself being eliminated by the emunctories of the body; or whether it be by the iron itself entering into the circulation, and thereby acting as a direct hæmatinic, is in my opinion a problem that has not hitherto been solved. That the greater part of the iron administered in the usual methods of exhibiting it, is ejected from the system cannot be questioned; whether it be all so is the great question; for many reasons my own opinion is that iron medicinally exhibited is absorbed, carried into the blood, and acts there as a direct hæmatinic; that, indirectly acting as a tonic, it may influence the absorption of the iron normally present in articles of diet, I am also free to confess; but that that is its sole *modus operandi*, I think cannot be acknowledged until we find some other tonic as efficacious as iron is as a hæmatinic, into the composition of which iron enters neither directly or indirectly. One important deduction, however, in my opinion may be gathered from these considerations, and that is, that when employed either as an hæmatinic or as a tonic, no advantage, but rather the reverse, can accrue from giving the preparations of iron in the large doses but too frequently had recourse to by some practitioners, the greater portion of which will pass through the system unassimilated, only to be expelled along with other excrementitious matter—a consideration in which we will be strengthened when we reflect upon the remarkably beneficial effects produced occasionally by a course of chalybeate waters, in many of which the iron is only present in what may almost be termed homœopathic quantities. The ferruginous salts contain their iron in two different conditions, either as the basic or acid element of the salt. When the iron enters into the basic portion of the salt, it will possess more or less well-marked hæmatinic and tonic properties; but when it enters into the acid portion of the salt, as in the ferrocyanide of potassium, it possesses no hæmatinic or tonic virtues, being in fact apparently inert. In addition to their tonic and hæmatinic properties, the salts of iron will be found to possess well-marked astringent properties. These have been already alluded to in the chapter on this class of remedies (p. 108 and seq.,) but an examination of the chemical characters of the salts of iron will show that they can be resolved into two great classes, proto and sesqui-salts of iron. In this latter class it is that the astringent properties of the preparations of iron are pre-eminently exhibited. The general

effects then of the ferruginous preparations, when their use has been continued for some time, are tonic, hæmatinic, 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. Constipation also is a frequent if not a constant attendant on their protracted exhibition. 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 in which the preparations of iron 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 formula of the Pharmacopœia (*fer réduit* of the French), has been introduced on the Continent, its use having been first suggested by M. M. Quevenne and Miquelard. More particular attention, however, will be directed to this subject under its proper heading.

PREPARATIONS OF IRON.—Emplastrum Ferri; Ferri Arsenias; Ferri Carbonas Saccharata; Ferri et Ammoniæ Citras; Ferri et Quiniæ Citras; Ferri Iodidum; Ferri Oxidum Magneticum; Ferri Peroxidum Humidum; Ferri Peroxidum Hydratum; Ferri Phosphas; Ferri Sulphas (see p. 113); Ferri Sulphas Exsiccata (see p. 115); Ferri Sulphas Granulata (see p. 115); Ferrum Redactum; Ferrum Tartaratum; Liquor Ferri Perchloridi (see p. 109); Liquor Ferri Perchloridi Fortior (see p.107); Liquor Ferri Pernitratis (see p. 110); Liquor Ferri Persulphatis (see p. 111); Mistura Ferri Aro-

matica; Mistura Ferri Composita; Pilula Ferri Carbonatis; Pilula Ferri Iodidi; Syrupus Ferri Iodidi; Syrupus Ferri Phosphatis; Tinctura Ferri Acetatis; Tinctura Ferri Perchloridi; Trochisci Ferri Redacti; Vinum Ferri; Vinum Ferri Citratis.

Mistura Ferri Aromatica. Aromatic Mixture of Iron. (Take of pale cinchona bark, in powder, one ounce; calumba root, in coarse powder, half an ounce; cloves, bruised, a quarter of an ounce; fine iron wire, half an ounce; compound tincture of cardamoms, three fluid ounces; tincture of orange-peel, half a fluid ounce; peppermint water, a sufficiency. Macerate the cinchona bark, calumba root, cloves, and iron, with twelve fluid ounces of the peppermint water, in a closed vessel for three days, agitating occasionally; then filter the liquid, adding as much peppermint water to the filter as will make the product measure twelve and a half fluid ounces; to this add the tinctures, and preserve the mixture in a well-stoppered 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 an eminent physician, it is commonly known as *Heberden's ink.* Notwithstanding its being an unchemical compound, omitted from the last edition of the British Pharmacopœia, it is a most excellent tonic, and so highly thought of as to have been retained in the last edition of that of Dublin, and it may almost be said to have forced its way into the present edition of the British Pharmacopœia; it is in very general use in this city, in the various states of debility attended with anemia. Dose, f℥j. to f℥ij. two or three times a day. It may be conveniently and advantageously prescribed in combination with the compound aloetic mixture, equal proportions of each being used.

Vinum Ferri. Wine of Iron. (Take of fine iron wire, (about No. 35) one ounce; sherry, one pint. Macerate for thirty days in a closed vessel, the iron being almost but not quite wholly immersed in the wine, and the vessel frequently shaken, and the stopper removed; then filter.) In the pharmacopœia of 1864, this wine was prepared by employing tartarated iron and sherry wine; to this method was objected that the sherry was already so charged with acid tartrate of potash that it was unable to dissolve the tartarated iron; be this as it may, in the present edition we have come back to the old formula of the London Pharmacopœia, which was but the adoption of an old fashioned domestic remedy, a few nails thrown into a bottle of port wine. In all these cases the iron is gradually converted into potassio tartrate of iron, by the acid tartrate of potash invariably present in wine. Dose, 1 to 4 fluid drachms.

Ferrum Redactum. *Reduced Iron.* Syn.: *Ferri Pulvis,* Dubl. *(Fer Réduit.)* (Metallic iron, with a variable amount of magnetic oxide of iron.)

PREPARATION.—Take of hydrated peroxide of iron, one ounce; zinc, granulated, a sufficiency; sulphuric acid, a sufficiency; chloride of calcium, a sufficiency. Introduce the hydrated 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 small 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 before removing the iron, 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 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 AND TESTS.—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 yellow prussiate of potash. Ten grains added to an aqueous solution of fifty grains of iodine and fifty grains of iodide of potassium, and digested 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. 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 being free from the inky taste which the preparations of iron possess in a degree proportioned to their solubility, it is peculiarly applicable for children. I have used the *pulvis ferri* very extensively, and with the best results; indeed I consider it superior in many cases to the other ferruginous preparations, 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.

DOSE AND MODE OF ADMINISTRATION.—The dose is from gr. j. to gr. x.; it may be given in powder, pill, or bolus.

Trochisci Ferri Redacti. Reduced Iron Lozenges. (Take of reduced iron, seven hundred and twenty grains; refined sugar, in powder, twenty-five ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; distilled water, one fluid ounce, or a sufficiency. Mix the iron, sugar, and gum, and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) Each lozenge contains one grain of reduced iron. Dose, 1 to 6 lozenges.

TINCTURA FERRI ACETATIS. *Tincture of Acetate of Iron.*

PREPARATION.—Take of solution of persulphate of iron, two fluid ounces and a half; acetate of potash, two ounces ; rectified spirit, a sufficiency. Dissolve the acetate of potash in ten fluid ounces, and add the persulphate of iron to eight fluid ounces of the spirit, then mix the two solutions in a two-pint bottle and shake them well together, repeating the agitation several times during an hour. Put the tincture, with the precipitated salt contained in it, upon a filter, and when the liquid has ceased to run through, put as much rectified spirit upon the filter as will make the filtered product measure one pint.

EXPLANATION OF PROCESS.—In this process the persulphate of iron 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, $Fe_2O_3 3SO_3 + 3KOC_4H_3O_3 = Fe_2O_3 3C_4H_3O_3 + 3KOSO_3$.

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 ($Fe_2O_3 3C_4H_3O_3$) 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 Dublin Pharmacopœia on the authority of Dr. Percival, who thought highly of the chalybeate powers of this salt of iron. In the preparation introduced by Dr. Percival he aimed at making it a tincture of the *proto*-acetate of iron; but when so prepared the tincture is so prone to decomposition, that, in my opinion wisely, the pharmacopœial authorities have made a virtue of necessity, and introduced it as a tincture of the sesquiacetate 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. In some forms of amenorrhœa I have derived signal advantage from its employment in combination with the liquid extract of ergot of rye; five mimins of the latter with thirty mimins of this tincture in the form of draught; one draught to be taken each night.

DOSE AND MODE OF ADMINISTRATION.—The dose is from min. xx. 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, it 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 Ammonio-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, $3FeO, AsO_5$ or $\mathbf{Fe_3As_2O_8}$, partially oxidized.)

PREPARATION.—Take of sulphate of iron, 9 ounces; arseniate of soda, dried at 300°, 4 ounces; acetate of soda, 3 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. 694), 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, $2NaO,HO,AsO_5+3FeOSO_3+NaOC_4H_3O_3=3NaOSO_3+3FeO,AsO_5+HO+C_4H_3O_3$. By the washings 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 AND TESTS.—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 yellow prussiate of potash, and a still more abundant one of a deeper colour with the red prussiate of potash. 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. 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 red prussiate of potash, until at least 170 grain-measures of the volumetric solution of bichromate of potash have been added.

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 ferri 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 ($3AgO,AsO_5$).

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 the protoxide 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 7·582 grains, corresponding to 37·91 per cent., of arseniate of the protoxide 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 anæmic 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 1-4th 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.

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 or $\mathbf{FeCO_3}$, mixed with peroxide of iron and sugar, the carbonate forming at least 57 per cent. of the mixture.)

PREPARATION.—Take of sulphate of iron, two ounces; carbonate of ammonia, one ounce and a quarter; boiling distilled water, two gallons; refined sugar, one ounce. Dissolve the sulphate of iron and the carbonate of ammonia each in half a gallon of the 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 AND TESTS.—Small coherent lumps of a grey colour with a sweet very feeble chalybeate taste. It dissolves with effervescence in warm hydrochloric acid diluted with half its volume of water, and the solution 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 red prussiate of potash, until at least 330 grain-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. 757). 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. In our medical halls a very agreeable preparation called *granulated carbonate of iron* is now-a-days found, which on being added to water briskly effervesces. Each sixty grains contains about two grains of carbonate of iron; the dose is from one to two teaspoonfuls in half a tumblerful of water, drank while effervescing.

PREPARATION.—Pilula Ferri Carbonatis, one part in one and a quarter.

Mistura Ferri Composita. Compound Mixture of Iron. Syn.: *Griffith's Mixture. Mistura Antihectica. The Green Iron Mixture.* (Take of sulphate of iron, twenty-five grains; carbonate of potash, thirty grains; myrrh, refined sugar, of each, sixty grains; spirit of nutmeg, four fluid drachms; rose-water, nine fluid ounces and a half. Reduce the myrrh to powder, add the carbonate of potash and sugar, and triturate them with a small quantity of the rose-water so as to form a thin paste; then gradually add more rose-water and the spirit of nutmeg, continuing the trituration and further addition of rose-water until about eight fluid ounces of a milky-looking liquid is formed, then add the sulphate of iron dissolved in the remainder of the rose-water, mix them together thoroughly, and preserve the mixture as much as possible from contact with the air.) 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 lime. 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.

* *Saccharated Carbonate of Iron and Manganese.* (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.) 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, the formula of which I have given above, and the rationale of which can be gathered from what I have already written when explaining the pharmacopœial process for obtaining the saccharated carbonate of iron. 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.

INCOMPATIBLES.—Acids, 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*, Lond., Dubl. *(Ammonio-Citrate of Iron. Ferro-Citrate of Ammonia.)*

PREPARATION.—Take of solution of persulphate of iron, eight fluid ounces; solution of ammonia, nineteen fluid ounces and a half; citric acid, four ounces; distilled water, a sufficiency. Mix the fourteen fluid ounces of the solution of ammonia with two pints of distilled water, and to this add gradually the solution of persulphate of iron, pre-

viously diluted with two pints of distilled water, stirring them constantly and briskly. Let the mixture stand for two hours stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate with chloride of barium. Dissolve the citric acid in eight ounces of distilled water, and having applied the heat of a water-bath, add the oxide of iron, previously well drained, and stir them together until the whole or nearly the whole of the oxide has dissolved. Let the solution cool, then add five and a half fluid ounces of solution of ammonia. Filter through flannel; evaporate to the consistence of syrup, and dry it in thin layers on flat porcelain or glass plates at a temperature not exceeding 100°. Remove the dry salt in flakes, and keep it in a stoppered bottle.

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, $Fe_2O_3 3SO_3 + 3NH_4O = Fe_2O_3 + 3NH_4OSO_3$. 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. 460) 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, $3HO, C_{12}H_5O_{11} + Fe_2O_3 = Fe_2O_3 2HO, C_{12}H_5O_{11} + HO$; and on the subsequent addition of the solution of ammonia, one of the two remaining equivalents of basic water is replaced by ammonia, thus, $Fe_2O_3 2HO\ C_{12}H_5O_{11} + NH_4O = Fe_2O_3 NH_4O C_{12}H_5O_{11} + HO$. 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 AND TESTS.—In thin transparent scales of a deep red colour, slightly sweetish and astringent in taste. It feebly reddens litmus paper, is soluble in water, but almost insoluble in rectified spirit. Heated with solution of potash it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with acetic acid, give any crystalline deposit. When incinerated with exposure to air, it leaves not less than twenty-seven per cent. of peroxide of iron, which is not alkaline to litmus.

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 $(5NH_4O + 2\ (C_{12}H_5O_{11}) + 6HO) + (4Fe_2O_3 + (C_{12}H_5O_{11}) + 3HO)$.

ADULTERATIONS.—Not liable to adulteration; its not precipitating with ferricyanide 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 resem-

bles 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. I place more confidence in their power as tonics than as hæmatinics; for which latter purpose they are in my opinion inferior in value to the inorganic salts of iron.

DOSE AND MODE OF ADMINISTRATION.—Gr. v. to gr. x. in solution; it may be prescribed in combination with the alkaline carbonates.

PREPARATION.—Vinum Ferri Citratis, eight grains in one fluid ounce.

Vinum Ferri Citratis. Wine of Citrate of Iron. (Take of citrate of iron and ammonia, one hundred and sixty grains; orange wine, one pint. Dissolve, and let the solution remain for three days in a closed vessel, shaking it occasionally; afterwards filter). Dose, 1 to 4 fluid drachms.

* *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 Hamilton of this city. The exact formula for its preparation has not been made public: every f℥vj. holds 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 is 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, crystallized, 39⅓ 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 first formed an acid tartrate of ammonia similar in composition to that of potash (see p. 195); 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, $Fe_2O_3+NH_4O,HO,C_8H_4O_{10}+3HO=Fe_2O_3,NH_4O,C_8H_4O_{10}+4HO$.

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.*

PREPARATION.—Take of solution of persulphate of iron, four fluid ounces and a half; sulphate of quinia, one ounce; diluted sulphuric acid, twelve fluid drachms; citric acid, three ounces ; solution of ammonia, distilled water, of each a sufficiency. Mix eight fluid ounces of the solution of ammonia with two pints of distilled water, and to this add the solution of persulphate of iron previously diluted with two pints of distilled water, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate with chloride of barium. Mix the sulphate of quinia with eight ounces of distilled water, add the diluted sulphuric acid, and when the salt is dissolved precipitate the quinia with a slight excess of solution of ammonia. Collect the precipitate on a filter and wash it with a pint and a half of distilled water. Dissolve the citric acid in five ounces of distilled water, and, having applied the heat of a water-bath, add the oxide of iron previously well drained ; stir them together, and when the oxide has dissolved add the precipitated quinia, continuing the agitation until this also has dissolved. Let the solution cool, then add in small quantities at a time twelve fluid drachms of solution of ammonia diluted with two fluid ounces of distilled water, stirring the solution briskly, and allowing the quinia which separates with each addition of ammonia to dissolve before the next addition is made. Filter the solution, evaporate it to the consistence of a thin syrup, then dry it in thin layers on flat porcelain or glass plates, at a temperature of 100°. Remove the dry salt in flakes, and keep it in a stoppered bottle.

EXPLANATION OF PROCESS.—On mixing the solution of persulphate of iron with that of ammonia, we have sulphate of ammonia formed, and peroxide of iron precipitated ; the oxide is treated with citric acid, when citrate of the peroxide of iron is formed, and this mixed with quinia forms the *Ferri et Quiniæ Citras.* The quinia itself is obtained by decomposing the sulphate of quinia with solution of ammonia, sulphate of ammonia being held in solution and quinia precipitated.

CHARACTERS AND TESTS.—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 yellow and red prussiates of potash, and greyish-black by tannic acid. The taste is bitter as well as chalybeate. When burned with exposure to air, it leaves a residue which when moistened with water is not alkaline to test paper. 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 almost entirely soluble in pure ether, and when burned leaves but a minute residue.

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 sesquioxide of iron; the solution of ammonia precipitates the quinia. In virtue of the iron present in

it, it yields a blue precipitate with the solutions of the ferro and the ferricyanide of potassium (see p. 749), and a greyish-black one with tannic acid.

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 or possibly of magnesia. The pharmacopœial test will demonstrate in it the presence of sixteen per cent. of quinia, the almost complete solubility in ether of the precipitate produced on the addition of the ammonia, evidencing that it is quinia and not cinchonia which was present in the salt; the character of its polarization would also serve to distinguish it from cinchonia (see p. 733), whilst the residue left upon its combustion not possessing an alkaline reaction demonstrates that magnesia has not been substituted for quinia in its composition, a fraud that might be attempted with some prospect of escaping detection, as the ammonia would yield with the magnesian salt a white precipitate that otherwise might be mistaken for the quinia that ought to be present.

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 decidedly 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. This preparation is also found in the granulated state in our medical halls, each drachm of the powder containing about three grains of the salt; a teaspoonful mixed with half a tumblerful of water will effervesce briskly, and is a pleasant form in which to exhibit it.

INCOMPATIBLES.—All substances incompatible with the salts of iron.

FERRI IODIDUM. *Iodide of Iron.* (Iodide of iron, FeI or $\mathbf{FeI_2}$, with about eighteen per cent. of water of crystallization and a little oxide of iron.

PREPARATION.—Take of fine iron wire, one ounce and a half; iodine, three ounces; distilled water, fifteen fluid ounces. Put 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 froth becomes white. Pass the solution as quickly as possible through a wetted calico 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 well-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 peroxide. This solution may be readily preserved by adding a sufficiency of pure sugar to it to convert it into a syrup.

CHARACTERS AND TESTS.—Crystalline green, with a tinge of brown, inodorous, deliquescent, almost entirely soluble in water, forming a slightly green solution, which gradually deposits a rust-coloured sediment, and acquires a red colour. Its solution gives a copious blue precipitate with the red prussiate of potash. Mixed with mucilage of starch, it acquires a blue colour on the addition of a minute quantity of solution 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 sesquioxide 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 359° F. is decomposed, the iodine being volatilized and the iron left in the state of peroxide. The formula of the Pharmacopœia yields an excellent preparation; it is that originally proposed by Messrs. Smith of Edinburgh.

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.

PREPARATIONS CONTAINING IODIDE OF IRON.—Pilula Ferri Iodidi, one part in three; Syrupus Ferri Iodidi, 4·3 grains in one fluid drachm.

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.) Each three grains of this mass contains one grain of iodide of iron. Dose, gr. iij. to gr. vj. 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:—Reduced iron, 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 is 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 43 grains of iodide of iron. Dose, min. xx. to f℥j.

INCOMPATIBLES.—Acids, 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.

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, ℥vij. gr. lxxii. ; pure sugar, ℥xiss. ; mucilage, a sufficiency ; make into lozenges, each weighing gr. x.) Each lozenge contains gr. ¾ of the salt.

* *Syrupus Ferri Lactatis*, CAP. (Lactate of iron, gr. lx. ; boiling

distilled water, f℥viss.; pure sugar, ℥xiij.; make into a syrup.) Dose, f℥ij. to f℥ss.

INCOMPATIBLES.—Same as for the ammonio-citrate of iron.

FERRI OXIDUM MAGNETICUM. *Magnetic oxide of iron.* Syn.: *Ferri Oxidum Nigrum,* Edin. *(Æthiops Martis.)* (Magnetic oxide of iron, Fe_3O_4 or $\mathbf{Fe_3O_4}$, combined with about 20 per cent. of water of hydration, and containing some peroxide of iron.)

PREPARATION.—Take of solution of persulphate of iron, 5½ fluid ounces; sulphate of iron, 2 ounces; solution of soda, 4 pints; distilled water, a sufficiency. Dissolve the sulphate of iron in two pints of the water and add to it the solution of persulphate of iron, then mix this with the solution of soda, stirring them well together. Boil the mixture, let it stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until what passes through the filter ceases to give a precipitate with chloride of barium. Lastly, dry the precipitate at a temperature not exceeding 120°.

EXPLANATION OF PROCESS.—Upon adding to a mixed solution of sulphate of the protoxide and of sulphate of the peroxide of iron a solution of sulphate of soda, 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, $Fe_2O_3 3SO_3 + 3NaO = 3NaO\ SO_3 + Fe_2O_3$. The mixture of these two oxides 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 AND TESTS.—Brownish-black, destitute of taste, strongly attracted by the magnet. It dissolves without effervescence in hydrochloric acid diluted with half its volume of water, and the solution thus obtained gives blue precipitates with the red and yellow prussiates of potash. When a small quantity is heated in a dry test tube by the flame of a lamp, a deposit of moisture takes place in the cool part of the tube. Twenty grains dissolved in hydrochloric acid continue to give a blue precipitate with the red prussiate of potash, until 83 grain-measures of the volumetric solution of bichromate of potash have been added.

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 ferri- and ferrocyanide of iron, indicating the presence respectively of the proto- and perchloride of iron.

ADULTERATIONS.—Prepared as directed in the Pharmacopœia, this preparation is unlikely to contain any impurity; it may con-

tain metallic iron, the presence of which will be indicated by the escape of hydrogen gas, when treated with hydrochloric acid. The amount of blue precipitate yielded with the volumetric solution of bichromate of potash represents gr. 8·75 per cent. of protoxide of iron. The rationale of this test will be understood by reference to what has been already written under the head of Ferri Arsenias (see p. 757).

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 HUMIDUM. *Moist Peroxide of Iron.* Syn.: *Ferri Peroxidum Hydratum*, 1864. (Hydrated peroxide of iron with about 86 per cent. of uncombined water.)

PREPARATION.—Take of solution of persulphate of iron, four fluid ounces; solution of soda, thirty-three fluid ounces; distilled water, a sufficiency. Mix the solution of persulphate of iron with a pint of the distilled water, and add this gradually to the solution of soda, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter and when the liquid has drained away, wash the precipitate with distilled water, until what passes through the filter ceases to give a precipitate with chloride of barium. Lastly, enclose the precipitate, without drying it, in a stoppered bottle or other suitable vessel, from which evaporation cannot take place. This preparation, when used, 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, $Fe_2O_3 3SO_3 + 3NaO = 3NaOSO_3 + Fe_2O_3$.

CHARACTERS AND TESTS.—A soft moist pasty mass, of a reddish-brown colour. Dissolves readily in diluted hydrochloric acid without the aid of heat, and the solution gives a copious blue precipitate with the yellow but not with the red prussiate of potash. A little of it dried at 212°, until it ceases to lose weight, gives off moisture when heated to dull redness in a test tube.

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. According to Dr. A. Taylor, this reaction will not occur unless with arsenious acid *in solution;* when mixed with arsenious acid in the solid form, the state in which it is almost invariably exhibited either for purposes of suicide or murder, hydrated peroxide of iron has no effect upon it.

THERAPEUTICAL EFFECTS.—In its medicinal properties this preparation is precisely similar to the dry peroxide presently to be described. It has, however, been advisedly introduced into the Pharmacopœia, as being, in the opinion of several authorities, the most certain antidote for poisoning with arsenic which has been yet discovered. Its beneficial effects 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; but from Dr. Taylor's experiments most 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 marked, 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 taken to empty the stomach by the pump, or emetics, as the case may be—a preliminary that should never be neglected.

PREPARATION.—Ferri Peroxidum Hydratum.

FERRI PEROXIDUM HYDRATUM. *Hydrated Peroxide of Iron.* Syn.: *Ferri Peroxidum*, 1864. *Ferri Sesquioxidum*, Lond. *Ferrugo Ferri, Oxidum Rubrum*, Edin. Fe_2O_3,HO or $\mathbf{Fe_2O_3H_2O}$.

* 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.

PREPARATION.—Take of moist peroxide of iron, 1 pound; dry it at a temperature not exceeding 212° until it ceases to lose weight, then reduce it to fine powder.

PREPARATION.—*Of Carbonate of Iron.*—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 PROCESSES.—In the first of these two processes the hydrated peroxide of iron is simply deprived of all its equivalents save one, of water, by the heat employed; the second is 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, $NaOCO_2 + FeOSO_3 = FeOCO_2 + NaO\ SO_3$. 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 it is the sesquioxide of iron that is precipitated, thus, $2FeOCO_2 + O = Fe_2O_3 + 2CO_2$. Consequently the following observations are equally applicable to these two preparations, inasmuch as their chemical composition is identical.

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.

CHARACTERS AND TESTS.—A reddish brown powder, destitute of taste and not magnetic. It dissolves completely, though slowly, with the aid of heat, in hydrochloric acid diluted with half its volume of water, and the solution gives a copious precipitate with the yellow but none with the red prussiate of potash. Heated to dull redness in a test tube, it gives off moisture.

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 ferricyanide 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 sesqui-oxide of iron is administered in doses of from gr. xxx. 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 proportions with sulphur confection, I have found it of great value in neuralgic affections.

Emplastrum Ferri. Chalybeate Plaster. (Syn. : *Emplastrum Roborans.*) (Take of hydrated peroxide of iron, in fine powder, one ounce; Burgundy pitch, two ounces; lead plaster, eight ounces. Add the peroxide of iron to the Burgundy pitch and lead plaster previously melted together, and stir the mixture constantly till it stiffens on cooling.) This plaster is employed, as is popularly supposed, with good effect to give mechanical support in muscular relaxations and weakness of the lumbar region, over the stomach in flatulent dyspepsia, and over the region of the heart in nervous palpitation.

INCOMPATIBLES.—The mineral acids, and acidulous salts.

* FERRI PERCYANIDUM.—*Percyanide of Iron. Prussian Blue.* $Fe_4FeCy_3 (= 166)$.

This substance was formerly introduced into the Materia Medica list of the London Pharmacopœia, from the last edition of which it was omitted as being solely used for preparing bicyanide of mercury, which salt is no longer officinal. 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 old standing cases of epilepsy. But according to more recent observations, it appears to possess very little, if any, therapeutical power. The dose in which Prussian blue has beeen administered is from gr. iij. to gr. vj. three or four times a day.

FERRI PHOSPHAS.—*Phosphate of Iron.* (Phosphate of iron, $3FeO,PO_5$ or $\mathbf{Fe_3P_2O_8}$ 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 the precipitate at a temperature not exceeding 120°.

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. 217). 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:—$2NaO,HOPO_5 + NaO_4C_4H_3O_3 + 3FeOSO_3 = 3NaOSO_3 + C_4H_3O_3 + HO + 3FeO,PO_5$. 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 AND TESTS.—A slate-blue amorphous powder, insoluble in water, soluble in hydrochloric acid. The solution yields a precipitate with both the yellow and red prussiate of potash, 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. When the salt is digested in hydrochloric acid with a lamina of pure copper, a dark deposit does not form on the metal. Twenty grains, dissolved in hydrochloric acid, continue to give a blue precipitate with red prussiate of potash, until 250 grain-measures of the volumetric solution of bichromate of potash have been added.

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 sesquioxides of iron, and hence it yields a precipitate with both the ferro- and ferricyanide of potassium; the crystalline precipitate alluded to in the characters is the ammoniaco-magnesian phosphate (see p. 616). Did it darken the lamina of copper when treated as described in the test, it would indicate the presence of arsenic (see p. 250). It is insoluble in water.

THERAPEUTICAL EFFECTS.—Phosphate of iron possesses all the tonic properties of the other ferruginous preparations; but until lately was very seldom used in these countries. It appears tome 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, and within the past few years has come greatly into vogue in consequence of the appearance of various proprietary medicines in which it plays an important part, and which have been extensively advertised under the name of *chemical food*. The best of these is known by the name of its promulgator, the distinguished American pharmaceutist, Mr. Parrish, who honourably preferring the general good to his own private emolument, has published his formulary, which I have extracted from his valuable work on practical pharmacy, and will give below. Mr. Squire, an authority upon such subjects, states that no other chemist produces so good a result as does Mr. Parrish; and consequently he has consented to become his agent for it in these countries.

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.

**Parrish's Compound Syrup of Phosphates.* (Take of protosulphate of iron, ℥x.; phosphate of soda, ℥xij.; phosphate of lime, ℥xij.; phosphoric acid, glacial, ℥xx.; carbonate of soda, gr. xx.; carbonate of potassa, ℥j.; muriatic acid, water of ammonia, of each, sufficient; powdered cochineal, ℥ij.; water, sufficient; sugar, ℔ij. ℥viij. offic.; orange-flower water, f℥j. Dissolve the sulphate of iron in f℥ij. of boiling water, and the phosphate of soda in f℥iv. of boiling water; mix the solutions, and wash the precipitated phosphate of iron till the washings are tasteless. Dissolve the phosphate of lime in four fluid ounces of boiling water, with sufficient muriatic acid to make a clear solution; when cool precipitate it with water of ammonia, and wash the precipitate. To the freshly-precipitated phosphates as thus prepared, add the phosphoric acid previously dissolved in

water ; when clear add the carbonates of soda and potassa, previously dissolved in water, and muriatic acid to dissolve any precipitate Now dilute the water till it reaches the measure of twenty-two fluid ounces, add the sugar, and towards the last, the cochineal ; dissolve by the aid of heat, strain, and when cool add the orange-flower water.) As thus made, each teaspoonful contains about $2\frac{1}{2}$ grains of phosphate of lime, 1 grain of phosphate of iron, with fractions of a grain of phosphates of soda and potassa, besides free phosphoric and hydrochloric acids. The solution is perfect, the taste agreeably acid, and the flavor pleasant. The dose will be from one drachm up to four drachms, according to the age of the patient.

FERRI SULPHAS. *Sulphate of Iron* (described p. 113, 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 115) combined with the pill of aloes and myrrh, productive of excellent effects in the treatment of chlorosis.

FERRI SULPHAS GRANULATA. *Granulated Sulphate of Iron.* (The mode of preparing this salt and the explanation of the process will be found at page 115.)

CHARACTERS.—This salt is in small granular crystals of a pale-green colour and mildly styptic taste, soluble in water, insoluble in rectified spirit. It should be free from opaque rust-coloured spots, and dissolve in water without leaving any ochry residue. The aqueous solution gives no precipitate with sulphuretted hydrogen, 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. 115.

FERRUM TARTARATUM. *Tartarated Iron.* Syn. : *Ferri Potassio-tartras,* Lond. *Ferrum Tartarizatum,* Edin. Dubl.

PREPARATION.—Take of solution of persulphate of iron, five fluid ounces and a half; solution of ammonia, ten fluid ounces ; acid tartrate of potash, in powder, two ounces; distilled water, a sufficiency. Mix the solution of ammonia with three pints of distilled water, and to this add gradually the solution of persulphate of iron previously diluted

with two pints of distilled water, stirring constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate with chloride of barium. Mix the washed and drained precipitate intimately with the acid tartrate of potash in a porcelain dish and let the mixture stand for twenty-four hours; then having applied a gentle heat, not exceeding 140°, add gradually a pint of distilled water, and stir constantly until nothing more will dissolve. Filter; evaporate at a temperature not exceeding 140° to the consistence of syrup, and dry it in thin layers on flat porcelain or glass plates in a drying closet at 120°. Remove the dry salt in flakes, and keep it in stoppered bottles.

EXPLANATION OF PROCESS.—On reference to what has been written on tartaric acid, page 464, 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 ($KO,HO,C_8H_4O_{10}$), 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, $Fe_2O_3 3SO_3 + 3NaO = 3NaOSO_3 + F_2O_3$. 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, $Fe_2O_3 + KOHO,C_8H_4O_{10} = (Fe_2O_3KO, C_8H_4O_{10} + HO)$.

CHARACTERS AND TESTS.—Thin transparent scales of a deep garnet colour, slightly sweetish and astringent in taste, soluble in water and sparingly soluble in spirit. The aqueous solution, when acidulated with hydrochloric acid, gives a copious blue precipitate with the yellow, but none with the red, prussiate of potash. 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 acetic acid gives as it cools, a crystalline deposit. By incinerating fifty grains of it at a red heat, washing what is left with distilled water, and again incinerating, a residue of peroxide of iron is obtained, weighing 15 grains.

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 peroxide of iron, and 1 of tartaric acid ($4KOC_8H_4O_{10} + FeOC_8H_4O_{10} + 3Fe_3O_2 + C_8H_4O_{10}$); 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 ferricyanide 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.

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*, SOUBEIRAN. The following formula by M. Soubeiran yields a very 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. This preparation contains the iron in the state of tartrate, with traces of the malate and probably the acetate. The dose is from f℥j. to f℥ss.

INCOMPATIBLES.—The mineral acids; lime water; and all astringent vegetable preparations.

GENTIANÆ RADIX. *Gentian Root.* (The dried root of Gentiana lutea, *Linn.; Steph. and Church. Med. Bot.* plate 132. Collected in the mountainous districts of Central and Southern 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, cylindrical, simple or somewhat branched, marked with numerous fine rings; stem, annual,

simple, erect, 3–4 feet high, roundish, hollow; leaves opposite, broad, ovate, entire, glabrous, 5–7 nerved, plaited; flowers yellow, whorled, numerous, on smooth peduncles; fruit a conical capsule, 2-valved, septicidal, 1-celled, 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 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 birdlime (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; it 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.

PREPARATIONS.—Extractum Gentianæ; Infusum Gentianæ Compositum, one hundred and twenty grains to one pint; Mistura Gentianæ, half an ounce to one pint; Tinctura Gentianæ Composita, one ounce and a half to one pint.

Extractum Gentianæ. Extract of Gentian. (Take of gentian root, sliced, one pound; boiling distilled water, one gallon. Infuse the gentian in the water for two hours; boil for fifteen minutes; pour off, press, and strain. Then evaporate the liquor by a water-bath until the extract is of a suitable consistence for forming pills.) An excellent tonic extract. Dose, gr. x. to gr. xxx. two or three times a day, in the form of pill; 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 root, sliced, bitter orange-peel, cut small, of each, sixty grains; fresh lemon-peel, cut small, a quarter of an ounce; boiling distilled water, ten fluid ounces. Infuse in a covered vessel for one hour, and strain.) This is the Infusum Gentianæ Compositum, *Lond.* The preparation under this name in the *British Pharmacopœia*, 1864, is now named Mistura Gentianæ. It is an agreeably tasted infusion, but as it does not keep should be prepared as required for use. Dose, f℥j. to f℥ij.

Mistura Gentianæ. Gentian Mixture. Syn.: *Infusum Gentianæ Compositum*, 1864. (Take of gentian root, sliced. a quarter of an ounce; bitter orange-peel, cut small, coriander fruit, bruised, each, thirty grains; proof spirit, two fluid ounces; distilled water, eight fluid ounces. Macerate the gentian, orange-peel, and coriander in the proof spirit for two hours, then add the water, macerate again for two hours, and strain through calico.) The quantity of proof spirit contained in this formulary may render its exhibition under certain conditions 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 attending on the quantity of spirit it contains is, that it will make the mixture keep better; the compound infusion is the preparation 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*. Dose, f℥ss. to f℥j.

Tinctura Gentianæ Composita. Compound Tincture of Gentian. (Take of gentian root, cut small and bruised, one ounce and a half; bitter orange-peel, cut small and bruised, three-quarters of an ounce; cardamom seeds, freed from the pericarps and bruised, a quarter of an ounce; proof spirit, one pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.) Dose, 3ss. to 3ij.

INCOMPATIBLES.—Solution of subacetate of lead; nitrate of silver; sulphate of iron; and analogous salts.

MYRRHA. *Myrrh.* (A gum-resinous exudation fron the stem of Balsamodendron Myrrha, *Ehrenb. Nees, Plant. Med.*, plate 357. 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; leaflets obovate, obtusely toothletted at the apex, the lateral ones smooth; flowers unknown; fruit somewhat larger than a pea, surrounded at the base by a 4-toothed calyx, 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 inadmissable 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 it is rarely employed *per se*.

PREPARATIONS.—Decoctum Aloes Compositum, (see p. 156) three grains to one fluid ounce ; Mistura Ferri Composita, (see p. 760) six grains to one fluid ounce; Pilula Aloes et Myrrhæ, (see p. 157) one part in six; Pilula Assafœtidæ Composita, (see p. 66) one part in three and a half; Pilula Rhei Composita, (see p. 202) one part in eight, nearly ; Tinctura Myrrhæ, fifty-four grains and a half to one fluid ounce.

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 in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject

the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) The dose of this tincture for internal use is from f3ss. to f3j. 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.

NECTANDRÆ CORTEX. *Bebeeru Bark.* (The bark of Nectandra Rodiæi, *Schomburgk*, in *Hooker's Journ. of Bot.*, 2nd series, the Greenheart tree. 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 Schomburgk in honour of Dr. Rodie, by whom it was originally described, and who urged its introduction as a remedial agent in 1834.

BOTANICAL CHARACTERS.—A large forest tree, often more than 60 feet high, the trunk often destitute of branches for 50 feet, and covered by a smooth ash-grey bark ; leaves opposite, oblong, acute, entire, shining, undulated, about 5 inches long; flowers small, hermaphrodite, in few-flowered axillary panicles much shorter than the leaves, finely downy ; perianth 6-partite, rotate ; stamens 12 in 4 whorls, the 9 outer fertile, the 3 inner sterile; anthers, 4-celled, opening by valves ; fruit succulent, 1-seeded, more or less immersed in the tube of the perianth, changed into a truncated cup.

CHARACTERS.—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. 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.

PREPARATION.—Beberiæ Sulphas.

BEBERIÆ SULPHAS. *Sulphate of Beberia.* $C_{35}H_{20}NO_6,HO,SO_3$ or $\mathbf{C_{35}H_{40}N_2O_6,H_2SO_4}$. The sulphate of an alkaloid prepared from Nectandra or Bebeeru bark. It may be obtained by the following process :—

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 ; diluted 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 to the filtrate add 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 by the heat of a water-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, diluted sulphuric acid till the fluid has a slight acid reaction. Evaporate the whole to complete dryness on the water-bath, pulverise the dry product, pour on it gradually one pint of cold distilled water, stirring diligently; filter through paper; evaporate the filtrate to the consistency 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 AND TEST.—In dark-brown thin translucent scales, yellow when in powder, with a strong bitter taste, soluble in water and in alcohol. Its watery solution gives a white precipitate with chloride of barium; and with caustic soda a yellowish-white precipitate, which is dissolved by agitating the mixture with twice its volume of ether. The ethereal solution, separated by a pipette and evaporated, leaves a yellow translucent residue, entirely soluble in dilute acids. It is entirely destructible by heat. Water forms with it a clear brown solution.

CHEMICAL HISTORY.—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 Dr. Douglas Maclagan of Edinburgh. It is unquestionably a *tonic* of some power, but as an *antiperiodic* its effects are undoubtedly in-

ferior 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 in Neligan's opinion was fully borne out by his own experience of its effects in some cases in which he employed it. My experience of it, however, is by no means so favourable, and of late years it does not appear to support the character which at first it gained.

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.

PHOSPHORUS. *Phosphorus.* P(=31) or **P(=31)**. (A non-metallic element obtained from bones.) Phosphorus, discovered in 1669 by Brandt, a merchant of Hamburgh, who procured it from the solid residue of urine, derives its name from its remarkable property of luminosity; *φῶς, light*, and *φέρειν, to bear*. For nearly a century, however, the discovery remained unproductive, until Scheele pointed out the method of obtaining it from bones.

PREPARATION.—The Pharmacopœia, in my opinion most judiciously, have given us no formulary for the preparation of phosphorus, its manufacture being always conducted on an extensive scale; large quantities of it are consumed in the making of lucifer matches, some manufacturers consuming as much as 20 tons annually in the production of these articles of everyday consumption. It is extensively present in the organic and inorganic kingdoms, but nowhere more abundantly than in bones, which, as correctly stated in the Pharmacopœia, are at present the great commercial source of all the phosphorus used either in the arts or in medicine. Bones being first burned to get rid of all their animal matter, the ash, ground to powder, is acted upon by sulphuric acid, which converts the insoluble phosphate of lime normally present in bone into the soluble phosphate (see p. 216). This latter is evaporated to dryness, and mixed with charcoal, which partially deoxidizes it, converting a portion of the soluble phosphate of lime into pyrophosphate of lime ($2CaO,PO_5$), and the remainder into phosphorus, which is distilled over; thus :—$2(2HO,CaO,PO_5) + C_5 = 2CaO,PO_5 + 5CO + 4HO + P$. During this process some phosphuretted hydrogen gas also escapes, it being formed by the action of a portion of the phosphorus on the water. The phosphorus so obtained is put into glass moulds, melted by immersion in hot water, and on cooling is withdrawn in

the form of *stick* phosphorus, the way in which it is generally met with in commerce. The product of the first distillation will require purification, which is effected by melting it in solution of ammonia, bleaching it by heating it with a mixture of sulphuric acid and bichromate of potash, remelting it, straining it through chamois leather to remove impurities, and finally recasting it in glass moulds as already described.

CHARACTERS AND TESTS.—A semi-transparent, colourless, wax-like solid, which emits white vapours when exposed to the air. Specific gravity 1·77. It is soft and flexible at common temperatures, melts at 110°, ignites in the air at a temperature a little above its melting point, burning with a luminous flame and producing dense white fumes. Insoluble in water, but soluble in ether and in boiling oil of turpentine.

PHYSICAL CHARACTERS.—In addition to the pharmacopœial characters, it may be stated that pure phosphorus when in the solid state is tasteless, but that in solution its taste is nauseous and rather pungent; that although at ordinary temperatures flexible, at 32° it is brittle; that exposed to the air it emits luminous fumes (most remarkably perceptible in the dark), and that it has a peculiar alliaceous odour.

CHEMICAL CHARACTERS.—Although strictly speaking insoluble in water, still water in which phosphorus has been kept for some time furnishes distinct proofs of the presence of phosphoric acid; this is not due to the decomposition of the water itself, inasmuch as no hydrogen escapes, but rather to the absorption by the phosphorus of the oxygen mechanically entangled in the water. In addition to being soluble in ether and boiling oil of turpentine, it is also soluble in naphtha, benzol, the common fixed oils, but most abundantly of all in bisulphide of carbon. Without entering more minutely into its chemical history, it must suffice here to state that very minute proportions of phosphorus, even when mixed with other substances, may be recognized in all cases by their luminosity in the dark, and in many instances also, as an additional test, by their peculiar alliaceous odour. Should we have reason to suspect that the quantity present was in very minute proportions, advantage may be taken of its solubility in bisulphide of carbon, to digest in it the subject of examination for some hours, decanting the fluid, and placing a few drops of it on a watch-glass floating on hot water, and on watching the evaporation of the fluid in the dark, if phosphorus be present it will evidence itself by its luminosity.

THERAPEUTICAL EFFECTS.—In medicinal doses phosphorus appears to act principally as a stimulant tonic, its action being more particularly evidenced over the nervous and vascular system; thus, after being for some time exhibited, it causes a general sense of exhilaration, accelerating the pulse, increasing the temperature of the skin, stimulating the mental faculties, and in some instances intensifying the venereal appetite; in large doses it acts as an irritant poison, producing an acrid burning sensation in the entire œsophogœal tract, extending from the mouth to the stomach, attended with thirst,

nausea, vomiting, purging, tympanitic distension of the abdomen, extreme depression, a weak fluttering pulse, cold extremities, clammy skin, convulsions, insensibility, and death. The class of diseases in which phosphorus is likely to prove beneficial may be gathered from its physiological effects as described above. Its use has been strongly urged in all these classes of cases where the indication is to improve nerve tone, and to repair nerve tissue; thus it is employed in epilepsy, and most beneficially in that form which occasionally follows undue sexual indulgence; as also in that form of impotence which results from a like cause; its use in long standing paralytic affections has been attended with advantage; in softening of the brain it has also been employed, but with very equivocal success; as also in phthisis, but with a like result. In some forms of melancholia, mania, amaurosis, attendant upon protracted cerebral exhaustion, its exhibition may be attended with advantage. At present a certain class of salts termed *hypophosphites* is with some practitioners in great favour in the treatment of that class of cases in which phosphorus has proved itself to be beneficial. These salts are all prepared by combining hypophosphorous acid (HO^2HO,PO) with the required base, their general formula being one atom of base, two of water, and one of hypophosphorous acid, as in the case of the hypophosphite of soda, one of the most popular of the class, thus :—NaO^2HO,PO. The majority of the salts of this class also possess the great advantage of being very soluble in water. The theory upon which their therapeutic value is based is, that the phosphorus is in a condition of very loose combination when in the state of hypophosphorous acid, and that therefore its salts, when introduced into the circulation, will very readily render up their phosphorus to the requirements of the system. As in many other instances, the reputation of this class of salts has, in my opinion, suffered from the too zealous advocacy of injudicious friends; virtues of the most extravagant character having been industriously claimed in their behalf; phthisis itself, as in the case of almost every other loudly vaunted panacea, being quoted in the list of maladies in which their use is certain to be crowned with success. Whilst the hypophosphites hitherto have failed in supporting these extravagant pretensions, still their value should by no means be ignored; in many cases of nervous exhaustion they seem to produce, but in a minor degree, the effects of phosphorus itself, their safety of action to a great extent compensating for their comparative want of energy. Occasionally, however, great symptoms of excitement, such as quick pulse, hot skin, &c., follow on their administration. In addition to the hypophosphite of soda already mentioned, we have hypophosphites of potash, ammonia, lime, manganese, iron, quinine, &c. In cases of poisoning with phosphorus either from design or accident, the latter being by far the most frequent occurrence, arising in many instances from children sucking lucifer matches, we are unfortunately unacquainted with any efficient antidote; mucilaginous drinks should be freely

exhibited, as also magnesia, as much to neutralize any acid produced by the oxidation of the phosphorus in the system, as to protect the stomach by its mechanical action from the further action of the phosphorus: the stomach should also be cleared by the action of an emetic. The subsequent inflammatory symptoms must be treated upon the ordinary principles. The period at which death occurs has varied exceedingly in the recorded cases, in some instances occurring within four hours, in others not for fifteen or sixteen days. The quantity also which will destroy life varies exceedingly, in some instances one grain and a half having been stated to have been followed by fatal results, whilst Pereira states that he himself exhibited ten grains of apparently good phosphorus to Chabert the "Fire King," who swallowed it in his presence, seemingly without suffering any inconvenience from its ingestion. Persons engaged in lucifer-match manufactories have occasionally suffered from caries and necrosis of the lower jaw; in fact such parties are stated to be peculiarly prone to such diseases. This is very generally attributed to the action of the fumes of the phosphorus producing first periostitis, and subsequently the caries and necrosis. I confess that to me it appears inexplicable why the lower jaw should so invariably be the seat of the disease, especially as the remarkable exemption of the workpeople in some factories has been attributed to strict attention to cleanliness. It has been attempted to account for this strange preference on the part of the disease, by the fumes of the phosphorus vapour having got access to the bone through the channel afforded them by the presence of carious teeth; in many instances no doubt such have been present, but cases are on record where the disease of the lower jaw has occurred in individuals whose teeth were apparently perfectly sound. If it be the result of constitutional contamination, why the other bones should escape is, as I said before, difficult to understand.

DOSE AND MODE OF ADMINISTRATION.—It is very generally stated that phosphorus should never be administered in the solid form; if strictly interpreted this is perfectly correct, but it is not so if it be understood that phosphorus may not be administered in the form of pill, as in my opinion this is by far the best and safest way of exhibiting it. These pills should be prepared by carefully dissolving the phosphorus in prepared suet in a closed vessel, in such proportions that each pill shall contain the thirtieth of a grain of phosphorus; these pills should be well coated with gelatine, whereby the phosphorus is protected from the action of the air, its taste completely, and its alliaceous smell very considerably though not completely, masked; one of these may be given three or four times a day. These pills are troublesome to prepare, but now-a-days are found ready-made in all our principal medical halls; the proportions in all instances being pretty closely those which I have here given. It has also been suggested to give it in the fluid form, when for any reason this mode of exhibition may be preferred, either dissolved in ether, or in some bland oil; the former of these two solutions is

open to the grave objection that by evaporation of the ether the solution is always liable to variations in its strength ; for its exhibition in oleaginous solution, the formulary given below will be found a convenient one. The dose of the *hypophosphites* is from five to ten or fifteen grains dissolved in water, to which some flavoring syrup or tincture may be added, or they may be prescribed in the infusions of some of the pure vegetable tonics, or in the form of syrup, a great variety of which has from time to time been suggested, but of which I shall give below but one formulary, extracted from Parrish's admirable work on practical pharmacy.

* *Oleum Phosphoratum. Phosphorated Oil.* (Phosphorus, dry and cut into small pieces, gr. ij. ; fresh almond oil, f℥j. Melt the phosphorus in the oil by the aid of a gentle heat in a closed vessel, and keep in a well stopped bottle.) The dose of this solution will be from five to ten minims, in the form of emulsion.

* *Parrish's Syrup of the Hypophosphites.* (Take of hypophosphite of lime, one ounce and a half; hypophosphite of soda, one ounce; hypophosphite of potassa, half an ounce; common sugar, one pound, twelve ounces; hot water, one pint, four fluid ounces; orange-flower water, one fluid ounce. Make a solution of the mixed salts in the hot water, filter through paper, dissolve the sugar in the solution by the aid of heat; strain and add the orange-flower water.) Dose, a teaspoonful, containing nearly five grains of the mixed salts.

PREPARATION.—Acidum Phosphoricum Dilutum.

QUASSIÆ LIGNUM. *Quassia Wood.* (The wood of Picræna excelsa, *Lindl.; Steph. and Church. Med. Bot. (Quassia excelsa)* plate 173. 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 the height of 100 feet; leaves imparipinnate; leaflets 9–17, opposite, stalked, oblong, acuminate, unequal at the base; flowers polygamous, small, yellowish-green, in axillary, very compound racemes; sepals 5, minute; petals 5, longer than the sepals; ovaries 3, seated on a round turned receptacle; style angular, bifid ; fruit 3 drupes, each about the size of a pea, black, shining, and globular.

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 may at once be 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.

PREPARATIONS.—Extractum Quassiæ ; Infusum Quassiæ, six grains to one fluid ounce; Tinctura Quassiæ, sixteen grains and a half to one fluid ounce.

Extractum Quassiæ. Extract of Quassia. (Take of quassia wood, rasped, one pound; distilled water, a sufficiency. Macerate the quassia with eight fluid ounces of the water for twelve hours ; then pack in a percolator, and adding more of the water, allow the liquor slowly to pass until the quassia is exhausted. Evaporate the liquor ; filter before it becomes too thick ; and again evaporate by a water-bath until the extract is of a suitable consistence for forming pills.) Dose, 5 grains to xx. grains.

Infusum Quassiæ. Infusion of Quassia. (Take of quassia wood, in chips, sixty grains; cold distilled water, ten fluid ounces. Macerate in a covered vessel for a 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.

Tinctura Quassiæ. Tincture of Quassia. (Take of quassia wood, in chips, three quarters of an ounce; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation ; then strain, press, filter, and add sufficient proof spirit to make one pint.) Dose, f℥ss. to f℥ij.

* 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 Decandria.* 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.—All the plants belonging to the genus *Salix* are either shrubs or trees. The catkin scales are quite entire. *Barren flowers;* scales of the catkin single flowered, imbricated, with 1-2 nectariferous glands; perianth, none; stamens 1–5. *Fertile flowers*; scales of the catkin single-flowered, imbricated, with 1–2 nectariferous glands; 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), lbj.; 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, lbj. of bark yields 3v. 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, by which property it is readily distinguished from sulphate of quinia, 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 salicin very extensively as a tonic in the debility following acute diseases, particularly in cases accompanied by irritability of the digestive organs, and consider its tonic powers to be very nearly if not 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. lx. 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 sesquisalts 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; leaves abruptly pinnate, leaflets alternate, shortly petiolate, oval, mucronate, pubescent beneath ; flowers unisexual ; calyx small, cup-shaped, 5–toothed ; petals 5-spreading ; male flowers decandrous; female flowers consist of 5 pistils on an even disk, with 10 rudimentary stamens at the base; styles 5, distinct at the base, but uniting above, and surmounted by a broad, 5–lobed stigma.

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); or $\mathbf{Na_2HAsO_4 7H_2O}$. (=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 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 AND TESTS.—In colourless transparent prisms soluble in water; the solution is 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. Heated to 300° it loses 40·38 per cent. of its weight. A watery solution of ten grains of the residue, treated with 53 grain-measures of the volumetric solution of soda, continues to give a precipitate with the volumetric solution of nitrate of silver until 1613 grain-measures of the latter have been added.

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.

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 1000 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 1000 measures, to obtain 27·42 grains we will require 1613 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; and if my experience misleads me not very much, it is the preparation of arsenic of which the system appears to become most tolerant. This word *tolerant* in connection with arsenic or its preparations must be accepted with extreme caution. I do not believe that arsenic resembles, for instance, opium in the remarkable influence exercised by habit over this last-mentioned drug. And this opinion, derived from some experience of its effects, has not been modified by the marvellous stories I have read of the so-called arsenic-eaters of Styria. The inhabitants of that country are stated to commence to inure their constitution to the effects of arsenic by small but gradually increasing doses, for the purpose of improving their wind, and of imparting to them an air of juvenility; and it is furthermore stated, that when at last they give up the practice, they become prematurely and suddenly old-looking and decrepit. But why they should ever give it up, knowing the certain result, is not satisfactorily explained. A most remarkable circumstance connected with these marvellous tales is, that no standard German author has, so far as I am aware, hitherto corroborated them; nay, or even alluded to them! The whole statement is so very unlike the effects produced by a protracted

course of arsenic upon the inhabitants of these countries, upon whom the result would be anything but the induction of an air of juvenility, that I can look upon it as but one of the wonderful stories with which travellers occasionally favour us; especially when so far from keeping probability in view, we are gravely informed that one of those peasants swallowed, with perfect impunity, on one day 4½ grains, and on the following day 5½ grains of arsenious acid, a quantity, as Taylor remarks, sufficient to kill five adult human beings! Arseniate of soda is used in the same diseases and with the same precautions as liquor arsenicalis (see page 704).

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. It must be borne in mind that arsenic acid is as deadly a poison as arsenious acid, if not more so. 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.*

PREPARATION.—Liquor Sodæ Arseniatis, 6·6 grains, or 4 grains dried, in 1 fluid ounce.

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, 5 minims, cautiously and gradually increased up to 10 minims, three times daily after food. This solution is intended as an officinal representation of the following preparation, from which, however, it differs in being much stronger; the increase in strength has been wisely adopted with the very proper view of having all the arsenical solutions in the Pharmacopœia of the same strength.

* *Pearson's Solution.* (Arseniate of soda, in crystals, gr. j.; distilled water, f3x.; dissolve.) This preparation is in very general use in France; being a weaker solution than the officinal one, it may be given in larger doses. Dose, min. xx., very gradually increased to f3ij. three times daily after food.

TARAXACI RADIX. *Dandelion Root.* (The fresh and dried roots of Taraxacum Dens Leonis, *DC.*, *Woodv. Med. Bot.* (*Leontodon Taraxacum*), plate 3. 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 head of flowers; involucral scales imbricated, the outer ones often lax and reflexed when the fruit is matured; receptacle naked; florets all ligulate, yellow; pappus pilose; *achenes* terete, or slightly angled at the base, terminating in a long slender beak.

CHARACTERS AND TESTS.—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. Not wrinkled or pale coloured externally; juice not watery; any adherent leaves runcinate and quite smooth.

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.

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 very 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. I am much in the habit of prescribing it in the treatment of hepatic affections in combination with other more powerful medicines of the same therapeutic value, such as diluted nitro-hydrochloric acid, chloride of ammonium, &c., and as it appears to me with marked advantage. The preparation of it which I prefer to all others is the succus. It is also held by many to be diuretic and aperient, but the latter of these effects is not produced unless it be given in very large doses.

DOSE AND MODE OF ADMINISTRATION.—Only as follows :—

PREPARATIONS.—Decoctum Taraxaci (dried), one ounce to one pint; Extractum Taraxaci (fresh); Succus Taraxaci (fresh).

Decoctum Taraxaci. Decoction of Dandelion. (Take of dried dandelion root, sliced and bruised, one ounce; distilled water, one pint. Boil for ten minutes in a covered vessel, then strain and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) Dose, 2 to 4 fluid ounces.

Extractum Taraxaci. Extract of Dandelion. (Take of fresh dandelion root, 4 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° until the extract has acquired a suitable consistence for forming pills.) Dose, 5 to 30 grains.

Succus Taraxaci. Juice of Dandelion. (Take of fresh dandelion root, 7 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; it is the best preparation of dandelion. The dose of it is from f℥ss. to f℥ij.

INCOMPATIBLES.—Acetate of lead; the sesquisalts of iron; corrosive sublimate; nitrate of silver; and infusion of galls.

ULMI CORTEX. *Elm Bark.* (The dried inner bark of Ulmus campestris, *Linn.*, Broad-leaved Elm. *Woodv. Med. Bot.*, plate 197. 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, wedge-shaped, and oblique at the base; flowers, in dense heads, each subtended by a small scale. Doubly serrate, acuminate, usually scabrous above and pubescent beneath, often nearly glabrous; flowers perfect; perianth 5–7 cleft, segments ciliate; *samara* oblong or roundish, broadest about or below the middle, shortly bifid at the apex, the seminiferous cavity below the middle and distant from the notch (HOOKER).

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, frequently using the decoction described below as the vehicle for the preparations of arsenic or of iodide of potassium, &c.

DOSE AND MODE OF ADMINISTRATION.—Used only in the form of decoction and syrup.

Decoctum Ulmi. Decoction of Elm Bark. (Take of elm bark, cut in small pieces, two and a half ounces; distilled water, one pint. Boil for ten minutes in a covered vessel, then strain and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.) Dose, 2 to 4 fluid ounces.

* *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 p. 147, 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 p. 148, 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.

WATERS.

In this chapter I propose considering in its various aspects the all-important subject of water, and in doing so I propose to divide water into three great classes, fresh waters, sea waters, and mineral waters. Commencing with distilled water, the purest variety of water, I shall first pass under review the therapeutic value of fresh waters, then of sea waters, and finally of mineral waters. But little difficulty is experienced in so far selecting this classification, nature herself apparently having adopted that which I am about to follow; but when we come to the subdivision of mineral waters, much will arise to perplex us. The first classification adopted by the older writers was founded upon their sensible properties, the most remarkable perhaps of which is their temperature, mineral waters having been by them subdivided into cold waters and hot waters. But increased experience soon demonstrated the great difficulties attendant upon this system of classification; for though in extreme cases the contrast was well marked, as between the classic Styx in Arcadia, the temperature of which is 33°, and the Geysers, or boiling springs of Iceland, the temperature of which is 212°, sufficiently elevated to boil an egg, still the differences of temperature pass so imperceptibly into each other, that it frequently becomes a matter of difficulty to decide to which class the mineral water should be referred; besides which, waters differing from each other in temperature, but possessed of similar chemical composition and of closely analogous remedial powers, would by such a system of classification appear in different classes. A classification founded upon their therapeutic properties appears to me in our present state of knowledge upon the subject impracticable, those most widely differing in their chemical and physical properties being equally vaunted in the treatment of the same classes of diseases. For the purposes of this work I consider it sufficient to discuss them under the following heads, sulphurous, chalybeate, and saline waters. The special therapeutic advantages of all these several varieties of water will be

most conveniently discussed under their respective headings. Here it will be sufficient to remark in general terms that more than a fair share of the occurring benefits attendant upon a sojourn at even the most celebrated of the spas should not be ascribed to them. Something must be allowed for change of climate and of scene; agreeable society; regularity of diet and of hours; open-air exercise; and, above all, release from the toils of business and relief from mental worry. So fully impressed were the ancient Romans with the value of these most important items in a course of mineral water treatment, that the following lines were inscribed over the baths of Antoninus :—

Curæ vacuus hunc adeas locum,
Ut morborum vacuus abire queas;
Non enim hic curatur qui curat.

AQUA DESTILLATA. *Distilled Water.* HO (=9) or $\mathbf{H_2O}$ (=18). Up to the year 1783 water was looked upon as an elementary substance; since then it has been unequivocally proved to be a compound body, the honor of which discovery is claimed for Watt and for Cavendish, and for the celebrated French chemist Lavoisier.

PREPARATION.—Take of water, ten gallons. Distil from a copper still, connected with a block-tin worm; reject the first half gallon, and preserve the next eight gallons.

EXPLANATION OF PROCESS.—In this process the first half gallon of water that distils over is to be rejected, inasmuch as with it come over all the volatile impurities, such as oxygen gas, atmospheric air, carbonic acid gas, &c., which have become mechanically entangled in the water, and they are thereby got rid of. Distillation to dryness is not permitted, inasmuch as the organic impurities of the water would become charred, and the product thereby contaminated.

TESTS.—A fluid ounce of it evaporated in a clean glass capsule leaves scarcely a visible residue. It is not affected by sulphuretted hydrogen, oxalate of ammonia, nitrate of silver, chloride of barium, or solution of lime.

IMPURITIES.—The ordinary impurities found in natural water are of two classes, either those mechanically suspended in it, or those which are held in it in solution; the first of these can be got rid of by subsidence, or better still by filtration; for the removal of the second class of impurities distillation is essential, and their general character is sufficiently well indicated by the pharmacopœial tests to render it unnecessary for me to allude to them further. If the water were affected by sulphuretted hydrogen, it would indicate the presence of metallic impurities, notably those of lead (see page 139); 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 solution of 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.

PROPERTIES.—In its physical properties distilled water closely resembles common water, save that it is not so sparkling, and that its taste, which is peculiarly mawkish and flat, is by no means so agreeable. It may present itself under three distinct forms, the fluid, the solid, or the gaseous. At 32°, under ordinary circumstances, it commences to assume the solid form; or, in popular language, to freeze. The statement, however, would be more universally correct were I to say that, above 32°, ice commences to melt; heat applied to ice raises its temperature until it reaches 32°, after which, until the ice is melted, no further increase of temperature takes place, even though the application of the heat be continued, the caloric becoming latent in the water. This is generally known as the caloric of the liquidity of the water, and appears to be 142° 65′. If, after all the ice be melted, the application of the heat be still continued, the water finally commences to boil, which it does at the temperature of 212°, after which any further heat applied to it no longer raises its temperature; in fact, it again becomes latent. This heat is known as the caloric of the elasticity of steam, and its value is 966° 6′. In freezing, water slightly expands in volume, but on assuming the condition of steam it expands enormously; one cubic inch of water at 60°, at 212° becoming 1695 cubic inches. Water is generally looked upon as a neutral oxide, but in the foregoing pages I have drawn attention to many cases in which it seems to play the part of a base, in others that of an acid; and I have also had occasion to allude to the energetic character of its action with anhydrous bases, whereby great heat is developed, consequent on the chemical union of the water with the bases, and the formation with them of definite compounds known by the name of hydrates. In the case of simple solution of salts in water, where no such chemical union takes place, a decrease instead of an increase of temperature will be observed. Finally, water is perhaps the most universal solvent which we have at our command.

USES.—Distilled water is more an article of value to the chemist and pharmaceutist than to the physician; with the former it is in continued requisition; by the latter it is very seldom indeed employed; occasionally its therapeutic use has been advocated in the treatment of various forms of calculous diseases; but the advantages consequent upon its employment in such cases being rather a subject of theoretical speculation than of clinical observation, its use now-a-days has become quite obsolete.

AQUA. *Water.* (Natural water, the purest that can be obtained; cleared, if necessary, by filtration.) In nature we find many varie-

ties of fresh water, such as rain, spring, river, lake, and pump waters. The purest variety of all these is rain water collected in clean vessels at a distance from inhabited places. Sea or salt-water, though not alluded to in the Pharmacopœia, on account of its frequent employment as a remedial agent, will also require a few brief remarks at my hands.

CHARACTERS.—In their sensible characters, the most remarkable difference observable between all the varieties of natural fresh-waters is in their comparative sparkle and varying taste; their chemical properties are identical in every respect, save purity, with those of distilled water already described. Sea-water differs from every variety of fresh-water in the large quantity (in round numbers, about $3\frac{1}{2}$ per cent.) of saline ingredients which it contains; these are principally chlorides of sodium, of potassium, and of magnesium, sulphates of magnesia and of lime, carbonate of lime, bromide of magnesium, traces of iodine, &c.; of these, chloride of sodium exists in by far the greatest proportion.

TESTS.—Free from odour, taste, and visible impurities.

IMPURITIES.—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. They may be recognised by evaporating a portion of water to dryness, when if organic matter be present it will appear as a brown residuum, which will become charred upon the application of a sufficiently high temperature. The discoloration of a solution of permanganate of potash by a solution containing organic matter can also be employed as a test of its presence, as also as a rough estimate of the amount of it present in a given sample, each five grains of organic matter decolorizing one grain of permanganate of potash. 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 recognised by the thrifty housekeeper. The amount of hardness in a water is ascertained by what is termed the *soap test;* everyone 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, but one which is 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 just 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 then 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 $(29—2)\times 0{\cdot}53 = 14{\cdot}31$. The special character of the several inorganic impurities can be gathered in a general way from what has been already written upon the tests for distilled water.

USES.—In pharmacy fresh water, both distilled and undistilled, is extensively used in preparing the several infusions, decoctions, extracts, &c. which have been discussed in the preceding pages, as also in the chemical manipulations necessary for the production of the several salts, alkaloids, &c. which are employed either as tests or in the treatment of disease. Independent of its chemical and pharmaceutical uses, water, though scarcely to be called a medicine, is also 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, ice externally applied 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; whilst the value of ice in the treatment of various forms of disease, such as that most distressing malady sea-sickness, diarrhœa, cholera, but more especially of epilepsy, has been ably insisted upon by Dr. Chapman, who employs it in ice-bags applied along the spine, over the nerves of which he believes ice so applied produces a decidedly sedative effect. These views of Dr. Chapman's are in my opinion of a higly important character, and call for more extended clinical investigation. 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 do we now see the sticking-plaster employed as formerly, 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 bedpost 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 disease, 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, and of that modern introduction, the Turkish or hot-air 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; as a general rule, a bath which would be cold in summer being evidently capable of being looked upon as tepid in winter, and vice versâ. 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 on the system by these baths 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 elbow or 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 to 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 and 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 will 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. The Turk-

ish bath has been elevated into a position that would be independent of the medical man by those who advocate its use; in fact, many would have it as the universal panacea. Such preposterous claims have only resulted in retarding its reaching the position to which it is justly entitled in the list of remedial agents. Whilst far from admitting the propriety of its indiscriminate and universal use, still I am an advocate for its employment in properly selected cases. Thus, I have found it of great use in the treatment of muscular rheumatism, especially when of recent date; of ordinary catarrh; as a valuable auxiliary in the treatment of diabetes, and of secondary venereal. Of course, for their employment our patients must be sent to proper establishments for the purpose, one or more of which are now-a-days to be found in all our principal cities. The time necessarily occupied in their administration is a great drawback to their general adoption. The continuous use of the warm bath has been found of great value in the treatment of burns, of severe wounds, and, after some forms of surgical operations, as excision of the elbow or ankle joint. By continuous use, I mean either partial or complete immersion during the entire period of treatment. In some forms of skin-affections Hebra has kept his patients immersed in the bath for many weeks at a time, without once taking them out of it. Of course provision must be made in the construction of the bath for changing the water as occasion may require, and also for keeping up the required temperature. We have had such a bath erected in the Meath Hospital, and in many cases found its use attended with great advantage; and for partial immersion of a limb we also have baths variously modified, to which my colleague Mr. Stokes has adapted an ingenious instrument for regulating the temperature of the water.

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, the pharmacopœial process for effecting which has been already described.

MINERAL WATERS.—As I have already stated, for the purposes of this work it will be sufficient for me to discuss mineral waters under the three heads of SULPHUROUS, CHALYBEATE, and SALINE waters. For the sulphurous waters include both *cold* and *thermal;* and the chalybeate both *effervescing* and *still*; whilst under the head of saline may be found both *cold* and *thermal*, *effervescing* and *still*, and it is manifest that no practical advantage would result from entering into the consideration of these subdivisions; more especially as each and all of them will be represented in many of the examples which I shall adduce of the classifications I have here adopted.

CLASS I. SULPHUROUS WATERS.—All the waters of this class are characterized by their extremely offensive odour, and very unpleasant taste, both of which are due to the presence in them in greater or lesser quantity of the sulphide of hydrogen gas, either free or in a state of combination. In either case the water will produce a black precipitate with solutions of the salts of lead (sulphide of lead). Whether the gas be free or in a state of combination can be decided by simple ebullition; if after being boiled the water no longer precipitates the solution of lead, the gas is free; if it continues to do so, it exists in a state of combination. Many of these springs are thermal, and they are especially found on the Continent. In these countries they are cold. In thermal sulphurous waters are found the peculiar organic substances called Barégine, Zoogène, Sulphuraire, Glairine, and Glaridine. Amongst the more important of the thermal sulphurous waters may be enumerated those of Aix-la-Chapelle, Baden near Vienna; Aix-les-Bains; Baréges; Bagnères de Luchon; Saint Sauveure; Eaux-Bonnes; Eaux-Chaudes; &c. And amongst the cold sulphurous waters may be enumerated, those of Harrowgate; Moffat and Strathpeffer in Scotland; Lucan, and Lisdoonvarna in Ireland; Nenndorff in Hesse; Winslar in Hanover; Weilbach in Nassau; Eilsen in Lippe, &c. It would manifestly exceed the bounds I have laid down for this work, were I to give separate analysis for the vast variety of spas annually resorted to for one reason or another. I shall content myself with making a selection for my readers of the more frequented of them, and for further information must refer them to some one or other of the many treatises which abound upon this subject.

AIX-LA-CHAPELLE. Perhaps of all the thermal sulphurous springs, those which are of most importance are found at Aix-la-Chapelle. Here are found four principal springs known respectively as the Emperor's Spring; Cornelius' Spring; Spring of the Roses; and Quirinus' Spring. According to Baron Liebig's analysis, the following is their composition in sixteen ounces.

The Emperor's Spring, Kaiserquelle, 131°. *Solids.*—Chloride of sodium, gr. 20.271; bromide of sodium, gr. .028; iodide of sodium, gr. .004; sulphuret of sodium, gr. .073; carbonate of soda, gr. 4.995; sulphate of soda, gr. 2.171; sulphate of potash, gr. 1.186; carbonate of lime, gr. 1.217; carbonate of magnesia, gr. .395; carbonate of strontia, gr. .002; carbonate of lithia, gr. .002; carbonate of protoxide of iron, gr. .073; silica, gr. .508; organic matter, gr. .577; total, gr. 31.502. *Gases.*—Nitrogen, 9 per cent.; carbonic acid, 89.40; carburetted hydrogen, .37; oxygen, 1.23.

Cornelius' Spring. Corneliusquelle, 113°.6. *Solids.*—Chloride of sodium, gr. 18·934; bromide of sodium, gr. .028; iodide of sodium, gr. .004; sulphuret of sodium, gr. .042; carbonate of soda, gr. 3·817; sulphate of soda, gr. 2.201; sulphate of potash, gr. 1.204; carbonate of lime, gr. 1.012; carbonate of magnesia, gr. .192; carbonate of strontia, gr. .002; carbonate of lithia, gr. .002; carbonate

of protoxide of iron, gr. .046 ; silica, gr. .459 ; organic matter, gr. .713 ; total, gr. 28.654. *Gases.*—Nitrogen, 7.79 per cent. ; carbonic acid, 92.91 ; carburetted hydrogen, traces ; oxygen, traces.

In addition to the amount of gases indicated in the foregoing tables as contained in the water of these springs, the following amount of gases disengage themselves from these springs:—*Emperor's Spring.* —Nitrogen, 66·98 per cent. ; carbonic acid, 30.89 ; carburetted hydrogen, 1.82 ; sulphuretted hydrogen, .31. *Cornelius' Spring.*— Nitrogen, 81.68 per cent. ; carbonic acid, 17·60 ; carburetted hydrogen, .72 ; sulphuretted hydrogen, 0.

Spring of the Roses. Rosenquelle, 116°.6. *Solids.*—Chloride of sodium, gr. 19.552 ; bromide of sodium, gr. .028 ; iodide of sodium, gr. .004 ; sulphuret of sodium, gr. .057 ; carbonate of soda, gr. 4.065 ; sulphate of soda, gr. 2.176 ; sulphate of potash, gr. 1.183 ; carbonate of lime, gr. 1.413 ; carbonate of magnesia, gr. .204 ; carbonate of strontia, gr. .002 ; carbonate of lithia, gr. .002 ; carbonate of protoxide of iron, gr. .046 ; silica, gr. .455 ; organic matter, gr. .703 ; total, gr. 29.888. *Gases.*—Nitrogen, 9.14 per cent. ; carbonic acid, 90.31 ; carburetted hydrogen, .55 ; oxygen, 0.

Quirinus' Spring. Quirinusquelle, 121°.3 *Solids.*—Chloride of sodium, gr. 19.937 ; bromide of sodium, gr. .028 ; iodide of sodium, gr. .004 ; sulphuret of sodium, gr. .018 ; carbonate of soda, gr. 4.244 ; sulphate of soda, gr. 2.243 ; sulphate of potash, gr. 1·164 ; carbonate of lime, gr. 1.330 ; carbonate of magnesia, gr. .257 ; carbonate of strontia, gr. .002 ; carbonate of lithia, gr. .002 ; carbonate of protoxide of iron, gr. .040 ; silica, gr. .476 ; organic matter, gr. .751 ; total, gr. 30.496. *Gases.*—Nitrogen, 6.41 per cent. ; carbonic acid, 93.25 ; carburetted hydrogen, .26 ; oxygen, .08.

BADEN, near Vienna, contains two principal springs, Romerquelle and the Leopoldsquelle. The following analysis of sixteen ounces by Dr. Keller represents their composition :—

Romerquelle, 94°.07. *Solids.*—Sulphuret of magnesium, gr. .125 ; sulphate of lime, gr. 5.6563 ; sulphate of potash, gr. .4892 ; sulphate of soda, gr. 2.1281 ; chloride of sodium, gr. 1.9906 ; carbonate of lime, gr. 1.3056 ; carbonate of soda, gr. .5329 ; chloride of magnesium, gr. 1.6156 ; silica, gr. .1850 ; organic matter, .0431 ; total, gr. 14.0696. *Gases.*—Carbonic acid, 1.433 cubic inches ; sulphuretted hydrogen, .082 ; nitrogen, .465 ; oxygen, .052 ; total, 2.032 cubic inches.

Leopoldsquelle, 91°.7. *Solids.*—Sulphuret of magnesium, gr. .118 ; sulphate of lime, gr. 5.5473 ; sulphate of potash, gr. .5560 ; sulphate of soda, gr. 2.5766 ; chloride of sodium, gr. 2.2659 ; carbonate of lime, gr. 1.5936 ; carbonate of soda, gr. .0530 ; chloride of magnesium, gr. 1.5145 ; silica, gr. .2166 ; organic matter, 0 ; total, gr. 14.4519. *Gases.*—Carbonic acid, 3.2256 cubic inches ; sulphuretted hydrogen, .6720 ; nitrogen, 7.8711 ; oxygen, .9033 : total, 12.6780 cubic inches.

AIX-LES-BAINS is the most important thermal sulphurous spa in

France. Two principal springs are found there, one called the sulphur spring, the other the alum spring. For a long time it has been accepted that the first of these only should be classed amongst the sulphurous waters, but recent investigations tend to abolish this distinction. The following are the analyses of M. Bonjean :—

Sulphur Spring, 108°.25—111°. *Solids.*—Sulphate of soda, gr. .7374; sulphate of magnesia, gr. .2709; sulphate of lime, gr. .1229; sulphate of alumina, gr. .4209; sulphate of iron, traces; chloride of sodium, gr. .0613; chloride of magnesium, gr. .1322; fluoride of calcium; phosphate of lime and alumina, gr. .0191; iodide of potassium, traces; carbonate of lime, gr. 1.1405; carbonate of strontia, traces; carbonate of protoxide of iron, gr. .0680; silica, gr. .0384; total, 3.3023. *Gases.*—Nitrogen, .03204 volumes; carbonic acid, .02578; sulphuretted hydrogen, .04140; oxygen, 0; total, .09922.

Alum Spring, 108°.25—116.°.34. *Solids.*—Sulphate of soda, gr. .3256; sulphate of magnesia, gr. .2380; sulphate of lime, gr. .1152 sulphate of alumina, gr. .4761; sulphate of iron, traces; chloride of sodium, gr. .1075; chloride of magnesium, gr. .1690; fluoride of calcium, phosphate of lime and alumina, gr. .0200; iodide of potassium, traces; carbonate of lime, gr. 1.3901; carbonate of strontia, traces; carbonate of protoxide of iron, gr. .0719; silica, gr. .0330; total, gr. 3.1541. *Gases.*—Nitrogen, .08010 volumes; carbonic acid, .01334; sulphuretted hydrogen, 0; oxygen, .01840; total, .11184 volumes.

HARROWGATE has long enjoyed a great reputation for its cold sulphurous springs; and undoubtedly has the fairest claim of all our British spas to compete with those of the highest reputation on the Continent. The spas of Harrowgate are not all of a sulphurous character; the fact being that four distinct classes of mineral waters are to be found there. First and principally the sulphur springs; next the saline springs; then the pure chalybeate springs, and finally the saline chalybeate springs. These facts should be taken into consideration by the physician who sends his patients to try these waters, so as correctly to direct him which spring he is to make use of. What more immediately concerns us here are the sulphur springs, Dr. Hofman's analysis of which I subjoin. According to this authority, a pint of these waters contain as follows :—

Old Sulphur Well. Solids.—Sulphuret of sodium, gr. 1.548; sulphate of lime, gr. .013; carbonate of lime, gr. 1.237; fluoride of calcium, trace; chloride of calcium, gr. 8.174; chloride of magnesium, gr. 5.569; chloride of potassium, gr. 6.470; chloride of sodium, gr. 86.018; bromide of sodium, trace; iodide of sodium, trace; ammonia, trace; carbonate of protoxide of iron, trace; carbonate of protoxide of manganese, trace; silica, gr. .025; total, gr. 109.658. *Gases.*—Carbonic acid, 2.200 cubic inches; carburetted hydrogen, .584; sulphuretted hydrogen, .531; nitrogen, .291; total, 3.409.

Montpellier Strong Spring. Solids.—Sulphuret of sodium,

gr. 1.441 ; sulphate of lime, gr. .059; carbonate of lime, gr. 2.418 ; fluoride of calcium, trace ; chloride of calcium, gr. 6.191 ; chloride of magnesium, gr. 5.467 ; chloride of potassium, gr. .575 ; chloride of sodium, gr. 80.309 ; ammonia, trace ; silica, gr. .184 ; organic matter, trace; total, gr. 96.646. *Gases.*—Carbonic acid, 1.401 cubic inches ; carburetted hydrogen, .053 ; oxygen, .048 ; nitrogen, .482 ; total, 1.984 ; so that this spring differs from the preceding one in containing no free sulphuretted hydrogen gas, nor any trace of iron.

STRATHPEFFER, in Scotland, is a spa which from an examination of its chemical ingredients one should imagine to be possessed of valuable remedial powers. The following analysis by Dr. Thompson shows what is its chemical composition :—In the imperial gallon, 24·16 cubic inches of sulphuretted hydrogen gas ; sulphate of soda, gr. 67·77; sulphate of lime, gr. 39·45; sulphate of magnesia, gr. 6·24 ; chloride of sodium, gr. 24·72.

LISDOONVARNA, in the northern part of the County of Clare, Ireland, of all our native spas is that which has the greatest capabilities, and were it situated with equal advantages either on the Continent or in England it would long since have won for itself a very high position indeed amongst the most celebrated of such resorts. Here are found two varieties of springs, chalybeate and sulphurated. In an imperial gallon of the sulphur spring called the Gowlann Sulphur Well, Professor Apjohn found four cubic inches of sulphuretted hydrogen gas. Silex, gr. .710 ; alumina, gr. .230; carbonate of lime, gr. 6.300; carbonate of magnesia, gr. 4.704 ; sulphate of magnesia, gr. 2.520; carbonate of soda, gr. 6.657; carbonate of potash, gr. .690; organic matter, gr. .946 ; chloride of lime, gr. 3.664; total, gr. 26.421.

NENNDORFF in Hesse is perhaps the most important of all the cold sulphurated waters. Three springs exist here; the *Trinquelle*, the *Badequelle*, and the *Quelle unter dem Gewolbe ;* the last of these is by far the richest in its amount of sulphuretted hydrogen gas—containing three times the amount present in the Trinquelle, which in its turn contains more than double the amount of the Badequelle. The following analysis by Professor Bunsen represents their composition :—

Trinquelle. Solids.—Sulphate of lime, gr. 8.121 ; carbonate of lime, gr. 3.381 ; sulphate of magnesia, gr. 2.318 ; sulphate of soda, gr. 4.549 ; sulphate of potash, gr. .339 ; chloride of magnesium, gr. 1.851 ; silica, gr. .162 ; hydrated sulphuret of calcium, gr. .555 ; total, gr. 21.276. *Gases.*—Sulphuretted hydrogen, 21.156 cubic centimetres ; carbonic acid, 86.517 ; nitrogen, 10.151 ; carburetted hydrogen, .857 ; total, 118.681.

Badequelle. Solids.—Sulphate of lime, gr. 5.461 ; carbonate of lime, gr. 3.541 ; sulphate of magnesia, gr. 1.812 ; sulphate of soda, gr. 1.995 ; sulphate of potash, gr. .135 ; chloride of magnesium, gr. .515 ; silica, gr. .091 ; hydrated sulphuret of calcium, gr. .134 ; total, gr. 13.685. *Gases.*—Sulphuretted hydrogen, 9.900 cubic

centimetres; carbonic acid, 146.783; nitrogen, 32.450; carburetted hydrogen, .230; total, 189.363.

THERAPEUTICAL EFFECTS.—The general action of sulphurated waters is undoubtedly stimulant, and in a minor degree diaphoretic; consequently their use is more likely to prove beneficial in chronic cases than in those of more recent occurrence, and their employment is decidedly contraindicated in inflammatory affections and in plethoric constitutions. In some forms of hepatic affections their use has been attended with marked benefit, and in hæmorrhoidal affections consequent upon this lesion service has followed upon their employment. In rheumatic affections, especially when attended with enlargement of the joints; in various forms of skin affections, ptyriasis, psoriasis, prurigo, sycosis, but especially in acne, much benefit has ensued upon a full course of sulphurated waters. In the treatment of secondary syphilis, especially when the symptoms partake of a rheumatic character, their use has been attended with advantage; as also in the treatment of the train of symptoms which follow as the sequel when the system has been poisoned with the preparations of lead, mercury, and copper.

DOSE AND MODE OF ADMINISTRATION.—These of course must vary with the character of each individual spa. In general terms it may be stated that the sulphurous waters are employed either internally or in the form of baths. If the water be that of a cold spring its taste will not be so disagreeable if it be warmed previous to drinking. Of late years a very ancient form of administering baths has been revived; in olden times the mud of the Nile was looked upon as a sovereign remedy when employed in the form of bath; now-a-days the mineralized mud in the vicinity of the sulphurous springs has been pressed into our list of remedial agents; and these kind of baths have been gaining reputation, especially at Sandefjord, on the southern coast of Norway.

CLASS II. CHALYBEATE WATERS.—Those mineral waters which contain a notable amount of iron are ranked under this head; I say a notable amount, as almost every variety of mineral water will yield to careful examination traces of the presence of this metal. The iron is generally found associated in these waters with carbonic acid in varying amount; when the quantity is large, sufficient to give a sparkling appearance to the water, it is termed an acidulo-carbonated chalybeate; when, however, the carbonic acid is present in quantity not sufficient to produce this sparkling character, they are termed simply carbonated waters. More rarely the iron is associated with sulphuric acid, when the water is termed a sulphated chalybeate. In many of such waters, in addition to sulphate of iron, sulphate of alumina is also present; when the salt is termed an aluminous sulphated water. In Ireland we find many examples of carbonated chalybeate waters; these, as well as the sulphurous springs

already described, being found, amongst other places, at Lisdoonvarna; in England at Harrowgate, Tunbridge Wells, and the Islington Spas. Of the sulphated chalybeate springs the most remarkable English ones are the Sand Rock spring in the Isle of Wight; Vicar's bridge chalybeate spring, and the strong Moffat spring in Scotland. The most remarkable acidulous chalybeate springs on the Continent are Spaa in Belgium, Schwalbach in Nassau, and Pyrmont in the principality of Waldeck. As in the case of the sulphurous waters, I shall make selections for the benefit of my readers, of the most important of them.

LISDOONVARNA. Here we have some five or six carbonated chalybeate springs, varying from each other but slightly; their principal difference lying in the amount of iron which they contain. Professor Apjohn has examined three of them, and his analysis shows that the iron exists in the following proportions, as 100, 73, 59. This variety in the amount of iron contained in the different springs is attended with the important therapeutic advantage of enabling us to apportion to each case the chalybeate, the strength of which is most suited for it. I shall give only the result of his analysis of the strongest of these springs, in one imperial gallon of which he found:—Silex, gr. 1.120; alumina, gr. .140; carbonate of iron, gr. 3.132; carbonate of lime, gr. 9.600; carbonate of magnesia, gr. .495; sulphate of lime, gr. 6.173; sulphate of magnesia, gr. 2.604; sulphate of potash, gr. .555; chloride of sodium, gr. 4.195; organic matter, gr. 1.100; total, gr. 291.114.

HARROWGATE. Here are found two principal chalybeate springs, Montpelier saline chalybeate and Cheltenham saline chalybeate; the principal difference between which, as will be seen by the annexed analysis of 16 ounces of each by Dr. Hofman, lies in the respective amount of saline ingredients which they contain.

Montpelier Saline Chalybeate Spring. Solids.—Carbonate of protoxide of iron, gr. .279; carbonate of protoxide of manganese, traces; chloride of sodium, gr. 65.684; chloride of potassium, gr. 1.138; chloride of calcium, gr. 15.928; chloride of magnesium, gr. 3.564; carbonate of magnesia, gr. 4.180; bromide of sodium, traces; iodide of sodium, traces; ammonia, traces; silica, .095; organic matter, trace; total, gr. 90.867. *Gases.*—Carbonic acid, 2.417 cubic inches; carburetted hydrogen, .240; oxygen, .051; nitrogen, .648.

Cheltenham Saline Chalybeate Spring. Solids.—Carbonate of protoxide of iron, gr. .463; carbonate of protoxide of manganese, traces; chloride of sodium, gr. 15.884; chloride of potassium, gr 2.741; chloride of calcium, gr. 5.163; chloride of magnesium, gr. 3.403; carbonate of magnesia, gr. 0; bromide of sodium, traces; iodide of sodium, traces; ammonia, traces; silica, gr. .145; organic matter, gr. .028; total, 28.587. *Gases.*—Carbonic acid, 1.950 cubic inches; carburetted hydrogen, 5.00; oxygen, 0; nitrogen, .101.

TUNBRIDGE WELLS. These celebrated chalybeate waters require but one thing to render them perfect, and that is a larger per-centage

of carbonic acid than reference to Scudamore's analysis, subjoined, would indicate ; the absence of carbonic acid renders them less agreeable to the taste, and prevents their sitting so lightly on the stomach as they otherwise would. An imperial gallon contains of *solids* :— chloride of sodium, gr. 1.500; chloride of calcium, gr. 1.848; chloride of magnesium, gr. .348; sulphate of soda, gr. 1.768; carbonate of lime, gr. .328; protoxide of iron, gr. 2.748; manganese, silica, &c., gr. 0.528. *Gases* ;—Carbonic acid, 9.66 cubic inches; nitrogen, 5.7 cubic inches; oxygen, 0·60 cubic inches.

SANDROCK. This most remarkable sulphated chalybeate spring has been examined by the celebrated Dr. Marcet, whose analysis has been confirmed by Dr. Turner of London. The quantity of iron present is really remarkable, which with the alum gives these waters a very perceptibly styptic and astringent taste. One imperial pint contains ;—chloride of sodium, gr. 4.0 ; sulphate of soda, gr. 16.0; sulphate of lime, gr. 10.10; sulphate of magnesia, gr. 3.60; sulphate of alum, gr. 31.6; silica, gr. 0.7 ; sulphate of iron, gr. 41.40; with a trace of carbonic acid gas.

SPA. Seven distinct springs exist here, all closely resembling each other in their being acidulous chalybeate springs, only differing from each other in the amount of iron which they contain. The spring which is held in highest estimation is called the Pouhon ; it stands in the centre of Spa, and is surrounded with a monument bearing a votive inscription from no less celebrated a person than the Czar Peter the Great. The spring, in sixteen ounces, has this composition, according to the analysis of M. Struve. *Solids.*—Carbonate of protoxide of iron, gr. .375 ; carbonate of protoxide of manganese, gr. .052 ; carbonate of soda, gr. .738; carbonate of lime, gr. .986; carbonate of magnesia, gr. 1.123 ; sulphate of potash, gr. .079 ; sulphate of soda, gr. .038 ; chloride of sodium, gr. .450 ; phosphate of lime, gr. 5.014; phosphate of alumina, gr. .009; silica, gr. .499; total, gr. 4.3593. *Gases.*—Carbonic acid, 21.6 cubic inches.

SCHWALBACH in some respects is to be preferred to Spa, principally on account of its superior accommodation as a resort for persons seeking relief for their diseases from the employment of mineral waters, as also on account of the larger amount of free carbonic acid which the waters contain. The following analysis by the celebrated chemist Fresenius shows the composition of the two principal springs, of which Schwalbach altogether boasts of some nine or ten :—

Stahlbrunnen, 46°.3—51°.1. *Solids.*—Bicarbonate of protoxide of iron, gr. .643 ; bicarbonate of protoxide of manganese, gr. .141 ; bicarbonate of soda, gr. .158 ; chloride of sodium, gr. .052 ; sulphate of soda, gr. .061 ; sulphate of potash, gr. .029 : bicarbonate of lime, gr. 1.700 ; bicarbonate of magnesia, gr. 1.630 ; silica, gr. .246 ; phosphate of soda, traces ; borate of soda, traces ; organic matter, traces ; total, gr. 4·660. *Gases.*—Free carbonic acid, 50.27 cubic inches; sulphuretted hydrogen, .003.

Weinbrunnen, 49°.3—50°. *Solids.*—Bicarbonate of protoxide

of iron, gr. .443 ; bicarbonate of protoxide of manganese, gr. .070; bicarbonate of soda, gr. 1.884 ; chloride of sodium, gr. .066 ; sulphate of soda, gr. .048 ; sulphate of potash, gr. .057 ; bicarbonate of lime, gr. 4.394 ; bicarbonate of magnesia, gr. 4.467 ; silica, gr. .357 ; phosphate of soda, traces ; borate of soda, traces ; organic matter, traces ; total, gr. 11.968. *Gases.*—Free carbonic acid, 45.6 cubic inches ; sulphuretted hydrogen, .003.

THERAPEUTICAL EFFECTS.—The therapeutical effects of all these varieties of chalybeate spas are in no ways different from those of the preparations of iron described in the chapter on *Tonics*. They require to be employed with the same precautions, and are suited for the same class of cases. It is, however, unquestionable that their use will frequently be attended with beneficial results, when nothing but failure has attended our best efforts with the pharmacopœial ferruginous preparations. Some of this must no doubt be ascribed to the fact that nature is a better chemist than the best of us are; and although we may fondly fancy that by the results of our analyses we have probed nature's secret, still such is not the fact ; and we are actually warned by some of the best chemists who have made mineral waters their study, against the danger of our falling into such an error ; many of them entertaining the opinion that the results obtained from their analysis differ widely from the true nature of the salt originally held in solution ; and a remarkable corroboration of the truth of this opinion is afforded by the fact that in many springs which by the ochrey colour they communicate to the surrounding soil give visible evidence of the existence of iron in them, chemical skill has failed in demonstrating its presence by the laboratory tests. In my opinion one great lesson has been taught us by nature's laboratory—the therapeutic value of administering our chalybeates in combination with carbonic acid ; in other words, in a state of effervescence ; thus those of the chalybeate spas in which the greatest amount of carbonic acid is present are those which sit most lightly on the stomach, and whose continual exhibition is the least likely to produce constitutional disturbance.

CLASS III. SALINE MINERAL WATERS.—This class of mineral waters may be still further subdivided into *Alkaline, Aperient,* and *Calcareous* mineral waters. As in the case of the mineral waters already described, some are sparkling, others are still ; some are thermal, others cold.

ALKALINE MINERAL WATERS. The most remarkable of the alkaline springs are the thermal spas of Vichy, Carlsbad, and Ems, and the cold springs of Vals, Fachingen, Seltzers, and Marienbad.

VICHY. At this renowned watering place nine springs are found, most of them thermal, varying, however, exceedingly in their temperature. For instance, the Puits Carré has a temperature of 110°.5 ; the Puits Chomel, 107°.6 ; Grand Grille, 105°.8 ; Source d'Hauterive,

59°; Source des Célestins, 53°6. I shall give M. Bouquet's analysis of the contents in 16 ounces of two of these, the Grand Grille, the spring most resorted to on the spot, and the Source d'Hauterive, as that which is almost exclusively exported.

Grand Grille. Solids.—Bicarbonate of soda, gr. 37.50; bicarbonate of potash, gr. 2.70; bicarbonate of magnesia, gr. 2.32; bicarbonate of strontia, gr. .02; bicarbonate of lime, gr. 3.33; bicarbonate of iron, gr. .03; bicarbonate of manganese, traces; sulphate of soda, gr. 2.29; phosphate of soda, gr. .78; arseniate of soda, gr. .01; borate of soda, traces; chloride of sodium, 4.10; silica, .05; total, gr. 54.13. *Gases.*—Carbonic acid, gr. 6.97.

Source d'Hauterive. Solids.—Bicarbonate of soda, gr. 37.57; bicarbonate of potash, gr. 2.90; bicarbonate of magnesia, gr. 2.56; bicarbonate of strontia, gr. .02; bicarbonate of lime, gr. 3.22; bicarbonate of iron, gr. .03; bicarbonate of manganese, traces; sulphate of soda, gr. 2.29; phosphate of soda, gr. .21; arseniate of soda, gr. .01; borate of soda, traces; chloride of sodium, gr. 4.10; silica, gr. .05; total, gr. 52.96. *Gases.*—Carbonic acid, 6.71.

EMS, which has long enjoyed a special reputation in the treatment of several diseases to which more particular allusion shall be subsequently made, possesses several springs, those which are most frequently employed being the Kesselbrunnen and the Krahnchenbrunnen. The following analysis by Fresenius gives the composition in 16 ounces of that which is the most markedly thermal (115°), and which is richest in alkaline salt.

Kesselbrunnen, 115°. *Solids.*—Bicarbonate of soda, gr. 15.1974; chloride of sodium, gr. 7.7705; sulphate of soda, gr. .0061; sulphate of potash, gr. .3937: bicarbonate of lime, gr. 1.8129; bicarbonate of magnesia, gr. 1.4360; bicarbonate of protoxide of iron, gr. .0278; bicarbonate of manganese, gr. .0047; bicarbonate of baryta, bicarbonate of strontia, gr. .0036; phosphate of alumina, gr. .0096; silica, gr. .3648; total, gr. 27.0272. *Gases.*—Free carbonic acid, 6.7886 cubic inches.

CARLSBAD is remarkable for its innumerable springs, and for their high temperature; the most celebrated of these is the Sprudel, the temperature of which is 162°.5, and from this the temperature ranges down to that of the Kaiserbrunnen, the temperature of which is 117°.9. Several chemists have examined these waters; I shall give the latest analysis, that by Göttl, of the Sprudel, the most famous of all the springs, 16 ounces of which contain:—*Solids.*—Sulphate of soda, gr. 19.9606; carbonate of soda, gr. 9.0624; chloride of sodium, gr. 8.7245; sulphate of potash, gr. .3696; carbonate of lime, gr. 2.0198; carbonate of magnesia, gr. .3994; carbonate of protoxide of iron, gr. .0307; phosphate of alumina, gr. .2150; silica, gr. 1.0520: total, gr. 45.8340. *Gases.*—Carbonic acid, 7.8033 cubic inches; nitrogen, .0318.

VALS, in the South of France is one of those spas which has recently come into notice, and which in time promises to prove a

formidable rival to even the renowned Vichy. A great number of springs are found here, all with one exception rich in alkaline carbonates. The principal springs are la Marquise, la Chrétienne, la Marie, la Victorine, la Camuse, la Chloé; all those are carbonated alkaline waters. La Dominique is the sole exception alluded to; it contains no appreciable amount of alkaline carbonates, but is rather a chalybeate spring, the iron in which is in combination with sulphuric acid; it is also stated to be very arsenical, consequently its prolonged use cannot be unattended with danger. The weakest of the alkaline springs is la Victorine; one of the strongest is la Chrétienne, which, according to an analysis of M. Henry, has in sixteen ounces the following composition :—Bicarbonate of soda, gr. 55·846; bicarbonate of potash, gr. 1·758; bicarbonate of lime and of magnesia, gr. 3·341; bicarbonate of iron, gr ·127; chloride of sodium, sulphates of soda and of lime, gr. 1·127; silicate of alumina, gr. ·923, with undetermined amounts of phosphates of lime and of alum, and decided evidence of the presence of arsenic. In addition, this water contains one third of its volume of free carbonic acid gas.

FACHINGEN. The springs here are cold, and remarkable for their alkalinity. Although but little employed on the spot, these waters are of importance, inasmuch as they are largely exported. The following analysis by Fresenius gives the contents in 16 ounces :—*Solids.*—Bicarbonate of soda, gr. 28.0883; bicarbonate of lime, gr. 2.8960; bicarbonate of magnesia, gr. 2.2912; bicarbonate of protoxide of iron, gr. .1103; bicarbonate of strontia, gr. .0008; bicarbonate of lithia, gr. .0006; sulphate of soda, gr. .1372; phosphate of soda, gr. .0506; phosphate of lithia, gr. .0002; phosphate of lime, gr. .0004; phosphate of alumina, gr. .0003; phosphate of silica, gr. .2610; fluoride of calcium, gr. .0027; chloride of sodium, gr. 4.5574; chloride of calcium, gr. .0034; total, gr. 38.3918. *Gases.*—Carbonic acid, 32.9750 cubic inches; nitrogen, .0256; total, 33.0006.

SELTERS or SELTZ, in the Duchy of Nassau, has long enjoyed a wide-spread reputation, not so much on account of the effects produced by the waters when consumed at their native source, as from the very extensive demand for them when exported. These waters are piquant, agreeable, and highly sparkling, with a slightly alkaline, saline, and ferruginous taste; they are by far the most agreeable natural waters for table consumption, widely differing, however, from our artificial seltzer water. According to an analysis by Kastner, they contain in 16 ounces :—*Solids.*—Bicarbonate of soda, gr. 9.7741; chloride of sodium, gr. 17.2285; chloride of potassium, gr. .2890; sulphate of soda, gr. .2615; phosphate of lime, gr. .0004; phosphate of alumina, gr. .0002; phosphate of soda, gr. .2615; fluoride of calcium, gr. .0016; bicarbonate of lime, gr. 2.6678; bicarbonate of magnesia, gr. 2.5586; bicarbonate of protoxide of iron, gr. .1088; bicarbonate of manganese, gr. .0032; bromide of sodium, gr. .0002; silica, gr. .2500; total, gr. 33.4054. *Gases.*—Carbonic acid, 30.0100 cubic inches; nitrogen, .0285; oxygen, .0046; total, 30.0431.

MARIENBAD is peculiarly rich in springs, numbers of them highly charged with carbonic acid, others not so markedly so. Those most employed are the Kreuzbrunnen and the Ferdinandsbrunnen, and comparison of their chemical composition with some of the true bitter salines presently to be described, will show how difficult it is to make a satisfactory classification of waters which in many points so closely resemble each other; but the therapeutic effects produced by these waters entitle them to their position in the class I have assigned them. According to an analysis by Kersten, 16 ounces of the Kreuzbrunnen have this composition.

Kreuzbrunnen, 53°.3. *Solids.*—Sulphate of soda, gr. 36.269; bicarbonate of soda, gr. 12.394; chloride of sodium, gr. 11.166; sulphate of potash, gr. .449; bicarbonate of lithia, gr. .077; bicarbonate of lime, gr. 6.630; bicarbonate of strontia, gr. .017; bicarbonate of magnesia, gr. 5.399: bicarbonate of protoxide of iron, gr. .482; bicarbonate of protoxide of manganese, gr. .053; phosphate of alumina, gr. .054; phosphate of lime, gr. .018; silica, gr. .679; total, gr. 73.736.

APERIENT SALINE WATERS. The waters of this class which are best marked in their therapeutic effects are characterized by a decided bitter, whilst all have a marked saline taste. The most remarkable of these are the bitter waters of Pullna, Sedlitz, Kissingen, Leamington, and the simple saline waters of Baden-Baden, Wiesbaden, Homburg, and Cheltenham.

PULLNA, in Bohemia, is perhaps now-a-days the most fashionable of the bitter waters, large quantities of it being exported, and its use as an aperient creeping into general vogue. According to Struve 16 ounces have this composition:—Sulphate of soda, gr. 123.800; sulphate of potash, gr. 4.800; sulphate of lime, gr. 2.600; carbonate of lime, gr. 0.770; sulphate of magnesia, gr. 93.086; chloride of magnesium, gr. 16.666; carbonate of magnesia, gr. 6.406; phosphate of lime, gr. .003; silica, gr. .176; total, 248.307.

SEDLITZ. These mineral waters are by no means to be confounded with the powders of the same name. Their composition in 16 ounces, according to an analysis by M. Steinman, is:—Sulphate of magnesia, gr. 79.55; sulphate of soda, gr. 17.44; carbonate of lime, gr. 5.29; carbonate of magnesia, gr. .20; carbonate of strontia, gr. .009; sulphate of lime, gr. 4.14; sulphate of potash, gr. 4.41; chloride of magnesium, gr. 1.06; carbonate of protoxide of iron and manganese, gr. .05; silica, gr. .05; total, gr. 112.199.

KISSENGEN. According to Baron Liebig's analysis, these bitter waters contain in 16 ounces:—*Solids.*—Sulphate of soda, gr. 46.51; sulphate of magnesia, gr. 39·55; chloride of sodium, gr. 61.10; chloride of magnesium, gr. 30.25; chloride of ammonium, gr. .02; chloride of lithium, gr. .09; total, gr. 177.53. *Gases.*—Carbonic acid, 5.9 cubic inches. Other springs are found here, such as the Pandur and Ragoczi, which according to the same eminent authority contain traces of iron.

LEAMINGTON. Several springs are found here, but the most celebrated is that called the Old Well. The following is stated to be its composition in one pint :—*Solids.*—Chloride of sodium, gr. 40.770 ; sulphate of soda, gr. 40.398 ; chloride of calcium, gr. 20.561 ; chloride of magnesium, gr. 3.266 ; total, gr. 105.195. *Gases.*—Carbonic acid, 2 cubic inches.

BADEN-BADEN. This watering place owes more to its natural beauties and other agréments than to the virtues of its waters, for the great prestige it at present enjoys amongst the health-seeking population. For although an inspection of the analysis of its springs would warrant the assumption that they must be possessed of well-marked remedial properties, still experience proves that a resort to this spa is not followed with the same amount of benefit to the invalid which attends his sojourn elsewhere. All its springs are thermal, and according to Bunsen 16 ounces of the Hauptquelle, the temperature of which is 155°·7, contain :—*Solids.*—Chloride of sodium, gr. 16.520 ; bicarbonate of lime, gr. 1.273 ; bicarbonate of magnesia, gr. .042 ; bicarbonate of protoxide of iron, gr. .037 ; bicarbonate of protoxide of manganese, traces ; bicarbonate of ammonia, gr. .051 ; sulphate of lime, gr. 1.556 ; sulphate of potash, gr. .017 ; phosphate of lime, gr. .021 ; arseniate of iron, traces ; chloride of magnesium, gr. .097 ; chloride of potassium, gr. 1.258 ; bromide of sodium, traces ; silica, gr. .914 ; alumina, gr. .008 ; nitrates, traces ; total, gr. 22.093. *Gases.*—Free carbonic acid, gr. .299.

WIESBADEN. The waters here are also thermal, and the springs very numerous. One of the most generally employed of these, the Kochbrunnen, according to an analysis of Fresenius, has in 16 ounces this composition :—155°75. *Solids.*—Chloride of sodium, gr. 52.50 ; chloride of potassium, gr. 1.12 ; chloride of lithium, gr. .001 ; chloride of ammonium, gr. .13 ; chloride of calcium, gr. 3.62 ; chloride of magnesium, gr. 1.57 ; bromide of magnesium, gr. .03 ; sulphate of lime, gr. .69 ; silica, gr. .46 ; carbonate of lime, gr. 3.21 ; carbonate of magnesia, gr. .08 ; carbonate of protoxide of iron, gr. .04 ; carbonate of protoxide of manganese, gr. .004 ; phosphate of lime, gr. .003 ; arseniate of lime, gr. .001 ; silicate of alumina, gr. .004 ; total, gr. 63.46. *Gases.*—Carbonic acid, 16.72 cubic inches ; nitrogen, .10. The gases ascending from the Kochbrunnen consist of carbonic acid, 79.8 volumes ; nitrogen, 20.2 ; total, 100.

HOMBURG.—The waters of this celebrated and much frequented place may be ranked amongst the simple saline cold waters, although like those of Kissengen they contain traces of iron, to the presence of which they owe their remarkably astringent taste. Several springs are found here, but that which is at the same time the longest known and most used is the Elizabethbrunnen. From an examination of the following analysis of it by Baron Liebig, it will readily be conceived that the waters should be at the same time tonic and aperient, the astringent properties of the iron being corrected by the

aperient properties of the salines. The amount of carbonic acid which they contain should render them at the same time exhilarating and digestible. Elizabethbrunnen in 16 ounces contains chloride of sodium, gr. 79·15; chloride of magnesium, gr. 7·79; carbonate of iron, gr. 0.46 ; carbonate of lime, gr. 10·99; carbonate of magnesia, gr. 2·01 ; sulphate of soda, gr. ·38; silica, gr. .32; together with 48·46 cubic inches of free carbonic acid gas.

CHELTENHAM. Here as elsewhere numbers of springs are found, all, however, closely resembling each other in composition. No watering place perhaps more forcibly illustrates the fluctuating character of the reputations attachable to such places than does Cheltenham. First winning its fame by being resorted to with benefit by George the Third, it rapidly rose in public estimation, until doubts were cast upon the genuineness of its waters in consequence of the extravagant assertion that each well that was sunk yielded a different water, possessed of some special advantage. These doubts were strengthened into convictions by the detection of persons in the very act of pouring several dozens of pounds of epsom salts into one of the wells, and by subsequent discovery that such was their daily practice. The following analysis by Messrs. Abel and Rowney, however, represents the amount of salts found in a gallon of the Pitville spa, which may be looked upon as the type of the Cheltenham waters :— *Solids.*—Chloride of sodium, gr. 481.1933 ; sulphate of soda, gr. 112.8666 ; carbonate of soda, gr. 20.1481 ; carbonate of magnesia, gr. 11.3897 ; sulphate of potash, gr. 2.9512 ; bromide of sodium, gr. 3.2928 ; carbonate of lime, gr. 7.7021 ; silica, 2.7755 ; crenic acid, gr. .3591 ; organic substances, gr. 3.4993 ; total, gr. 646.1777. *Gases.*—Carbonic acid, 16.254 cubic inches ; sulphuretted hydrogen, traces.

CALCAREOUS OR EARTHY SPRINGS. The most remarkable of these on the Continent are the waters of Wildungen, Leuk, Lippspringe, and Weissenburg; at home those of Bath and Scarborough.

WILDUNGEN. These waters are principally exported from their native source, being rarely employed on the spot. They are remarkable for the amount of free carbonic acid which they contain. The following analysis by M. Wiggers, of the contents in 16 ounces of the Salzbrunnen, one of the springs in very general consumption, gives a tolerably accurate general idea of all these kinds of waters : —*Solids.*—Bicarbonate of soda, gr. 5.457 ; bicarbonate of protoxide of iron, gr. .236; bicarbonate of protoxide of manganese, gr. .033 ; bicarbonate of lime, gr. 8.524 ; bicarbonate of magnesia, gr. 8.589 ; chloride of sodium, gr. 6.284 ; sulphate of magnesia, gr. .455 ; chloride of magnesium, gr. .773; silica, gr. 1.116 ; alumina, gr. .023; total, 31.490. *Gases.*—Carbonic acid, gr. 23.145 or 46 cubic inches.

LEUK, in Switzerland, is perhaps one of the most remarkable spa stations in the world, not so much on account of its chemical composition, as on account of the fashion which prevails there of using the waters. They are generally employed in the form of bath, and

this during a great many hours at a time—patients spending nearly their entire day in the bath, eating, drinking, smoking, writing, and reading in them as if they were dressed. The bath is entered at early dawn (from 3 to 4 a.m.), and they remain in it all day, with perhaps a respite for an hour or two in the mid-day. They are principally had recourse to for the cure of old wounds, ulcers, and long standing cutaneous affections. It is stated that at first these are aggravated, and an eruption appears, which if the baths be discontinued are difficult of cure; but if the baths be persevered in they disappear. According to Bremner, the *Lorenzquelle*, 123°1, one of the most celebrated springs, in 16 ounces contains:—*Solids.*—Sulphate of lime, gr. 12.712; sulphate of magnesia, gr. 1.991; sulphate of soda, gr. ·509; sulphate of strontia, gr. .031; chloride of sodium, gr. .055; chloride of potassium, gr. .020; chloride of magnesium, gr. .027; carbonate of lime, gr. .357; carbonate of magnesia, gr. .002; carbonate of protoxide of iron, gr. .024; silica, gr. .102; total, gr. 15.830. *Gases.*—Carbonic acid, .267 cubic inches; oxygen, .192; nitrogen, .347.

Bath. This place, which dates all its present position as a city from its humble commencement as a spa, is no longer dependent on any such kind of reputation for its present importance. According to Walcker's analysis, an imperial pint contains:—*Solids.*—Sulphate of lime, gr. 10.20; sulphate of soda, gr. 2.42; chloride of magnesium, gr. 1.67; chloride of sodium, gr. 1.89; carbonate of lime, gr. 1.33; alumina, gr. .01; silica, gr. .41; oxide of iron, gr. .03; total, gr. 17.96. *Gases.*—Carbonic acid, .20 cubic inches.

Scarborough. This is one of the most charming watering places in England. According to Phillips one imperial pint of these waters contains sulphate of lime, gr. 28·17; sulphate of magnesia, gr. 28·17; bicarbonate of lime, gr. 5·97; carbonate of iron, gr. 0·22. The quantity of lime represented in this analysis as being contained in one pint of the water is remarkable, and in my opinion open to doubt.

Indifferent Thermal Springs. In addition to all the foregoing varieties of mineral waters, which undoubtedly possess more or less of saline matter to account for their real or reputed efficacy in the treatment of the several diseases for the relief of which they have gained their reputation, there is a class of waters which, possessing no other character to recommend them than a more or less elevated temperature, and a greater or lesser quantity of free gases (carbonic acid and nitrogen gases) have still secured a high position in public estimation. These are generally classed by themselves as *indifferent thermal springs*. The most remarkable of these foreign waters are the springs of Gastein, of Teplitz, of Wildbad, of Warmbrunn, and of Pfaffers; and in England those of Clifton Hot Wells and of Buxton. They all resemble each other so closely in their chemical composition, that I shall only trouble my readers with one analysis.

Pfaffers. This spa, situated in one of the wildest ravines in the

Swiss mountains, some 2000 feet above the level of the sea, is of long-standing reputation, being used both internally and in the form of bath. In former times the immersion in the bath far exceeded even that of Leuk in point of continual duration, for it was the custom to leave patients in it both day and night for several days in succession, until the cutaneous eruption alluded to when discussing the baths of Leuk, termed by French authorities *la poussée*, presented itself; now-a-days, half an hour or an hour's immersion is considered sufficient. As to the character of the waters, it may be gathered from the answer made by the resident medical attendant to the query of one of the most distinguished of our Dublin physicians as to what was their composition:—"Well! as you are a brō-ther, I will tell you; they do contain nō-thing." How correct the answer was may be gathered from the perusal of the following analysis by M. Pagenstecher:—Carbonate of lime, gr. 0·910; carbonate of magnesia, gr. 0·147; carbonate of iron, gr. 0·006; sulphate of soda, gr. 0·242; sulphate of potash, gr. 0·004; sulphate of lime, gr. 0·027; chloride of sodium, gr. 0·268; chloride of magnesium, gr. 0·048; silicic acid, gr. 0·140; equal to gr. 1·792 in 16 ounces. The temperature of the springs varies from 95° to 96° F.

BUXTON. An account of the mineral waters of England could scarcely be considered complete without some allusion to this most celebrated resort, and yet, save in the quantity of free gases which they contain, the Buxton differ in no respect from many other varieties of drinkable waters. One imperial gallon contains altogether but 20 grains of saline matter, principally carbonates of lime and of magnesia; but in the same quantity the amount of gases present is very considerable; according to Playfair, 704·2 grains of carbonic acid gas, and 200 cubic inches of nitrogen gas. It is difficult to explain the effects both beneficial and the reverse ascribed by patients to these waters, when we reflect upon the results afforded us by their chemical history. That frequently most valuable effects attend a sojourn at Buxton cannot be questioned; how much of these is to be attributed to the considerations discussed in the preliminary remarks upon this chapter, I leave for my reader's decision.

THERAPEUTICAL EFFECTS.—The therapeutic effects produced by these several varieties of saline waters are pretty much those which we might expect from their chemical composition; thus the alkaline waters will prove of use in all those affections in which such remedies are indicated. In dyspepsia, and in affections of the mucous membranes, whether of the lungs or alimentary canal, or those of the urinary organs attended with thick ropy secretion, their use for a time will result in decided benefit. In sabulous and calculous affections of the bladder relief will follow their employment. In gout, and in the gouty dyspepsia, we may expect them to be serviceable, as also in rheumatism. Some waters, such as those of Vichy, enjoy special reputation in the treatment of these affections. In affections of the liver; in icterus; and in that form of diathesis which predis-

poses to the generation of gall stones, their use is occasionally followed by the happiest results. For obesity and abdominal plethora they are valuable adjuncts to other plans of treatment. In scrofulous and cutaneous affections a residence at one or other of these spas is frequently attended with marked improvement. In uterine affections the waters of Ems have long enjoyed a high reputation, many instances being recorded of women who previous to drinking them were sterile becoming after a course of these waters happy mothers of families. The value of this class of saline waters has also been much insisted upon in diabetes. The *aperient saline mineral waters* prove of service in cases of habitual constipation, their use for some time frequently being attended with lasting beneficial results; and from an attentive consideration of their chemical composition, a practical hint of much importance can be derived for our guidance in the extemporaneous prescription of salines—not so much to depend on a large dose of any one particular saline, as on a judicious combination of several of them in the one prescription. The *calcareous mineral waters* are also employed in a similar class of diseases to that in which the alkaline salines are had recourse to, and with pretty much the same results; but in both classes of waters (the calcareous and alkaline) care must be taken that the blood be not impoverished, such a result being as capable of being produced by their too protracted exhibition as by our pharmaceutical alkaline preparations (see p. 1).

CHAPTER XXII.

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, are still made use of as *adjuvants, colouring agents, perfumes, tests*, and *pharmaceutical agents*.

ALCOHOL.—Described (p. 536).

ALBUMEN OVI.—*Egg Albumen.* (The liquid white of the egg of Gallus Banckiva, var. domesticus, *Temminck.*)

USES.—Employed as one of the characters by which creasote is identified (see p. 102), and as a test for phosphoric acid (see p. 694), &c. Its value as an antidote in poisoning by corrosive sublimate has been already alluded to (see p. 654), whilst the alimentary value of eggs requires not to be dwelt upon here.

ALCOHOL AMYLICUM. *Amylic Alcohol.* Syn.: *Fousel Oil.* (Described p. 76.)

ARGENTUM PURIFICATUM. *Refined Silver.* (Pure metallic silver.)

TEST.—If ammonia be added in excess to a solution of the metal in nitric acid, the resulting fluid exhibits neither colour nor turbidity.

IMPURITIES.—The ordinary impurities found in metallic silver are lead, copper, and gold; the last of these will not be dissolved by the nitric acid, and thus its presence will be disclosed. The first two will be dissolved, but on the addition of the ammonia the copper if present will strike an azure blue colour with it, (see p. 744) and the lead if present will be precipitated, giving rise to the appearance of turbidity.

PREPARATION.—Argenti Nitras.

BENZOL. $C_{12}H_6$ or $\mathbf{C_6H_6}$. (A colourless volatile liquid, obtained from coal tar. Specific gravity, 0·85.)

USE.—It is employed as a test for copaiva (see p. 628).

BORACIC ACID. $BO_3,3HO$ or $\mathbf{H_3BO_3}$.

TESTS.—Soluble in alcohol. The solution burns with a green flame.

USE.—Introduced as a test for the purity of rhubarb (see p. 200).

CALX. *Lime.* (Syn.: *Quicklime.*) (An alkaline earth, CaO or **CaO**, with some impurities, obtained by calcining chalk or limestone so as to expel carbonic acid.)

CHARACTERS AND TESTS.—In compact masses of a whitish colour, which readily absorb water, and which, when rather less than their weight of water is added, crack and fall into powder with the development of much heat. The powder obtained by this process of slaking, 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. The powder obtained by slaking dissolves, without much residue and without effervescence, in diluted hydrochloric acid, and if the solution thus formed be evaporated to dryness, and the residue redissolved in water, only a very scanty precipitate forms on the addition of saccharated solution of lime.

PREPARATION.—Calcis Hydras.

CALCIS HYDRAS. *Slaked lime.* (Hydrate of lime, CaO,HO or $\mathbf{CaH_2O_2}$, with some impurities.)

PREPARATION.—Take of lime, 2 pounds; distilled water, 1 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 the temperature has fallen to that of the atmosphere, put the slaked lime on an iron-wire sieve, and by gentle agitation cause the fine powder to pass through the sieve, rejecting what is left. Put the powder into a well-stopped bottle, and keep it excluded as much as possible from the air. Slaked lime should be recently prepared.

EXPLANATION OF PROCESS.—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.

USES.—Hydrate of lime is only employed as a pharmaceutical agent.

PREPARATIONS.—Liquor Calcis. Liquor Calcis Saccharatus.

CARBO ANIMALIS. *Animal Charcoal. Bone black.* (The residue of bones, which have been exposed to a red heat without the access of air; consists principally of charcoal, and phosphate and carbonate of lime.)

HISTORY.—Animal charcoal is usually prepared by calcining the bones of animals in close vessels; thus obtained, it contains in addition to the charcoal so produced, phosphate and carbonate of lime, which latter would unfit it for the purposes to which it is applied in pharmacy, namely, that of acting as a decolourizing agent in the preparation of the vegetable alkaloids; the following process is con-

sequently given in the Pharmacopœia for purifying the commercial article.

PREPARATION.—Carbo Animalis Purificatus.

CARBO ANIMALIS PURIFICATUS. *Purified Animal Charcoal.* (Animal charcoal from which the earthy salts have been almost wholly removed.)

PREPARATION.—Take of bone black, in powder, 16 ounces : hydrochloric acid, 10 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 closely 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 ; inodorous and almost tasteless. Tincture of litmus diluted with twenty times its bulk of water, agitated with it and thrown upon a filter, passes through colourless. When burned at a high temperature with a little red oxide of mercury and free access of air, it leaves only a slight residue.

USES.—Although in the Pharmacopœia a dose (from 20 to 60 grains) is assigned for this preparation, still it rarely if ever is employed as a medicinal agent, wood charcoal being almost invariably preferred to it ; I see no reason, however, why it should not be employed in all that class of cases in which wood charcoal is indicated (see p. 347). As a pharmaceutical agent it is far superior to wood charcoal. After animal charcoal has been employed as a decolourizing agent, it loses its power as such ; which, however, may be again restored to it by drying and heating to redness.

CERII OXALAS. *Oxalate of Cerium.* $2CeO,C_4O_6+6HO$ or $Ce C_2O_4.3H_2O$. (A salt which may be obtained as a precipitate by adding solution of oxalate of ammonia to a soluble salt of cerium.)

CHARACTERS AND TESTS.—A white granular powder, insoluble in water, decomposed at a dull red heat into a reddish-brown powder, which dissolves completely and without effervescence in boiling hydrochloric acid, and the resulting solution gives with solution of sulphate of potash a white crystalline precipitate. If the salt be boiled with solution of potash and filtered, the filtrate is not affected by solution of chloride of ammonium, but when supersaturated with acetic acid it gives with chloride of calcium a white precipitate, which is soluble in hydrochloric acid. Ten grains, when incinerated, lose 5·2 grains in weight.

USES.—The value of this salt has been already described, p. 493, where the present pharmacopœial formula for its preparation should, but for an oversight on my part, more properly have been introduced.

CHLORIDE OF BARIUM. $BaCl,2HO$ or $BaCl_2.2H_2O$. Already described (see p. 708).

COCCUS. *Cochineal.* (The dried female insect Coccus Cacti, *Linn.* Reared in Mexico and Teneriffe.) A native of Mexico ; belonging to the 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.

NATURAL HISTORY.—The cochineal insect feeds chiefly on the Nopal plant, *(Opuntia cochinillifera),* 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.

PROPERTIES.—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.*

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.

USES.—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 latterly resorted to in many parts of the continent, particularly in Germany. The tincture has been introduced into the Pharmacopœia, principally, however, with the view of its being employed as a colouring pharmaceutical agent.

PREPARATIONS.—Tinctura Cardamomi Composita, sixty grains to one pint; Tinctura Cinchonæ Composita, thirty grains to one pint ; Tinctura Cocci, two ounces and a half to one pint.

Tinctura Cocci. Tincture of Cochineal. (Take of cochineal, in powder, two ounces and a half ; proof spirit, one pint. Macerate for seven days in a closed vessel, with occasional agitation ; strain, press, filter, and add sufficient proof spirit to make one pint.) Dose, f3ss. to f3j.

CRETA. *Chalk.* (Native friable carbonate of lime.)

USES.—Chalk is only employed pharmaceutically either as the source from whence to obtain carbonic acid gas, or for making prepared chalk (see p. 12).

PREPARATION.—Creta Preparata.

COPPER FOIL. (Pure metallic Copper, thin and bright.)
USES.—Employed in the conduct of Reinsch's test for detecting the presence of arsenic (see p. 250).

CUPRUM. *Copper.* (Fine copper wire, about No. 25.)
PREPARATIONS CONTAINING COPPER.—Cupri Sulphas.
PREPARATIONS IN WHICH COPPER IS USED.—Spiritus Ætheris Nitrosi.

GOLD, FINE. (Gold, free from metallic impurities.)
USES.—Although in these countries gold or its preparations are not employed therapeutically, still they are so abroad (see p. 620). Gold is only introduced into the British Pharmacopœia with the view of making the test solution of terchloride of gold, described farther on.

HIRUDO. *The Leech*, 1. (Sanguisuga medicinalis, *Savigny*, the Speckled Leech; and 2. S. officinalis, *Sav.*, the Green Leech. Collected in Spain, France, Italy, and Hungary.)

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.

HISTORY.—The leech belongs to the subdivision Abranchiatæ, of the class Annelidæ, and has been placed by Savigny in a distinct genus Sanguisuga. In addition to the characters given in the Pharmacopœia, it may be stated that the jaws are three in number, provided with a single, not a double row of teeth as generally stated; that the body, whilst tapering to both ends, is thicker posteriorly; that its rings are about 95 in number; and that it is androgynous, that is, each animal is provided with both male and female organs, but that they are not capable of auto-impregnation.

COLLECTION.—They are collected in their native marshes, either by the hand, by net, or by bait, the latter either being bullocks' livers, which are objectionable as being injurious to the leech, or the naked feet of the collectors, which, as being injurious to their health, is even still more objectionable. The enormous extent of the trade may be collected from the fact that it has been calculated that in the city of Paris alone 7 millions of these animals are annually employed.

THERAPEUTICAL USES.—As to the therapeutical uses of leeches the question is too wide a one to be entered upon here; at some one period or other of almost every inflammatory affection, whether medical or surgical, their employment in greater or lesser numbers being attended with advantage; 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, produce a far more marked effect than a far greater number applied elsewhere: in conjunctivitis, one leech applied to the mucous membrane covering the lower eyelid is far more effective than a large number applied on the cutaneous surface: in ophthalmia, a few applied to the inner angle of the eye just under the insertion of the tendo oculi, produce far more decided effect than a much greater number applied elsewhere: in a fit of the piles, one leech applied directly to the inflamed pile produces far more beneficial effects than a dozen applied to the perineal region; 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 further comment here.

MODE OF APPLICATION.—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. 323) first pointed out their great value in the treatment of opthalmic 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 be next 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 about half an ounce of blood, between what it sucks and that which is lost after it drops off; 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. Occasion-

ally 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; besides it is attended with the disadvantage of sometimes 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 *bulldog 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. 128) has also been used with advantage. Occasionally, however, nothing remains for the surgeon to do but to transfix the wound with a needle and to 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, which acts as a poison to the animal, should be swallowed in all haste; and the most convenient emetic, such as a saturated solution of common salt in lukewarm water should be administered without delay. For the application of leeches in those cavities, glasses of suitable shape are manufactured; but even when using these the precaution should not be omitted of securing the leeches in the manner already described.

HYPOSULPHITE OF SODA. NaO,S_2O_2+5HO or $\mathbf{Na_2H_2S_2O_4.4H_2O}$.

TEST.—24.8 grains decolorize 100 measures of the volumetric solution of iodine.

USES.—The therapeutic uses of hyposulphite of soda have been already described (see p. 214). Its pharmaceutical use is to prepare the volumetric solution described further on.

INDIGO. $C_{16}H_5NO_2$ or $\mathbf{C_8H_5NO}$. (A blue pigment prepared from various species of indigofera, *Linn.*) (Described p. 659.)

ISINGLASS. (The swimming bladder or sound of various species of acipenser, *Linn.*, prepared and cut into fine shreds.) Isinglass is

obtained from the air-bag or swimming bladder of many kinds of fish, the best or Russian isinglass being obtained, as stated in the Pharmacopœia, from various species of acipenser or sturgeon.

PREPARATION.—This varies very much; at times the bladder is dried unopened; at others it is slit open, well washed, and put up in leaves, or cut into ribbons, or folded into pipes; all of which are subsequently cut into shreds.

CHARACTERS.—These vary very much with the genuineness of the article. If pure and in good condition, isinglass is free from smell, white in colour, all but completely soluble in warm water, forming with it on cooling a transparent, tremulous jelly. Isinglass in fact is nothing more than the very purest variety of gelatine.

USES.—It is extensively used as an article of nutritious diet for the invalid; when boiled with milk it is slightly astringent; it is also emollient and demulcent. No question has been more debated than the nutritious value of gelatine, which is popularly held in the highest estimation. Scientifically it apparently received its *coup de grace* from the Parisian Gelatine Committee, who pronounced against its powers of sustaining life. That *per se* it is incapable of doing so must be admitted as having been proved, but that it is void of all nutritious qualities, as is now the opinion of many able authorities, is a question which has been reopened with his usual ability by my friend Professor Cameron, in a paper which he read at the recent meeting of the British Medical Association in this city. He assigned a high nutritive power to gelatine when that article is properly prepared; and he stated his belief that that article is superior to arrow-root and the other starches. He denied that gelatine is not assimilable, in proof of which assertion he adduced the fact that as gelatine when taken into the animal economy is not afterwards detectable in the solid or liquid ejecta, it must be appropriated to some useful purpose in repairing the waste of the animal organism, or in contributing to the production of nerve-force or animal heat. For various reasons he believes it to be used chiefly as a fat-former. Professor Cameron made a number of experiments with gelatine on dogs and white mice, the results of which have shown the high alimental value of this food. Animals cannot subsist exclusively on gelatine, but the same may be said of a great number of other food substances the nutritive value of which is unquestioned. Gelatine contains neither phosphorus nor sulphur, and this is the reason why, although a nitrogenous substance, it is incapable (unlike albumen) of forming muscular tissue. Even when combined with the ordinary oils and fats, starches and sugars, it cannot form muscle. A curious fact was, however, discovered by him; namely, that mice, whilst they died if fed on either exclusively, could subsist on a diet composed of brain fats (which contain unoxidized or organic sulphur and phosphorus) and gelatine. From this he concludes that the synthesis of albumen from gelatine and fat is effected in the animal economy—a fact of

the highest physiological interest. In conclusion he referred to the instinctive fondness for gelatine exhibited by thousands of people in both health and disease, which he says is a strong argument in favor of its utility. In the Pharmacopœia, however, gelatine is only introduced as a test for tannic acid.

LAC. *Milk.* (The fresh milk of the Cow, Bos Taurus, *Linn.*) Although milk is in the Pharmacopœia looked upon *par excellence* as being the milk of the cow, still the reader needs scarcely to be reminded that the milk of several other animals is pressed into man's service.

CHARACTERS.—Milk is the most perfect type of an emulsion, every variety being nothing more than oil globules (butter) suspended in water by means of a peculiar principle termed casein. When freshly drawn it is slightly alkaline, but on keeping, or on the addition of an acid or of rennet (the infusion of the fourth stomach of the calf) it sours, separating into curds, which can be separated from it by filtration, and a thin sub-acid fluid well known as *whey*, which by evaporation will yield lactic acid. The smell, colour, and taste of milk are too well known to require comment. 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

USES.—The only object with which milk is introduced into the Pharmacopœia is to prepare the Mistura Scammonii, but it needs not here to insist upon its vast economic importance. Medicinally considered, it may be looked upon as a bland demulcent, possessed at the same time of highly nutritious properties. Combined with lime water in equal proportions, it frequently proves of signal service in the treatment of gastric derangement; and its whey is too well known as an article of diet-drink in febrile disturbances to require further notice here. Asses' milk and goats' milk are looked upon as being more assimilable and consequently more nutritious than cows' milk, and therefore are frequently recommended in the treatment of exhaustive diseases, such as phthisis, &c.

PREPARATIONS IN WHICH MILK IS USED.—Mistura Scammonii.

LITMUS. (A blue pigment prepared from various species of rocella, *Aschariu*s.) Also obtained from Rocella fusiformis, *Lind-*

ley.) Natives of the Mediterranean and Channel islands; belonging to the Natural family *Lichenaceæ* (*Lichenales*, Lindley), and to the Linnæan class and order *Cryptogamia Algæ*.

PREPARATION.—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.

USES.—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 coarse powder, one ounce; proof spirit, ten fluid ounces. Macerate for two days in a closed vessel, and filter.)

* 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*.

CHARACTERS.—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.

USES.—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.

MANGANESII OXIDUM NIGRUM. *Black Oxide of Manganese.* MnO_2 or $\mathbf{MnO_2}$. Found native in some parts of England and Scotland; it is known to the mineralogists under the name of *Pyrolusite.*

CHARACTERS AND TESTS.—A heavy black powder, which dissolves almost entirely in hydrochloric acid with evolution of chlorine, and gives off oxygen when heated to redness.

USES.—It is only used as a pharmaceutical agent, at least in this country, being employed in the preparation of oxygen, chlorine, permanganate of potash, etc.

MARMOR ALBUM. *White Marble.* CaO,CO_2 or $\mathbf{CaCO_3}$. (Hard white crystalline native carbonate of lime, in masses.) Used in producing carbonic acid gas.

MICA PANIS. *Crumb of Bread.* (The soft part of bread made with wheat flour.)

PREPARATION.—Cataplasma Carbonis.

* 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.*

BOTANICAL CHARACTERS.—A small tree; leaves oblong, more or less elongated, dentate, acute or obtuse, under surface paler than the upper; petiole somewhat winged; flowers small, white; calyx urceolate, 3-5 cleft; petals 5-8; stamens numerous with flattened filaments which are often polydelphous at the base; fruit pale-yellow, pyriform, or depressed; rind with concave receptacles of oil.

PREPARATION.—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.

USE.—It is only employed in medicine as a perfume, chiefly to give an agreeable odour to ointments.

OLEUM RUTÆ. *Oil of Rue.* (The oil distilled from the fresh herb of Ruta graveolens, *Linn. Woodv. Med. Bot.*, plate 37) described p. 72.

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

OLEUM THEOBROMÆ. *Oil of Theobroma.* Syn.: Cacao Butter. (A concrete oil obtained by expression and heat from the ground seeds of Theobroma Cacao, *Linn.*) The Theobroma Cacao is a

native of the West Indies and of South America; a handsome tree growing from 12 to 20 feet in height, belonging to the Natural family *Byttneriaciæ, D.C.* From the seeds are also obtained chocolate and cocoa, well-known articles of domestic consumption.

BOTANICAL CHARACTERS.—A small upright tree; leaves oblong, lanceolate, bright green, entire, stalked; flowers in axillary clusters; calyx of 5 sepals; petals 5, vaulted at the base, ligulate above; stamens 15, united into an urceolus at the base; sterile filaments 5, alternate with the petals, linear, subulate, elongated; fertile ones short, united into 5 filaments, each opposite to a petal and bearing 2 anthers; style 5-cleft at the apex; stigmas simple; fruit 5-celled, smooth, yellow or red, oval, 3 inches long, and with a thick fleshy rind which encloses the seeds (about 25) immersed in a buttery, sweet, subacid pulp.

CHARACTERS.—Of the consistency of tallow; colour yellowish; odour resembling that of chocolate; taste bland and agreeable; fracture clean, presenting no appearance of foreign matter. Does not become rancid from exposure to the air. Melts at a temperature of 122°.

USES.—Cacao butter is only introduced into the Pharmacopœia as a valuable basis for the preparation of the various kinds of suppositories. Of itself it does not possess sufficient consistency for this purpose, but when mixed with white wax, in the proportion of two parts of Cacao butter and one of white wax, it forms a most admirable excipient for any medicine which we may desire to exhibit in this form.

PREPARATIONS.—Suppositoria Acidi Tannici (see p. 120), one part in two; Suppositoria Hydrargyri (see p. 642), one part in two; Suppositoria Morphiæ (see p. 453), one part in two; Suppositoria Plumbi Composita (see p. 132), four parts in nine.

OS USTUM. *Bone Ash.* (The residue of bones which have been burned to a white ash in contact with air. Consists principally of phosphate of lime mixed with about 10 per cent. of carbonate of lime, and a little fluoride of calcium and phosphate of magnesia.)

PREPARATIONS IN WHICH BONE ASH IS USED.—Calcis Phosphas, Sodæ Phosphas.

OXALIC ACID OF COMMERCE (described p. 462). *Oxalic Acid Purified.* $2HO,C_4O_6+4HO$ or $\mathbf{H_2C_2O_4.2H_2O}$ (described p. 463). (Take of oxalic acid of commerce, one pound; boiling distilled water, thirty fluid ounces. Dissolve, filter the solution, and set it aside to crystallise. Pour off the liquor, and dry the crystals by exposure to the air on filtering paper placed on porous bricks.)

TEST.—It is entirely dissipated by a heat below 350°.

USE.—Employed only as a test for lime and its salts.

OXALATE OF AMMONIA. $2NH_4O,C_4O_6+2HO$ or $(NH_4)_2C_2O_4H_2O$. (Take of purified oxalic acid, one ounce; boiling distilled water, eight fluid ounces; carbonate of ammonia, a sufficiency. Dissolve the oxalic acid in the water, neutralise the solution at a boiling temperature, filter it while still hot, and set it by that crystals may form as it cools.)

USE.—As a test for lime and its salts.

PLASTER OF PARIS. (Native sulphate of lime, CaO,SO_3+2HO or $CaSO_42H_2O$, deprived of water by heat.)

USE.—Only to prepare the test solution described further on.

PLATINUM BLACK. (Platinum in a state of minute division, obtained by adding excess of carbonate of soda and some sugar to a solution of perchloride of platinum, and boiling until a black precipitate is formed, which is washed and dried.)

USE.—Only used in the characters of Amylic Alcohol, which is stated in the Pharmacopœia to become slowly oxidized when exposed in contact with it to the air, yielding valerianic acid (see p. 76.)

PLATINUM FOIL. Used in making the solution of perchloride of platinum (which see further on.)

POTASSÆ PRUSSIAS FLAVA. *Yellow Prussiate of Potash.* Syn.:—*Ferrocyanide of Potassium.* $K_2FeC_6N_3+3HO$ or $K_4FeC_6N_63H_2O$. (A salt obtained by fusing animal substances, such as the cuttings of horns, hoofs, and skins, with carbonate of potash in an iron pot, lixiviating the crude product with water, and purifying the salt by crystallization.)

CHARACTERS AND TESTS.—In large yellow crystals, permanent in the air, soluble in water, insoluble in alcohol. The aqueous solution precipitates deep blue with persulphate of iron, brick-red with sulphate of copper, and white with acetate of lead. Heated with diluted sulphuric acid, hydrocyanic acid vapors are evolved.

USES.—Only pharmaceutical, as a test for the preparations of iron and for making prussic acid.

PREPARATION IN WHICH YELLOW PRUSSIATE OF POTASH IS USED. Acidum Hydrocyanicum dilutum (see p. 477).

PTEROCARPI LIGNUM. *Red Sandal-Wood.* (The wood of Pterocarpus santalinus, *Linn.*; *Woodv. Med. Bot.*, plate 254. From Ceylon.) The Pterocarpus Santalinus is an inhabitant of the mountainous regions of Coromandel and Ceylon. It is an arboraceous

plant, belongs to the natural family of the Leguminosæ, and to the class and order Diadelphia Decandria.

BOTANICAL CHARACTERS.—A lofty tree; leaves imparipinnate, leaflets 3-5 sub-rotund, retuse, glabrous; calyx 5-toothed; corolla papilionaceous; stamens 10, which are combined into a sheath, split down to the base above, and half way down below; *Legume* long-stalked, with a broad membranous wing, obtuse at the base, 1 or 2-seeded.

PROPERTIES.—In addition to the pharmacopœial characters given lower down, it may be remarked that sandal-wood contains a colouring principle named by Pelletier *Santalin*, which is scarcely soluble in water, but abundantly so in spirit. Santalin can be obtained by adding any acid to an alkaline infusion of the wood, when it will be precipitated of a resinous dark red appearance. Its composition is $C_{16}H_8O_3$. The tincture precipitates solutions of lead violet, of corrosive sublimate scarlet, and of sulphate of iron a deep violet.

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.

USES.—Sandal-wood is exclusively employed as a colouring agent.

PREPARATION.—Tinctura Lavandulæ Composita.

RED PRUSSIATE OF POTASH. $K_3Fe_2C_{12}N_6$ or $\mathbf{K_6Fe_2C_{12}N_{12}}$.

USE.—Only as a test for the salts of iron. Its solution in water gives no precipitate with persulphate of iron.

ROSÆ CENTIFOLIÆ PETALA. *Cabbage-rose Petals.* (The fresh petals fully expanded of Rosa centifolia, *Linn.; Woodv. Med. Bot.;* plate 140. 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.*

BOTANICAL CHARACTERS.—A small shrub with almost straight prickles, which are not much expanded at the base; leaves imparipinnate; leaflets 5-7, ovate, glandular and flaccid at the margin, hairy on the under surface; calyx urceolate; segments 5, spreading, not deflexed, during flowering glandulose, hispid; fruit a *cynarrhodum*, ovate and pulpy, consisting of the tube of the calyx, on which are inserted numerous hairy achenes.

CHARACTERS.—Taste sweetish, bitter, and faintly astringent; odour roseate; both readily imparted to water.

PREPARATION.—Aqua Rosæ, 10 pounds in 1 gallon.

Aqua Rosæ. Rose Water. (Take of fresh petals of the hundred-leaved rose, (or an equivalent quantity of the petals preserved while

fresh with common salt) 10 pounds; water, 2 gallons. Distil one gallon.)

USES.—Rose water is employed 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.

PREPARATIONS.—Mistura Ferri Composita, Trochisci Bismuthi.

SAPO DURUS. *Hard Soap.* (Soap made with olive oil and soda.)

CHARACTERS.—Greyish-white, dry, inodorous; horny and pulverisable when kept in dry warm air; easily moulded when heated. Soluble in rectified spirit; not imparting an oily stain to paper. Incinerated, it yields an ash which does not deliquesce.

PREPARATIONS.—Emplastrum Resinæ; Emplastrum Saponis; Extractum Colocynthidis Compositum; Linimentum Potassii Iodidi cum Sapone; Linimentum Saponis; Pilula Aloës Barbadensis; Pilula Aloës et Assafœtidæ; Pilula Aloës Socotrinæ; Pilula Cambogiæ Composita; Pilula Rhei Composita; Pilula Saponis Composita; Pilula Scillæ Composita. 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-green, inodorous, of a gelatinous consistence. Soluble in rectified spirit; not imparting an oily stain to paper. Incinerated, it yields an ash which is very deliquescent.

PREPARATION.—Linimentum Terebinthinæ, 2 parts in 17½ nearly.

SODÆ NITRAS. *Nitrate of Soda.* NaO,NO_5 or $\mathbf{NaNO_3}$. (A native salt, purified by crystallisation from water.

CHARACTERS AND TESTS.—In colourless obtuse rhombohedral crystals, having a cooling saline taste. Thrown on the fire, it deflagrates; warmed in a test tube with sulphuric acid and copper wire, it evolves ruddy fumes. It is soluble in about two parts of cold distilled water. The solution gives no precipitate with nitrate of silver or chloride of barium.

PREPARATION IN WHICH NITRATE OF SODA IS USED.—Sodæ Arsenias.

SUBACETATE OF COPPER OF COMMERCE. *Verdigris.* (Described p. 252.) Used in making the test solution of acetate of copper.

SULPHATE OF COPPER, ANHYDROUS. CuO,SO_3 or $\mathbf{CuSO_4}$. (Sulphate of copper deprived of its water by a heat of 400°.)

CHARACTERS.—A yellowish white powder, which becomes blue when moistened with water.

USES.—Employed as a test for the presence of water in alcohol (see p. 539).

SULPHIDE OF IRON. FeS or **FeS.** (Produced by applying the end of a rod of iron, heated to a white heat at a blacksmith's forge, to the end of a roll of sulphur, and allowing the sulphide of iron as it is formed to run into a vessel of water.)

USES.—Only employed for generating sulphuretted hydrogen gas (See next preparation).

SULPHURETTED HYDROGEN. HS or $\mathbf{H_2S}$.

PREPARATION.—Take of sulphide of iron, half an ounce; water, four fluid ounces; sulphuric acid, a sufficiency. Place the sulphide of iron and the water in a gas-bottle closed with a cork perforated by two holes, through one of which passes 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 as it may be required.

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, $FeS+SO_3+HO=FeOSO_3+SH$.

USES.—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 Depuytren 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 $\frac{1}{200}$th of its volume of sulphuretted hydrogen.

TEST SOLUTIONS.

OF ACETATE OF COPPER.—Take of subacetate of copper of commerce, in fine powder, half an ounce; acetic acid, one fluid 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. Filter it.

OF ACETATE OF POTASH.—Take of acetate of potash, half an ounce; distilled water, five fluid ounces. Dissolve and filter.

OF ACETATE OF SODA.—Take of acetate of soda, half an ounce; distilled water, five fluid ounces. Dissolve and filter.

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.—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.—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.

OF AMMONIO-SULPHATE OF MAGNESIA.—Take of sulphate of magnesia, one ounce; chloride of ammonium, half an ounce; solution of ammonia, half a fluid ounce; distilled water, a sufficiency. Dissolve the sulphate of magnesia and chloride of ammonium in eight fluid ounces of the water, and to the solution add the ammonia, and as much distilled water as will make up the bulk to ten fluid ounces. Filter it.

OF BORACIC ACID.—Take of boracic acid, fifty grains; rectified spirit, one fluid ounce. Dissolve and filter.

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. Keep it excluded from the light.

OF CARBONATE OF AMMONIA.—Take of carbonate of ammonia, in small pieces, half an ounce; distilled water, ten fluid ounces. Dissolve and filter.

OF CHLORIDE OF AMMONIUM.—Take of chloride of ammonium, one ounce; distilled water, ten fluid ounces. Dissolve and filter.

OF CHLORIDE OF BARIUM.—Take of chloride of barium, in crystals, one ounce; distilled water, ten fluid ounces. Dissolve and filter.

OF CHLORIDE OF CALCIUM.—Take of chloride of calcium, one ounce; distilled water, ten fluid ounces. Dissolve and filter.

OF CHLORIDE OF CALCIUM *(Saturated)*.—Take of chloride of calcium, four ounces; distilled water, five fluid ounces. Dissolve and filter.

OF CHLORIDE OF GOLD.—Take of fine gold, reduced by a rolling machine to a thin lamina, sixty grains; nitric acid, one fluid ounce and a half; hydrochloric acid, seven fluid ounces; distilled water, a sufficiency. Place the gold in a flask with the nitric acid 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 the additional fluid ounce of hydrochloric acid, evaporate at a heat not exceeding 212° until acid vapours cease to be given off, and dissolve the chloride of gold thus obtained in five fluid ounces of distilled water. The solution should be kept in a stoppered bottle.

OF CHLORIDE OF TIN.—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 GELATINE.—Take of isinglass, in shreds, fifty grains; warm distilled water, five

fluid ounces. Mix and digest for half an hour on a water-bath with repeated shaking, and filter through clean tow moistened with distilled water.

OF IODATE OF POTASH.—Take of iodine, fifty grains; chlorate of potash, fifty grains; nitric acid, eight 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, ten fluid ounces. Dissolve and filter.

OF OXALATE OF AMMONIA.—Take of oxalate of ammonia, half an ounce; warm distilled water, one pint. Dissolve and filter.

OF PERCHLORIDE OF PLATINUM.—Take of thin platinum foil, a quarter of an ounce; nitric acid, a sufficiency; hydrochloric acid, a sufficiency; distilled water, seven fluid ounces. Mix a fluid ounce of the nitric acid with four 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 dish, 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. Filter and preserve it in a stoppered bottle.

OF PHOSPHATE OF SODA.—Take of phosphate of soda, in crystals, one ounce; distilled water, ten fluid ounces. Dissolve and filter.

OF RED PRUSSIATE OF POTASH.—Take of red prussiate of potash, in crystals, a quarter of an ounce; distilled water, five fluid ounces. Dissolve and filter.

OF SULPHATE OF INDIGO.—Take of indigo, dry and in fine powder, five grains; sulphuric acid, ten fluid ounces. Mix the indigo with a fluid drachm of 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 remainder of the acid, agitate the mixture, and when the undissolved indigo has subsided, decant the clear liquid into a stoppered bottle.

OF SULPHATE OF IRON.—Take of granulated sulphate of iron, ten grains; boiling distilled water, one fluid ounce. Dissolve and filter. This solution should be recently prepared.

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 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.

OF SULPHIDE OF AMMONIUM.—Take of solution of ammonia, five fluid ounces. Put three fluid ounces of the ammonia into a bottle, and conduct into this a stream of sulphuretted hydrogen so long as the gas continues to be absorbed; then add the remainder of the ammonia, and transfer the solution to a green glass bottle, furnished with a well ground stopper.

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 YELLOW PRUSSIATE OF POTASH.—Take of yellow prussiate of potash, in crystals, a quarter of an ounce; distilled water, five fluid ounces. Dissolve and filter.

TEST SOLUTIONS FOR VOLUMETRIC ESTIMATIONS.

The processes for volumetric estimations may be performed either with British or with metrical weights and measures, and the solutions are so arranged that they will be of the same strength, and the same indications will be obtained in using them, whichever system is employed, without the *necessity* of altering any of the figures by

which the quantities of the substances tested or of the test solutions required in the process are expressed.

According to the British system, the quantities of the substances to be tested are expressed in grains by weight, whilst the quantities of the test solutions employed in testing are expressed in grain-measures,—the grain-measure being the volume of a grain of distilled water.

According to the metrical system the quantities of the substances to be tested are expressed in grammes by weight, whilst the quantities of the test solutions employed in testing are expressed in cubic centimetres,—the cubic centimetre being the volume of a gramme of distilled water.

As the cubic centimetre bears the same relation to the gramme that the grain-measure bears to the grain, the one system may be substituted for the other with no difference in the results, excepting that by the metrical system all the quantities will be expressed in relation to a weight (the gramme) which is more than fifteen times as great as the British grain.

In practice it will be found convenient in substituting metrical for British weights and measures, to reduce the values of all the numbers to one tenth, by moving the decimal points; and this has been done in the tables appended to the descriptions of the volumetric solutions. The quantities indicated in the Pharmacopœia, which in grains and grain-measures can be conveniently used, would be found inconveniently large if the same numbers of grammes and cubic centimetres were employed.

The following apparatus is required in the preparation and use of these solutions.

For British weights and measures :—

1. A flask which, when filled to a mark on the neck, contains exactly 10,000 grains of distilled water at 60°. The capacity of the flask is therefore 10,000 grain-measures.

2. A graduated cylindrical jar which, when filled to 0, holds 10,000 grains of distilled water, and is divided into 100 equal parts.

3. A burette. A graduated glass tube which, when filled to 0, holds 1,000 grains of distilled water, and is divided into 100 equal parts. Each part therefore corresponds to 10 grain-measures.

For metrical weights and measures :—

1. A glass flask which, when filled to a mark on the neck, contains one litre or 1,000 cubic centimetres.

2. A graduated cylindrical jar which, when filled to 0, contains one litre (1,000 cubic centimetres), and is divided into 100 equal parts.

3. A burette. A graduated tube which, when filled to 0, holds 100 cubic centimetres, and is divided into 100 equal parts.

(One cubic centimetre is the volume of one gramme of distilled water at 4° C.* 1,000 cubic centimetres equal one litre.)

Volumetric solutions, before being used, should be shaken, in order that they may be throughout of uniform strength. They should also be preserved in stoppered bottles. All measurements should be made at 60°.

Under each of the following volumetric tests I propose to give an example explanatory of their mode of application, so as to enable the reader to understand the rationale of their action; although in the body of the work the reader will also find their value in each case in which they are used fully explained.

OF BICHROMATE OF POTASH. (Bichromate of Potash, $KO,2CrO_3$=147·5 or $K_2Cr_2O_7$ =295.) Take of bichromate of potash, 147·5 grains; distilled water, a sufficiency. Put the bichromate of potash into the 10,000 grain flask, and, having half filled the flask with water, allow the salt to dissolve; then dilute the solution with more water, until it has the exact bulk of 10,000 grain-measures. 1,000 grain-measures of this solution contain 14·75 grains of the bichromate ($\frac{1}{10}$th of $KO,2CrO_3$ or $\frac{1}{10}$th of $K_2Cr_2O_7$, in grains) and when added to a solution of a protosalt of iron acidulated with hydro-

* It is customary to make the measurements with metrical apparatus at 60° Fahr.

chloric acid, are capable of converting 16·8 grains of iron ($\frac{1}{10}$th of 6Fe or $\frac{1}{20}$th of **6F**, in grains) from the state of protosalt to that of persalt.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. Thus 14·75 grammes of bichromate of potash should be made to form 1,000 cubic centimetres of solution. 100 cubic centimetres of this solution contain 1·475 grammes of the bichromate ($\frac{1}{100}$th of $KO,2CrO_3$ or $\frac{1}{200}$th of $\mathbf{K_2Cr_2O_7}$, in grammes) and when added to a solution of protosalt of iron acidulated with hydrochloric acid are capable of converting 1·68 grammes of iron ($\frac{1}{100}$th of 6Fe or $\frac{1}{200}$th of **6Fe**, in grammes) from the state of protosalt to that of persalt.

This solution is used for determining the proportion of protoxide of iron in the following preparations. It is known that the whole of the protosalt has been converted into a persalt when a minute drop of the liquid, placed in contact with a drop of the solution of red prussiate of potash on a white plate, ceases to strike with it a blue colour.

	British Weights and measures.				Metrical Weights and Measures.		
	Grain Weight of Substance.	=	Grain-measures of Vol. Sol.	or	Grams. wt. of Substance	=	C. C. of Vol. Sol.
Ferri Arsenias . . .	20	=	170	or	2·0	=	17·0
,, Carb. Sacch. . .	20	=	330	or	2·0	=	33·0
,, Oxid. Magn. . .	20	=	83	or	2·0	=	8·3
,, Phosphas . . .	20	=	250	or	2·0	=	25·0

EXPLANATION OF TEST.—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 red prussiate of potash, until at least one hundred and seventy 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 red prussiate of potash. 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 1000 measures of the volumetric solution; but for the quantity operated upon only 170 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 1000 : 44·6 :: 170 : 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 crystallised, $NaO,S_2O_2+5HO=124$ or $\overline{Na}_2H_2S_2O_4.4H_2O=248$.) Take of hyposulphite of soda, in crystals, two hundred and eighty grains; distilled water, a sufficiency. Dissolve the hyposulphite of soda in 10,000 grain-measures of water. Fill a burette with this solution and drop it cautiously into 1,000 grain-measures of the volumetric solution of iodine, until the brown colour is just discharged. Note the number of grain-measures (n) required to produce this effect; then put 8,000 grain-measures of the same solution into a graduated jar, and augment this quantity by the addition of distilled water until it amounts to $\frac{8000\times1000}{n}$ grain-measures. If for example, $n=950$ the 8,000 grain-measures of solution should be diluted to the bulk of $\frac{8000\times1000}{950}=8{,}421$ grain-measures. 1,000 grain-measures of this solution contain 24·8 grains of the hyposulphite ($\frac{1}{10}$th of $2(NaO,S_2O_2+5HO)$ or $\frac{1}{10}$th of $Na_2H_2S_2O_4.4H_2O$, in grains), and therefore correspond to 12·7. grains of iodine ($\frac{1}{10}$th of an equivalent.)

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres of this solution contain 2·48 grammes of the hyposulphite ($\frac{1}{100}$th of $2(NaO,S_2O_2+5HO)$ or $\frac{1}{100}$th of $Na_2H_2S_2O_4.4H_2O$, in grammes), and therefore correspond to 1·27 grains of iodine ($\frac{1}{100}$th of an equivalent).

This solution is used for testing the following substances. In each case, excepting that of iodum, a solution of iodide of potassium and hydrochloric acid are added to the substance, and the amount of iodine so liberated is indicated by this solution.

	British weights and measures.				Metrical weights and measures.		
	Grains weight of substance.	=	Grain measures of Vol. Sol.	or	Grams. wt. of Substance.	=	C. C. of Vol. Sol.
Calx Chlorata . .	. 10·0	=	850	or	1·00	=	85·0
Iodum . . .	. 12·7	=	1000	or	1·27	=	100·0
Liq. Calc. Chloratæ	. 60·0	=	500	or	6·00	=	50·0
,, Chlori . .	. 439·0	=	750	or	43·90	=	75·0
,, Sodæ Chloratæ .	. 70·0	=	500	or	7·00	=	50·0

EXPLANATION OF TEST.—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 eight hundred and fifty 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, $CaOClO + 2HCl = 2HO + CaCl + 2Cl$; 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 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, $2(NaOS_2O_2) + I = NaI + NaOS_4O_5$. 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 1000 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 1000 : 12·7 :: 850 : 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 or I = 127.) Take of iodine, one hundred and twenty-seven grains; iodide of potassium, one hundred and eighty grains; distilled water, a sufficiency. Put the iodide of potassium and the iodine into the 10,000 grain flask, fill the flask to about two-thirds its bulk with distilled water, gently agitate until solution is complete, and then dilute the solution with more water until it has the exact volume of 10,000 grain-measurss. 1,000 grain-measures of this solution contain $\frac{1}{10}$th of an equivalent in grains (12.7 grains) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain 1·27 grammes of iodine and correspond to 0·17 grammes of sulphuretted hydrogen, 0·32 grammes of sulphurous, and 0·495 grammes of arsenious acid.

This solution is used for testing the following substances. It is dropped from the burette into the liquid to be tested until free iodine begins to appear in the solution.

	British weights and measures.				Metrical weights and measures.		
	Grains weight of Substance.	=	Grain-measures of Vol. Sol.	or	Grams. wt. of Substance.	=	C. C. of Vol. Sol.
Acid Arsenios. . .	4·0	=	808	or	0·40	=	80·8
,, Sulphurosum .	34·7	=	1000	or	3·47	=	100·0
Liquor Arsenicalis .	441·5	=	808	or	44·15	=	80·8
,, Arsenici Hydrochloricus	441·5	=	810	or	44·15	=	81·0

EXPLANATION OF TEST.—To explain this test we shall select for our example the sulphurous acid of the Pharmacopœia. Of which, 3·47 grains by weight, " when mixed with an ounce of distilled water and a little mucilage of starch, do not acquire a permanent blue colour

with the volumetric solution of iodine until 1000 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 any given solution. One thousand measures being equal to gr. 3·2, what are say sixteen hundred and sixty-four measures equal to? 1000 : 3·2 :: 1640 : 5·248. Therefore 5·248 grains of sulphurous acid must have been present in the imaginary quantity operated upon.

OF NITRATE OF SILVER.—(Nitrate of silver, $AgO,NO_5=170$ or $AgNO_3=170$.) Take of nitrate of silver, a hundred and seventy grains; distllled water, a sufficiency. Put the nitrate of silver into the 10,000 grain flask, and, having half filled the flask with water, allow the salt to dissolve; then dilute the solution with more water until it has the exact bulk of 10,000 grain-measures. The solution should be kept in an opaque stoppered bottle. 1,000 grain-measures of this solution contain $\frac{1}{10}$th of an equivalent in grains of nitrate of silver (or 17·0 grains).

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{100}$th of an equivalent in grammes of nitrate of silver (or 1·7 grammes).

It is used in testing the following substances:—

	British weights and measures.				Metrical weights and measures.		
	Grains weight of Substance.	=	Grain-measures of Vol. Sol.	or	Grams. wt. of Substance.	=	C. C. of Vol Sol.
Acid Hydrocyan. . .	270	=	1000	or	27·0	=	100·0
Potass. Bromid. . .	10	=	840	or	1·0	=	84·0
Sodæ Arsenias (dry) . .	10	=	1613	or	1·0	=	161·3

EXPLANATION OF TEST.—I shall select for my example here hydrocyanic acid. In the Pharmacopœia it is stated that 270 grains of the officinal acid, "when rendered alkaline by the addition of solution of soda, require the addition of 1000 grain measures of the volumetric solution of nitrate of silver to be added 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. 270 grains by weight require a thousand grain measures of the volumetric solution of nitrate of silver, a quantity that represents the tenth of an equivalent in grains of nitrate of silver (17 grains), which is equivalent to the tenth of an equivalent in grains of absolute prussic acid (2·7 grains); but inasmuch as an equal amount of prussic acid has been consumed in the formation of the cyanide of sodium, it is evident that each tenth of an equivalent of nitrate of silver thus consumed is in reality equal to 5·4 grains of prussic acid, an amount which corresponds to a strength of 2 per cent. of absolute prussic acid, inasmuch as 270 : 5·4 : : 100 : 2.

OF OXALIC ACID.—(Crystallised oxalic acid, $2HO,C_4O_6+4HO=126$ or $H_2C_2O_4.2H_2O=126$.)—Take of purified oxalic acid in crystals, quite dry, but not effloresced, 630 grains; distilled water, a sufficiency. Put the oxalic acid into the 10,000 grain flask, fill the flask to about two thirds of its bulk with water, allow the acid to dissolve, and then dilute the solution with more water until it has the exact volume of 10,000 grain-measures. 1,000 grain-measures of this solntion contain half an equivalent in grains (63 grains) of oxalic acid, and are therefore capable of neutralising one equivalent in grains of an alkali or alkaline carbonate.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{10}$th of an equivalent in grammes (6·3 grammes) of oxalic acid, and will neutralise $\frac{1}{10}$th of an equivalent in grammes of an alkali.

The following substances are tested with this solution :—

	British weights and measures.				Metrical weights and measures.		
	Grains weight of Substance.	=	Grain-measures of Vol. Sol.	or	Grams. wt. of Substance.	=	C. C. of Vol. Sol.
Ammoniæ Carb. . .	59·0	=	1000	or	5·90	=	100·0
Borax . . .	191·0	=	1000	or	19·10	=	100·0
Liq. Ammon. . .	85·0	=	500	or	8·50	=	50·0
,, ,, Fort. .	52·3	=	1000	or	5·23	=	100·0
,, Calcis . . .	4380·0	=	200	or	438·00	=	20·0
,, ,, Sacchar. .	460.2	=	254	or	46·02	=	25·4
,, Plumbi Subacet. .	413·3	=	810	or	41·33	=	81·0
,, Potassæ . .	462·9	=	482	or	46·29	=	48·2
,, ,, efferves. .	4380·0	=	150	or	438·00	=	15·0
,, Sodæ ,, .	458·0	=	470	or	45·80	=	47·0
,, ,, efferves. .	4380·0	=	178	or	438·00	=	17·8
Plumbi Acetas . .	38·0	=	200	or	3·80	=	20·0
Potassa Caustica . .	56·0	=	900	or	5·60	=	90·0
Potassæ Bicarb. . .	50·0	=	500	or	5·00	=	50·0
,, Carb. . .	83·0	=	980	or	8·30	=	98·0
,, Citras . .	102·0	=	1000	or	10·20	=	100·0
,, Tartras . .	113.0	=	1000	or	11·30	=	100·0
,, ,, Acida .	188·0	=	1000	or	18·80	=	100·0
Soda Caustica . .	40·0	=	900	or	4·00	=	90·0
,, Tartarata . .	141·0	=	1000	or	14·10	=	100·0
Sodæ Bicarb. . .	84·0	=	1000	or	8·40	=	100·0
,, Carb. . .	143·0	=	960	or	14·30	=	96·0

EXPLANATION OF TEST.—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 half an equivalent of oxalic acid 63, which is capable of neutralizing one equivalent of base, it is evident that 28 grains of lime will be exactly neutralized by 63 grains of oxalic acid; but 1000 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 1000 measures can neutralize 28 grains of lime, what are 20 measures equivalent to? 1000 : 28 : 20 : 5·6; therefore the ten ounces of lime water contain gr. 5.6 of lime, equivalent to gr. 11·2 to one pint.

OF SODA. (Hydrate of soda, NaO,HO=40 or **NaHO**=40.) Take of solution of solution of soda, a sufficiency; distilled water, a sufficiency. Fill a burette with the solution of soda, and cautiously drop this into 63 grains of purified oxalic acid dissolved in about two ounces of water, until the acid is exactly neutralized as indicated by litmus. Note the number of grain-measures (n) of the solution used, and having then introduced 9,000 grain-measures of the solution of soda into a graduated jar, augment this quantity by the addition of water, until it becomes $\frac{9000 \times 1000}{n}$ grain-measures. If for example, $n=930$, the 9,000 grain-measures should be augmented to $\frac{9000 \times 1000}{930} =$ 9,677 grain-measures. 1,000 grain-measures of this solution contain one equivalent in grains (40 grains) of hydrate of soda, and will therefore neutralise one equivalent in grains of any monobasic acid.

Grammes and cubic centimetres may be employed instead of grains and grain-measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{10}$th of an equivalent in grammes (4 grammes) of hydrate of soda, and will neutralise $\frac{1}{10}$th of an equivalent in grammes of an acid.

This solution is used for testing the following substances:—

	British weights and measures.				Metrical weights and measures.		
	Grains weight of Substance.	=	Grain-measures of Vol. Sol.	or	Grams. wt. of Substance.	=	C. C. of Vol. Sol.
Acetum . .	445·4	=	402	or	44·54	=	40·2
Acid. Acet. .	182·0	=	1000	or	18·20	=	100·0
,, ,, Dil. .	440·0	=	313	or	44·00	=	31·3
,, ,, Glac. .	60·0	=	990	or	6·00	=	99·0
,, Citric. .	70·0	=	1000	or	7·00	=	100·0
,, Hydrochl. .	114·8	=	1000	or	11·48	=	100·0
,, ,, Dil.	345·0	=	1000	or	34·50	=	100·0
,, Nitric. .	90·0	=	1000	or	9·00	=	100·0
,, ,, Dil.	361·3	=	1000	or	36·13	=	100·0
,, Nitro-Hydrochl Dil.	352·4	=	920	or	35·24	=	92·0
,, Sulp. .	50·6	=	1000	or	5·06	=	100·0
,, ,, Arom.	304·2	=	830	or	30·42	=	83·0
,, ,, Dil. .	359·0	=	1000	or	35·90	=	100·0
,, Tart. Dil. .	75·0	=	1000	or	7·50	=	100·0

EXPLANATION OF TEST.—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 "50·6 grains by weight of sulphuric acid mixed with an ounce of distilled water require for neutralization 1000 measures of this solution;" now 1000 measures contain 31 grains of soda, equivalent to 40 grains (its equivalent number) of anhydrous sulphuric acid, which amount must therefore have been present.

TIN, GRANULATED. (Grain tin, reduced to small fragments by fusing and pouring into cold water.)

TINCTURA VERATRI VIRIDIS. *Tincture of Green Hellebore.* (Take of green hellebore root, in coarse powder, four ounces; rectified spirit, one pint. Macerate the hellebore for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.) The properties of the veratrum viride have been already described, p. 523, where this tincture would have been more appropriately placed. Dose, 5 to 20 minims.

TROCHISCI POTASSÆ CHLORATIS. *Chlorate of Potash Lozenges.* (Take of chlorate of potash in powder, 3600 grains; refined sugar, in powder, twenty-five ounces; gum acacia, in powder, one ounce; mucilage of gum acacia, two fluid ounces; distilled water, one fluid ounce, or a sufficiency. Mix the powders and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.) The properties of chlorate of potash have been already described, p. 470, where the lozenges would have come in more appropriately. Each lozenge contains five grains of chlorate of potash. Dose, 1 to 6 lozenges.

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.*

BOTANICAL CHARACTERS.—Root perennial, tuberous, palmate, and internally of a deep-yellow colour; leaves with long sheathing petioles, broad-lanceolate; flowers in a bracteated spikose scape;

perianth tube enlarging upwards, limb 2-lipped, each lip 3-parted; filament of the single fertile stamen broad; anther incumbent, with 2 spurs at the base; style capillary; capsule 3-celled; seeds numerous, arillate.

CHARACTERS.—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*.

USES.—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 white paper steeped in tincture of turmeric, and dried by exposure to the air.)

Turmeric Tincture. (Take of turmeric, bruised, one ounce; rectified spirit, six fluid ounces. Macerate for seven days in a closed vessel, and filter.)

VAPOR ACIDI HYDROCYANICI. *Inhalation of Hydrocyanic Acid.* (Take of diluted hydrocyanic acid, ten to fifteen minims; water (cold), one fluid drachm. Mix in a suitable apparatus and let the vapour that arises be inhaled.) Hydrocyanic acid has been already described, p. 477, where this preparation would have been more appropriately placed. It is an uncalled for preparation, as it must always be left for extemporaneous prescription.

ZINCUM. *Zinc.* (Zinc of commerce.)

PREPARATIONS CONTAINING ZINC.—Liquor Zinci Chloridi; Unguentum Zinci; Zinci Acetas; Zinci Carbonas; Zinci Chloridum; Zinci Oxidum; Zinci Sulphas; Zinci Valerianas; Zincum Granulatum.

ZINCUM GRANULATUM. *Granulated Zinc.*

PREPARATION.—Take of zinc of commerce, one pound. Fuse it in an earthen crucible, heated to a sufficient but not excessive degree in a suitable fire, and pour the fused metal in a thin stream into a vessel containing two gallons of cold water. Remove the granulated zinc from the water, and dry it.

PURITY.—If the zinc be perfectly pure, the hydrogen gas evolved when the metal is dissolved 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.)

PREPARATIONS.—Liquor Zinci Chloridi; Zinci Chloridum; Zinci Sulphas.

CHAPTER XXIII.

ON THE ADMINISTRATION OF MEDICINES.

AFTER the medical man has maturely studied, in all its bearings, the case about which he may have been consulted, and decided upon the nature of the disease in question, a most important duty still remains for him to discharge—the application to it of the proper remedy, and the determination of the best form in which it can be administered. In fact in these few minutes must be concentrated all the knowledge upon every professional subject which he has hitherto studied—all his information, as it may truly be stated, culminating in that prescription which he is about to write. It is therefore that I conceive a few pages may well be devoted to this subject, especially for the benefit of my junior readers. Premising that medicines may be introduced into the system in a far greater number of ways than by the stomach, a subject to which I shall presently allude to more fully, I now proceed to make some observations on the general construction of a prescription, considerations which are applicable more or less to every form by which medicines are employed remedially. First, and most important in every respect, is the consideration of the medicine which will be most likely to prove of benefit in the special disease under treatment—the *remedy* for it in fact; this, in the construction of the prescription, is technically termed the *remedium*. But this remedium may be, and most likely is possessed of some unpleasant quality, from the effects of which we would wish to guard the system. In fact, whatever may be that property, we wish to *correct* it, and accordingly we introduce into our formula some corrective ingredient, and this is termed the *corrigens*. But we may entertain some doubt as to the efficacy of our remedium, and consequently may desire to assist it, or our previous experience will have taught us that the combination of two different remedies possessed of analogous therapeutic value, acts even with greater energy in doses the sum of which is less than what may be required of either singly; and acting upon this knowledge we resolve to order some other medicine possessed of similar virtues to the remedium to *assist* its action; and this is termed the *adjuvans*. And finally we will require an excipient to give it the form we may desire it to possess; this is termed the *vehiculum* or the *menstruum*. So that in every scientifically constructed prescription we find all these elements entering into its composition—the remedium, the corrigens,

the adjuvans, and, finally, the vehiculum or menstruum. The feature which specially characterised prescription writing in the olden time was the employment of a multiplicity of ingredients; in more modern times simplicity seems to be the great object aimed at. But whilst recognizing the absurdity of ordering in the one prescription some fifty or sixty different articles—a task which it would tax the knowledge of an accomplished Materia Medica scholar to effect without the introduction of some incompatible, and as a consequence the production of some unexpected decompositions, I fear that whilst avoiding Scylla we have run upon Charybdis, and that now-a-days the error is as much on one side as formerly it was on the other; in fact, that we but too frequently sacrifice to the effort after simplicity the very great advantages that arise from judicious combination. Part of this, no doubt, is due to the tendency in the human mind to run into extremes. A great portion, I fear, is to be attributed to the but too prevalent neglect on the part of students of medicine of the study of Materia Medica, and the desire to cloak ignorance under a simulated love of simplicity. How true are these considerations as to the value of judicious combinations will be quickly evidenced by the study of the prescriptions of that therapeutist who never errs—Nature. The skill of the accomplished prescriber is shown not only in the attention he pays to the essentials of a scientifically constructed prescription, as enumerated above, but also in their selection; for at one and the same time he can make his adjuvans a corrigens, and he may also press his menstruum into the service of the remedium. I shall give two examples to illustrate my meaning. The first, in which the ingredients of the prescription are employed simply as remedium, corrigens, adjuvans, and menstruum; the second, more artistic in its construction, where all the ingredients are made subservient to the remedium. We shall presume that the case is one in which the exhibition of a saline cathartic, such as Epsom salts, is considered advisable.

Remedium	...	Sulphatis Magnesiæ, ℥j.
Corrigens	...	Tincturæ Zingiberis, f℥ss.
Adjuvans	...	Mannæ, ℥j.
Menstruum	...	Aquæ ad f℥viij.

Here we have the four conditions which ought to be present in a scientifically constructed prescription, and yet it is not an artistic one. I shall now give an example of a prescription which is not only scientifically but artistically constructed; as in the last case Epsom salts is to be the medicine indicated.

Remedium	...	Sulphatis Magnesiæ, ℥j.
Corrigens	...	Syrupi Zingiberis, f℥ss.
Adjuvans	...	Tincturæ Sennæ, f℥j.
Menstruum	...	Infusi Sennæ ad ℥viij.

Here the action of the remedium is not only assisted by the adju-

vans, but this latter assists the corrigens in its action, in virtue of the spirit and aromatics which it contains; whilst the menstruum not only acts as such, but also acts as an adjuvans, and in a minor degree, in virtue of the ginger which it contains, as a corrigens. The corrigens, again, discharges a double duty. In the first prescription it would simply guard against the griping properties of the Epsom salts; in the second prescription it not only discharges this function, but to a certain extent masks its unpleasant taste; a minor consideration to be sure, but by no means to be despised, as the more palatable a medicine can be made, without sacrificing what should be the primary consideration—its efficiency, the better will it be in every respect.

A few words, and they shall be very few, on the grammatical construction of a prescription. Thanks to the progress made by preliminary examinations, they are not so much required now-a-days as they would have been some few years back; but even were they so, this is not the place in which to teach the elements of the Latin grammar. In these countries we always commence our prescriptions with a figure of this kind ℞. What this may have originally imported is immaterial here. At present it is accepted as being the initial letter of the imperative mood of the Latin verb *recipio, recipe;* in which interpretation we are followed by the French physicians, who write *prenez,* take. Accepting this view, the subsequent noun is to be put in the accusative case, the noun being the quantity ordered, and not the medicine, which is to be in the genitive case, the directions being to take so much of whatever it may be; thus in the foregoing prescription, the directions are to take one ounce of sulphate of magnesia.—℞ Sulphatis magnesiæ unciam unam. With these very brief observations, I shall refer the reader for the Latinity of his prescription to the instructions which it is to be hoped he received at school before entering upon his medical studies. Custom has sanctioned writing the body of the prescription in Latin, and much can be advanced in support of the continuance of the custom. For many sound reasons, it is almost invariably better that patients should not know what medicines they are about to take. Faith is a great element in the result produced. Familiarity breeds contempt; besides which, Latin is capable of greater precision than is the English language; and, in addition, every pharmaceutist is expected to know Latin, which may be looked upon as the universal language in all countries that are usually regarded as being within the pale of Christendom or of European civilization; consequently prescriptions written in that tongue can be, and frequently are, compounded in places where, had they been written in any modern language, it would be vain to expect it; finally, Latin being a dead language is not liable to the changes of time or fashion, and this is more than can be said of any modern language. But the directions as to how the medicine is to be taken are a different affair; it certainly seems absurd to take the greatest pains to write in Latin directions which must subsequently be translated into English for the guidance of the patient, thereby

running the risk of having your meaning misunderstood, either by the possible ignorance of the compounder, or by your own powers of Latin composition not being of the first order. Numerous ludicrous instances of mistakes of this kind have been placed on record, which it is unnecessary to reproduce here.

Having once established in the prescriber's mind the class of medicines most suited for the case, his next consideration will be the tissue of the body which he will select for its introduction into the system; and the form, whether fluid, solid, or gaseous, in which he will administer it. The popularly received idea in connection with medicines is, that they are to be swallowed, or, in other words, to be administered by the stomach; no doubt this is by far the most frequent channel selected, but it is by no means the only one; and, in fact, the tendency of the age is becoming more and more to leave the stomach to its proper office, the reception of food, and to look out for some other channel through which to introduce medicines into the system. The oldest of these routes, that by the rectum, is frequently had recourse to in the form either of enema or suppository, analogous to which is, in the female, that by the vagina in the form of pessary. Another old route, by the cuticle, either by medicated baths, fumigation, or by the *iatroleptic method*, in which the medicine is rubbed on the unbroken skin, though not abandoned, is still not so frequently had recourse to in the present day, as that by *subcutaneous injection* into the cellular tissue, by means of Wood's syringe, an improvement on one suggested several years ago by my predecessor in the Meath Hospital, the late Mr. Rynd. The *endermic method* is that in which the cuticle is removed by the agency of a blister, and the remedy directly applied to the cutis vera. The introduction of medicines by the *aerian membrane*, though not a suggestion of modern date, is still now-a-days getting into greater vogue than formerly—formulæ for the purpose, termed *Vapors*, having been introduced into the present edition of the British Pharmacopœia. Very rarely indeed, though still occasionally, medicines are introduced into the system by means of inoculation; or by injection into the veins.

When the stomach is the channel through which medicines are to be introduced, they must be administered either in the solid or fluid form. Of the first of these we have examples in powders, boluses, confections or electuaries, lozenges or pills; of the latter, draughts and mixtures. Powders are about the simplest way in which medicines can be administered; they are, however, attended with the great drawback that it is not easy to cover the taste of the medicine should it be nauseous, and that frequently the bulk required to produce efficacy of action proves an insuperable barrier to their exhibition. In infantile diseases they are a favourite form for administering medicines. When mixed with honey or treacle sufficient to make one dose, they constitute a bolus; when in larger quantities, sufficient to make several doses, they constitute confections or electuaries. Pills are

universally known forms for the exhibition of medicine; they are generally so prescribed that the bulk of each shall not exceed five grains in weight. To prevent their sticking to each other, as also to mask their taste, they are dispensed in pill boxes partially filled with some such powder as magnesia, liquorice, lycopodium; or coated with gold or silver leaf; or, better than all, varnished over with a solution of gelatine. Draughts and mixtures differ from each other in but one respect, that the former contain but one dose of the medicine, the latter several doses. A draught varies in size from half an ounce up to two ounces; the mixture from two ounces up to four, six, eight, twelve or sixteen ounces, medicine bottles being generally made of these several capacities—a fact which the prescriber should bear in mind when writing his prescriptions, so as to order his mixture of one or other of these bulks, as nothing more frequently gives rise to misgivings in the patient's mind as to the accuracy with which a prescription has been dispensed, than receiving it in a bottle not completely filled. This portion of the prescriber's task can easily be effected by ordering an amount of the menstruum *to* the desired size of the mixture, as in the preceding prescription, *ad uncias octo.*

By the rectum medicines are ordered either in the form of enema or suppository. Enemata are prescribed with one of two objects in view, either that they are to be retained or rejected; the former when we require some special constitutional effect to be produced, as a narcotic one when we use the opium enema. In this case their bulk should not exceed two ounces. Many medicines act at all events as well when so administered by the rectum as when given by the stomach (see Enema Opii, p. 443). When, however, our object is that the medicine should not be retained, but on the contrary be expelled, as in the case of the cathartic enema, we order as large a quantity as the rectum will receive, from twelve to sixteen ounces, so as to distend the gut, and thereby throw its muscular fibres into action, and so cause the expulsion of its contents. Even tepid water so employed acts satisfactorily in this manner, and is very frequently had recourse to with this object in view by our continental neighbours, so much so as to render the *lavement* machine an indispensable requisite of the trousseau of a young lady about to become a bride. Various forms of enema apparatus are to be found in our shops, from the old fashioned bag and pipe, up to O'Beirne's tube; this latter will frequently prove of inestimable value, but should never be entrusted into any other hands than those of the medical man himself, as it requires skill and care for its safe employment. Suppositories are coming more and more into use every day, and in my opinion most deservedly so, as they are a most efficient method of introducing many kinds of medicines into the system, without upsetting the stomach by their exhibition. In this way it is competent for us to introduce into the system medicines from almost every class described in the foregoing chapters, and at page 835 I have given the form of menstruum which may be employed for their efficient

preparation. In our shops will be found an instrument for their introduction within the sphincter ani, a muscle which frequently opposes their introduction by the ordinary method, on the point of the finger. The construction of this instrument will be at once understood when I say it is on the *pop-gun* principle. Analogous to the suppository is the use in the female of the medicated pessary; pessaries, however, are more generally employed with a view of producing some local action upon those portions of the body with which they are brought into contact, as the os uteri, the mucous membrane of the vagina, &c. As in the case of the suppository, almost every variety of medicine is introduced into the system through their agency; and since their first introduction to the notice of the profession many years since by Sir James Y. Simpson, they have been gradually increasing in favour, until at the present time they are in almost daily requisition by the medical man engaged to any extent in the treatment of uterine affections.

The plan of introducing medicines into the system by means of injection into the cellular tissue has hitherto been principally confined to narcotics, a solution of morphia being the preparation generally selected. I have frequently found this method of employing medicines of great value in the treatment of severe neuralgia, as also in producing sleep when narcotics administered both by the stomach and rectum had completely failed in producing the desired effect. The same remark may also be applied to their introduction into the system by the endermic plan; in gastric affections the value of a small blister over the epigastrum, and dressing the blistered surfaces with some medicated ointment, being frequently one of the most valuable plans of treatment at our command in such cases. As to the employment of medicated vapours, they also are creeping into more general use, and I doubt not but that, as our experience increases, they will become yet more extended in their application; I have thus produced the diuretic action of juniper, by causing the patient to inhale the steam of warm water in which its oil had been diffused. The method by fumigation is principally confined to the preparations of mercury, and I have already had occasion to express myself in terms of approbation of this plan of treatment (see p. 640).

Having decided upon the particular medicine suited for the disease, and the form which he will select for its administration, the practitioner will have to decide upon the dose in which he will prescribe it. Of course this will depend upon a variety of circumstances, prominent amongst which is the age of the patient. In the posological table attached to this work, I have endeavoured, so 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, ½ 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	$\frac{1}{12}$	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+1 :: the adult dose, or 1 : to the child's dose, or 7. Or, to state it more concisely, $\frac{2}{2+12} = \frac{1}{7}$. which in words may thus be simply expressed, add twelve years to the age of the child, and divide the sum by the child's real age. 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 a lady under my care some years ago whom I repeatedly saw drink off a wineglassful of laudanum with no more effort or effect than that with which 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 excru-

ciating 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 patients under my care whom the smallest dose of assafœtida would cause to 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.

In giving directions to the patient as to how he is to dispose of his medicine, the practitioner cannot be too particular. In the case of mixtures, for convenience sake it is usual to direct the quantity to be measured in some domestic article, as a wine-glass or spoon, and this custom has been so universal that it is all but hopeless to supplant it with the more strictly accurate ounces and drachms. It is therefore necessary to entertain clear ideas as to the relation which exists between the domestic and pharmaceutic measures. The following proportions are generally accepted as being correct:—

f℥j.	=	One teaspoonful.
f℥ij.	=	One dessertspoonful.
f℥ss.	=	One tablespoonful.
f℥ij.	=	A small wineglassful.

Drops and minims are pretty generally looked upon as being convertible terms which however is a grave error. Reference to the table of pharmacopœial measures will show that the fluid drachm contains sixty minims; but from that it is by no means to be inferred that it contains sixty drops, inasmuch as according to the physical properties of the fluid, and the size of the mouth of the bottle from which the fluid is dropped, it may contain that number, or more or less than that number, of drops. For instance in Durand's tables upon this subject we find that a fluid drachm of medicinal prussic acid yielded but forty-five drops, whilst a fluid drachm of sulphuric ether yielded one hundred and fifty drops ; a fluid drachm of sulphuric acid yielded ninety drops, whilst the same quantity of hydrochloric acid yielded but fifty-four drops. From this statement it therefore follows that, when prescribing medicines in this form, we should always order minims, and direct our patients to provide themselves with a minim meter, whereby to apportion with precision the prescribed number.

In conclusion, there is one point which I would earnestly desire to impress on the young practitioner's consideration, and that is above all things to avoid routine prescription writing, by which I mean having one set formula for each particular disease—such as an unvarying balsam emulsion for each case of gonorrhœa, a never-changing cough bottle, purgative mixture, &c. Nothing tends more to betray weakness than the pursuing of such a course. Let him study well the properties of the several articles of the Materia Medica, their compatibles and their incompatibles, their doses, &c. and where called upon to write a prescription let him summon to his recollection the fruits of his bygone studies. If it be a mixture which he is about to write, let him reflect upon the proper dose of each ingredient which is to enter into it; let him also determine upon the number of doses which his mixture is to contain, and from these data let him calculate how much he is now to order; but by all means let him not get into the habit of prescribing so many drachms, scruples, or ounces of a medicine, because he thinks he has seen the hospital physician doing so likewise. I say *thinks*, because the well-educated physician in reality never pursues such a course; rapidly in his mind's eye weighing all the considerations to which I have referred not only in this chapter, but more particularly throughout the body of this work, he orders his prescription, which in the mind of the unreflecting gives rise to this erroneous impression.

APPENDIX A.

POSOLOGICAL TABLE.

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	ʒij. to ʒss.	.. ..	In water
Colchici	ʒss. to ʒij.	.. ..	In draught or mixture
Opii	min. x. to min. xxx.	min. ss. to min. j.	ditto
Scillæ	ʒss. to ʒiss.	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 ..	ʒss. to ʒj.	min. ij. to min. v.	ditto
Nitricum dilutum ..	ʒss. to ʒj.	ditto	ditto
Nitro-hydrochloricum dilutum	ʒss. to ʒj.	ditto	ditto
Oxalicum	gr. j. to gr. ij.	.. ..	ditto
Phosphoricum dilutum	ʒss. to ʒj.	min. ij. to min. v.	ditto
Sulphuricum dilutum ..	ʒss. to ʒj.	ditto	ditto
Sulphuricum aromaticum	ʒss. to ʒj.	ditto	ditto
Tannicum	gr. ij. to gr. x.	gr. ¼ to gr. ½	In pill, draught, or mixture
Tartaricum ..	gr. x. to gr. xxx.	.. ..	In draught or mixture
Æther Aceticus	ʒss. to ʒij.	min. ij. to min. v.	ditto
Sulphuricus	ʒss. to ʒij.	ditto	ditto
Allium	ʒss. to ʒj.	.. ..	In infusion
Aloine	gr. ⅛ 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.	gr. ⅛ to gr. ¼.	In pill or powder
pulvis compositus ..	gr. ij. to gr. v.	ditto	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. ¼th	In draught
(Expectorant) ..	gr. 1-10th to gr. 1-6th	.. ..	In draught or mixture
(Sedative) ..	gr. j. to gr. iij.	.. ..	ditto
Aqua Anethi	ʒss. to ʒiij.	ʒss. to ʒj.	ditto
Anisi	ʒss. to ʒij.	ditto	ditto
Camphoræ	ʒss. to ʒj.	ditto	ditto
Carui	ʒj. to ʒiv.	ditto	ditto
Cassiæ	ʒj. to ʒiv.	ditto	ditto
Chalybeata	ʒj. to ʒij.	ditto	ditto
Cinnamomi	ʒj. to ʒiv.	ditto	ditto
Fœniculi	ʒj. to ʒiv.	ditto	ditto
Lauro-cerasi	ʒss. to ʒj.	min. ij. to min. v.	ditto
Magnesiæ bicarbonatis ..	ʒss. to ʒiij.	ʒss. to ʒj.	ditto
Menthæ piperitæ ..	ʒj. to ʒij.	ditto	ditto
pulegii ..	ʒj. to ʒij.	ditto	ditto
viridis ..	ʒj. to ʒij.	ditto	ditto
Picis liquidæ	Oj. to Oij.	.. ..	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Aqua Pimentæ	ʒj. to ʒij.	ʒss. to ʒj.	In draught or mixture
Potassæ effervescens ..	ʒij. to ʒviij.	.. ..	In draught
Sodæ effervescens ..	ʒij. to ʒviij.	.. ..	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
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. ¼ 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	ʒij. to ʒvj.	.. ..	In draught
Cassiæ pulpa	ʒss. to ʒiij.	.. ..	In confection
Catechu	gr. x. to gr. lx.	gr. ½ to gr. ij.	In powder or pill
Cerevisiæ fermentum ..	ʒij. to ʒiv.	.. ..	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 ʒj.	.. ..	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 ʒss.	.. ..	ditto
Sulphuris ..	gr. cxx. to ʒss.	.. ..	ditto
Terebinthinæ ..	gr. cxx. to ʒiv.	.. ..	Rubbed up with water
Conia	gr. 1-50th to gr. 1-30th.	.. ..	In pill
Copaiba	min. x. to ʒj.	.. ..	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	ʒss. to ʒj.	.. ..	In infusion
Decoctum Actææ	ʒj. to ʒij.	.. ..	In draught or mixture
Aloes compositum ..	ʒss. to ʒij.	.. ..	ditto
Althææ	ʒij. to ʒij.	.. ..	ditto
Belæ	ʒss. to ʒij.	.. ..	ditto
Cetrariæ ..	ʒj. to ʒiv.	.. ..	ditto
Chimaphilæ ..	ʒj. to ʒij.	.. ..	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Decoctum Cinchonæ Flavæ ..	ʒj. to ʒij.	.. ..	In draught or mixture
Colocynthidis ..	ʒij. to ʒss.	.. ..	ditto
Gallæ ..	ʒss. to ʒij.	.. ..	ditto
Granati Radicis ..	ʒiv. to ʒvilj.	.. ..	ditto
Guaiaci	ʒij. to ʒiv.	.. ..	ditto
Hæmatoxyli ..	ʒj. to ʒij.	.. ..	ditto
Hordei	ʒj. to ʒij.	.. ..	ditto
Lichenis islandici (*Cetrariæ*) ..	ʒj. to ʒij.	.. ..	ditto
Mezerei	ʒij. to ʒiv.	.. ..	ditto
Pareiræ	ʒj. to ʒiij.	.. ..	ditto
Pyrolæ (*Chimaphilæ*)	ʒj. to ʒij.	.. ..	ditto
Quercus	ʒj. to ʒiv.	.. ..	ditto
Sarsæ	ʒiv. to ʒviij.	.. ..	ditto
compositum ..	ʒiv. to ʒvi.	.. ..	ditto
Scoparii	ʒj. to ʒiv.	.. ..	ditto
compositum	ʒj. to ʒiv.	.. ..	ditto
Taraxaci	ʒj. to ʒij.	.. ..	ditto
Tormentillæ ..	ʒj. to ʒiss.	.. ..	ditto
Ulmi	ʒij. to ʒvj.	.. ..	ditto
Delphinia	gr. 1-12th to gr. 1-4th.	.. ..	In pill
Digitalinum	gr. 1-50th 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 gr. 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 ..	ʒss. to ʒij.	.. ..	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
liquidum	ʒss. to ʒj.	.. ..	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
Liquidum ..	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. ½ to gr. ¼	.. ..	ditto
Sarsæ liquidum ..	ʒss. to ʒij.	.. ..	In mixture or draught
Sennæ fluidum ..	ʒj. to ʒij.	.. ..	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Extractum Sennæ fluidum et Spigeliæ fluidum ..	fʒss. to fʒj.	.. ..	In mixture or draught
Stramonii ..	gr. ¼ to gr. ss.	.. ..	In pill
Taraxaci ..	gr. v. to gr. xx.	.. ..	ditto
Uvæ ursi ..	gr. v. to gr. xv.	.. ..	ditto
Veratri viridis (Emetic)	g. 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
et ammoniæ-tartras ..	gr. v. to gr. viij.	.. ..	ditto
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 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 fʒss.	.. ..	In draught
Indigo	gr. v. to gr. cxx.	.. ..	In bolus
Infusum Absinthii	fʒj. to fʒij.	.. ..	In draught or mixture
Allii	fʒij. to fʒiij.	.. ..	ditto
Anthemidis ..	fʒj. to fʒij.	.. ..	ditto
Armoraciæ compositum	fʒj. to fʒij.	.. ..	ditto
Arnicæ	fʒij. to fʒss.	.. ..	ditto
Aurantii	fʒj. to fʒij.	.. ..	ditto
Bucco	fʒj. to fʒij.	.. ..	ditto
Calami aromatici ..	fʒj. to fʒij.	.. ..	ditto
calumbæ	fʒj. to fʒij.	.. ..	ditto
Caryophylli ..	fʒj. to fʒij.	.. ..	ditto
Cascarillæ ..	fʒj. to fʒij.	.. ..	ditto
Catechu	fʒj. to fʒij.	.. ..	ditto
Centaurei	fʒj. to fʒij.	.. ..	ditto
Chiratæ	fʒj. to fʒij.	.. ..	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Infusum Cinchonæ flavæ ..	ʒj. to ʒij.	ʒss. to ʒj.	In draught or mixture
Cuspariæ	ʒj. to ʒij.	.. ..	ditto
Cusso	ʒiv. to ʒviij.	.. ..	ditto
Digitalis (Diuretic) ..	ʒij. to ʒss.	min. x. to min. xx.	ditto
(Sedative) ..	ʒj. to ʒij.	.. ..	ditto
Dulcamaræ ..	ʒj. to ʒiij.	.. ..	ditto
Ergotæ	ʒss. to ʒij.	.. ..	ditto
Gallæ	ʒss. to ʒij.	.. ..	ditto
Gentianæ	ʒj. to ʒij.	.. ..	ditto
compositum	ʒj. to ʒij.	.. ..	ditto
Hemidesmi ..	ʒj. to ʒij.	.. ..	ditto
Hydrocotyle Asiaticæ	ʒij. to ʒiv.	.. ..	ditto
Juniperi	ʒj. to ʒij.	.. ..	ditto
Krameriæ	ʒj. to ʒij.	ʒss. to ʒj.	ditto
Lini	ʒij. to ʒiv.	.. ..	ditto
Lupuli	ʒj. to ʒij.	ʒss. to ʒj.	ditto
Marrubii	ʒij. to ʒiv.	.. ..	ditto
Maticæ	ʒj to ʒij.	ʒss. to ʒj.	ditto
Menthæ	ʒj. to ʒij.	ditto.	ditto
Quassiæ	ʒj. to ʒij.	.. ..	ditto
Rhei	ʒss. to ʒij.	.. ..	ditto
Rosæ acidum ..	ʒss. to ʒij.	ʒss. to ʒj.	ditto
Sabinæ	ʒss. to ʒj.	.. ..	ditto
Sassafras	ʒj. to ʒij.	.. ..	ditto
Senegæ	ʒj. to ʒij.	.. ..	ditto
Sennæ	ʒij. to ʒiv.	.. ..	ditto
Serpentariæ ..	ʒj. to ʒij.	.. ..	ditto
Simarubæ	ʒj. to ʒij.	.. ..	ditto
Spigeliæ	ʒss. to ʒj.	.. ..	ditto
Sumbul	ʒss. to ʒj.	.. ..	ditto
Uvæ ursi	ʒss. to ʒij.	.. ..	ditto
Valerianæ	ʒj. to ʒij.	.. ..	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 ʒss.	.. ..	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	ʒss. to ʒvj.	.. ..	In draught or mixture
Liquor Ammoniæ	min. x. to min. xxx.	.. ..	ditto
acetatis ..	ʒss. to ʒj.	min. x. to min. xxx.	ditto
citratis ..	ʒij. to ʒj.	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 ʒij.	.. ..	ditto
Calcis	ʒj. to ʒiv.	ʒss. to ʒj.	ditto
chloratæ ..	min. x. to min. xx.		ditto
saccharatus	ʒj. to ʒiij.	min. v. to min. x.	ditto
Chlori	ʒss. to ʒij.	.. ..	ditto
Ferri pernitratis ..	ʒss. to ʒj.	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 ʒj.	.. ..	In draught or mixture
effervescens ..	ʒij. to ʒviij.	.. ..	In draught
permanganatis (*internally*) ..	min. x. to ʒj.	.. ..	In draught or mixture
Sodæ	min. x. to ʒj.	.. ..	ditto
arseniatis ..	min. iij. to min. x.	.. ..	In draught
chloratæ ..	min. x. to min. xxx.	.. ..	ditto
effervescens ..	ʒvj. to ʒviij.	.. ..	ditto
Strychniæ	min. iij. to min. x.	.. ..	ditto
Lithiæ Carbonas	gr. ij. to gr. iv.	.. ..	In effervescing solution

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Lithiæ 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
Magnesiæ (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
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
Mannite	℥ss. to ℥j.	gr. ij. to gr. v.	ditto
Mel Rosæ	gr cxx. to ℥ss.	. ..	ditto
Violæ	gr. lx. to ℥ss.	.. ..	ditto
Mistura Althææ	ƒ℥j. to ƒ℥ij.	.. ..	ditto
Ammoniaci ..	ƒ℥ss. to ƒ℥j.	.. ..	ditto
Amygdalæ	ƒ℥j. to ƒ℥ij.	.. ..	ditto
Creasoti	ƒ℥j. to ƒ℥ij.	.. ..	ditto
Cretæ	ƒ℥j. to ƒ℥ij.	ƒ℥ss. to ƒ℥j.	ditto
Ferri aromatica ..	ƒ℥j. to ƒ℥ij.	.. ..	ditto
composita ..	ƒ℥j. to ƒ℥ij.	.. ..	ditto
Guaiaci	ƒ℥ss. to ƒ℥ij.	.. ..	ditto
Monesiæ	ƒ℥ss. to ƒ℥ij.	ƒ℥ss. to ƒ℥j.	ditto
Scammonii	ƒ℥ij. to ƒ℥iv.	ƒ℥j. to ƒ℥ij.	ditto
Spiritus vini gallici ..	ƒ℥j. to ƒ℥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 ℥ss	.. ..	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 x.	min ½ to min. 1.	ditto
Carui	min. j. to min. x.	.. ..	ditto
Carophylli	min. ij. to min. viij.	.. ..	ditto
Cassiæ	min. ij to min. v.	.. ..	ditto
Cinnamomi . ..	min. j. to min. v.	.. ..	ditto
Copaibæ	min. xx. to ƒ℥j.	.. ..	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	ƒ℥ss. to ƒ℥ij.	ƒ℥ss. to ƒ℥j.	See p. 669
Myristicæ	min j. to min. v.	.. ..	In pill or draught
Olivæ	ƒ℥j. to ƒ℥ij.	.. ..	In draught
Pimentæ	min. ij. to min. v.	.. ..	In pill or draught
Ricini	ƒ℥ss. to ƒ℥ij.	ƒ℥ss. to ƒ℥ij.	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)	ƒ℥ss. to ƒ℥ij.	min. x. to ƒ℥j.	In draught or enema
(Cathartic)	ƒ℥ij. to ƒ℥ij.	min. x. to ƒ℥j.	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Oleum Terebinthinæ (Diuretic)	min. x. to min. xxx.	min. ij. to min. v.	In draught or enema
(Stimulant)	min. x. to min. xx.	min. ij. to min. v.	ditto
Opium	gr. ss. to gr. iij.	.. ..	In pill
Oxymel	f℥j. 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
Aloes et Assafœtidæ ..	gr. x. to gr. xv.	.. ..	ditto
et Ferri ..	No. 1 to 3.	.. ..	ditto
ante cibum	No. 1 to 2.	.. ..	ditto
Asiaticæ	No. 1 to 2.	.. ..	ditto
Assafœtida composita ..	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	gr. v. to gr. xv.	.. ..	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 Scilla	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 ..	gr. ij. to gr. x.	.. ..	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.	.. ..	ditto
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 ℥ss.	.. ..	ditto
(Diuretic) ..	gr. x. to gr. xx.	.. ..	ditto
Aqua effervescens ..	f℥ij. to f℥viij.	.. ..	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)	℥ss. to ℥j.	.. ..	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 f℥ij.	.. ..	ditto
nitras (Diuretic) ..	gr. xxx. to gr. xl.	.. ..	ditto
nitras (Refrigerant) ..	gr. x. to gr. lx.	.. ..	In draught
sulphas	gr. lx. to ℥ss.	.. ..	In draught or mixture
tartras	gr. cxx. to ℥j.	.. ..	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

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Pulvis Rhei compositus ..	gr. xxx. to gr. lx.	.. ..	In draught
Salinus compositus ..	gr. cxx. to ℥ss.	.. ..	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
Veratri Viridis (Emetic)	gr. iij to gr. vj.	.. ..	In pill
(Sedative)	gr. ss. to gr. ij.	.. ..	ditto
Quinia	gr. j. to gr. v.	.. ..	In pill or mixture
amorphous	gr. j. to gr. v.	.. ..	ditto
Quiniæ acetas	gr. j. to gr. v.	.. ..	ditto
arsenias	gr. 1-10th to gr. 1-4th.	.. ..	ditto
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. ½ to gr. iij.	.. ..	In pill
Scammonii	gr. ij. to gr. v.	gr. ½ to gr. j.	In pill, draught, powder
Sabadilla	gr. j. to gr. viij.	.. ..	See article
Sagapennum	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. ½ to gr. j.	In draught
Scilla (Expectorant) ..	gr. j. to gr. ss.	.. ..	In pill
(Diuretic)	gr. j. to gr. iij.	.. ..	ditto
Scoparin	gr. v. to gr. vj.	.. ..	In draught or mixture
Sinapis (Emetic)	℥ss. to ℥j.	.. ..	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. min. xxx.	.. ..	ditto
exsiccata	gr. v. to gr. xx.	gr. ss. to gr. ij.	In pill or powder
et potassæ tartras ..	gr. lx. to ℥j.	.. ..	In draught or mixture
hyposulphis	gr. lx. to cxx.	.. ..	ditto
phosphas	℥ss. to ℥iss.	gr. x. to gr. xx.	ditto
sulphas	℥ss to ℥j.	.. ..	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*) ..	f℥ss. to f℥ij.	.. ..	ditto
Elaterinæ	min. xxx. to min. xl.	.. ..	In draught
Spiritus Ætheris nitrosi ..	f℥ss. to f℥iij.	min. v. to min. x.	In draught or mixture
Ætheris	f℥j. to f℥iij.	.. ..	ditto
compositus ..	f℥ss. to f℥ij.	.. ..	ditto
Ammoniæ	f℥ss. to f℥iss.	.. ..	ditto
aromaticus ..	min. xxx. to f℥j.	.. ..	ditto
fœtidus ..	f℥ss. to f℥j.	.. ..	ditto
Armoraciæ compositus	f℥ss. to f℥j.	.. ..	ditto
Cajuputi	min. x. to min. xxx.	min. j. to min. v.	ditto
Chloroformi ..	min. x. to min. xl.	ditto	ditto
Camphora	min. xx. to f℥j.	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

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Succus Belladonnæ	min. xx. to min. xl.	.. ..	In draught or mixture
Colchici	min. v. to min. xx.	.. ..	ditto
Conii	min. xxx. to ʒj.	.. ..	ditto
Cotyledon	ʒvj. to ʒj	.. ..	ditto
Digitalis	ʒss. to ʒj.	.. ..	ditto
Hyoscyami	min. xx. to min. xl.	.. ..	ditto
Limonis	ʒj. to ʒiv.	.. ..	ditto
Scoparii	ʒss to ʒij.	.. ..	ditto
Taraxaci	ʒss. to ʒij.	.. ..	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 Accti	ʒij. to ʒj.	.. ..	In draught or mixture
Acidi citrici ..	ʒij. to ʒj.	.. ..	ditto
Allii	ʒss. to ʒj.	.. ..	ditto
Althææ	ʒss. to ʒj.	.. ..	ditto
Aurantii	ʒij. to ʒss.	.. ..	ditto
floris ..	ʒss. to ʒij.	.. ..	ditto
Cinchonæ	ʒj. to ʒss.	.. ..	ditto
Croci	ʒij. to ʒss.	.. ..	ditto
Ferri iodidi ..	min. xv. to min. lx.	min. ij. to min. v.	ditto
Ferri lactatis ..	ʒij. to ʒss.	.. ..	ditto
phosphatis ..	ʒj. to ʒij.	min. ij. to min. v.	ditto
Guaiaci	ʒj. to ʒij.	.. ..	ditto
Hemidesmi ..	ʒj. to ʒss.	.. ..	ditto
Ipecacuanhæ (Emetic)	ʒj. to ʒij.	ʒss. to ʒj.	In draught
(Expectorant)	ʒj. to ʒij.	min. v. to min. x.	In mixture
Limonis	ʒj. to ʒij.	.. ..	In draught or mixture
Mori	ʒj. to ʒij.	.. ..	ditto
Morphiæ acetatis ..	ʒss. to ʒiss.	min. v. to min. x.	ditto
muriatis ..	ʒss. to ʒiss.	min. v. to min. x.	ditto
Papaveris	ʒss. to ʒj.	min. v. to min. x.	ditto
Potassii cyanidi ..	ʒij. to ʒvj.	.. ..	In draught
Rhamni	ʒss. to ʒj.	.. ..	In draught or mixture
Rhei	ʒss. to ʒj.	ʒss. to ʒj.	ditto
Rhæados	ʒss. to ʒj.	min. x. to min. xx.	ditto
Rosæ gallicæ ..	ʒss. to ʒj.	.. ..	ditto
Sarzæ	ʒiv. to ʒvj.	.. ..	ditto
Scillæ (Emetic) ..	ʒj. to ʒij.	ʒss. to ʒj.	ditto
(Expectorants) ..	min. x. to min. xxx.	min. ij. to min. v.	ditto
compositus ..	ʒj. to ʒij.	min ij. to min. v.	ditto
Sennæ	ʒss. to ʒj.	ʒss. to ʒj.	ditto
Tolutanus	ʒj. to ʒss.	min. x. to min. xxx.	ditto
Violæ	ʒj. to ʒij.	ʒss. to ʒj.	ditto
Zingiberis	ʒij. to ʒss.	.. ..	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	ʒij. to ʒss.	.. ..	In draught or mixture
Aconiti	min. v. to min. x.	.. ..	ditto
Actææ	ʒss. to ʒij.	.. ..	ditto
Aloes	min. xxx. to ʒss.	.. ..	ditto
Arnicæ	min. x. to ʒj.	.. ..	ditto
Assafœtidæ ..	ʒss. to ʒij.	.. ..	ditto
Aurantii	ʒss. to ʒij.	.. ..	ditto
Belladonnæ ..	min. xx. to ʒj.	.. ..	ditto
Benzoini composita ..	ʒss. to ʒij.	.. ..	ditto
Buchu	ʒss. to ʒij.	.. ..	ditto
Calumbæ	ʒss. to ʒij.	.. ..	ditto
Camphoræ cum opio ..	ʒss. to ʒij.	.. ..	ditto
Cannabis indicæ ..	min. xx. to ʒj.	.. ..	ditto
ætherea	min. x. to min. xx.	.. ..	ditto
Cantharidis ..	min. v. to min. xl.	.. ..	ditto
Capsici	min. xx. to ʒj.	.. ..	ditto
Cardamomi Composita	ʒss. to ʒij.	.. ..	ditto
Cascarillæ	ʒss. to ʒij.	.. ..	ditto
Castorei	ʒj. to ʒss.	.. ..	ditto
Catechu	ʒss. to ʒij.	min. v. to min. x.	ditto
Chiratæ	ʒss. to ʒij.	.. ..	ditto

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration
Tinctura Cinchonæ composita	fʒss. to fʒij.	.. ..	In draught or mixture
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
Conii fructus	min. xx. to min. xl.	.. ..	ditto
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

Medicine.	Dose for an Adult.	Dose for a Child aged 1 year.	Form of Administration.
Vinum Ferri	ʒj. to ʒss.	.. ..	In draught or mixture
Ipecacuanhæ (Emetic) ..	ʒij. to ʒiv.	min. xx. to ʒj.	In draught
(Expectorant)	min. x to min xl.	min. ij. to min. v.	In mixture
Opii	min. x. to ʒss.	min ss. to min. j	In draught
Quiniæ	ʒss. to ʒj.	min. v. to min. xx.	In draught or mixture
Rhei	ʒij. to ʒj.	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

APPENDIX B.

FORMULÆ.

ANTACIDS.

℞ Liquoris Ammoniæ, min. x. ; Tincturæ Aurantii, f℥j. ; Infusi Chiratæ, f℥vij. ; M. Fiat haustus, mane meridieque sumendus. (A useful antacid draught in the dyspepsia of the debilitated, attended with acid eructations.)

℞ Ammoniæ Bicarbonatis, gr. viij. ; Tincturæ Lupuli, f℥j. ; Tincturæ Hyoscyami, min. xx. ; Infusi calumbæ, f℥vij. ; 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. ; Spiritus Ætheris Nitrosi, f℥j. ; Tincturæ Cinnamomi, f℥iij. Infusi Cascarillæ, ad f℥viij. ; M. Fiat mistura, de quâ sumantur cochlearia duo 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℥iiiss. ; Aquæ Lauro-cerasi, f℥ij. Fiat mistura ; Capiat cochlearia duo ampla bis terve in die, phialâ prius concussâ. (Useful in cardialgia and in gastrodynia.)

℞ Aquæ Calcis Effervescentis (*Carrara Water*) ; Lactis Recentis, ana, f℥ij. ; Fiat haustus, ter quaterve in die sumendus. (In dyspepsia, with much irritability of the stomach, and in cardialgia.)

℞ Tincturæ Lupuli, f℥j. ; Tincturæ Cardamomi compositæ, f℥vij. ; Vini Opii, f℥j. ; Misturæ Cretæ, f℥vj. ; 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.)

℞ Tincturæ Lavandulæ compositæ, f℥ss. ; Liquoris Magnesiæ Carbonatis, f℥viiss. ; M. Fiat haustus, sumat statim, et repetatur semihorio si opus sit. (An excellent remedy in heartburn.)

℞ Tincturæ Rhæi, f℥ij. ; Syrupi Zingiberis, f℥j. ; Tincturæ Colchici Seminum, f℥ss. ; Chlorodynii min. x. ; Liquoris Magnesiæ Carbonatis, ad f℥ij. M. Fiat haustus statim sumendus. (An admirable aperient draught in gouty dyspepsia.)

℞ Magnesiæ Carbonatis, gr. xl. ; Carbonis Ligni, ℥ss. ; Pulveris Zingiberis, gr. x. M. et divide in chartulas iv. Sumat unam ter in die. (Useful in flatulent dyspepsia attended with acid eructations.)

℞ Solutionis Alkalinæ *(Brandish)*, f℥iv. ; Essentiæ Anisi, f℥ij. ; Syrupi Aurantii Floris, f℥j. ; Infusi Chiratæ, f℥vii. ; M. Fiat mistura ; Capiat cochlearia duo magna ter in die. (In the lithic acid diathesis.)

℞ Tincturæ Chiratæ ; Tincturæ Lupuli, ana, f℥ss. ; Liquoris Potassæ effervescentis, f℥iv. ; Fiat haustus, ex effervescentia 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.)

℞ Vini Colchici, min. xx. ; Tincturæ Cardamomi compositæ, f℥ss. ; Liquoris Lithiæ effervescentis, f℥iij. 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. ; Aquæ Lauro-cerasi, min. xxx. ; Creasoti, min. j. ; Infusi Calumbæ, f℥iss. ; M. Fiat haustus, sextis horis sumendus, et ad tertiam vel quartam vicem repetatur 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 46), 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.; Sodii Chloridi, gr. xij.; Saponis Jalapini (page 181), gr. xxiv.; Mellis Despumati, q. s. M. Divide in bolos ij.; Sumat unum mane, et alterum post horas sex, nisi prius benè dejecerit alvus. (In cases of lumbrici or ascarides.)

℞ Infusi Absinthii, f℥ij.; Extracti Spigeliæ et Sennæ Fluidi (page 60), f℥iss.; Tincturæ Valerianæ; Syrupi Zingiberis, ana, f℥ij M. Fiat mistura; Capiat partem quartem trihorio. (For expelling lumbrici.)

℞ Extracti Filicis, 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.)

℞ Santonini, gr. v.; Olei Theobromæ, g. iij.; Ceræ Albæ, gr. ij. M. Fiat suppositorium nocte adhibendum. (A useful form for employing santonine in cases of ascarides.)

℞ 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.

℞ Spiritus Ammoniæ fœtidi, f℥ss.; Aquæ Lauro-cerasi, f℥ss.; 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 ut opus sit. (In the flatulent colic of hysteria.)

℞ Tincturæ Castorei, f℥v.; Spiritus Ætheris compositi, f℥iij.; 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, f℥j.; Sodæ Carbonatis, gr. xxx.; Syrupi Aurantii Floris, f℥iij.; 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.; Syrupi Aurantii Floris, f℥j.; Misturæ Camphoræ, f℥viss.; M. Fiat mistura; capiat unciam omni horâ donec abierit spasmus. (In hysteria of females.)

℞ Moschi, gr. x.; Carbonatis Ammoniæ, gr. iij.; Spiritus Ætheris compositi, f℥ss.; Mucilaginis; Syrupi, ana, f℥ij.; 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, f℥ij. M. Sumat cochlearia duo ampla tertiis horis. (In hysteria.)

℞ Infusi Valerianæ ad f℥viij.; Tincturæ Sumbul, f℥ss.; Spiritus Ætheris Compositi (see page 535), f℥ij.; Aquæ Lauro-cerasi, f℥ij.; Etheris Chlorici, f℥ij. M. Sumat cochlearia duo ampla tertia quâque horâ, phialâ prius agitatâ. (A useful mixture in hysteria.)

℞ Quinæ Valerianatis (see page 81), 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, f℥ij.; Syrupi Hemidesmi, f℥ij.; Aquæ Aurantii Floris, f℥iiiss.; 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 Tolutani, 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 vinoso 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, ad f℥viij.; Mucilaginis Acaciæ, f℥j.; Aluminis, gr. lx.; Mellis Rosæ, f℥ij. M. Fiat gargarisma, sæpè in die 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 de-

stillatæ, f℥iij. M. Capiat cochleare amplum sextis horis. (A very useful astringent and tonic mixture in chronic mucous diarrhœa, and in leucorrhœa.)

℞ Ferri Persulphatis, gr. iij.; Pulveris Opii, gr. ss.; Ceræ albæ, gr. ij.; Olei Theobromæ, gr. iij. M. Fiat suppositorium statim, adhibendum. (A useful astringent in mucous discharges from the rectum, and in hæmorrhoids.)

℞ 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 duas ter in die. (In leucorrhœa, in chronic diarrhœa, and in pyrosis.)

℞ Tincturæ Matico, f℥vj.; Syrupi Croci, f℥ij.; Infusi Krameriæ, f℥vij.; M. Fiat mistura, cujus capiat semiunciam 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 tertiis horis 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 Hæmatoxyli, 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.)

℞ Acidi Tannici, g. iij. ; Pulveris Opii, gr. j. ; Ceræ Albæ, gr. ij. ; Olei Theobromæ, gr. iij. M. Fiat suppositorium, statim adhibendum. (Useful in dysentery.)

℞ 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 in cyatho vinoso aquæ 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 Floris, f℥j. M. Fiat liquor, quo gingivas sæpe 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.

℞ Aloinæ (see page 154), gr. iij. ; Ceræ Albæ, gr. ij. ; Olei Theobromæ, gr. iv. M. Fiat suppositorium, recto nocte adhibendum. (A valuable method of acting on the bowels.)

℞ 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.)

℞ Hydrargyri Subchloridi, gr. xxx. ; Saponis Crotonis (see page 170), gr. vj. ; Pilulæ Colocynthidis et Hyoscyami, gr. xxiv. ; Olei Rutæ, min. vi. ; 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 (see p. 181), ana, gr.

lx. M. Fiat massula, et divide in pilulas xxiv. e quibus sumantur duæ prout res poscat. (A good formula for purgative pills for general use.)

℞ Pilulæ Cambogiæ compositæ, gr. xl.; Pilulæ Hydrargyri, gr. xx. M. Divide in pilulas xij.; capiat duas 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 Tincturæ Aloës ana, f℥ss.; Spiritus Myristicæ, f℥ij.; Infusi Rhei, ad f℥viij. M. Fiat mistura, de quâ sumantur cochlearia ampla duo tertiis vel quartis horis ad effectum. (A useful cathartic in gouty and rheumatic habits.)

℞ Tincturæ Colocynthidis (see p. 168), min. xx.; Tincturæ Cardamomi compositæ, f℥ss.; Infusi Sennæ, f℥ij. M. Fiat haustus, bis quotidie sumendus. (In dropsical cases.)

℞ Tincturæ Elaterii (see p. 172), f℥j.; Syrupi Sennæ, f℥ss.; Syrupi Zingiberis, f℥j.; Aquæ Menthæ Piperitæ, f℥j. M. Fiat haustus, quamprimum sumendus, et, nisi alvus sit interea copiosè soluta, quadrihorio repetatur. (In ascites occurring in the robust, provided no inflammatory tendency be present.)

℞ Olei Ricini, f℥vj.; Mucilaginis Acaciæ, f℥iv.; Tere quam optime simul, hisque inter terendum paulatim adjice; Syrupi Croci, f℥ij.; Aquæ destillatæ, f℥iss. Fiat haustus. (A safe and efficacious purgative draught.)

℞ Saponis Crotonis (see p. 170), gr. ss.; Extracti Hyoscyami; Pilulæ Hydrargyri, ana, gr. iv.; Olei Pimentæ, min. ij. M. Divide in pilulas, duas horâ somni sumendas. (See next prescription.)

℞ Tincturæ Hellebori (see p. 174), f℥iss.; Syrupi Zingiberis, f℥j.; Infusi Sennæ, f℥j. M. Fiat haustus, primo mane sumendus. (This draught and the pills immediately preceding will be found very useful in cephalægia 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 portiones æquales vj.; e quibus sumatur una omni nocte. (An excellent alterative and cathartic for children; very useful in worm cases.)

℞ Resinæ Jalapæ, gr. v.; Pulveris Amygdalæ compositi, gr. xxx.; simul terantur, hisque inter terendum adde Aquæ destillatæ, f℥iss. M. Fiat haustus illico sumendus. (An excellent cathartic in simple constipation.)

℞ Sulphatis Magnesiæ, ℥ij. Syrupi Zingiberis, f℥ss.; Infusi Rosæ Acidi, ad f℥viij. M. Fiat mistura. Sumat cochlearia duo ampla tertiis horis ad effectum. (An excellent purgative mixture—*the red bottle* of our hospitals—in mild febrile and inflammatory affections, accompanied by constipation.)

℞ Magnesiæ, ℥ij.; Sulphatis Magnesiæ, ℥j.; Syrupi Zingiberis, f℥j.; Liquoris Magnesiæ Carbonatis, ad f℥viij. M. Sumat cochlearia duo ampla quartis horis ad effectum, phialâ prius bene agitatâ. (The *white bottle* of our hospitals, a very useful antacid aperient.

℞ Magnesiæ Sulphatis, ℥ss.; Tincturæ Seminum Colchici, min. xxx. Syrupi Zingiberis, f℥ij.; Infusi Rhæi, 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. 190.)

℞ Resinæ Podophylli, gr. j.; Aloinæ, gr. ij.; Extracti Belladonnæ, gr. ¼; Seræ Albæ, gr. ij.; Olei Theobromæ, gr. iij. M. Fiat suppositorium nocte adhibendum. (A useful formula for constipation.)

℞ 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 ut opus sit. (A valuable combination in constipation accompanied with hepatic torpor.)

℞ Potassæ Sulphatis, ℥ss.; Acidi Sulphurici diluti, min. v.; Tincturæ Cardamomi Compositæ, f℥j.; Infusi Rhæi, f℥ij. M. Fiat haustus. (In mild febrile and inflammatory affections.)

℞ Potassæ Tartratis Acidæ, ℥iv.; Syrupi Zingiberis, f℥j.; Aquæ destillatæ f℥xij. Fiat mistura, cujus pars quarta tertiâ quâque horâ ad alvi plenam solutionem sumatur. (In dropsical effusions, more especially into the abdominal cavity.)

℞ 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, ad f℥viij.; Tincturæ Sennæ, f℥i.; Sulphatis Magnesiæ, ℥i. M. Sumat cochlearia duo ampla tertiis horis, ad effectum. (The usual *black* mixture of our hospitals.)

℞ Infusi Sennæ, f℥ij.; Syrupi Rhei, f℥ij.; Spiritus Myristicæ, f℥j. M. Fiat mistura de quâ sumantur cochlearia duo 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 (see p. 228); Mannæ, ana, ℥ss.; Syrupi Violæ (see p. 228), 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 Floris 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.; Acidi Sulphurici diluti, min. ij.; Infusi Rosæ Acidi, f℥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.

℞ Ammonii Chloridi, ℥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 case as the former.)

℞ Arsenici Albi, partes vj.; Calomenalos, 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 subtilissimus. (In thickening of the cornea, to be blown into the eye three or four times a-day.)

℞ Carbonatis Cupri, gr. cxx.; Adipis præparati, ℥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.*)

DIAPHORETICS.

℞ Ammoniæ Carbonatis, gr. xc.; Succi Limonum, quantum sufficit ad

saturationem. Spiritus Etheris Nitrosi, f℥ij.; Aquæ Camphoræ, ad f℥viij. M. Sumat cochlearia duo ampla quartis horis. (An excellent diaphoretic in mild inflammatory affections.)

℞ Liquoris Ammoniæ Acetatis, f℥iij.; 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.; Syrupi Hemidesmi, f℥ss.; Infusi Dulcamaræ, f℥viiss. M. Fiat mistura, de quâ capiat cochleare amplum secundis horis. (An excellent diaphoretic mixture in inflammatory cutaneous affections.)

℞ Antimonii Tartarati, gr. j.; Tincturæ Lavandulæ compositæ, f℥iij.; 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, ℥ij.; Mucilaginis Tragacanthæ, f℥ij.; Tere simul, et paulatim adjice Misturæ Amygdalæ, f℥iiiss. Fiat mistura, sumenda in die vicibus partitis. (In atonic gout, in chronic rheumatism, and in chronic cutaneous diseases.)

℞ 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. (see p. 308); Nitratis Potassæ, gr. xxx.; Spiritus Ætheris Nitrosi, f℥ss.; Spiritus Juniperi, f℥ij. M. Fiat mistura; capiat cochleare amplum tertiâ quâque horâ. (A stimulating diuretic in old cases of dropsy.)

℞ Tincturæ Buchu, 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, f℥ij.; Aceti Scillæ, f℥ss. M. et sumat cochlearia duo ampla quartis horis. (A most certain diuretic; in fact the best I know.)

℞ Extracti Pareiræ, gr. lx.; Carbonatis Sodæ Exsiccatæ, gr. xij.; Extracti Conii, gr. vj.; Syrupi Papaveris, q. s. ut fiant pilulæ xxiv.; capiat duas sextâ quâque hora. (In calculous affections, and in chronic catarrh of the bladder.)

℞ Infusi Digitalis, ad f℥viij.; Spiritus Ætheris Nitrosi, f℥ij.; 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 vinosa 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 Buchu; 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 Floris, 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.; Syrupi Croci, f℥ij.; Infusi Senegæ, f℥j. 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 (see p. 322), gr. ij.; Syrupi Aurantii Floris, 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 (see p. 325), gr. xxx.; Syrupæ 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℥x. 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 duæ bis quotidie. (Useful in chlorosis.)

℞ Ergotinæ, 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; Mucilaginis Acaciæ; Syrupi, ana, f℥j.; 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 inflammation of the mucous membranes.)

℞ Mucilaginis Acaciæ, f℥j.; Syrupi Hemidesmi, f℥ij.; Misturæ Amygdalæ, f℥v. M. Fiat mistura, de quâ capiat cochlearia duo ampla horis intermediis. (A useful demulcent mixture in chronic bronchitis.)

℞ Decocti Hordei, f℥vj.; Extracti Glycirrhizæ, gr. cxx.; Tincturæ Opii camphoratæ, f℥ss.; Syrupi Hemidesmi, f℥iss. M. Fiat mistura, capiat cochleare amplum tussi urgenti. (In the troublesome cough of pthisis and of chronic bronchitis.)

℞ Camphoræ, rasæ et redactæ, gr. x.; Glycerini, f℥j.; Unguenti Cetacei, f℥ij.; M. Fiat unguentum. (To allay the itching attendant on some cutaneous diseases.)

℞ Sodæ Carbonatis, gr. xxx.; Aquæ Sambuci, f℥viiss.; Glycerini, f℥ss.; M. Fiat lotio. (For the same purpose 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 counter-irritant.)

℞ Euphorbiæ, in pulvere subtilo, gr. xxx.; Adipis præparati, ℥j. M. Fiat unguentum. (An excellent issue ointment, see page 385.)

℞ 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 386); Linimenti Ammoniæ, ana, partes

æquales. M. Fiat linimentum. (An excellent counter-irritant, applied with friction.)

EXPECTORANTS.

℞ Syrupi Hemidesmi, f℥ij.; Tincturæ Tolutanæ, f℥ss.; Tincturæ Camphoræ compositæ, f℥j.; Vini Ipecacuanhæ, f℥ij.; Aquæ destillatæ, ad f℥viij. Fiat syrupus expectorans, cujus sumat cochleare amplum secundâ quâque horâ. (In chronic bronchitis.)

℞ Vini Ipecacuanhæ, f℥iij.; Syrupi Tolutani, f℥v.; 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 Lauro-cerasi, f℥ij.; Syrupi simplicis, f℥vj. M. Fiat mistura, de qua 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 compositæ, 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, f℥ij.; Misturæ Amygdalæ, f℥viss.; Succi Conii, f℥ij.; Syrupi Hemidesmi, f℥j. M. Fiat mistura, cujus capiat cochleare amplum tertiis horis. (An excellent mixture in asthma and in paroxysmal coughs.)

℞ Spiritus Chloroformi, f℥ij.; Vini Ipecacuanhæ, f℥j.; Aquæ Aurantii Floris, f℥j.; Liquoris Morphiæ Hydrochloratis, f℥ij.; 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, f℥iv.; 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 Aurantii Floris, 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 (Battley), 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.; Extracti Taraxaci, 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; of course the effects of the mercury must be watched.)

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, f℥ij. M. Fiat haustus, in effervescentiâ cum succi limonis recentis cochleare magno subinde sumendus. (To allay thirst in febrile and inflammatory disorders.)

SEDATIVES OR CONTRA-STIMULANTS.

℞ Acidi Hydrocyanici Diluti, min. j.; Aquæ destillatæ, f℥vij.; Syrupi simplicis, f℥j. 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.)

℞ Ammonii Bromidi, gr. xx.; Etheris Chlorici, f℥ss.; Aquæ Camphoræ, f℥viiss. M. Fiat haustus statim sumendus. (A useful formula in ovarian irritation.)

℞ 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, f℥j.; Syrupi Aurantii Floris, f℥ss.; 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, f℥j.; Mucilaginis Acaciæ, f℥j.; Aquæ Menthæ Viridis, f℥vj. M. Fiat haustus, mitte tales, vj. Sumat unum 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 quaterve in die. (In the sickness of pregnancy.)

℞ Chloroformi, min x.; Tincturæ Belladonnæ, min. x.; Syrupi Croci, f℥j.; Aquæ destillatæ, f℥iss. M. Fiat haustus, capiat unum talem ter quaterve in die. (In epileptiform hysteria, and in hysterical neuralgia.)

℞ Chloroformi, min. x.; Syrupi Rhœados, f℥j.; 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.)

℞ Potassii Bromidi, gr. xxx.; Codeiæ, gr. ij.; Syrupi Aurantii Floris, f℥j. Infusi Lupuli, f℥vij. M. Fiat haustus nocte sumendus. (A valuable sedative in the vigilia dependant upon nervous exhaustion.)

℞ Succi Digitalis, min. xij.; Aquæ Camphoræ, f℥vj.; Syrupi Aurantii Floris, 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 Acetici, 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 Aurantii Floris, 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 Hydrochloratis, 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 statum sumendus. (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.)

℞ Ammonii Chloridi, 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 Aurantii Compositi 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 depuratæ, ℥j. Fiat gargarismus, sæpè utendus, prius phialâ concussâ. (An exceedingly useful gargle in excessive mercurial salivation.)

℞ Liquoris Calcis Chloratæ, f℥xij.; Acidi Hydrocyanici Diluti, f℥j. Fiat lotio; signetur Poison. (An excellent preparation in chronic cutaneous diseases, when itching and tingling are very troublesome.)

℞ Camphoræ, rasæ et redactæ, gr. cxx.; Mucilaginis Acaciæ, f℥j.; Aquâ 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.)

℞ Ammonii Chloridi, gr. xx.; Pulveris Aromatici, gr. vj.; Theriacæ, q. s. ut fiat bolus. Capiat unum talem sextâ quâque horâ. (For uses, see page 545.)

℞ 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 hora. (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, qarum 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, f℥ij. 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, f℥iij. ; Solutionis Alkalinæ (Brandish), f℥iss. ; Tere benè simul in mortario vitreo, dein adde inter terendum, Olei Limonum, f℥ss., et Syrupi simplicis, f℥iij. 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, f℥ij. ; Tincturæ Lavandulæ compositæ, f℥ss. ; Mucilaginis Acaciæ, f℥ij. ; Aquæ Menthæ Piperitæ, ad f℥viij. M. Sumat cochleare amplum ter in die. (A favorite formulary for the administration of copaiva.)

℞ Copaibæ, f℥j. ; Olei Cubebarum, f℥ss. ; Aluminis, gr. cxx. ; Syrupi simplicis ; Mucilaginis Acaciæ, ana, f℥j. ; Aquæ Camphoræ ad f℥viij. M. Sumat cochleare amplum ter quaterve in die. (A very useful combination in gonorrhœa.)

℞ Copaibæ, f℥xij. ; Tincturæ Cantharidis ; Tincturæ Ferri Sesquichloridi, ana, f℥ij. M. Sumat minima lx., e cyatho vinoso aquæ, ter in die. (In old standing gleet.)

℞ Copaibæ, f℥j. ; 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, f℥j. ; Sulphatis Ferri Siccati, gr. x. ; Acidi Tannici ; Pulveris Cubebarum, ana, 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. xl. 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 Cretâ, gr. xij. ; Pul-

veris 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, f℥j.; 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. ad ℥ss.; Pulveris Aromatici, gr. xv. ad gr. xxx.; Syrupi simplicis. f℥ss. ad f℥j. M. Fiat electuarium, in die sumendum. (For uses, see page 660.)

℞ Iodi, gr. iv.; Etheris, f℥j. 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, f℥ij.; Olei Limonis, f℥j.; Aquæ Carui, f℥iij.; Essentiæ Carui, f℥ij. 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, f℥ss.; Olei Bergamotæ, f℥j.; Adipis præparati, q.s. M. Fiat unguentum, sæpé utendum. (In scrofulous ulcerations, and in obstinate cutaneous diseases.)

℞ Tincturæ Nucis Vomicæ, f℥ij.; Tincturæ Cinchonæ, f℥vj.; 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, ℥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 Aurantii Floris, f℥ss. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. (In cephalalgia 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, f℥ij.; 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, f℥j.; Aquæ destillatæ, f℥vij. 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, f℥vij.; Syrupi Aurantii Floris, f℥j. 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 Sacchara^{ti}, 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 Floris, f℥viiss.; Syrupi simplicis, f℥ss. M. Fiat mistura, cujus capiat cochleare amplum quartis horis. An agreable 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 idodide 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 una 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 C.

CLASSIFICATION
OF THE
CHIEF PLANTS USED IN MEDICINE,

TOGETHER WITH THE PREPARATIONS OF THOSE WHICH ARE INCLUDED IN THE BRITISH PHARMACOPOEIA (ACCORDING TO THE NATURAL SYSTEM).

N.B.—Those which are not officinal are printed in italics.

PHANEROGAMIA.

PLANTS PRODUCING STAMENS AND PISTILS, AND SEEDS CONTAINING AN EMBRYO.

CLASS I.—DICOTYLEDONES OR EXOGENÆ.

Embryo consisting of an unsheathed radicle, plumule, and two cotyledons.

SUB-CLASS I.—THALAMIFLORÆ.

Plants with a calyx, and (usually) a corolla consisting of distinct petals, which, with the stamens, are inserted on the receptacle.

Order.	Plant.	Officinal part.	Preparations.
Ranunculaceæ ...	Aconitum napellus;	Root	Liniment and Tincture; Aconitia and Ointment of Aconitia
		Leaves	Extract
	Aconitum ferox;	*Root*	
	Ranunculus acris;	*Root*	
	Ranunculus flammula;	*Root*	
	Helleborus niger;	*Rhizome*	
	Delphinium staphisagria;	*Seeds*	
	Actæa racemosa	*Rhizome*	
Podophyllaceæ ...	Podophyllum peltatum;	Rhizome	Resin
Magnoliaceæ ...	Illicium anisatum;	Seeds	Volatile Oil
Menispermaceæ ...	Cissampelos Pareira;	Root	Decoction, Extract and Liquid Extract
	Jateorrhiza Calumba;	Root	Extract, Infusion, and Tincture
	Cocculus Indicus;	*Seeds*	
Sarraceniaceæ ...	*Sarracenia purpurea;*	*Rhizome*	
Papaveraceæ ...	Papaver somniferum;	Fruit	Decoction, Extract, and Syrup of Poppy; Opium
	Papaver rhæas;	Petals	Syrup

Order.	Plant.	Officinal part.	Preparations.
Papaveraceæ *(con.)*	*Sanguinaria Canadensis;*	*Rhizome*	
Cruciferæ ...	Cochlearia Armoracia;	Root	Compound Spirit
	Sinapis nigra;	Seeds	Volatile Oil; Mustard Poultice; Compound Liniment of Mustard
	Sinapis alba;	Seeds	
Violaceæ ...	*Viola odorata;*	*Root*	
		Petals	*Syrup*
	Ionidium ipecacuanha;	*Root* (This is false Brazilian Ipecacuanha)	
Polygalaceæ ...	Polygala Senega;	Root	Infusion and Tincture
Krameriaceæ ...	Krameria triandra;	Root	Extract, Infusion, & Tincture of Rhatany; Compound Powder of Catechu
Malvaceæ ...	*Malva sylvestris;*	*Leaves*	
	Althæa officinalis;	*Root*	
	Gossypium herbaceum (and other species);	Hairs of the Seed	Cotton; Pyroxylin; Collodion
Byttneriaceæ ...	Theobroma cacao;	Seeds	Oil
Dipteraceæ ...	*Dryobalanops camphora;*	*Wood*	*Borneo Camphor*
Ternstræmiaceæ	*Thea (sp. var.);*	*Leaves*	*Tea*
Aurantiaceæ ...	Citrus aurantium;	*Fruit*	
		Flowers	Orange-flower Water; Syrup of Orange-flower
	Citrus bigaradia;	Flowers	Orange-flower Water; Syrup of Orange-flower
		Rind of fruit	Syrup, Tincture, Infusion, and Compound Infusion of Orange; Compound Infusion, Mixture, and Tincture of Gentian; Compound Spirits of Horse-radish, and Compound Tincture of Bark
	Citrus limonum;	Fruit	Volatile Oil, Syrup, and Tinc. of Lemon; Comp. Infusion of Orange, and of Gentian; Lemon juice
	Citrus limetta;	*Fruit*	*The Lime*
	Citrus medica;	*Fruit*	*The Citron*
	Citrus bergamia;	*Flower & Fruit*	*Oil of Bergamot*
	Ægle marmelos;	Fruit	Liquid Extract of Bael
Guttiferæ	Garcinia Morella	Stem	The gum resinous exudation—Gamboge; Compound Gamboge Pill
Canellaceæ ...	Canella Alba;	Bark	Rhubarb Wine

Order.	Plant.	Officinal part.	Preparations.
Vitaceæ ...	Vitis vinifera;	Dried fruit (Raisins)	Compound Tincture of Cardamoms & of Senna
Linaceæ ...	Linum usitatissimum;	Seeds	Linseed Oil and Infusion; Linseed-meal, which is the basis of all the officinal poultices except yeast poultice
	Linum catharticum;	*Entire plant*	
Zygophyllaceæ ...	Guaiacum officinale;	Wood	Compound decoction of Sarsaparilla
		Resin	Ammoniated Tincture and Mixture of Guaiacum, and Compound Calomel Pill
Rutaceæ ...	Barosma betulina;	Leaves	Infusion and Tincture of Buchu
	Barosma crenulata;	Leaves	Ditto
	Barosma serratifolia;	Leaves	Ditto
	Galipea cusparia;	Bark	Infusion of Angostura
	Ruta graveolens;	Entire plant	Volatile Oil
Simarubaceæ ...	Picræna excelsa;	Wood	Infusion, Tincture & Extract of Quassia

SUB-CLASS II.—CALYCIFLORÆ.

Flowers usually with a calyx and corolla; petals, if present, distinct or united, perigynous; stamens perigynous or epigynous.

Rhamnaceæ ...	Rhamnus catharticus; ...	Fruit	Syrup of Buckthorn
	Rhamnus frangula;	*Fruit*	
Anacardiaceæ ...	Pistacia lentiscus;	Stem	Mastiche
	Pistacia terebinthus;	*Stem*	*Chian Turpentine, an oleo-resinous exudation;*
	Rhus toxicodendron;		
Amyridaceæ ...	Balsamodendron myrrha;	Stem	Myrrh, an oleo-resinous exudation
			Tincture of Myrrh; Compound Rhubarb Pill; Aloes and Myrrh Pill; Compound Assafœtida Pill; Compound Decoction of Aloes; Compound Iron Mixture

Order.	Plant.	Officinal part.	Preparations.
Amyridaceæ *(con.)*	*Balsamodendron Gileadense;*	*Stem*	*Balm of Gilead (an oleo-resinous exudation)*
	Boswellia serrata;	*Stem*	*Olibanum, the True Frankincense, an oleo-resin*
	Canarium commune;	*Stem*	Elemi (an oleo-resinous exudation); Elemi Ointment
	Icica icicariba;	*Stem*	*Brazilian Elemi (oleo-resin)*
	Elaphrium elemiferum;	*Stem*	*Mexican Elemi (oleo-resin)*
Leguminosæ *Sub-order I.* Papilionaceæ ...	Astragalus verus;	Stem	Tragacanth (a gummy exudation); Compound Powder of Tragacanth; Mucilage of Tragacanth
	Glycyrrhiza glabra;	Root	Extract of Liquorice; Confection of Turpentine; Compound Decoction of Sarsaparilla; Infusion of Linseed; Blue Pill; Iodide of Iron Pill
	Myroxylon Pereiræ;	Stem	Balsam of Peru (an exudation from the stem)
	Myroxylon toluiferum	Stem	Balsam of Tolu (an exudation from the stem); Syrup of Tolu; Tincture of Tolu; Compound Tincture of Benzoin
	Sarothamnus Scoparius;	Branches	Decoction of Broom; Broom Juice
	Pterocarpus marsupium;	Stem	Kino (the inspissated juice); Tincture and Compound Powder of Kino; Compound Powder of Catechu
	Pterocarpus Santalinus;	Wood	Compound Tincture of Lavender
	Pterocarpus erinceus;	*Stem*	*African Kino*
	Colutea arborescens;	*Leaves*	*Bladder Senna*
	Butea frondosa;		*East Indian Kino*
	Mucuna pruriens;	*Hairs of pod (Cowhage)*	
	Tephrosia Apollinea;	*Leaves*	*Used to adulterate Senna.*
	Andira inermis;	*Bark*	*Cabbage-tree Bark, used as an anthelmintic*
	Dipterix odorata;	*Seeds (Tonka Beans)*	

Order.	Plant.	Officinal part.	Preparations.
Sub-order I.			
Papilionaceæ *(con.)*	*Indigofera tinctoria ;*	*Leaves*	*Indigo*
	Indigofera cerulea ;	*Leaves*	*Indigo*
	Indigofera argentea ;	*Leaves*	*Indigo*
Sub-order II.			
Cæsalpineæ ...	Cassia lanceolata ; Cassia obovata ;	Leaflets (Alexandrian Senna)	Confection, Infusion, Syrup, Compound Mixture, and Compound Tincture of Senna
	Cassia elongata ;	Leaflets (Tinnivelly Senna)	Ditto
	Cassia fistula ;	Fruit	Cassia Pulp ; Confection of Senna
	Tamarindus Indica;	Fruit	Pulp of Tamarinds ; Confection of Senna
	Copaifera multijuga ;	Stem	Copaiba (an oleo-resin) ; Oil of Copabia
	Hæmatoxylon Campeachianum ;	Heartwood	Decoction and Extract of Logwood
Sub-order III.			
Mimoseæ ...	Acacia (sp. var.) ;	Stem	Gum Arabic (an exudation from the stem) ; Mucilage ; Compound Powder of Almonds ; Compound Powder of Tragacanth ; Chalk Mixture ; Guaiac Mixture ; all the Officinal Lozenges
	Acacia catechu ;	*Heartwood*	*An Artificial Extract, which is called Catechu*
Rosaceæ ...	Amygdalus communis, *var.* dulcis ;	Seeds (sweet Almonds)	Compound Powder ; Mixture, and fixed Oil of Almonds
	A. communis, *var.* amara ;	Seeds (bitter Almonds)	Fixed Oil and Volatile Oil of Almonds
	Prunus domestica ;	Fruit	Pulp of Prunes ; Confection of Senna
	Prunus lauro-cerasus ;	Leaves	Laurel Water
	Pyrus malus ;	*Bark of stem & root*	*Phloridzin*
	Cydonia vulgaris ;	*Seeds*	*Decoction (Ph. Lond.)*
	Brayera anthelmintica ;	Flowers	Infusion of Kousso

Order.	Plant.	Officinal part.	Preparations.
Rosaceæ *(con.)*	Rosa canina ;	Fruit	Confection of Hips
	Rosa centifolia ;	Petals	*Otto of Roses;* Rose Water
	Rosa Gallica ;	Petals	Acid Infusion, Confection, and Syrup
Calycanthaceæ ...	*Calycanthus floridus ;*	*Bark*	
Myrtaceæ ...	Melaleuca minor ;	Leaves	Oil of Cajeput ; Croton Oil Liniment
	Caryophyllus aromaticus ;	Flower-buds (Cloves)	Infusion and Oil of Cloves ; Aromatic Iron Mixture; Aromatic Chalk Powder ; Aromatic Chalk Powder with Opium ; Socotrine Aloes Pill ; Compound Colocynth Pill ; Colocynth and Hyoscyamus Pill ; Compound Infusion of Orange ; Opium Wine
	Eugenia pimenta ;	Fruit	Water and Oil of Pimento ; Syrup of Buckthorn
	Eucalyptus resinifera ;	*Living stem*	*Botany-Bay Kino*
Granateæ ...	Punica granatum ;	*Fruit*	*Decoction*
		Bark of root	Decoction
Crassulaceæ ...	*Cotyledon umbilicus ;*	*Herb*	*Juice; Fluid Extract*
Cucurbitaceæ ...	*Cucumis sativus ;*	*Fruit*	*Ointment*
	Cucurbita pepo ;	*Seeds*	
	Citrullus colocynthis ;	Fruit	Compound Extract and Compound Pill of Colocynth ; Pill of Colocynth and Hyoscyamus
	Ecbalium officinarum ;	Fruit	Elaterium
Hamamelaceæ ...	Liquidambar Orientale ; This genus has been placed by some authorities in the Amentiferæ, and by Lindley in a distinct Order, the Altingiaceæ.	Living stem	Storax (a balsamic exudation) ; Compound Tincture of Benzoin ;
Umbelliferæ ...	*Hydrocotyle Asiatica ;*	*Entire plant*	
	Carum carui ;	Fruit	Caraway Water and Volatile Oil ; Confection of Scammony and Barbadoes Aloes Pill
	Fœniculum dulce ;	Fruit	Fennel Water ; *Oil of Fennel*

Order.	Plant.	Officinal part.	Preparations.
Umbelliferæ *(con.)*	Anethum graveolens ;	Fruit	Dill Water ; Oil of Dill
	Narthex assafœtida ;	Root	The Gum-Resin Assafœtida ; Tincture, Enema, and Compound Pill of Assafœtida ; Fœtid Spirits of Ammonia ; Pill of Aloes and Assafœtida
	Dorema ammoniacum ;	Stem and branches	The Gum-Resin Ammoniacum ; Ammoniac Mixture ; Ammoniac and Mercury Plaster ; Galbanum Plaster ; Compound Squill Pill ; Squill and Hippo Pill
	Opoidia galbanifera ; (?)	Root or Stem	Galbanum ; Compound Pill of Assafœtida ; Galbanum Plaster
	Coriandrum sativum ;	Fruit	Volatile Oil ; Confection of Senna ; Gentian Mixture ; Syrup of Rhubarb ; Tincture of Rhubarb and of Senna
	Pimpinella anisum ;	Fruit	Oil, Water, and Essence of Anise ; Compound Tincture of Camphor ; and Ammoniated Tincture of Opium
	Conium maculatum ;	Fruit	Tincture of Conium
		Leaves	Extract, Juice, and Poultice of Hemlock
	Cuminum cyminum ;	*Fruit (Cumin)*	
Araliaceæ ...	*Panax ginseng ;*	*Root*	
	Panax quinquefolium ;	*Root*	
Cornaceæ ...	*Cornus florida ;*	*Bark*	*Decoction, U. S. Pharm.*
Caprifoliaceæ ...	Sambucus nigra ;	Flowers	Elder-flower Water
Stellatæ ...	*Rubia tinctoria ;*	*Root*	
Cinchonaceæ ...	Cephaëlis ipecacuanha ;	Root	Compnd. Powder, Wine, & Lozenges of Ipecacuan ; Morphia and Ipecacuan Lozenges ; Compound Pill of Hemlock ; Pill of Squill and Ipecacuan
	Cinchona calisaya ;	Bark (yellow bark)	Decoction, Infusion, Tincture, and Liquid Extract of Bark ; Sulphate of Quinine
	Cinchona Condaminea ;	Bark (pale bark)	Comp. Tincture of Bark ; Aromatic Iron Mixture

Order.	Plant.	Officinal part.	Preparations.
Cinchonaceæ *(con.)*	Cinchona succirubra ;	Bark (red bark)	*Sulphate of Quinine*
	Uncaria Gambir ;	Leaves & young branches	An Extract called Pale Catechu ; Tincture, Infusion, Lozenges, and Compound Powder of Catechu
	Coffea Arabica ;	*Seeds*	*Coffee ; Caffeine*
	Richardsonia scabra ;	*Root*	*Undulated Ipecacuanha*
	Psychotria emetica;	*Root*	*Striated Ipecacuanha*
Valerianaceæ ...	Valeriana officinalis ;	Rhizome	Tincture, Ammoniated Tincture, and Infusion
Compositæ			
Cichoraceæ ...	Taraxacum dens leonis ;	Root	Decoction, Extract, and Juice
	Lactuca virosa ;	Herb	*Lactucarium ;* Extract of Lettuce
Cynarocephalæ	*Calendula officinalis ;*	*Florets*	*Used to adulterate Saffron*
	Carthamus tinctorius ;	*Florets*	*Used to adulterate Saffron*
Corymbiferæ	*Artemisia absinthium ;*	*Young branches*	*Wormwood*
	Artemisia Santonica ;	Flower-heads	Santonine
	Anthemis Nobilis;	Flower-heads	Infusion, Extract, & Volatile Oil of Chamomile
	Anacyclus Pyrethrum ;	Root	Tincture of Pellitory
	Arnica Montana ;	Root	Tincture
Lobeliaceæ ...	Lobelia inflata ;	Entire herb	Ethereal Tincture, and Tincture
	SUB-CLASS III.—COROLLIFLORÆ. Plants with a calyx and a gamopetalous, hypogynous corolla ; stamens generally epipetalous.		
Ericaceæ ...	Arctostaphylos Uva Ursi ;	Leaves	Infusion of Bearberry
Oleaceæ ...	Olea Europea ;	Fruit	Olive Oil, which enters into the Liniments of Ammonia, of Lime, of Camphor, of Mercury, of Turpentine and Acetic Acid, into several of the Plasters, and into Blistering Paper
	Fraxinus Ornus ;	Living stem	Manna

Order.	Plant.	Officinal part.	Preparations.
Oleaceæ *(con.)*	Fraxinus rotundifolia ;	Living stem	Manna
Styraceæ ...	Styrax benzoin ;	Living stem	Benzoin (a Balsamic exudation) ; Compound Tincture of Benzoin ; Benzoated Lard ; Benzoic Acid
	Styrax officinale ;	*Living stem*	*Storax (?) a Balsamic exudation*
Loganiaceæ ...	Strychnos nux vomica ;	Seeds	Strychnia ; Solution of Strychnia ; Tincture & Extract of Nux Vomica
	Stychnos Ignatia ;	*Seeds*	*St. Ignatius' Beans*
	Spigelia Marilandica ;	*Root*	*Worm-grass*
Gentianaceæ ...	Gentiana lutea ;	Root	Infusion, Mixture, Tincture, and Extract
	Erythræa centaurea ;	*Entire plant*	*Infusion*
Asclepiadaceæ ...	Hemidesmus indicus ;	Root	Syrup
	Solenostemma arghel ;	*Leaves*	*An adulteration of Senna*
Convolvulaceæ ...	Convolvulus scammonia ;	Root	Scammony ; Compound Powder, Resin, Mixture, and Confection of Scammony ; Extract & Compound Pill of Colocynth ; and the Pill of Colocynth and Hyoscyamus
	Exogonium purga ;	Root	Compound Powder, Resin, Extract and Tincture of Jalap, and Compound Powder of Scammony
Solonaceæ ...	Solanum dulcamara ;	Young branches	Infusion
	Datura Tatula ;	*Leaves*	
	Datura stramonium ;	Leaves	
		Seeds	Tincture and Extract
	Hyoscyamus niger;	Leaves	Extract and Tincture ; Pill of Colocynth and Hyoscyamus
	Atropa belladonna ;	Root	Liniment ; Atropia ; Ointment of Atropia ; Solution of Atropia ; Sulphate of Atropia ; Solution of Sulphate of Atropia
		Leaves	Tincture, Extract, Plaster, Ointment
	Nicotiana Tabacum;	Leaves	Enema ; *Nicotine*

Order.	Plant.	Officinal part.	Preparations.
Solonaceæ *(con.)*	Capsicum fastigiatum;	Fruit	Tincture of Capsicum
Labiatæ ...	Mentha piperita;	Herb in flower	Oil, Spirit, Essence, and Peppermint Water; Compound Rhubarb Pill; Aromatic Iron Mixture
	Mentha viridis;	Herb in flower	Oil; Mint Water
	Mentha pulegium	*Herb in flower*	*Oil; Pennyroyal Water*
	Lavandula vera	Herb in flower	Oil; Compound Tincture; Fowler's Solution of Arsenic; Compound Camphor Liniment
	Rosmarinus officinalis	Herb in flower	Oil and Spirit of Rosemary, Compound Tincture of Lavender, and Soap Liniment
	Marrubium vulgare	*Herb*	*Horehound*
	Thymus serpinum	*Herb*	*Thyme*
Scrophulariaceæ ...	*Scrophularia nodosa;*	*Leaves*	*Ointment*
	Digitalis purpurea	Leaves	Digitaline; Infusion; Tincture
Sub-Class IV.—MONOCHLAMYDEÆ. Plants having a perianth, which is either sepaloid or petaloid, or even reduced to one or more bracts, or, more rarely, entirely absent.			
Polygonaceæ ...	Rheum *(sp. var.)*	Root	Tincture, Infusion, Extract, Wine, Comp. Pill, and Compound Powder
Chenopodiaceæ ...	*Chenopodium (sp. var.)*	*Entire plant*	*Barilla*
	Salsola (sp. var.)	*Entire plant*	*Barilla*
	Salicornia (sp. var.)	*Entire plant*	*Barilla*
Lauraceæ ...	Camphora officinarum	Wood	Spirit, Liniment, Compound Liniment, Compound Tincture, and Water of Camphor; it enters into the composition of the Aconite, Belladonna, Chloroform, Iodine, Opium, Soap, Compound Mustard, Turpentine, and the Turpentine and Acetic Acid Liniments, and into the Compound Ointments of Mercury and Subacetate of Lead

Order.	Plant.	Officinal part.	Preparations.
Lauraceæ *(con.)*	Cinnamomum Zeylanicum ;	Inner bark	Oil, Compound Powder, Tincture and Water of Cinnamon ; it is an ingredient in the Tincture, Infusion, & Compound Powder of Catechu ; in the Compound Tinctures of Lavender and Cardamoms ; in Aromatic Sulphuric Acid, Aromatic Chalk Powder, Decoction of Logwood, Wine of Opium, and Compound Powder of Kino
	Cinnamomum cassia ;	*Inner bark*	*Volatile Oil of Cassia Bark*
	Nectandra rodiæi ;	Bark	Sulphate of Beberine
	Sassafras officinale ;	Root	*Volatile Oil ;* Compound Decoction of Sarsaparilla
Myristicaceæ ...	Myristica moschata ;	*The Arillus of the seed (mace)* Seeds	Volatile and Expressed Oil of Nutmeg ; Compound Catechu, and Aromatic Chalk Powders ; Compound Spirit of Horseradish, and Compound Tincture of Lavender. The Volatile Oil is an ingredient in Sal Volatile, in Socotrine Aloes Pill, and in Spirit of Nutmeg
Thymelaceæ ...	Daphne mezereum ;	Bark	Ethereal Extract (an ingredient in Compound Mustard Liniment) and Compound Decoction of Sarsaparilla
Euphorbiaceæ ...	Croton eleuteria ;	Bark	Infusion and Tincture of Cascarilla
	Croton tiglium ;	Seeds	Croton Oil, and the Liniment of Croton Oil
	Ricinus communis ;	Seeds	Castor Oil, an ingredient in Flexible Collodion, Compound Liniment of Mustard, and in Compound Calomel Pill
	Rottlera tinctoria ;	Minute glands on the outer surface of the fruit (Kamala)	

Order.	Plant.	Officinal part.	Preparations.
Euphorbiaceæ (*con.*)	*Euphorbia lathyris;*	*Entire plant*	*Resin*
	Janipha manihot;	*Root*	*Tapioca*
Urticaceæ ...			
Sub-order.			
Cannabineæ ...	Cannabis Indica;	Flowering tops	Extract and Tincture; *Churrus; Bang; Hachish Lapuline;* Tincture, Infusion, and Extract of Hops
	Humulus lupulus;	Catkins	
Sub-order.			
Moreæ ...	Morus nigra;	Fruit	Syrup of Mulberry
	Ficus carica;	Fruit	Confection of Senna
	Ficus elastica;		*Caoutchouc*
Ulmaceæ ...	Ulmus campestris;	Bark	Decoction
Juglandaceæ ...	*Juglans regia;*	*Leaves*	*Decoction*
Cupuliferæ ...	Quercus pedunculata;	Bark	Decoction
	Quercus infectoria;	Excrescences on the bark (Galls)	Tincture and Ointment of Galls; Ointment of Galls and Opium; Gallic Acid; Glycerine of Gallic Acid; Tannic Acid; Glycerine, Suppository, and Lozenge of Tannic Acid
Salicaceæ ...	*Salix (sp. var.);*	*Bark*	*Salicine*
Piperaceæ ...	Cubeba officinalis;	Fruit	
	Piper nigrum;	Fruit	Black and White Pepper; Confection of Pepper; Compound Powder of Opium; Confection of Opium
	Artanthe elongata;	Leaves	Infusion and *Tincture* of Matico
Aristolochiaceæ ...	Aristolochia serpentaria;	Rhizome	Infusion and Tincture of Serpentary; Compound Tincture of Bark
Coniferæ ...			
Sub-order.			
Pinaceæ ...	Pinus sylvestris (Scotch fir);	Living tree	Turpentine; Oil of Turpentine, an ingredient in the Enema, Confection and Liniment of Turpentine, in Liniment of Turpentine and Acetic Acid, and in the Ointment of Turpentine
	Pinus pinaster (Cluster-pine);	Living tree	
	Pinus palustris (Swamp-pine);	Living tree	
	Pinus Tæda (Frankincense or Torch pine);	Living tree	
	Pinus pinea;	Living tree	

Order.	Plant.	Officinal part.	Preparations.
Coniferæ ...			
Sub-order. Pinaceæ *(con.)*	Abies excelsa (Spruce Fir);	Living tree	Burgundy Pitch, an ingredient in Iron Plaster and Pitch Plaster
	Abies balsamea (Balm of Gilead Fir)	Living tree	Canada Balsam, an ingredient in Blistering Paper and Flexible Collodion
	Juniperus communis;	Fruit	Oil of Juniper; Spirit of Juniper, an ingredient in Creasote Mixture
	Juniperus sabina;	Tops	Savin Oil, Tincture, and Ointment
	Larix Europea (Pinus larix) (larch);	*Living tree* *Bark*	*Venice Turpentine* *Tincture of Larch Bark* *Larch Soap*
Sub-order. Cycadaceæ ...	*Cycas revoluta;*	*Trunk*	*Sago*
	Cycas circinalis;	*Trunk*	*Sago*

Class II.—MONOCOTYLEDONES.

Embryo consisting of a sheathed radicle, plumule, and one cotyledon.

Palmaceæ ...	*Areca catechu;*	*Seeds (Betel nuts)*	*Areca Catechu*
	Sagus rumphii;		*Sago*
	Saguerus rumphii;		*Sago*
	Phœnix farinifera;		*Sago*
	Areca oleracea;		*Sago*
Aroideæ ...	*Arum maculatum;*	*Rhizome*	*Portland Arrow-root*
	Acorus calamus;	*Rhizome*	
Dioscorideæ ...	*Dioscorea sativa;*	*Root*	*Yams*
	Tamus communis;	*Root*	*Black Bryony Root*
Smilaceæ ...	Smilax officinalis;	Rhizome	Decoction, Compound Decoction, and Liquid Extract of Sarsaparilla
Liliaceæ ...	Aloe (sp. var.);	Leaves	Socotrine Aloes, Tincture, Wine, Pill, and Extract of Aloes; Compound Decoction of Aloes; Compound Tincture of Benzoin; Compound Extract of Colocynth; Rhubarb, Aloes and Myrrh, Aloes and Assafœtida Pill Masses

Order.	Plant.	Officinal part.	Preparations.
Liliaceæ *(con.)* ...	Aloe vulgaris ;	Leaves	Barbadoes Aloes ; Compound Pill of Gamboge and of Colocynth ; Pill of Colocynth and Hyoscyamus ; Pill of Barbadoes Aloes and of Aloes and Iron ; Extract of Barbadoes Aloes ; Enema of Aloes
	Urginea scilla ;	Bulb	Tincture, Vinegar, Oxymel, and Syrup of Squill, Compound Squill Pill, and Pill of Ipecacuanha with Squill
	Allium cepa ;	*Bulb*	*Onion*
	Allium sativum ;	*Bulb*	*Garlic*
	Dracæna draco ;		*Dragon's Blood*
Melanthaceæ ...	Colchicum autumnale ;	Corm	Extract, Acetous Extract, and Wine of Colchicum
		Seeds	Tincture of Colchicum
	Asagræa officinalis ;	Seeds	Veratria ; Ointment of Veratria
	Veratrum viride ;	Rhizome	Tincture of Green Hellebore
	Veratrum album ;	*Rhizome*	
Orchidaceæ ...	*Orchis mascula ;*	*Root*	*Salep*
Zingiberaceæ ...	Zingiber officinale ;	Rhizome	Tincture, Essence, and Syrup of Ginger ; Confection of Opium, and of Scammony ; Compound Powders of Cinnamon, Jalap, Scammony, Opium, and Rhubarb ; Compound Squill Pill ; Syrup of Buckthorn, and Wine of Aloes
	Elettaria cardamomum ;	Seeds	Compound Tincture of Cardamoms ; Compound Tincture of Gentian ; Tincture of Rhubarb ; Wine of Aloes ; Compound Powder of Cinnamon ; Aromatic Chalk Powder ; and Compound Extract of Colocynth
	Curcuma longa ;	Rhizome (turmeric)	
	Amomum grana Paradisi ;	*Seeds (Grains of Paradise)*	
Marantaceæ ...	*Canna edulis ;*	*Rhizome*	*Tous-les-mois*
	Maranta arundinacea ;	*Rhizome*	*Arrow-root*

Order.	Plant.	Officinal part.	Preparations.
Irideæ ...	Crocus sativus;	Stigmas (saffron)	Tincture of Saffron and of Rhubarb; Compound Tincture of Bark; Ammoniated Tincture of Opium; Aloes & Myrrh Pill; Compound Decoction of Aloes; Aromatic Chalk Powder
	Iris florentina;	*Rhizome (orris root)*	
Gramineæ ...	Triticum vulgare (wheat);	Fruit	Wheaten-flour, an ingredient in yeast poultice
	Hordeum distichon (barley);	Fruit	Decoction of Barley
	Avena sativa (oat);	*Fruit*	*Oatmeal; Gruel; Stirabout*
	Zea Mays (Indian corn);	*Fruit*	*Corn Flour*
	Oryza sativa (rice);	*Fruit*	
	Saccharum officinarum;	Culm	White Sugar; *Brown Sugar;* Treacle; Sugar is an ingredient in all the Syrups and Lozenges, in the Mixtures of Guaiacum and Chalk, in the Confections of Dog Rose, French Rose, and of Senna; Saccharated Carbonate of Iron; Griffith's Mixture, &c.

CRYPTOGAMIA.

PLANTS DESTITUTE OF STAMENS AND PISTILS, BUT WHICH PRODUCE, IN VARIOUS KINDS OF FRUIT, SPORES, CONSISTING OF SINGLE CELLS, NOT CONTAINING AN EMBRYO.

Division I.—ACROGENS.

Plants having a distinct axis furnished with more or less modified leaves.

Filices ...	Aspidium filix mas;	Rhizome	Liquid Extract of Male Fern
	Adiantum pedatum;	*Fronds*	*Syrup of Capillaire*
Lycopodiaceæ ...	*Lycopodium clavatum;*	*Spores*	*Lycopodium, or Vegetable Brimstone*

Division II.—THALLOGENS.

Plants, destitute of a leafy axis, consisting of a cellular expansion *(Thallus)*, very variable in form.

Class I.—ALGÆ.

Plants growing either in water or in a moist situation; the thallus either of distinct cells, or filamentous, or foliaceous, or shrubbily branched, and of a membranous, gelatinous, or cartilaginous texture.

Order.	Plant.	Officinal part.	Preparations.
Rhodospermeæ ...	*Chondrus crispus (Carrageen moss);*	*Thallus*	*Decoction*
	Plocaria helminthocorton (Corsican moss);	*Thallus*	
	Plocaria candida (Ceylon moss);	*Thallus*	*Jelly and Decoction*
Fucaceæ ...	*Fucus vesiculosus (Bladder-wrack);*	*Thallus*	*Extract; Kelp*
	F. serratus;	*Thallus*	*Kelp*
	F. nodosus;	*Thallus*	*Kelp*
	Laminaria digitata	*Thallus*	*Kelp*
	Hemanthalia (sp. var.)	*Thallus*	*Kelp*

Class II.—LICHENES.

Plants having a foliaceous, crustaceous, or pulverulent Thallus, growing and fructifying on rocks, trees, &c.

Lichenaceæ ...	*Peltidea canina;*	*Thallus*	*Pulvis Antilyssus (Lond. Ph. 1721)*
	Cladonia rangiferina (reindeer moss);	*Thallus*	
	Cetraria Islandica; (Iceland moss);	Thallus	Decoction of Iceland Moss
	Rocella tinctoria et sp. var.;	Thallus	Litmus
	Lecanora Tartarea;	*Thallus*	*Cudbear*

Class III.—FUNGI.

Plants destitute of green colouring matter (chlorophyll) and starch, growing in or on living or decaying organic matter; the thallus consists of a number of branched cellular filaments *(Mycelium)* capable of growing at every free point.

Agaricaceæ ...	*Agaricus campestris;*	*Fructification*	*Edible Mushrooms*
	A. deliciosus;	*Ditto*	*Edible Mushrooms*
	A. procerus;	*Ditto*	*Edible Mushrooms*
Sphæriaceæ ...	Claviceps purpurea	Sclerotium or compact mycelium	Tincture, Infusion, and Liquid Extract of Ergot; *Ergotine*
Botrytaceæ ...	Torula cerevisia (yeast plant);	Mycelium	Yeast; Yeast Poultice

INDEX.

Page

Abies 586
balsamea 313
excelsa 586
Abietis resina 586
Absinthine 44
Absinthium 44
Abortifacient ergotætia 330
Abuta rufescens 303
Acacia (Arabica) .. 337
catechu 98
Acaciæ gummi 337
Acetas, *see required head*
Acetate, *see required head*
Acetification 85
Acetum 84, 460
aromaticum .. 530
Britannicum .. 84
cantharidis .. 380
gallicum .. 84
opii 447
scillæ 311
vini 84
Acid, acetic 232
camphorated 530
commercial 232
dilute .. 87
glacial .. 230
strong .. 232
aconitic 484
aloeretinic .. 154
aloetic 154
arsenious 247
auric 622
benzoic 394
boracic 824
carbolic 67, 87
carbonic 476
catechuic 99
cerotic 349
cevadic 55
chrysophanic .. 200
cinchonic 732
cinnamic .. 396, 406
cinnamomic .. 396
citric 460
copaivic 627
crotonic 169
elaiodic 204
ellagic 117
equisetic 484
formic 494
gallic .. 117, 120
gambogic .. 158
guaiacic 280
hemidesmic .. 359
hippuric 395
hydrochloric .. 234
dilute 690
hydrocyanic, absolute 478
dilute 477

Page

Acid, hydrosulphuric .. 839
igasuric 670
ipecacuanhic .. 321
kinic 732
kinovic 732
krameric 127
larixinic 601
lichenic 724
lichestearic .. 724
lithic 2
lobelic 401
luteogallic .. 117
margaritic .. 204
mastichic 578
meconic 433
melisic 349
muriatic, *see* hydrochloric.
myronic 325
nitric 236
commercial 236
dilute .. 691
pure .. 236
solidified .. 237
nitro-hydrochloric 238
dilute 692
nitro-muriatic .. 238
dilute 692
oxalic .. 462, 835
parallinic .. 286
peptic 117
phenic 87
phosphoric, dilute 693
pinic 592
polygallic 404
prussic 477
pyrogallic .. 119
pyroligneous .. 232
rhabarberic .. 200
ricinic 204
Scheele's .. 478
smilasperic .. 359
strychnic .. 670
sulphovinic .. 532
sulphuric 89, 239, 876
aromatic 93
commercial 692
dilute .. 94
pure .. 90
sulphurous .. 239
sumbulic .. 73
sylvic 592
tannic .. 118, 732
tartaric 464
uric 395
valerianic .. 75
veradric 55
virgineic 404
vitriolic 89
zootic 477
infusion of rose .. 141

Page

Acid tartrate of potash 195, 305
Acidulated drops .. 466
Acidum, *see* Acids
Acipenser 830
Aconella 484
Aconite 483
Aconiti folia 483
radix 483
Aconitia .. 484, 486
Aconitic acid 484
Aconotina 484
Aconitum napellus .. 483
Acroleine .. 354, 362
Actæa racemosa .. 613
Adeps benzoatus .. 340
myristicæ .. 582
ovillus 370
suillus 339
præparatus 339
Adhesive plaster .. 138
Administration of medicines 852
Ægle marmelos .. 97
Ærugo 252
Æther 531
aceticus 530
cantharidalis .. 382
chloricus .. 506
purus 535
sulphuricus .. 531
Æthereum oleum .. 535
Ætheris nitrosi spiritus 292
spiritus compositus 535
Æthiops martis 770
Æthiops per se 635
Agathotes chirayta .. 725
Agents, colouring .. 824
pharmaceutical 824
supplementary .. 824
Ague drop, tasteless .. 703
Albespeyre's paper .. 383
Albumen ovi .. 365, 824
Alcohol 536
amylic 76
Aldehyd 85
valerianic .. 77
Alexandrian senna .. 210
Algarothi's powder .. 242
Alkaline mineral waters 815
Alkaline solution, Brandish's 29
Alkalines 1
Allium sativum 45
Allspice 583
Allyle, sulphuret of .. 65
Almond, bitter 341
confection .. 342
mixture .. 342
oil 343
powder of, compound .. 345
sweet 341

Page
Aloe vulgaris 152
Aloes 152
Barbadensis .. 152
Capensis 153
Indica 152
Socotrina 152
Aloine 153
Aloesin 154
Aloeretinic acid 154
Aloetic acid 154
Alteratives 613
Alum 94
burnt 96
cataplasm 96
dried 96
whey 96
Alumen 94
exsiccatum .. 96
Aluminis et ammoniæ sulphas 94
Aluminis et potassæ sulphas liquor compositus 95 96
Amber, oil of 389
American calumba .. 720
hellebore .. 523
Amidide of hydrogen .. 3
Amidogene 4
Ammonia 3
strong solution of 3, 241, 376
Ammoniacal blistering ointment 377
Ammoniacal gas .. 3
Ammoniaco-nitrate of silver 840
Ammoniacum 541
and mercury plaster 642
præparatum 541
Ammoniæ acetatis liquor 267
aqua fortior 3, 241, 376
et aluminis sulphas .. 94
arsenias .. 615
benzoas .. 615
bicarbonas .. 7
carbonas 8, 318, 543
citratis liquor 269
cuprosulphas 743
hydrochloras 543
hydrosulphuretum .. 543
linimentum 377
liquor .. 5, 542
fortior 3, 241, 376
murias .. 543
oxalas .. 836
phosphas .. 616
sesquicarbonas 8, 543
spiritus aromaticus .. 543
fetidus .. 66
valerianas .. 79
Ammoniated copper .. 743
mercury .. 644
silver, solution of .. 840
submuriate of mercury 644
tincture of guaiacum 281
tincture of opium .. 445
tincture of valerian .. 76
Ammonii bromidum .. 617
chloridum .. 544
sulphidi liquor 543
Ammonio-chloride of iron 755
mercury 644
Ammonio-citrate of iron 761
Ammonio-nitrate of silver 840
Ammonio-sulphate of copper 743
Ammonio-sulphate of magnesia 840
Ammonio-tartrate of iron 764
Ammonium 4
bromide of 617
chloride of 544
sulphide of 543
Amomum zingiber .. 610
Amorphous quinia .. 742
Amygdala amara .. 341
dulcis .. 341
Amygdalæ amaræ oleum 488
Amygdalin 342
Amygdalus communis .. 341
dulcis .. 341
Amylene 490
Amylic alcohol 76
Amylin 361
Amylum 343
Anacyclus pyrethrum .. 527
Analysis, qualitative .. 839
volumetric .. 841
Anamirta cocculus .. 569
Anæsthetics 475
Anethi fructus 546
oleum 546
Anethum graveolens .. 546
Angostura bark 745
false .. 746
table of 746
Anilina 491
Aniline 491
Animal charcoal .. 825
purified 826
Aniseed 547
Anisi oleum 547
Annesley's formulary .. 322
Anodyne, Hoffman's .. 536
liniment .. 444
Anodynes 407
Ant 494
Antacids 1
Anthelmintics 42
Anthemidis flores .. 696
Anthemis nobilis .. 696
Antihectic mixture, Griffith 760
Neligan 87
Antilithics 1
Antimonial powder .. 271
wine .. 277
Antimonii et potassæ tartras, *see* Antimonium tartaratum
Antimonii chloridi liquor 241
oxidum .. 270
oxysulphuratum 274
potassio tartras, *see* Antimonium tartaratum
præcipitatum 274
pulvis .. 271
sulphuretum aureum .. 274
præparatum 273
terchloridi liquor 241
teroxidum .. 270
tersulphuretum 274
Antimonium nigrum .. 273
sulphuratum 274
sulphuretum 273
tartaratum 275, 319, 377, 395, 492
tartarizatum 275, 319, 377, 395, 492
Antispasmodics 63
Antimony, butter of .. 241
oxychloride of 242
see antimonium.
Aperient mineral waters 818
Aperients 150
Apis mellifica .. 187, 348
Apple of Peru 455
Aporetine 200
Apothecaries' weights .. xv.
Apparatus for volumetric analysis 841
Aqua 802
anethi 546
anisi 548
aurantii floris .. 705
calcis 9
camphoræ .. 557
carui 561
cassiæ 563
chalybeata .. 763
cinnamomi .. 568
destillata .. 801
fervens 378
fœniculi 576
fortis 236
lauro-cerasi .. 518
lithiæ effervescens 18
magnesiæ bicarbonatis 24
menthæ piperitæ 579
pulegii 580
viridis 581
picis liquidæ .. 587
pimentæ 583
potassæ effervescens 31
pulegii 580
regia 238
rosæ 857
sambuci 370
sodæ effervescens 38
Arabin 338, 372
Arbutin 144
Arbutus uva-ursi .. 143
Arctostaphylus uva-ursi 143
Areca catechu 98
oleracea 368
Arenga saccharifera .. 368
Argel 211
Argenti chloridum .. 697
iodidum .. 699
nitras .. 243, 698
oxidum .. 699
Argentum purificatum 824
Argol 195
Arica bark 733
Aricina 732
Aristolochia serpentaria 594
Amoracia .. 526, 548
Army treatment of itch 600
Arnica montana .. 548
Arnicæ radix 548
Arnicina 549
Arrack 538
Aromatic confection .. 14
iron mixture 752
powder of chalk and opium 104
spirit of ammonia 543
sulphuric acid 93
vinegar .. 530
Aromia moschata .. 70
Arrow-root 363
Brazilian .. 364
East Indian 364
West Indian 364
Arseniate of iron .. 756
of soda .. 794
Arsenic .. 247, 700
chloride o .. 704
eaters 795

Page

Arsenic, hydriodate of, and mercury .. 619
iodide of .. 618
pastes of .. 251
powder of 247, 700
solution of .. 703
hydrochloric 704
sulphuret of .. 657
teriodide .. 618
white oxide of 247, 700
Arsenical paste .. 251
Cazenave 251
Frere Come 251
Miss Plunket 251
powders .. 251
Dubois 251
Dupuytren 251
saturation .. 702
solution, Devergie 704
De Valangin 704
Fowler 703
Neligan 704
Arsenicum album 247, 700
Arsenious acid 247, 700
Artanthe elongata .. 128
Artemisia absinthium .. 44
contra .. 56
glomerata .. 56
moxa .. 386
Art of prescribing .. 852
Articles employed in chemical testing 841
Articles included in the Brititish Pharmacopœia of 1867, but not in that of 1864, table of xxi.
Articles in the British Pharmacopœia 1864, but omitted in that of 1867, table of xxii.
Articles the names of which have been altered in the British Pharmacopœia, 1867, table of xxiii.
Asagræa officinalis .. 54, 502
Ascaris lumbricoides .. 43
vermicularis .. 43
Asiatic pills 702
Asparagin 356
Aspidium filix mas .. 49
Assafœtida 64
Astragulus gummifer .. 371
verus .. 371
Astringents 83
Atropa belladonna .. 408
Atropia .. 409, 414
Atropiæ sulphas .. 417
Atropine gelatine .. 416
paper 416
Aurantii cortex 705
floris aqua .. 705
oleum 706
Aurantium 467
Aurantium citrus .. 466
Auri iodidum 621
perchloridum .. 621
peroxydum .. 622
pulvis 620
Auric acid 622
Aurum .. 620, 828
Avena 345
sativa 345
Axunge 339
Axungia 339

B.

Page

Bacher's Pills 173
Bael 97
decoction of .. 97
liquid extract of .. 97
wine of 97
Baker's salt 8
Balm of Gilead fir .. 314
Balneum acidi nitro hydrochlorici 693
sulphuretum 592
Balsam (what is a) .. 627
Canada 313
capsules 631
copaiba 627
friars' 400
gurjun 628
Peru .. 396, 550
Powell's .. 445
Tolu 397
Balsamodendron myrrha 782
Balsamum Peruvianum 396, 550
Tolutanum 397
Bang 418
Barbadoes aloes 153
Barilla 39
Barii chloridum .. 708
Barium, bromide of .. 624
chloride of .. 708
Bark 727
angostura 745
false .. 746
Arica 733
Bebeeru 784
Bogota 731
canella 721
Caribæan 734
cascarilla 722
cassia 563
cinchona 727
false .. 734
pale 727, 730
red 727, 730
yellow 727, 720
cinnamon 567
copalchi 723
coquetta 731
crown 730
cusparia 745
cuzco 733
elm 798
gray 730
Huanuco 731
Jesuits' 727
Loxa 730
mezereon 282
nux vomica .. 746
oak 139
orange 731
pale 727, 730
Pitaya 734
Piton 734
pomegranate-root 51
red 727, 730
silver 731
strychnos 746
willow 792
Winter's 722
false .. 722
yellow .. 727, 729
Barley 360
pearl 360
water 361
Barm 564
poultice 565
Barosma 295
Betulina .. 295
crenata .. 295

Page

Barosma crenulata .. 295
serratifolia .. 295
Barytæ murias 708
Barytin 605
Basilicon ointment .. 593
Bassorin 338, 369, 372
Baths 805
of nitromuriatic acid 693
sulphur vapour .. 600
sulphuretted .. 592
Bearberry leaves .. 143
Beaume de vie .. 155, 156
Beaver 66
Beberia 784
sulphate of .. 784
Bebeeru bark 784
Bee 187, 348
Beer yeast 564
Bees'-wax 348
bleached .. 348
Beetle, blistering .. 297
Belæ fructus 97
extractum liquidum 98
Belladonna 408
Belladonnæ folia .. 408
radix .. 409
Belladonnine 409
Belloc's charcoal .. 348
Benjamin, flowers of .. 394
Benzimide . .. 489
Benzoate of ammonia .. 615
Benzoated lard 340
Benzoic acid 394
Benzoinum 398
Benzol 824
Benzoyle, hydride of .. 406
Benzoin 398
Bergamotæ oleum .. 834
Betel nut 99
Bicarbonates, *see* Bicarbonas
Bicarbonas ammoniæ .. 7
magnesiæ .. 24
potassæ .. 29
sodæ .. 35
trochisci 37
Bichromate of potash .. 257
Bindweed, Mexican .. 178
Biscuits of Jalap .. 181
of scammony .. 210
Bismuthi carbonas .. 711
et ammoniæ citras
liquor .. 715
nitras .. 712
subnitras .. 712
Bismuthum 710
album .. 712
purificatum 710
Bitter almond 341
cucumber 166
orange peel .. 705
purging salt .. 182
sweet 278
waters 818
Bittern 183
Black antimony .. 273
draught 213
drop 447
flux 195
ginger 611
mercurial lotion .. 655
mustard 324, 389, 525
oxide of manganese 833
pepper 584
salts 33
wash 655
Blancard's pills 768
Bleaching powder .. 551
Blistering beetle .. 297
cloth 382
liquid . 381

	Page
Blistering paper ..	380
Blisters, flying	379
Blue line, Burton's ..	135
litmus paper ..	883
pill 174,	641
Prussian	108
Turnbull's	108
verdigris .. 252,	838
vitriol 104, 254, 320,	745
Bone ash	835
black	825
Bonjean's ergotine ..	106
Bonplandia trifoliata ..	745
Books containing plates of officinal plants ..	xix
Boracic acid	825
Borax 142, 313,	336
calcined	142
glass of	142
glycerine of ..	143
honey	143
Bostaurus	832
Bothriocephalus latus ..	43, 44
Bougie, caustic	246
Box, common	144
Brandish's alkaline solution	29
Brandy	536
mixture	540
Brayera anthelmintica ..	47
Bread, crumb of	834
Bremser's vermifuge ..	57
Brimstone	223
vegetable ..	833
Broad leaved elm ..	798
Brodie's liniment ..	376
Bromide of ammonium	617
of barium ..	624
of calcium ..	624
of iron	758
of mercury ..	624
of potassium ..	681
Bromine	623
disinfecting fluid of	624
Bromum	623
Broom tops	311
Brown citrine ointment	649
Brucea antidysenterica	746
Brucia	670
Bryonia epigæa	720
Buckthorn berries ..	197
juice ..	197
Bucco	295
Buchu folia	295
Buckthorn juice ..	197
syrup, ..	198
Burgundy pitch ..	586
prepared	586
Burnett's solution ..	264
Burnt alum (dried alum)	96
Burton's blue line ..	135
Butter, cacao	834
of antimony ..	241
of zinc	262
Butyrate of zinc ..	78
Buxus semper virens ..	144

C.

	Page
Cabbage-rose petals ..	837
Cacao butter	834
Cachalot	350
Cadmii iodidum	624
sulphas	626
Cadmium	625
Cajuput oil	550
Calabar bean	677
Calabar gelatine ..	679
paper	679
Calamine	146
cerate of ..	147
ointment ..	147
Calamus aromaticus ..	538
Calandula arvensis ..	329
Calcareous springs ..	820
Calcii chloridum ..	717
Calcium, bromide of ..	624
Calcined borax	142
magnesia ..	19
Calcis aqua	9
carbonas præcipitata	14
chloratæ liquor ..	553
hydras	825
liquor	9
saccharatus	10
murias	717
phosphas	718
Calendula arvensis ..	329
Calmative lotion ..	520
Calmatives	475
Calomel 175,	655
ointment ..	656
pills of, compound 275,	656
sublimed ..	175
vegetable ..	190
Calumbæ radix ..	719
Calumbin	720
Calx 10,	825
chlorata	551
Cambogia .. 158,	296
Siamensis ..	158
Zeylanica ..	159
Camphor	554
julep	557
liniment ..	557
compound	377
mixture ..	557
ointment	558
spirit of ..	557
water	557
Camphora officinarum ..	554
Camphorated acetic acid	530
liniment	531
oil ..	557
spirit ..	557
tincture of opium ..	444
Canada balsam	313
Canarium commune ..	575
Candle, Colles	657
mercurial ..	657
Cane sugar .. 365,	537
Canella alba	721
Canellæ albæ cortex ..	721
Canellin	722
Canna	346
coccinea	346
edulis	346
Cannabin	418
Cannabis Indica ..	417
sativa	417
Cantharidal collodium ..	382
ether ..	382
Cantharides .. 297,	378
Cantharidine	297
Cantharis vesicatoria ..	297
Caphopicrite	200
Capnomor	102
Capsici fructus	385
Capsicin	383
Capsicum .. 383,	558
annuum ..	383
fastigiatum ..	383
Caput mortuum	114
Capsules, balsam ..	631
poppy	427
Capsules, Savaresse's ..	631
Caraway seeds	560
Carbo animalis	825
purificatus	826
ligni	347
Carbolic acid 67,	87
Carbonas ammoniæ .. 7,	543
bismuthi ..	711
calcis præcipitata	14
cupri	253
ferri	773
saccharata	759
lithiæ	15
magnesia .. 22,	182
levis	25
plumbi ..	133
potassæ ..	32
e tartari crystallis	33
sodæ	38
exsiccata	39
zinci	146
Carbonates, *see* Carbonas	
Carbonic acid	476
Cardamoms	559
Cardamomum	559
Caribæan bark	734
Carmine	827
Carolina pink	60
Carrageheen jelly ..	727
moss ..	726
Carrara water	13
Carron oil	364
Carthamus tinctorius ..	329
Carui aqua	561
essentia	561
fructus	560
oleum	561
Carum carui	560
Caryophillin	562
Caryophyllum	561
Caryophyllus aromaticus	561
Cascarilla	722
Cascarillæ cortex ..	722
Cascarilleros	729
Cascarillin	723
Cassava bread	371
Cassia bark	563
buds	563
elongata	210
fistula	160
lanceolata ..	210
obovata	210
oil	563
purging	160
præparata ..	161
pulp	160
senna	210
Castor	66
fiber	66
North American	66
Russian ..	66
oil	203
American ..	204
cold drawn ..	203
draught of, Righini	205
Macnamara	205
East Indian ..	204
emulsion of ..	205
North American	204
purgative emulsion	205
tincture of ..	205
West Indian ..	204
Castoreum	66
Castorine	67
Cataplasma aluminis ..	96
carbonis ..	348
conii	511
fermenti ..	565
lini	363

	Page
Cataplasma rubefaciens	586
sinapis ..	389
sodæ chloratæ	597
Catechine	99
Catechu, black	98
brown	99
in cubes ..	99
lozenges ..	101
nigrum ..	98
pale	98
palm	99
Catechuic acid	99
Cathartin .. 197,	211
Cathartic enema ..	184
pills	177
Cathartics	150
Catheretics	229
Caustic arsenical ..	251
bougie ..	246
Filhos' ..	260
lunar .. 243,	698
of Recamier ..	622
of Rivallie ..	237
Vienna ..	260
potash ..	257
soda	261
water of potash	26
Caustics	229
Cauterants	229
Cayenne lozenges ..	559
pepper 383,	558
Cazenave's arsenical paste	251
Cellulose	358
Centaurium	723
Centaury	723
Cephaelis ipecacuanha	320
Cera	348
alba	348
flava	348
Cerasus lauro-cerasus	517
Cerate, Galen's ..	343
Gowland's ..	136
Neligan's ..	343
Turner's ..	147
Ceratum cantharidis ..	382
lauro-cerasi ..	343
resinæ ..	593
sabinæ ..	388
Cerevisiæ fermentum ..	564
Cerii nitras	493
oxalas .. 493,	826
Cerium	493
Cerite	493
Cerotic acid	349
Cerussa	133
Cetaceum	350
Cetine	350
Cetraria	724
Cetraria Islandica ..	724
Cetrarin	724
Cevadic acid	55
Cevadilla 54,	594
Chalk 12,	103
mixture	14
powder aromatic	14
powder, with opium	104
precipitated ..	14
prepared	12
with mercury 177,	641
Chalybeate mineral waters	812
plaster ..	774
Chamomelum	696
Chamomile flowers ..	696
Charcoal, animal ..	825
purified	826
Belloc's ..	348
poultice ..	348
wood	347
Charta epispastica ..	380
vesicatoria ..	382

	Page
Chelsea pensioner ..	281
Chenopodium	39
Cherry-laurel	517
cerate ..	343
leaves ..	517
water ..	518
Chian turpentine ..	315
Chili vinegar	559
Chillies	383
Chimaphila umbellata ..	307
China loxa	730
regia	729
rubra	727
Chirata	725
Chiretta	725
Chloral	494
Chlorate of potash ..	470
Chloric ether	506
Chlorides, *see required head*	
Chlorimetry	552
Chlorinated lime ..	551
solution of..	553
inhalation of	554
soda ..	596
solution of	596
Chlorine solution ..	565
inhalation of	554
Chlori liquor	565
Chloro-amidyde of mercury	644
Chlorodyne	507
Chloroform	493
gelatinized ..	507
Chloroformyle	494
Chlorothalle	724
Chondrus crispus ..	726
Christmas rose	173
Chrysophanic acid ..	200
Chrysophyllum glycyphlœum	129
Churrus	418
Cimacifuga racemosa ..	613
Cimacifugin	614
Cinchona	727
alkaloids ..	732
table of	733
calisaya 727,	729
chaharguera ..	727
cinerea	731
condaminea ..	727
coronæ	730
crispa	727
erythroderma ..	730
flava .. 727,	729
lancifolia ..	728
micrantha ..	731
nitida	730
officinalis ..	728
ovata	738
pallida 727,	730
pitayo	720
rubra	727
siccirubra 727,	730
Cinchonia	732
Cinchonic acid	732
red	732
yellow ..	732
Cinchonicia	733
Cinchonidia	732
Cinchotin	732
Cinnabar	656
Cinnameine	396
Cinnamic acid .. 396, 406,	568
Cinnamomi cortex ..	567
Cinnamomic acid ..	396
Cinnamomum aromaticum	563
cassia	563
zeylanicum	567
Cinnamon bark	567
oil	569
water ..	568

	Page
Cinnamon, wild	721
Cissampelina	304
Cissampelos pareira ..	303
Citras ammoniæ ..	269
et bismuthi	715
et ferri ..	761
ferri et quiniæ ..	765
lithiæ	18
potassæ	283
Citrates, *see* Citras	
Citrene	467
Citric acid	460
saturating powers of	462
Citrine ointment ..	649
milder	650
Citro-tartrate of soda ..	37
Citrullus colocynthis ..	166
Citrus aurantium ..	466
Citrus bergamotæ ..	834
bigaradia ..	705
limetta .. 460,	834
limonum	467
medica	467
Citrylene	467
Claret	609
Clarified honey	187
Classification of plants, table of	899
Clavelli cinnamomi ..	563
Claviceps purpurea ..	330
Clay ironstone	748
Cloves	562
Club-moss	833
Cocci cactus	827
Cocculus Indicus ..	569
menispermum	569
palmatus ..	719
platiphylla ..	393
Coccus cacti	827
Cochineal	827
Cochinillin	827
Cochlearia armoracia ..	526
Codeia	441
Cod-liver oil	666
dragees ..	670
Coffinites	401
Cohosh	613
Colchiceine	163
Colchici cormus ..	161
semina	161
Colchicia	163
Colchicum autumnale ..	161
wine ..	166
Colcothar	114
Cold cream	343
Colles' candle	657
Colic, lead	134
Collodion	359
Collodium	359
cantharidale	382
flexile ..	359
vesicans ..	382
Colloid, styptic	121
Colocynth	166
Mogadore ..	167
Colocynthidis pulpa ..	166
Colocynthin	167
Colophony	592
Colouring agents ..	824
Colutea arborescens ..	212
Common frankincense	602
salt	597
Condensation	91
Condy's disinfecting fluid	589
ozonised water	590
Conein	441
Confectio amygdalæ ..	342
aromatica ..	14
cassiæ ..	161
catechu ..	101

Page

Confectio piperis nigri .. 585
rosæ caninæ .. 474
gallicæ .. 141
opii 442
rutæ 72
scammonii .. 209
sennæ .. 213
sulphuris .. 225
terebinthinæ .. 62
Confection of hips .. 474
Confection, *see* Confectio
Conia 508
inhalation of .. 512
Conicin 508
Conii folia 507
fructus 507
Conium maculatum .. 507
Conserva amygdalarum 342
Constringents 83
Contents, table of .. xxvii
Contra-stimulants .. 475
Convolvulus jalapa .. 178
scammonia 206
Copahine mège 632
ferrée .. 632
Copaiba 627
Copaifera multijuga .. 627
Copaiva 627
solidified .. 631
Copaivic acid 627
Copalchi bark 723
Copper 828
with alum .. 254
ammoniated .. 743
ammonio-sulphate of 743
solution of 744
carbonate of .. 253
foil 828
impure diacetate of 252
nitrate 253
subacetate of .. 252
sulphate of
104, 254, 320, 745
anhydrous 839
Copperas 113
Coriander fruit 570
seed 570
Coriandri fructus .. 570
Coriandrum sativum .. 570
Coriaria myrtifolia .. 212
Corm, colchicum .. 161
Corn poppy 455
Corroborants 689
Corrosive sublimate .. 651
Cotton 357
gun 357
wool 357
Cotyledon umbilicus .. 67
Counter-irritants .. 375
Countess' powder .. 727
Cousso 47
Cow 832
Cowhage 54
Cowitch 54
Crampton's powders .. 634
Cream of tartar 195, 305
whey .. 305
cold 343
Creasote .. 101, 512
inhalation of .. 103
Creasotum .. 101, 512
Creta .. 12, 105, 827
præparata .. 12
Cretæ mistura 14
Crocus 328
sativus 328
Croton eluteria 722
oil .. 168, 384
pseudo-china .. 723
seeds 168

Page

Croton tiglium 168
Crotonic acid 169
Crown bark 730
Crude tartar 195
Crumb of bread .. 834
Crystals of tartar .. 195
Cubeba 632
officinalis .. 632
Cubebin 633
Cubebs 632
Cucumber 350
bitter .. 166
pomade .. 351
wild or squirting 171
Cucumis colocynthis 166
sativus .. 350
Cucurbita pepo .. 46
Cuprum, *see* Copper
Curcuma longa 849
Curcumin 850
Cure, the king's .. 307
Currants 373
Cusparia bark 745
cortex .. 745
Cusparin 745
Cusso 47
Cuzco bark 733
Cuzconia 732
Cyanides, *see required head*
Cycas circinalis .. 368
revoluta 368
Cynanchum arghel .. 210
Cynips gallæ tinctoriæ 116
Cytisin 549
Cytisus scoparius .. 312

D.

Dandelion 796
Daphne laureola .. 282
mezereum .. 282
Daphnin 282
Datura alba 457
fastuosa .. 457
ferox 457
stramonium .. 455
tatula 457
Daturia 456
Deadly nightshade .. 408
Decoction of sweet woods 288
woods .. 282
Decoctions, *see* Decoctum.
Decoctum actææ .. 614
aloes compositum 156
belæ .. 97
cetrariæ .. 725
chimaphilæ 308
cinchonæ flavæ 738
colocynthidis 168
fuliginis .. 68
granati radicis 52
guaiaci .. 281
hæmatoxyli 124
hordei .. 361
lichenis Islandici 725
mezerei .. 283
papaveris .. 428
pareiræ .. 304
pyrolæ .. 308
quercus .. 140
sarsaparillæ 288
compositum 288
sarsæ .. 288
compositum 288
scoparii .. 312
taraxaci .. 797

Page

Decoctum ulmi 798
Delphinia 599
Delphinium staphisagria 599
Demulcents 337
Deodorisers 553
Derivatives .. 375, 590
Dessicants 83
De Valangin's mineral solution 704
Devergie's arsenical solution 704
Devil's apple 455
Dextrine 344
Diacetate of copper .. 252
of lead .. 135
Diachylon plaster .. 138
Diaphoretic mixture .. 269
Diaphoretics 266
Diapnoics 266
Digitalin .. 299, 513
granules of .. 517
Digitalinum .. 299, 513
Digitalis folia 299
purpurea .. 299
Dill fruit 546
oil 546
seed 546
water 546
Dinneford's magnesia .. 24
Dinner pills .. 157, 578
Diosma, *see* Barosma
Diosmin 296
Diplolepis gallæ tinctorum 116
Disinfectants 553
Disinfecting fluids 553, 590, 624
Distillatio per descensum 587
Distilled water 801
Diuretic potion, Swediaur 295
Diuretics 291
Dog-rose 473
Dolomite 182
Donovan's solution of hydriodate of arsenic and mercury 619
Dorema ammoniacum .. 541
Aucheri .. 541
Dover's powder 284
Dragées, cod liver oil .. 670
copaiva .. 632
Drastics 150
Dried alum 96
carbonate of soda 41
sulphate of iron .. 115
Drying oil .. 204, 362
Drymis winteri 722
Dryabalanops camphora 554
Dubois' arsenical paste 251
Dulcamara 278
Duncan's extract of senna 214
Dupuytren's arsenical powder 214
Dwale, common 409
Dzondi's pills 654

E.

Earthy springs 820
Eau médicinale 164
Ecbalii fructus 171
Ecbalium agreste .. 171
officinarum .. 171
Eczema mercuriale .. 638
Effervescing citro-tartrate of soda .. 37
powders 462, 466
solution of lithia .. 18

Page

Effervescing solution of potash .. 31
solution of soda .. 38
water of potash .. 31
water of soda 38
Eggs 365
albumen of .. 365
white of .. 365
yolk of 365
Elaine 340
Elaiodic acid 204
Elaterin 172
solution of .. 172
Elaterium 171
memordica .. 171
Elder flowers 370
Electricity 571
Electuarium piperis .. 585
Electuarium, *see* Confection
Elm bark 798
Elettaria cardamomum 559
Elixir paregoric .. 444
of vitriol 93
salutis 214
Elm bark 798
Embrocation, Roche's .. 390
Emeta 321
Emetics 317
Emetic tartar, 275, 319, 377, 395, 492
wine of .. 277
ointment of 378
Emetina 321
Emmenagogues 327
Emollients 337
Emplastrum adhærens 138
adhæsivum 138
ammoniaci cum hydrargyro 642
belladonnæ 413
calefaciens 380
cantharidis 381
compositum 382
cerati saponis 137
conii .. 512
crotonis olei 384
ferri .. 774
galbani .. 69
hydrargyri 642
lithargyri 138
cum resina 138
opii .. 443
picis .. 586
plumbi .. 138
iodidi 681
resinæ .. 138
roborans .. 774
saponis .. 138
Emulsion of castor oil 205
Endosmosis 292
Enema of aloes 156
of assafœtida .. 65
cathartic .. 184
of cevadilla .. 56
of colocynth .. 168
fœtid 65
of opium .. 443
of sulphate of magnesia 184
of tobacco .. 523
of turpentine .. 62
Epispastics 375
Epsom salts 182
Equivalent weights and symbols xx
Erethism, mercurial .. 637
Ergot of rye 330
Ergota 330

Page

Ergotin 106, 331, 334
styptic 107
Ergotina 106, 331, 334
Ergotætia abortifaciens 330
Ergotism 333
Erythræa centaurium .. 723
Erythroretine 200
Escharotics 229
Essence of aniseed .. 548
of caraway .. 561
of fennel .. 576
of ginger .. 612
of peppermint 579
Ether spray 534
Ether, *see* Æther
Ethereal extract of mezereon 386
tincture of lobelia 402
Ethyl 532
oxide of 532
acetate of .. 531
hydrated .. 538
Eucalyptus resinifera .. 124
Eugenia pimenta .. 583
Euphorbia antiquorum 385
canariensis .. 385
officinarum .. 385
Euphorbium 384
Eupion 102
Evacuants 150
Everitt's salt 477
Excitants 529
Exogonium purga .. 178
Exosmosis 292
Expectorants 392
Extract, Goulard's .. 135
Extracts, *see* Extractum.
Extractum aconiti .. 485
aloes barbadensis 156
aloes Socotrinæ 157
anthemidis 697
belæ liquidum 98
belladonnæ 413
calumbæ .. 721
cannabis Indicæ 420
chamæmeli 697
cinchonæ flavæ liquidum 638
colchici .. 165
aceticum 165
colocynthidis compositum .. 168
conii .. 511
elaterii .. 171
ergotæ liquidum 333
filicis liquidum 51
fuliginis .. 68
gentianæ .. 781
glycyrrhizæ 356
hæmatoxyli 124
hyoscyami .. 423
jalapæ .. 180
krameriæ .. 127
lactucæ .. 425
laricis .. 601
lupuli .. 427
mezerei æthereum 386
nucis vomicæ 673
opii 443
liquidum 443
papaveris .. 428
pareiræ .. 304
liquidum 505
physostigmatis 679
punicis granati 52
quassiæ .. 791
rhataniæ .. 127
rhei 201
sabadillæ .. 594

Page

Extractum sarsaparillæ fluidum 288
sarsæ liquidum 288
saturni .. 135
sennæ fluidum 214
stramonii .. 457
styracis .. 405
taraxaci .. 797
uvæ ursi .. 144

F.

False angostura bark .. 746
calumba 720
cinchona bark .. 734
winter's bark .. 722
Farina tritici 352
lini 362
Fat 339, 370
Febrifuges 690
Fel bovinum purificatum 747
Fennel fruit 576
seed 576
Fer reduit 752
Ferment 537
Fermentation, vinous .. 537
Fermentum cerevisiæ .. 564
Fern, male-shield .. 49
Ferri pulvis 752
et ammonio citras 761
Ferrocyanide of potash 836
Ferruginous pills .. 771
Ferrugo 772
Ferrum redactum .. 752
Ferrum, *see* Iron.
Ferula assafœtida .. 64
erubescens .. 69
orientalis .. 541
Persica 64
Fetid spirit of ammonia 66
Ficus carica 352
Figs 352
Portuguese 353
Turkey 353
Filhos, caustic 260
Filix mas 49
Flax, common 361
Fleming's tincture of aconite 486
Flies, Spanish 297
Flour, wheaten 352
of mustard 324, 389, 595
Flowers of Benjamin .. 394
of lead 136
of sulphur .. 223
of zinc 147
Fluid extract of senna .. 214
magnesia 24
Flux, black 195
Fly paper 796
Flying blisters 379
Fœniculi fructus .. 576
Fœniculum dulce .. 576
vulgare .. 576
Foliated earth of tartar 191
Formic acid 494
Formica rufa 494
Formulæ 872
Formyle 494
terchloride of .. 493
Fousel oil 76
Fowler's solution .. 703
Foxglove, purple .. 299
Frankincense 602
Frank's powder of Irish moss 727
specific solution of copaiba .. 632

Page
Fraseri walteri 720
Fraxinus ornus 185
rotundifolia .. 185
French rose 140
vinegar 84, 460
wadding .. 357
yellow 356
Friar's balsam 400
Frere Come's arsenical paste 251
Fructose 537
Fruit sugar 537
Fucus vesiculosus .. 663
Fuligo ligni 68
Fumigations, mercurial 640
Fusel oil 76

G.

Gaduine 667
Gadus brosma 666
callarias .. 666
lota 666
morrhua 666
Galbanum 69
Galipea cusparia .. 745
Gall nuts 116
Galla 116
Gallic acid .. 117, 120
Galls 116
Gallus bankiva 365
domesticus .. 365
Galvanic test 653
Galvanism 571
Gambir 98
Gamboge .. 158, 296
cake 158
Ceylon 159
lump 158
pipe 158
Siam 158
Gambogic acid 158
Garcinia morella .. 158
Garlic 45
syrup of 46
Gelatine 831
capsules of copaiba 631
tannate of .. 117
General stimulants .. 529
Geneva .. 303, 538
Gentian 779
Gentiana lutea 779
Gentianæ radix .. 779
Gentianin 780
Gentianite 780
Gentisin 780
Geoghegan's salt .. 480
test .. 480
Gin 538
Ginger 610
Glacial acetic acid .. 230
Glass of borax 142
Glauber's salts 218
Glucose .. 344, 537
Glycerine 353
Glycerinum 353
acidi carbolici 88
gallici 123
tannici 120
amyli .. 345
boracis .. 143
Glycyrrhiza glabra .. 355
Glycyrrhizæ radix .. 355
Glycirrhizine 356
Glycocoll 395
Gold, *see* Aurum.
Golden sulphuret of antimony 274
Gondret's blistering ointment 377
Gossypium 357
herbaceum .. 357
Goulard's cerate .. 136
extract .. 135
vegeto-mineral water .. 136
Grana tiglii 169
Granati radicis cortex .. 51
radix 51
Granatum 51
Granulated sulphate of iron 115
tin 849
zinc .. 850
Granules of digitaline .. 517
hydrocotyle 658
Grape cure 373
Grape sugar .. 366, 537
Grapes 373
diseased, poisoning from 374
Gray bark 731
Green-heart tree .. 784
hellebore root .. 523
iron mixture .. 760
iodide of mercury 647
Scheele's 249
verdigris 252
vitriol 113
Gregory's powder .. 202
Grey powder 177
Griffith's tonic mixture 760
Groats 346
Grotto del cane 477
Gruel 346
Guaiaci lignum 279
rasura 279
resina 279
scobs 279
Guaiacic acid 280
Guaiacum officinale .. 279
wood .. 279
Guaiacyle 280
Gum acacia 338
ammoniac 541
Arabic 338
Barbary 338
Cape 338
East India .. 338
Elemi 575
picked 338
Senegal 338
tragacanth .. 371
Turkey 338
Gun cotton 357
Gunjah 418
Gurjun balsam 628

H.

Hachish 418
Hæmatin 123
Hæmatoxyli lignum .. 123
Hæmatoxylin 123
Hæmatoxylum 123
Campeachianum 123
Hæmostatic solution, Pagliari 96
Hard soap 838
Hartshorn and oil .. 377
Hatschich 418
Heat, latent 91
Heavy oil of wine .. 532
Heberden's ink 752
Hebradendron cambogioides 158
Helianthus annuus .. 387
Hellebore, black .. 173
green .. 523
white .. 604
Helleborous niger .. 173
Helonias officinalis .. 55
Hemidesmi radix .. 359
Hemidesmus Indicus .. 359
Hemidesmic acid .. 359
Hemlock 507
Hemostatic solution .. 96
Hemp, Indian 417
Henbane 421
Hepar sulphuris .. 590
Hepatic aloes 153
Hesperidin 467
Hiera picra 155
Hippo, *see* Ipecacuanha.
Hippurates 395
Hippuric acid 395
Hips 473
confection of .. 474
Hirudo 828
Hive syrup 324
Hoffman's anodyne .. 536
Hog's lard 339
Hollands 538
Honey, clarified 187
Narbonne .. 187
See Mel.
Hop 425
Hordein 361
Hordeum decorticatum 360
distichon .. 360
Horehound 402
candied .. 403
tea 403
Horse-radish .. 526, 548
Huanaco bark 731
Huile de cade 588
Hume's test 249
Humulus lupulus .. 425
Hundred-leaved rose .. 837
Husson's eau medicinale 164
Huxham's tincture of bark 738
Hydragogues 150
Hydrargyrum, *see* Mercury.
Hydrate of potash .. 258
of soda 261
Hydrated peroxide of iron 772
Hydride of benzoyle .. 406
Hydriodate, *see required base.*
Hydrochlorates, *see required base.*
Hydrochloric acid commercial 234
dilute 690
pure 234
Hydrocotyle Asiatica .. 658
Hydrocyanic acid, absolute 478
dilute .. 477
inhalation of 850
vegetable 489
Hydrogenii peroxydum 658
Hydrogen, sulphuretted 839
Hydrosulphuret of ammonia 543
Hydrosulphuric acid .. 839
Hyoscyami folia 421
Hyoscyamia 422
Hyoscyamus 421
niger .. 421
Hypersthenics 529
Hypnotics 407
Hypochlorite of lime .. 551
Hypophosphites .. 788, 790
syrup of, Parrish's 790
Hyposulphite of soda .. 214

I.

	Page
Ice	805
Iceland moss	724
and bark, jelly of	739
Icica icicariba	575
Icthyocolla	830
Ichthyoglycine	667
Idiosyncracy	859
Igasuria	671
Igasuric acid	670
Illicium anisatum ..	547
Imperial	305
Incitants	529
Indian aloes	153
hemp	417
poke	523
sarsaparilla ..	359
tobacco	400
Indifferent thermal springs	821
Indigo .. 659,	830
pills of, compound	660
sulphate of, solution	660
Indigofera anil	659
argentea ..	659
disperma ..	659
tinctoria ..	659
Indigotin	660
Infusum absinthii ..	45
angosturæ ..	747
anthemidis ..	697
arnicæ	549
aurantii ..	707
bucco	296
buchu	296
calumbæ ..	721
caryophylli ..	562
cascarillæ ..	723
catechu ..	100
centaurii ..	724
chiratæ ..	726
cinchonæ flavæ	738
cuspariæ ..	747
cusso	49
digitalis ..	300
dulcamaræ ..	279
ergotæ ..	334
gentianæ compositum	781
gentianæ compositum, 1864 ..	781
juniperi ..	303
krameriæ ..	127
lini	363
lupuli ..	427
maticæ ..	129
menthæ viridis	581
polygalæ ..	404
quassiæ ..	791
rhataniæ ..	127
rhei	202
rosæ acidum ..	141
rutæ	72
sabinæ ..	335
senegæ ..	404
sennæ	213
serpentariæ ..	595
simirubæ ..	793
spigeliæ ..	60
sumbul ..	73
uvæ-ursi ..	144
valerianæ ..	76
Infusion, *see* Infusum	
Inhalation of chlorine ..	554
of conia ..	512
of creasote ..	103
of iodine ..	666
of prussic acid	850
Inspissated ox gall ..	747
Intoxication, saturnine	134
Inulin	724
Iodate of potash, solution of	841
Iodide of cyanogen ..	662
Iodides, *see required head.*	
Iodine	660
Iodism	663
Iodo-chloride of mercury	648
Iodum	660
Ioduretted mineral waters	666
Ipecacuanha 320, 385,	400
Ipecacuanhæ pulvis compositus	284
Ipecacuanhic acid ..	321
Ipomœa purga	178
Irish moss	726
Iron	748
acetate of	754
tincture of	754
ammonio-chloride of	755
tincture of	756
ammonio-citrate of	761
wine of	763
ammonio-tartrate of	764
and aloes, pills of	115
and magnesia, citrate of	763
and manganese, saccharated carbonate of	761
and quinia, citrate of	765
aromatic mixture of	752
arseniate of ..	756
black oxide of ..	770
bromide of ..	758
pills of ..	759
carbonate of ..	773
pill ..	761
saccharated	759
characters of ..	748
citrate of, and of ammonia	761
citrate of and of Quinia	765
compound mixture of	760
filings	751
hydrated peroxide of	772
iodide of	766
pills of ..	768
syrup of ..	769
lactate of	769
lozenges of	769
syrup of	769
magnetic ore of ..	748
magnetic oxide of	770
malleable	748
mixture of aromatic	752
compound	760
muriated tincture of	110
nails	748
perchloride of, solution	109
strong	107
tincture of	110
percyanide of ..	774
pernitrate of, solution	110
peroxide of hydrated	722
moist	771
persulphate of, solution	111
phosphate of ..	774
syrup of	776
Parrish's	776
pills, ferruginous	771
plaster of	774
potassio-tartrate of	777
powder of	752
protosulphate of 113,	777
red oxide of ..	772
reduced	752
lozenges of	754
sesquichloride, tincture of	110
sesquioxide of ..	772
hydrated	772
Iron, sesquioxide of, moist	771
sulphate of .. 113,	777
commercial	113
dried ..	115
granulated 115,	777
pills of ..	116
saccharated	116
sulphide of	839
sulphuret of ..	839
tanno-gallate of ..	117
tartarated	777
tartrate of	777
tincture of the acetate of	754
of the ammonio-chloride of	756
of the muriate of	110
valerianate of ..	80
wine of	752
Soubeiran's	779
wire	748
wrought	748
Isinglass	830
Issues 259,	388

J.

Jalap	178
biscuit	181
resin .. 179,	180
Jamaica sarsaparilla ..	285
James' powder	271
Jamestown weed ..	455
Janipha manihot ..	371
Jatamansi	72
Jateorrhiza columba ..	719
Jateorrhiza Miersii ..	719
Jaune royal	729
Jecoris aselli oleum ..	666
Jelly, carragheen ..	727
of bark and Iceland moss	739
Jervin	605
Jesuit's bark	727
Jordan almonds ..	341
Jozeau's copahine ..	631
Julep of camphor ..	557
Juniper, oil of .. 301,	302
Juniperus communis ..	301
oxycedrus ..	588
sabina ..	335

K.

Kamala	53
Kali water	31
Kelp .. 39,	661
Kentish's liniment ..	390
King's, the, cure ..	307
Kinic acid	732
Kino	124
African	124
Botany Bay ..	124
East Indian ..	124
Kinovic acid	732
Kousso	47
Krameria triandra ..	126
Krameriæ radix ..	126
Krameric acid ..	127
Kwoseine	48

L.

Page

Labarraque's disinfecting liquor 596
Lac 832
sulphuris 225
Lacmus, *see* Litmus
Lactine 367
Lactuca 424
Lactucarium 424
Lactucin 425
Lady, naked 161
Lady De Crespigny's pills 578
Webster's pills .. 578
Lana philosophica .. 147
Lapis infernalis .. 257
Lard 339
benzoated 340
prepared 339
Latent heat 91
Laudanum 445
Laurel water 518
Lauro-cerasi folia .. 517
aqua .. 518
Lauro-cerasus 517
Laurus sassafras .. 289
Lavandula vera .. 576
spica .. 577
Lavandulæ oleum .. 576
Lavender 576
drops 578
Laxatives 150
Lead, acetate of .. 130
mixture of 132
ointment of 133
carbonate of .. 133
ointment of 135
colic 134
diacetate of .. 135
ointment of 136
solution of 135
dilute 136
flowers of .. 137
fused protoxide of 137
iodide of .. 679
ointment of 680
plaster of 681
nitrate of 138
ointments of 135, 136, 680
oxide of 136
pills of, and opium 132
plaster 138
poisonous effects of 134
semivitreous oxide of 136
subacetate of .. 135
ointment of 136
solution of 135
solution of diluted 136
sugar of 130
suppositories of, compound 132
white 133
Leblanc's process .. 39
Ledoyen's fluid 139
Leeches 828
Leeching 829
Lemonade 469
Lemon-juice 467
artificial .. 469
saturating powers of 469
Lemon, oil of 467
peel 467
syrup of .. 469
wild 189
Lenitive electuary .. 213
Leopard's bane 548
Lepidolite 17
Lettuce 424
Lettuce opium 424
Lewah 430
Lichen Islandicus .. 724
Lichenic acid 724
Lichenin 724
Lichestearic acid .. 724
Liebert's remedy .. 139
Light magnesia .. 21
carbonate of 25
Ligni carbo 347
fuligo 68
Lignin 357
Lignum vitæ 279
Lime 10
bleaching salt of .. 551
carbonate of .. 12
precipitated 14
chlorinated .. 551
liquor of 553
vapour 554
hydrochlorate of .. 717
hypochlorite of .. 551
liniment 364
muriate of .. 717
phosphate of .. 718
quick 825
saccharated solution of 18
slaked 825
sulphate of .. 836
water 9
Limonis cortex 467
oleum 467
succus 467
Lini semina 361
farina 362
oleum 362
Liniment, anodyne .. 444
Brodie's .. 537
camphorated acetic .. 531
Carron .. 364
Kentish's .. 390
lime 364
mercurial .. 642
St. John Long's 391
Linimentum aconiti .. 486
æruginis .. 252
ammoniæ 377
belladonnæ 414
calcis .. 364
camphoræ 557
compositum 377
cantharidis 381
chloroformi 506
crotonis .. 384
hydrargyri 642
iodi .. 665
ipecacuanhæ 386
opii .. 444
potassii iodidi cum sapone 686
saponis 551
sinapis compositum .. 389
terebinthinæ 390
aceticum 390
Linseed 361
meal 362
oil 362
tea 363
Linum usitatissimum .. 361
Liquidambar officinale 405
Liquor ætherous oleosus 536
aluminis compositus 96
ammoniæ .. 5, 542
acetatis 267
arseniatis 615
citratis 269
fortior 3,241,376
ammonii sulphidi 543
Liquor antimonii chloridi 241
terchloridi 241
arsenicalis .. 703
Devergie .. 704
arsenici hydrochloricus 704
arsenici et hydrargyri hydriodatis 619
atropiæ 416
sulphatis 417
bismuthi et ammoniæ citratis .. 715
bismuthi "Schacht" 716
barii chloridi .. 710
calcii chloridi .. 718
calcis 9
chloratæ 553
saccharatus 10
chlori 565
chloroformi compositus 507
epispasticus .. 381
ferri perchloridi 109
fortior 107
ferri-pernitratis 110
ferri-persulphatis 111
hydrargyri bichloridi 654
hydrargyri nitratis acidus .. 256
hydrargyri perchloridi 654
iodi 665
kali 26
lithiæ effervescens 18
magnesiæ carbonatis 25
morphiæ acetatis 450
hydrochloratis 453
muriatis 453
opii sedativus Battley 444
Cooley 447
plumbi subacetatis 135
dilutus 136
potassæ 26
arsenitis 703
causticæ 26
effervescens 31
permanganatis .. 590
sodæ 34
arseniatis .. 796
chloratæ .. 596
effervescens 38
strychniæ .. 675
zinci chloridi .. 264
Liquorice 355
List of books referred to containing plates of officinal plants .. xix
List of substances added in the British Pharmacopœia, 1867 xxi
of substances with altered composition in the British Pharmacopœia, 1867 .. xxv
of substances with altered names in the British Pharmacopœia, 1867 xxiii
of substances omitted in the British Pharmacopœia, 1867 xxii
Litharge 136
plaster .. 138
Lithargyrum 136
Lithia water 18
Lithiæ carbonas .. 15
liquor effervescens 18
citras 18
sulphas .. 17

Page

Lithic acid 2
Lithium 16
Litmus 832
paper, blue .. 833
red .. 833
tincture 833
Lithontriptics 1
Liver of sulphur .. 590
Liverwort 724
Lobelein 401
Lobelia 400
inflata 400
Lobelina 401
Logwood 123
Lotio calmativa .. 520
hydragyri flava .. 654
nigra .. 655
Loxa bark 730
Lozenges of bismuth .. 715
of bicarbonate of
of soda .. 37
of catechu .. 101
of cayenne .. 559
chlorate of potash 849
ipecacuanha 323
lactate of iron 769
liquorice .. 357
morphia .. 454
and ipecacuanha .. 323
of opium .. 446
of reduced iron 754
of santonine .. 59
of tannic acid 120
of tartaric acid 466
Lugol's solutions .. 666
Lunar caustic 243
Lupulin 426
Lupulite 426
Lupulus 425
Lycopodium 838
clavatum .. 833
selago .. 833
Lytta vesicatoria .. 297

M.

Mace 581
Magistery of bismuth .. 712
Magnesia 19, 181
ammonio-sulphate of 840
and iron, citrate of 763
bicarbonate of .. 25
calcined 19
carbonate of .. 22, 182
light 25
solution of 25
fluid 25
light 21
Murray's .. 24
sulphate of .. 182
water of bicarbonate 25
White's saccharized 22
with mercury .. 178
Magnetic electricity .. 571
iron ore .. 748
oxide of iron .. 770
Male fern 49
Mandioc plant 371
Manganese, black oxide of 833
binoxide of 833
peroxide of 833
saccharated carbonate of iron and 761

Page

Manihot utilissima .. 371
Manna 185
cannellata .. 186
pinguis 186
Mannite 186
Maranta 363
arundinacea .. 363
Indica 363
Marble, white 834
Marigold 329
Marmor album 834
Marrubium vulgare .. 402
Marseilles vinegar .. 530
Marsh's test 249
Massicot 137
Masticatories 526
Mastich 578
Masticine 578
Maticæ folia 128
Maticine 128
Matico 128
Meadow saffron 161
Meal, linseed 362
Measures and weights of the British Pharmacopœia, tables of xv
of the metric system xv
Meconic acid 433
Meconin 433
Medicinal naphtha .. 520
pepsine .. 675
Medicines, administration of 852
Mel 187
Ægyptiacum .. 252
æruginis 252
boracis 143
depuratum 187
violæ 228
Melaleuca cajuputi .. 550
minor .. 550
Melampodium 173
Melisic acid 349
Meloe vesicatorius .. 297
Memordica elaterium .. 171
Menispermin 570
Menispermum cocculus 569
Mentha piperita .. 578
pulegium .. 580
viridis .. 580
Menthæ piperitæ oleum 578
Mercurial candle .. 657
cigarettes .. 657
diarrhœa .. 637
eczema .. 638
erethism .. 637
fumigation .. 640
lotion, black .. 654
yellow 655
pill .. 174, 641
salivation .. 636
soap 644
suppositories 642
tremor .. 635
Mercurialism .. 636
Mercury 634
acid nitrate of 256
ammoniated .. 644
ointment of 645
ammonio-chloride of 644
and ammoniac plaster .. 642
and arsenic, hydriodate of .. 619
bichloride of .. 651
biniodide of .. 645
bisulphuret of 656
black oxide of 650
bromide of .. 624

Page

Mercury, chloride of .. 516
mild 175, 655
corrosive sublimate of .. 651
pills of .. 654
muriate of .. 651
iodide of green 647
ointment of 648
iodide of, red 645
ointment of 647
iodo-chloride of 648
liniment of .. 642
nitric oxide of.. 254
ointment of .. 642
compound 643
of ammoniated 645
of nitrate of 649
milder 650
oxide of 650, 651
black .. 650
bin- .. 651
nitric .. 254
per- .. 651
red 254, 651
sub- .. 650
oxymuriate of 651
perchloride of.. 651
solution of 654
pernitrate of .. 256
pills of .. 174, 641
plaster of .. 642
purified .. 634
red sulphuret of 656
soap of 644
subchloride of 175, 655
compound pill of 275
ointment of 657
subiodide of .. 647
suboxide of .. 650
sulphate of .. 656
per .. 656
biper .. 656
sulphuret of .. 656
suppository of .. 642
white precipitate of 644
with chalk 177, 641
magnesia 178, 644
Methyl, oxide of .. 520
Methylated spirit 521, 540
Mexican bindweed .. 178
Mezerei cortex 282, 386, 527
Mezereon 282, 386, 527
ethereal extract of 386
Mica panis 834
Midges 388
Milk 832
ass's 832
bitch's 832
cow's 832
goat's 832
human 832
mare's 832
of sulphur 225
sugar of 367
Mindererus' spirit .. 267
Mineral solution De Valangin 704
ioduretted Lugol 666
Mineral Waters .. 807
Sulphurous waters .. 808
Aix la Chapelle 808
Baden .. 809
Aix les Bains .. 809
Harrowgate .. 810
Strathpeffer .. 811
Lisdoonvarna .. 811
Nenndorff .. 811
Chalybeate waters .. 812
Lisdoonvarna .. 813
Harrowgate .. 813

Page

MINERAL WATERS.
Chalybeate waters.
Tunbridge Wells 813
Sandrock .. 814
Spa .. 814
Schwalbach 814
Saline mineral waters 815
Alkaline mineral waters .. 815
Vichy .. 815
Carlsbad .. 816
Vals .. 816
Fachingen 817
Selters or Seltz 817
Marienbad 818
Aperient mineral waters .. 818
Pullna .. 818
Sedlitz .. 818
Kissengen 818
Leamington 819
Baden Baden 819
Wiesbaden 819
Homburg .. 819
Cheltenham 820
Calcareous or earthy springs .. 820
Wildungen 820
Leuk .. 820
Bath .. 821
Scarborough 821
Indifferent thermal springs .. 821
Pfaffers .. 822
Buxton .. 822
Mistura acidi nitro-hydrochlorici 693
ammoniaci .. 542
amygdalæ .. 342
antihectica .. 760
(*Neligan*) .. 87
camphoræ (*aqua*) 557
cum magnesia 557
creasoti .. 103
cretæ 14
diaphoretica .. 269
ferri aromatica 752
composita 760
gentianæ .. 781
guaiaci .. 281
hordei 361
monesiæ .. 130
terebinthinæ alcoholica .. 601
scammonii .. 209
sennæ composita 213
spiritus vini gallici 540
Mixture, *see* Mistura.
Mogadore colocynth .. 167
Moist peroxide of iron .. 771
Molasses 365
Momes 418
Momordica elaterium .. 171
Monesia 129
Monesin 129
Monkshood 483
Mori succus 470
Morphia 448
acetate of .. 449
and ipecacuanha lozenges .. 323
hydrochlorate of 450
lozenges of .. 454
muriate of .. 450
sulphate of .. 454
suppositories .. 453
Morrhuæ oleum .. 666
Morus nigra 470
Moschus 70
moschiferus .. 70

Page
Moss, carragheen .. 726
Iceland 724
Irish 726
Moxa 386
Dr. Osborne's .. 387
Mucilage 338, 339
of starch .. 345
of tragacanth 372
Mucilago acaciæ .. 339
amyli 345
gummi Arabici 339
tragacanthæ .. 372
Mucuna pruriens .. 54
Mulberry juice 470
Muriates, *see required head.*
Muriatic acid, *see* acidum hydrochloricum.
Murray's solution of magnesia 25
Muscovado 365
Musk 70
ox 70
rat 70
root 72
Mustard 324, 389
Mutton suet 370
Myristica 581
fragrans .. 581
officinalis .. 581
Myristicæ adeps .. 582
oleum .. 582
Myristicine 582
Myronic acid 325
Myrospermum 396
Myrosyne 325
Myroxylon Pereiræ .. 396
toluiferum .. 397
Myrrh 782
Myrrhin 783
Myrrhol 783
Myrtus pimenta .. 583

N.

Naked lady 161
Naphtha, medicinal .. 520
Narcein 433
Narcotics 407
Narcotina 441
Narbonne honey .. 187
Narthex assafœtida .. 64
Nauclea Gambir .. 98
Navelwort 67
Nectandra Rodiæi .. 784
Nectandræ cortex .. 784
Nephrodrium filix mas 49
Neutral tartrate of potash 193
Nicotiana tabacum .. 522
Nicotianin 522
Nicotina 522
Nightshade, deadly .. 408
woody .. 278
Nihil album 147
Nitrates, *see required head.*
Nitre 306, 472
sweet spirit of .. 292
whey .. 307, 473
Nitric acid 236
commercial .. 236
dilute .. 691
pure .. 236
solidified .. 237
Nitric ether, spirit of .. 292
Nitric oxide of mercury 254
Nitro-benzole 491

Page
Nitro-hydrochloric acid 238
Nitro-muriatic acid .. 238
dilute 692
Nitrous ethereal spirit 292
Nouffer's (Madame) vermifuge 50
Nutgalls 116
Nutmegs 581
Nux-vomica 670

O.

Oak bark 139
galls 116
Oat, common 345
Oatmeal 345
Oil æthereal 535
allspice 584
almonds 342
amber 389
anise 547
assafœtida 65
badiana 547
bergamot 834
bitter almonds, volatile 488
cajuput 550
camphorated .. 557
carron 364
caraway 561
cassia 563
castor .. 203
chamomile 697
cinnamon 569
cloves 562
cod-liver 666
copaiba .. 627, 632
coriander 571
croton .. 168, 384
cubebs 634
dill 546
ergot of rye .. 331
fennel 576
ethereal 535
filix mas 51
fusel 76
garlic 46
henbane 424
hyoscyamus .. 424
juniper 301
lavender 576
lemons 467
linseed 363
mace 582
male-shield fern .. 51
mustard 595
nutmeg, expressed 582
volatile .. 582
olive .. 188, 364
pennyroyal .. 580
peppermint 578
phosphorated .. 790
pimento 584
pitch 588
rosemary 593
rue 72, 834
sassafras .. 289, 290
savin 336
spearmint 580
star anise 547
theobroma 834
turpentine 61, 227, 314, 390, 600
valerian 74
vitriol 89
Oils, volatile 302

Page

Ointment, acetate of lead 133
aconitia .. 488
ammoniacal blistering .. 377
ammoniated mercury .. 645
ammonio-chloride of mercury .. 645
antimonial .. 378
atropia .. 416
basilicon .. 593
belladonna .. 414
biniodide of mercury .. 647
bromide of potassium .. 682
brown citrine 649
calamine .. 147
calomel .. 657
camphor .. 558
cantharides .. 382
carbonate of copper .. 253
carbonate of lead 135
carbonate of zinc 147
citrine .. 649
milder 650
cocculus Indicus 570
creasote .. 103
cucumber .. 351
digitalis .. 517
elder .. 370
elemi .. 575
euphorbium 385
foxglove .. 517
galls 117
and opium 117
gold 621
Gondret's .. 377
green iodide of mercury .. 648
hydriodate of potash .. 686
iodide of cadmium 626
of lead 680
of mercury, green 648
of mercury, red 647
of potassium 686
of sulphur 688
iodine, compound 665
iodochloride of mercury .. 648
mercurial .. 642
compound 643
mezereon .. 386
nitrate of mercury .. 649
milder 650
nitrate of silver 247
nitric oxide of mercury 255
opium .. 447
opium and galls 117
oxide of zinc 148
picrotoxin .. 570
mercury .. 642
green iodide of 648
iodo-chloride of .. 648
red iodide of 647
red oxide of mercury .. 217
red precipitate 255
resin .. 593
savin .. 388
simple .. 341
spermaceti .. 350

Page

Ointment, stavesacre .. 599
subacetate of copper .. 252
subacetate of lead .. 136
subchloride of mercury .. 657
sulphur .. 600
sulphurated potash .. 592
sulphuret of potassium 592
tar .. 587
tartarated antimony .. 378
tartar emetic 378
tobacco .. 523
turpentine .. 601
veratria .. 604
verdigris .. 252
white precipitate 645
zinc .. 148
Olea Europæa .. 188
Olefiant gas 532
Oleine 340
Oleum badianæ .. 547
cadinum .. 588
Oleum, *see* Oil.
Olivæ oleum .. 188, 364
Ophelia chirata .. 725
Opium 429
alkaloids .. 433
Constantinople .. 431
Egyptian .. 431
East Indian .. 431
Bengal 432
Garden Patna .. 432
Malwah 432
Persian 432
resin 433
Smyrna 431
Turkey 431
Opodeldoc 557
Opoidia 69
Opuntia cochinillefera .. 827
Orange 466
flowers, water of 705
juice 467
oil of 706
peel 705
wine 707
Orchis mascula 369
Ordeal bean 677
Osborne's moxas .. 387
Os ustum 835
Ovi vitellus 365
albumen 365
Ovum 365
Ox bones 834
Oxalate of ammonia .. 836
cerium 493, 826
Oxalic acid 462
purified .. 835
Oxalyle 463
Ox-bile 747
gall 747
Oxides, *see required head.*
Oxymel 87
scillæ 324
Oxyuris vermicularis .. 43

P.

Pagliari's solution . 96
Pale catechu 98
cinchona bark .. 727

Page

Palma Christi 202
Papaver rhœas 455
somniferum 427
Papaverina 441
Papaveris capsulæ .. 427
Paper, blistering .. 380
blue litmus .. 833
fly 796
red litmus .. 833
turmeric 850
Papier d'Albespeyre .. 383
Moure 796
Paraglin 286
Parallinic acid 286
Paramylene 490
Pararhodeoretin .. 181
Paregoric elixir .. 444
Scotch .. 446
Pareiræ radix 303
Paris, plaster of 836
Parrish's compound syrup of phosphates .. 776
Passulæ 373
Paste, London 261
Vienna 261
Pastes, arsenical .. 251
Pearl ashes 33
Pearl barley 360
Pearl sago 368
Pearson's solution .. 796
Pectorals 392
Pellitory of Spain .. 527
Pelosina 304
Pennyroyal 580
Pennyworth 658
Pepo cucurbita 46
Pepper, black 584
Cayenne 383, 558
cubeb 632
long 584
narrow leaved .. 128
red .. 383, 558
white 584
Peppermint 578
Pepsina 675
porci 676
Pepsine 675
Perchloride of gold .. 621
Permanganate of potash 588
Peroxide of hydrogen .. 658
Persesquinitrate of iron 110
Peru balsam .. 396, 550
Peruvian bark 727
Phaoretine 200
Pharmaceutical agents 824
Phenyle 490
Phenylanime 490
Philonium 442
Philosopher's wool .. 147
Phœnix farinifera .. 368
Phosphates, *see required head.*
Phosphoric acid, dilute 693
Phosphorus 786
Physeter macrocephalus 350
Physostigma venenosum 677
Physostigmatis faba .. 677
Phytocolla 409
Picamar 102
Picræna excelsa .. 790
Picrotoxin 569
Pierre divine 254
Pierlot's solution .. 80
Pills, Annesley's .. 322
Asiatic 702
Bacher's 173
blue .. 174, 641
cathartic . .. 177
compound calomel 275
copaiva 631
dinner .. 157, 578

Page

Pills, Dzondi's 654
ferruginous .. 771
indigo 660
mercurial 174
opium 444
oxide of gold .. 623
Plummer's .. 275
quinia 741
Rufus 202
Pills, *see* Pilula.
Pilula aloes Barbadensis 157
et assafœtidæ 66
et ferri .. 115
et myrrhæ 157
Socotrinæ .. 157
ante cibum 157, 578
Asiatica 702
assafœtida composita 66
calomelanos composita .. 275, 656
cambogiæ composita 160
cathartica composita 177
colocynthidis composita 168
colocynthidis composita et hyoscyami 168
conii composita .. 323
copaibæ 631
corrosivi sublimati 654
digitalis et scillæ 301
ferri bromidi .. 759
carbonatis .. 761
iodidi .. 768
sulphatis .. 116
galbani composita 66
hydrargyri .. 174
subchloridi composita 275
ipecacuanhæ cum scilla 323
opii 444
plumbi cum opio 132
quiniæ 741
rhei composita .. 202
saponis composita 444
scillæ composita 403
styracis composita 447
Pimenta 583
Pimento 583
Pimpinella anisum .. 547
Pine, cluster 61
loblolly 61
long-leaved .. 61
old field 61
swamp 61
Pinic acid 592
Pinus abies 586
balsamea .. 314
Pinus larix 601
palustris 61
pinaster 61
sylvestris 587, 602
tæda 61, 602
Piper angustifolium .. 128
caudatum .. 633
nigrum 584
Piper, *see Pepper.*
Piperin 585
Pipsissewa 307
Pistacia lentiscus .. 578
terebinthus .. 315
Pitaya bark 734
Pitch plaster 586
Pitch, *see* Pix.
Piton bark 734
Pix Burgundica 586
liquida 587
oleum 587
Plants, table of classification of 899

Page

Plaster, chalybeate .. 774
of Paris .. 836
of pitch .. 580
sticking .. 138
warm 380
Plaster, *see* Emplastrum.
Platinum, potassio bichloride of .. 27
black 836
foil .. 836
Plumbum, *see Lead.*
Plummer's pill .. 275, 656
Plums, dried 197
Plunket's, Miss, arsenical paste 251
Podophyllum peltatum 189
root .. 189
Podophylli radix .. 189
resina .. 190
Poke root 523
Polychroite 328
Polygala senega .. 403
Polygallic acid 404
Pomade of balsam of Peru 550
cucumber .. 351
Pomegranate-root bark 51
Poppy, corn .. . 455
heads 427
red 455
trash 430
white 427
Porphyroxin 433
Porridge 346
Port wine 609
Posological table .. 861
Potash, *see* Potassæ.
Potashes 32
Potassa 257
caustica 258
cum calce 260
fusa 257
sulphurata .. 590
Potassæ acetas .. 191, 305
aqua 26
effervescens 31
arsenitis liquor 703
bicarbonas .. 29
bichromas .. 257
bitartras .. 195
carbonas .. 32
e tartari crystallis 33
impura .. 32
pura 33
causticæ aqua 26
chloras 470
citras 283
et antimonii tartras 275, 319, 377, 395, 492
et ferri tartras 777
et sodæ tartras 221
hydras .. 257
hydriodas .. 683
hydrocyanas .. 519
liquor 26
effervescens 31
nitras 306, 472
permanganas .. 588
prussias flava .. 836
sulphas .. 192
sulphuretum .. 590
tartras 193
acida 195, 305
Potassii bromidum .. 681
cyanidum .. 519
ferridcyanidum 837
ferrocyanidum .. 836
hydrargyro-iodocyanidum .. 480
iodidum .. 683
sulphuretum .. 590

Page

Potassio bichloride of platinum 27
Potassio-tartrate of antimony 275, 319, 377, 395, 492
Potassio tartrate of iron 777
of soda 221
Potassium and arsenic, iodiuretted solution of the iodide of .. 704
bromide of .. 681
cyanide of .. 519
cyanuret of .. 519
ferridcyanide of 837
ferrocyanide of 836
hydrargyro-iodocyanide of .. 480
iodide of .. 683
iodiuretted iodide of 683
sulphuret of .. 590
Potato-starch 345
sugar 366
Potheen 538
Potio diuretica Swediaur 295
Poudre nutrimentive .. 676
des Capuchins .. 55
Poultice, *see* Cataplasma.
Powder, antimonial .. 271
Algarothi's .. 242
aromatic .. 569
arsenical .. 251
bleaching .. 551
caustic, of Vienna 260
Crampton's .. 634
Dover's .. 284
Dubois' .. 251
Dupuytren's .. 251
Gregory's .. 202
James' 271
of Algaroth .. 242
seidlitz .. 222
see Pulvis.
Powell's balsam of aniseed 445
Precipitate, red .. 254
white .. 644
Precipitated carbonate of lime 14
phosphate of lime 718
sulphur 223, 225
sulphuret of antimony 274
Preparations the composition of which has been altered in the British Pharmacopœia of 1867, table of xxv
Prepared chalk .. 12
lard .. 339
storax .. 405
suet 370
sulphuret of antimony .. 273
Prescribing, art of .. 852
Primitive saturnine intoxication 134
Proof spirit 536
vinegar 86
Propylamine 667
Prune 196
Prunes 197
Prunum 196
Prunus domestica .. 196
laurocerasus .. 517
Prussian blue 108
Prussiate of potash, red 837
yellow 836
Prussic acid 477
Pseudotoxin 409
Pterocarpi lignum .. 836

	Page
Pterocarpus erinaceus	142
marsupium	124
santalinus	837
Ptyalism	637
Pudding pipetree ..	160
Puddling	748
Pulegium	580
Pulp, cassia . ..	160
colocynth ..	166
tamarind ..	226
Pulveres effervescentes citrati	462
tartarizati	466
Pulvis Algarothi ..	242
amygdalæ compositus	342
antimonialis ..	271
antimonii tartarati, 319, 377, 395, 492	275,
aromaticus ..	569
auri	620
catechu compositus	101
cinnamomi compositus	567
comitissæ ..	727
cinnamomi compositus	569
cretæ aromaticus	14
cum opio ..	104
Doveri	284
elaterii compositus	172
ferri	752
ipecacuanhæ compositus ..	284
cum opio	284
Jacobi	271
jalapæ compositus	180
kino compositus	126
kino cum opio	126
opii compositus	444
rhei compositus	202
salinus aperiens effervescens	185
compositus	185
scammonii compositus ..	210
scillæ compositus	403
sternutatorius, (Laycock) ..	605
tragacanthæ compositus ..	372
Pumpkin	46
Punica granatum ..	51
Punicine	52
Purgatives	150
Purging cassia	160
Purkhea	430
Purple foxglove ..	299
Pussewah	430
Pyrethri radix	527
Pyrethrin	527
Pyrethrum	527
Pyretin 68,	588
Pyrola chimaphilla ..	307
Pyroligneous acid ..	232
Pyrolusite	833
Pyroxylic spirit	520
Pyroxylin	357
Pyrrol	5

Q.

Qualitative analysis ..	839
Quassia	790
excelsa	790
Quassin	791
Quassite	791
Quercitannic acid ..	118
Quercus cortex	139
infectoria ..	116
pedunculata ..	139
Quicklime	825
Quicksilver	634
Quina	732
acetate of	742
amorphous ..	742
and iron, citrate of	765
antimoniate of ..	742
arsenite of ..	742
citrate of	742
disulphate of ..	739
muriate of ..	742
nitrate of	742
phosphate of ..	742
pill of	741
sulphate of ..	739
unbleached ..	742
tannate of ..	742
tartrate of ..	742
tincture of ..	741
valerianate of ..	81
wine of	741
Quinicia	733
Quinidia	732
Quinine wine	741
Quinoidine	742
Quinometry	734
Quinquina de Loxa ..	730
rouge ..	730

R.

Racemosa actæa ..	613
Rack	538
Radix, *see* Root.	
Raia clavata	670
Raisins	373
Rasura guaiaci	279
Realgar	657
Recamier's caustic ..	622
Rectified spirit	536
Red cinchona bark ..	727
iodide of mercury	645
oxide of mercury ..	254
ointment of	254
pepper .. 383,	558
precipitate	254
prussiate of potash	837
sandalwood ..	836
whortleberry ..	144
Reduced iron	752
lozenges of	754
Refined silver	824
sugar	365
Refrigerants	459
Reinsch's test	250
Relaxants	337
Renealmia cardamomum	559
Reroo	53
Resin	592
brown	592
plaster	138
yellow	592
Resina copaibæ	632
flava	592
guaiaci	279
jalapæ	180
nigra	592
podophylli ..	190
scammonii 207,	209
Revulsives	375
Rhabarberic acid ..	200
Rhabarberin	200
Rhamni baccæ	197
succus	197
syrupus ..	198
Rhamnus catharticus ..	197
frangula ..	197
Rhatany	126
Rhei radix	198
Rhein	200
Rheum	198
Rheumin	200
Rhœados petala	454
Rhœas	455
Rhodœoretin	181
Rhubarb	198
Chinese ..	199
English ..	199
Russian ..	199
Richardson's ether spray	534
Ricini oleum	203
Ricinic acid	204
Ricinus communis ..	203
Rivallie's caustic ..	237
Rocella fusiformis ..	832
Roche's embrocation ..	390
Rochelle salts	221
Roll-sulphur	223
Rollot's counter-irritant	378
Root, aconite	483
arnica	548
belladonna ..	408
calumba	719
dandelion	796
gentian	779
green hellebore ..	523
hemidesmus ..	358
horseradish ..	526
liquorice	355
pareira	303
pellitory	527
podophyllum ..	189
pomegranate ..	57
rhatany	126
rhubarb	198
sarsaparilla ..	285
sassafras	289
scammony ..	206
senega	403
serpentary ..	594
sumbul	72
valerian	74
Rosa, *see* Rose.	
Rose cabbage	837
Christmas ..	173
dog	473
French	140
gallic	140
hundred-leaved ..	837
red	140
water	837
Rosmarini oleum ..	593
Rosemary	593
Rosin, *see* Resin.	
Rosmarinus officinalis ..	593
Rottlera tinctoria ..	53
Rubefacient cataplasm ..	586
Rubefacients	375
Rue 71,	334
Rufus pills	202
Rum	537
Russian bath . ..	806
Ruta graveolens 71, 334,	388
Rye, ergot of	330
spurred	330

S

Sabadilla 54,	594
Sabadilline	55
Sabina .. 335,	388

Page
Sabinæ cacumina .. 335
Saccharate of lime .. 12
Saccharated carbonate of iron 759
and manganese 761
protosulphate of iron .. 116
solution of lime 11
Sacchari fæx 365
Saccharized magnesia, (White's) 22
Saccharum 365
lactis .. 367
officinarum 365
purificatum 365
Safflower 329
Saffron 328
cake 328
hay 328
Sago 368
meal 368
milk 369
pearl 368
pudding 369
Saguerus rumphii .. 368
Sagus farinifera 368
genuina 368
lævis 368
rumphii 368
Sal ammoniac 544
cornu cervi volatile 8
polychrest 192
prunelle 306
volatile 8
Salep 369
Salicin .. 792, 793
Salicornia 39
Saline mineral waters .. 815
Saline powder, compound 185
Salivation 636
Salix 792
caprea 792
pentandra 792
Salseparine 286
Salsola 39
Salt, Baker's 8
bitter purging .. 182
common 597
Epsom 182
Everitt's 477
Glauber's 218
Geoghegan's .. 480
of Hartshorn .. 8
Rochelle 221
Seignette's 221
spirits of 234
tasteless purging .. 216
Saltpetre 306
Salts, *see* Salt.
Sambuci flores 370
Sambucus nigra 370
Sandal wood 836
Sanguisuga medicinalis 828
officinalis .. 828
Santonica 56
Santonin 57
brown 58
lozenges .. 59
pure 57
Santoninum 57
Sapo, crotonis 170
durus 838
jalapinus 181
mollis 838
Sarcinæ ventriculi 215, 219
Sarcoptes hominis .. 600
Sarothamnus scoparius 311
Sarsæ radix 285
Sarsaparilla 285
Brazil .. 286
Page
Sarsaparilla Honduras .. 286
Indian .. 359
Jamaica 285, 286
Lima .. 286
Sarza 285
Sassafras officinale .. 289
oleum 290
radix 289
Sassafrid 289
Saturnine extract .. 135
intoxication 134
Saunders-wood, *see* Sandal-wood.
Savaresse's capsules .. 631
Savin .. 335, 388
Scammoniæ radix .. 205
Scammonium .. 206, 207
Scammony 206
biscuits of .. 210
resin of 207, 209
root 206
virgin .. 207
Schacht's liquor bismuthi 716
Scheele's Prussic acid .. 478
green 249
Schœnocaulon officinale 55
Scilla 308, 324, 403
Scillitina 309
Scio turpentine 315
Scobs guaiaci 279
Scoparii cacumina .. 311
Scoparin 312
Scoparius 312
Sea onion 308
Secale cereale 330
Sedatives 475
Seeds 346
colchicum 161
stramonium .. 455
Seidlitz powders .. 222
Seignette's powders .. 222
Salt 221
Semen-contra 56
sanctum 56
Semivitreous oxide of lead 136
Senega 403
Senegæ radix 403
Seneka 403
Senna 210
Alexandrian .. 210
Indian 210
Tinnivelly .. 210
Tripoli 211
Serpentaria 594
Serpentariæ radix .. 594
Sesquichlorides, *see required head*
Setons 388
Seville orange 706
Sevum præparatum .. 370
Sherry wine 605
Shield fern 49
Sialogogues 526
Sidhee 418
Silver 824
ammoniated solution of 840
arsenite of .. 249
chloride of .. 697
iodide of 699
nitrate of .. 243, 698
oxide of 699
quick 634
refined 824
Simaruba 793
amara .. 793
Simple ointment .. 341
Sinapis .. 324, 389, 595
alba 324
nigra 324
Sinapisin 325
Siperia 784
Page
Sirocrocis stibica .. 278
Slaked lime 825
Smelling salts 8
Smilacin 286
Smilasperic acid .. 359
Smilax aspera 359
officinalis .. 285
papyracea .. 286
sarsaparilla .. 286
Snake root 403
black .. 613
Virginian .. 594
Soap cerate plaster .. 137
hard 838
liniment 557
of croton oil .. 170
of jalap 181
of mercury .. 644
plaster 138
soft 838
test 803
Socotrine aloes 153
Soda, chlorinated .. 596
solution of 596
caustica 261
chlorata 261
tartarata 221
water 38
Soda, *see* Sodæ.
Sodæ acetas .. 312, 840
aqua effervescens 38
arsenias 794
biboras .. 142, 313, 336
bicarbonas .. 35
bicarbonatis trochisci 37
carbonas .. 38
exsiccata 41
chloratæ liquor .. 596
citro-tartras effervescens .. 37
et potassæ tartras 221
hypochloris .. 596
hyposulphis 214, 830
liquor 34
effervescens 38
murias 597
nitras 838
phosphas .. 216
potassio tartras .. 221
sulphas 218
sulphis 219
valerianas .. 76
Sodii auro-terchloridum 622
chloridum .. 597
iodidum 686
Solania 278
Solanum dulcamara .. 278
nigrum .. 409
Solenostemma arghel .. 210
Solidified nitric acid .. 237
Soluble tartar 193
Solutio, *see* Solution
Solution of acetate of ammonia .. 267
copper .. 839
morphia 450, 453
potash .. 840
soda .. 840
of albumen .. 840
of ammonia .. 542
strong 241, 376
of ammonio-nitrate of silver .. 840
of ammonio sulphate of copper . 840
of ammonio sulphate of magnesia 840
of arseniate of soda 796
of arsenic, hydrochloric .. 904

Page

Solution, arsenical .. 703
of atropia .. 416
of bichromate of potash, volumetric .. 842
of boracic acid .. 840
of bromine .. 840
of carbonate of ammonia .. 840
of carbonate of magnesia .. 25
of chloride of ammonium .. 840
antimony 241
barium 840, 710
calcium 840, 718
saturated 840
gold .. 840
tin .. 840
zinc .. 264
of chlorinated soda 596
of chlorine .. 565
of citrate of ammonia .. 269
of bismuth and ammonia .. 715
of gelatine .. 840
of hydrochlorate of morphia .. 453
of hyposulphite of soda, volumetric .. 844
of iodate of potash 841
of iodide of potassium .. 841
of iodine .. 665
volumetric 845
of lime 9
chlorinated 553
saccharated 10
of lithia, effervescing .. 18
of nitrate of mercury, acid .. 256
of nitrate of silver, volumetric .. 846
of oxalate of ammonia .. 841
of oxalic acid .. 847
of perchloride of mercury .. 654
platinum .. 841
iron .. 109
of permanganate of potash .. 590
of pernitrate of iron 110
of persulphate of iron 111
of phosphate of soda 841
of potash .. 26
of red prussiate of potash .. 841
of soda 34
effervescing 38
volumetric 848
of strychnia .. 675
of subacetate of lead 135
diluted .. 136
of sulphate of atropia .. 417
of Sulphate of Indigo .. 841
iron 841
lime 841
of sulphide of ammonium .. 841

Page

Solution of tartaric acid 841
of yellow prussiate of potash 841
Solution, Biett's .. 615
Brandish's .. 29
De Valangin's 704
Devergie's .. 704
Donovan's .. 619
Fowler's .. 703
Frank's .. 632
Hemostatic .. 96
Lugol's .. 666
Neligan's .. 704
Pagliari's .. 96
Pearson's .. 796
Pierlot's .. 80
Wilde's .. 416
Solutions, test .. 839
for volumetric estimations 841
Soot 68
Soporifics 407
Spanish fly .. 297, 378
Spartium scoparium .. 311
Spearmint 580
Special stimulants .. 613
Specifics 613
Spermaceti 350
ointment .. 350
Spermœdia clavus .. 330
Spigelia marilandica .. 60
Spirit, camphorated .. 557
Spirit, methylated 521, 540
Mindererus' .. 267
of wine 536
proof 536
pyroxylic .. 520
rectified 536
see Spiritus.
Spirits of salt 234
Spiritus ætheris .. 535
compositus 535
nitrici .. 292
nitrosi .. 292
ammoniæ aromaticus .. 543
fœtidus .. 66
armoraciæ compositus .. 548
cajuputi .. 551
camphoræ .. 557
chloroformi .. 506
fuliginis .. 68
juniperi .. 303
lavandulæ .. 577
compositus .. 577
menthæ piperitæ 579
pulegii 580
Mindereri .. 267
myristicæ .. 582
pyroxylicus rectificatus .. 520
rectificatus .. 536
rosmarini .. 594
tenuior 536
vini gallici .. 536
Spruce fir 586
Spurred rye 330
Squill .. 308, 324, 403
Squirting cucumber .. 171
St. John Long's liniment 391
Staphisagria 599
Starch 343
glycerine of .. 345
mucilage of .. 345
Staves-acre 599
Stearopten 61
Stephens, Miss, receipt for Stone 10
Sternutatories .. 605

Page

Sticking-plaster .. 138
Stimulants, general .. 529
special .. 613
Stirabout 346
Storax 405
common 406
liquid 405
prepared .. 405
Stramonii folia .. 455
semina .. 455
Stramonium 455
smoking .. 457
Strychnia 673
Strychnic acid 670
Strychnos bark 746
Strychnos nux vomica 670
Styptic ergotin 107
colloid 121
Styptics 83
Styracine 406
Styrax 405
benzoin 398
officinale 405
Styrole 406
Subacetate of copper 252, 838
of lead .. 135
Subchloride of mercury 175, 655
Subjee 418
Sublimatum corrosivum 651
Sublimed sulphur .. 223
Subnitrate of bismuth 712
Substances added in the British Pharmacopœia, 1867, list of xxi
with altered composition, in the British Pharmacopœia 1867, list of .. xxv
with altered names in the British Pharmacopœia, 1867, list of .. xxiii
omitted in the British Pharmacopœia, 1867, list of xxii
Succini oleum 389
Succus belladonnæ .. 414
colchici 166
conii 511
digitalis .. 517
hyoscyami .. 423
limonis .. 467
mori 470
rhamni 197
scoparii 312
taraxaci 797
Sucrose 537
Sudorifics 266
Suet 370
Sugar 365
cane .. 365, 537
fruit 537
grape .. 366, 537
of lead 130
of milk 367
potato 366
raw 365
refined .. . 365
Sulphates, *see required head.*
Sulphide of ammonium 546
of iron .. 839
Sulpho-vinic acid .. 532
Sulphur 223, 599
confection of .. 225

Page
Sulphur electuary .. 225
flowers of .. 223
iodide of .. 687
liver of 590
milk of 225
ointment .. 600
Sulphur, precipitated 223, 225
roll 223
sublimed .. 223
vapour bath .. 600
Sulphurated antimony .. 273
potash .. 590
Sulphuratum balneum 592
Sulphurets, *see required head.*
Sulphuretted hydrogen 839
sulphite of soda 214
Sulphuric acid .. 89, 239
aromatic 93
commercial 89
dilute .. 94
ether .. 531
pure .. 90
Sulphuris iodidum .. 687
Sulphurous acid .. 239
waters .. 807
Sumbul Radix 72
resin 73
Sumbulic acid 73
Supplementary agents 824
Suppositoria acidi tannici 120
hydrargyri 642
morphiæ .. 453
plumbi composita .. 132
Sus scrofa 339
Swamp hellebore .. 523
Swediaur's diuretic potion 295
Sweet almonds 341
spirits of nitre .. 292
Sylvic acid 592
Symbols and equivalents, table of xx
Synaptase 488
Syrup 367
of acetate of morphia 450
balsam of tolu .. 398
bark 739
buckthorn .. 198
citric acid .. 462
cyanide of potassium .. 520
elm bark .. 798
garlic 46
ginger 611
gold 621
guaiacum .. 282
hemidesmus indicus 360
hive 324
hydrocotyle .. 658
hypophosphites, (Parrish) .. 790
iodide of iron .. 769
ipecacuanha .. 323
lactate of iron .. 769
lemons .. 469
mulberries .. 470
muriate of morphia 454
orange flower .. 707
peel .. 707
phosphate of iron 776
poppies .. 429
red poppy .. 455
red roses .. 142
rhamnus .. 198
rhubarb .. 202
roses (gallic) .. 142
rue 72
saffron 330
sarsaparilla .. 288

Page
Syrup of senna 213
smilax aspera .. 360
squills 324
compound 324
tolu 398
vinegar .. 460
violets 228
Syrupus, *see* Syrups.

T.

Tabaci folia 521
Tabacum 522
Table of articles in the British Pharmacopœia 1867, but not in that of 1864 xxi
articles in the British Pharmacopœia 1864, but not in that of 1867 xxii
articles the names of which have been altered in the British pharmacopœia, 1867 xxiii
cinchona alkaloids 733
classification of plants .. 899
contents .. xxvii
list of books referred to containing plates of officinal plants xix
morphia alkaloids 433
435, 441
posology .. 861
preparations the composition of which has been altered in the British pharmacopœia, 1867 xxv
symbols and equivalents .. xx
true and false angostura bark 746
weights and measures .. xv
Tænia solium 43
Tamarinds 226
East Indian 226
West Indian 226
Tamarindus Indica .. 226
Tannate of gelatine .. 117
quinia .. 742
Tannic acid .. 118, 732
glycerine of 120
lozenges .. 120
suppositories 120
Tannin .. 118, 732
Tanning 83
Tanno-gallate of iron .. 117
Tapioca 371
Tar 587
ointment 587
water 587
Taraxaci radix 796
Taraxacine 797
Taraxacum 796
Tartar, cream of 195, 305
crude 195
crystals of .. 195
emetic 275, 319, 377, 395, 492

Page
Tartar emetic, liquor of 277
ointment of 378
wine of .. 277
foliated earth of 191
soluble 193
Tartarated antimony 275, 319, 377, 395, 492
iron 777
soda 221
Tartari crystalli 195
Tartaric acid 464
lozenges of .. 466
saturating powers of 466
Tartrates, *see required head.*
Tasteless ague drop .. 703
purging salt .. 216
Tela vesicatoria 382
Temperants 459
Tephrosia apollinea .. 211
Terchloride of formyle .. 493
Terebinthina canadensis 313
Terebinthina, *see* Turpentine.
Terra japonica 99
Test solutions 839, *et seq.*
Thebaina 441
Theobroma cacao .. 834
Theriaca 365
Theriaci 437
Thick-leaved pennywort 658
Thorn apple 455
Thus Americanum .. 602
Tin, granulated 849
chloride of solution of 840
Tincal 142
Tinctura absinthii .. 45
acetatis ferri .. 754
aconiti 486
actææ 614
aloes 157
ammonio-chloridi ferri 756
arnicæ 549
assafœtidæ .. 66
aurantii .. 707
balsami tolutani 398
belladonnæ .. 414
benzoini composita 399
bucco 296
buchu 296
calumbæ .. 721
cambogiæ .. 160
camphoræ .. 557
cum opio 444
composita 444
cannabis indicæ 421
ætherea 421
(Neligan) 421
cantharidis .. 299
capsici .. 558
cardamomi composita 560
cascarillæ .. 723
castorei .. 67
catechu .. 101
chiratæ .. 726
chloroformi composita 507
cinchonæ composita 738
flavæ 739
cinnamomi .. 569
cocci .. 827
colchici seminis 166
colocynthidis .. 168
conii 511
croci 329
cubebæ .. 634
curcumæ .. 850
digitalis .. 301
elaterii .. 172
ergotæ .. 334

Page
Tinctura, ferri acetatis .. 754
ammonio-chloridi .. 756
aurantiacea 763
muriatis 110
perchloridi 110
sesquichloridi 110
fuliginis .. 68
gallæ 117
gambogiæ .. 160
gentianæ composita 782
guaiaci ammoniata 281
hellebori .. 174
hyoscyami .. 423
iodi 665
jalapæ .. 181
kino 126
krameriæ .. 127
laricis .. 601
lavandulæ composita 577
limonis .. 469
litmi 833
lobeliæ .. 402
ætherea 402
lupuli 427
maticæ .. 129
monesiæ .. 130
muriatis ferri 110
myrrhæ .. 783
nucis vomicæ 673
opii 445
ammoniata 445
camphorata 444
pinus laricis .. 601
polygalæ .. 405
pyrethri .. 528
quassiæ .. 791
quiniæ .. 741
rhataniæ .. 127
rhei 202
et aloes .. 203
ricini 205
ætherea 205
sabadillæ .. 594
sabinæ 336
sacra 155
scillæ 311
senegæ .. 405
sennæ 214
serpentariæ .. 595
stramonii .. 458
sumbul .. 74
thebaica .. 445
tolutana .. 398
valerianæ .. 76
ammoniata 76
veratriæ .. 604
veratri viridis .. 849
zingiberis .. 611
fortior 612
Tincture, *see* Tinctura
Tinnevelly senna .. 210
Toast 352
water 352
Tobacco 522
enema of .. 523
Indian .. 400
Tolu balsam 597
Tonics 689
Torulæ 220
Tous-les-mois 346
Tragacanth 371
Tragacanthin 372
Treacle 365
Tremblement metallique 635
Tricocephalus dispar .. 43
Trisnitrate of bismuth .. 712
Triticum æstivum 343, 352
vulgare 343, 352

Page
Trochisci, *see* Lozenges.
Turmeric 849
paper .. 850
tincture .. 850
Turnbull's blue 108, 113
solution of aconitia 488
Turner's cerate .. 147
Turpentine, American .. 61
Bourdeaux 61
Canada .. 313
Chian .. 315
common .. 61
confection of 62
enema of .. 62
liniment .. 390
acetic 390
oil of 61, 227, 314, 390, 600
ointment .. 601
punch .. 601
resin of .. 61
Scio .. 315
spirits of .. 61
Tutty 147

U.

Ulmi cortex 798
Ulmin 793
Ulmus campestris .. 798
Umbelled winter green 307
Uncaria gambir 98
Unguentum, *see* Ointment.
Urea 315
Uric acid 395
Urginea scilla 308
Usquebaugh 538
Uvæ 373
Uvæ ursi folia 143

V.

Vaccinium vitisidæa 144, 212
Valangin's solution .. 704
Valentia almonds .. 341
Valerian 74
oil of 74
Valeriana officinalis .. 74
Valerianæ radix .. 74
Valerianate of ammonia 79
solution of 80
of iron .. 80
of quina 81
of soda 76
of zinc .. 77
Valerianic acid .. 75
aldehyde .. 77
Valerole 74
Valley of poisons .. 476
Vapor acidi hydricyanici 850
chlori 554
coniæ 512
creasoti 103
iodi 666
Vegetable brimstone .. 833
hydrocyanic acid 489
calomel .. 190
Vegeto mineral water .. 136
Velvet leaf 303
Veratri viridis radix .. 523
Veratria .. 55, 163, 602
Veratric acid 55

Page
Veratrum album .. 604
sabadilla .. 55
viride .. 523
Verdigris .. 252, 838
blue .. 252, 838
green 252
Vermicides 42
Vermifuge, Bremser's .. 57
Nouffer's .. 50
Vermifuges 42
Vermilion 656
Vesicants 375
Vienna paste 260
Vinegar 84
aromatic .. 530
British 84
Chili 559
French 84
Marseilles .. 530
of cantharides 380
of commerce .. 85
of four thieves 530
of squill .. 311
proof 86
Vinum, *see* wine.
Viola odorata 227, 325
Violet flowers 228
honey of 228
syrup of 228
root 325
Violina 326
Virgin scammony .. 207
Virgineic acid 404
Virginian snake root .. 594
Vitellus ovi 365
Vitis vinifera 373
Vitriol, blue 104
elixir of .. 93
green 113
oil of 89
white 148
Voigtel's tincture .. 160
Volatile oils 302
Volumetric analysis .. 841
estimations 841
solutions .. 842
Vomits 317

W.

Wadding, French .. 357
Ward's paste 585
Warming plaster .. 380
Wash, black .. 132, 554
yellow 555
Water, *see* Aqua.
Waters 800
mineral 807
MINERAL WATERS.
Sulphurous waters .. 808
Aix la Chapelle 808
Baden .. 809
Aix les Bains .. 809
Harrowgate .. 810
Strathpeffer .. 811
Lisdoonvarna .. 811
Nenndorff .. 811
Chalybeate waters .. 812
Lisdoonvarna .. 813
Harrowgate .. 813
Tunbridge Wells 813
Sandrock .. 814
Spa 814
Schwalbach .. 814
Saline mineral waters 815

	Page
Waters, *Alkaline mineral waters* ..	815
Vichy ..	815
Carlsbad ..	816
Vals ..	816
Fachingen	817
Selters or Seltz	817
Marienbad	818
Aperient mineral waters ..	818
Pullna ..	818
Sedlitz ..	818
Kissengen	818
Leamington	819
Baden Baden	819
Wiesbaden	819
Homburg ..	819
Cheltenham	820
Calcareous or earthy springs ..	820
Wildungen	820
Leuk ..	820
Bath ..	821
Scarborough	821
Indifferent thermal springs ..	821
Pfaffers ..	822
Buxton ..	822
Wax pockets	348
white	348
yellow	348
Weights and measures	xv
Wheaten flour	352
starch	343
Whey, alum	96
cream of tartar ..	305
nitre	307
tamarind ..	227
White lead	133
marble	834
precipitate ..	644
wax	348
wood	721
Whiskey	538
White's saccharized hydrate of magnesia ..	22
Whortle berry, red ..	144
Wild cinnamon tree ..	721
cucumber	171
Wild lemon	189
Wilde's solution of atropia	416
Willow bark	792
Wine, antimonial ..	277
bela	97
Burgundy ..	609
Cape	609
claret	609
Madeira	609
of aloes	157
of bael	97
of citrate of iron	763
of colchicum ..	166
of ipecacuanha ..	323
of iron	752
Soubeiran's	779
of opium	446
of orange	707
of pepsine ..	677
of quinia	741
of rhubarb ..	202
of tartar emetic ..	277
of veratrum ..	605
Port	609
Sherry	605
Spanish	605
Winter-green	307
Winter's bark	722
false ..	722
Wire	748
Wolfsbane	483
Wood charcoal	347
soot	68
Woody night shade ..	278
Wool, cotton	357
philosopher's ..	147
Worm-grass	60
Worm-seed, American ..	56
Barbary ..	56
European ..	56
Levant ..	56
Wormwood	44

X.

	Page
Xyloidine	358

Y.

	Page
Yeast	564
poultice	564
Yellow bark ..	727, 729
French ..	356
gentian	779
prussiate of potash	836
resin	592
wash	654
wax	348
Yolk of egg	365

Z.

	Page
Zinc, acetate of	145
butter of	262
butyrate of ..	78
carbonate of ..	146
chloride of ..	262
solution of	264
cyanide of ..	525
cyanuret of ..	525
flowers of ..	147
granulated ..	850
hydrocyanate of protoxide of ..	525
of commerce ..	850
ointment of ..	148
oxide of ..	147, 799
sulphate of	148, 265, 326, 799
valerianate of ..	77
Zincum	850
granulatum ..	850
Zingiber officinale ..	610
Zootic acid	477
Zymosis	220