X

# MATERIA MEDICA AND THERAPEUTICS.

Lately Issued.

# THERAPEUTICS AND MATERIA MEDICA:

A SYSTEMATIC TREATISE ON THE

# ACTIONS AND USES OF MEDICINAL AGENTS,

INCLUDING THEIR DESCRIPTION AND HISTORY.

BY ALFRED STILLÉ, M. D.,

Professor of the Theory and Practice of Medicine in the University of Pennsylvania.

**Second edition, revised and enlarged.**

*In two large and handsome octavo volumes of* 1800 *pages.*

Dr. Stillé's splendid work on therapeutics and materia medica.—*London Med. Times*, April 8. 1865.

We have placed first on the list Dr. Stillé's great work on therapeutics.—*Edinburgh Med. Journ.*, 1865.

If it were desirable to prove the rapid diffusion of medical knowledge, we could not point to a better example than this treatise on Therapeutics. The author, who seems to have spent some time in France, is so familiar with all our doctrines, and even with all our opinions, that his erudition might well be envied by some of our own compatriots. He is no less at home with the investigations of English and German science, and he makes use of all these materials with a skill and discrimination which must give his work a classical position among the text-books prepared for American students. . . . Being under the necessity of criticizing it as though it were a French treatise on Therapeutics, our highest expression of praise is to record our regret that it is not among the manuals used in our own schools. . . . . Notwithstanding these little criticisms, which are rather matters of praise in an elementary work, Dr. Stillé's book deserves to be classed among the best and most practical treatises on Therapeutics.—*Translated from the "Archives Générales de Médecine,"* Juin, 1860.

Rarely, indeed, have we had submitted to us a work on medicine so ponderous in its dimensions as that now before us, and yet so fascinating in its contents. It is, therefore, with a peculiar gratification that we recognize in Dr. Stillé the possession of many of those more distinguished qualifications which entitle him to approbation, and which justify him in coming before his medical brethren as an instructor. A comprehensive knowledge, tested by a sound and penetrating judgment, joined to a love of progress—which a discriminating spirit of inquiry has tempered so as to accept nothing new because it is new, and abandon nothing old because it is old, but which estimates either according to its relations to a just logic and experience—manifests itself everywhere, and gives to the guidance of the author all the assurance of safety which the difficulties of his subject can allow. In conclusion, we earnestly advise our readers to ascertain for themselves, by a study of Dr. Stillé's volumes, the great value and interest of the stores of knowledge they present. We have pleasure in referring rather to the ample treasury of undoubted truths, the real and assumed conquest of medicine, accumulated by Dr. Stillé in his pages; and commend the sum of his labors to the attention of our readers, as alike honorable to our science, and creditable to the zeal, the candor, and the judgment of him who has garnered the whole so carefully.—*Edinb. Med Journal*, Sept. 1860.

This is what Dr. Stillé has attempted; and this he has accomplished with singular success. We mean that his treatise is the result of a patient, laborious, intelligent, and comprehensive research into the records of ancient and modern medicine; that it exhibits a careful collation of an immense number of facts; that it is, in short, an admirable digest of our present knowledge of Therapeutics and Materia Medica. If we have succeeded in drawing the attention of any of the profession to Dr. Stillé's treatise, we have done them a substantial service It fills an important place among works on Therapeutics, and we hope it will be largely studied. None can read it without advantage. We may add that its clear and simple style is not one of its least merits. In these days, when there is such a tendency to fine writing, it is delightful to come across an author who is not ashamed to use good old Saxon English; who can crowd a book full of learning without pedantry; and who evinces equal scholarship and modesty.—*Am. Journ. Med. Sciences*, July, 1860.

However high public expectation may have been raised, we venture to affirm that no disappointment will be felt in the work just issued. We therefore congratulate the author on the successful termination of his arduous labor, and the profession on the addition to our national literature of a most valuable and elaborate treatise on an interesting and important department of medical science. A treatise which, in our opinion, is second to no work on the same subject in the English language.—*St. Louis Med. and Surg. Journal*, May, 1860.

We have read both volumes from beginning to end with equal pleasure and profit, and we commend them heartily to our readers, with the advice to go and do likewise. The work is as honorable to our literature as it is to the author.—*Boston Med. and Surg. Journal*, April 19, 1860.

Our expectations of the value of this work were based on the well-known reputation and character of the author as a man of scholarly attainments, an elegant writer, a candid inquirer after truth, and a philosophical thinker; we knew that the task would be conscientiously performed, and that few, if any, among the distinguished medical teachers in this country are better qualified than he to prepare a systematic treatise on therapeutics in accordance with the present requirements of medical science. Our preliminary examination of the work has satisfied us that we were not mistaken in our anticipations.—*N. O. Med. News*, Mar. 1860.

The work is especially designed for medical practitioners; these will find in it much matter that is new and valuable, and which proves that the author is not only an accomplished scholar, but also a careful observer and a sound practical physician. We cordially recommend the work, therefore, to the medical practitioners of this country.—*London Pharm. Journal*, May, 1860.

HENRY C. LEA, Philadelphia.

# MANUAL

OF

# MATERIA MEDICA & THERAPEUTICS.

BEING AN ABRIDGMENT OF THE LATE

## DR. PEREIRA'S ELEMENTS OF MATERIA MEDICA

ARRANGED IN CONFORMITY WITH THE BRITISH PHARMACOPŒIA, AND ADAPTED TO THE USE OF MEDICAL PRACTITIONERS, CHEMISTS AND DRUGGISTS, MEDICAL AND PHARMACEUTICAL STUDENTS, &c.

BY

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EDITED, WITH NUMEROUS REFERENCES TO THE U. S. PHARMACOPŒIA, AND MANY OTHER ADDITIONS.

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WITH TWO HUNDRED AND THIRTY-SIX WOOD ENGRAVINGS.

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# PREFACE TO THE AMERICAN EDITION.

THE English Editors of this work have abridged and altered the original *Pereira's Materia Medica* until it is scarcely the semblance of its former self, and bears the impress of their footsteps almost as deeply as those of their learned predecessors. As published by them, it is so narrowed in its scope as scarcely to serve the purpose of a general work on Materia Medica, and indeed claims only to be a manual for the use of British medical men. At the same time, they have labored upon it until, within its own limited field, it is without a peer. The duties of the American Editor have been to adapt that which was originally prepared for the English student or practitioner only, to the wants and necessities of the American physician. To do this, the first thing required was the introduction of the U. S. Pharmacopœia; the discussion of not only the various items of its Materia Medica List and preparations, which had been omitted, but also of the U. S. processes for preparing various drugs already noticed.

Over one hundred articles on substances in the U. S. Pharmacopœia have thus been introduced; many of them indeed on subjects of but little importance, but others on drugs which occupy a prominent position amongst our every-day remedies. To show the importance of many of these additions, it is only necessary to allude to Veratrum Viride, Wild Cherry Bark, Sago, Tapioca, Arrowroot, Glauber Salt, Ammonio-ferric Alum, &c., as being among them. The remarks on the less important substances have been of necessity brief, but probably they will be found to contain all requisite information. There are some drugs, as the Calabar bean, which, although not officinal in either Pharmacopœia, have seemed to merit a notice, and have been in consequence more or less thoroughly discussed.

When the U. S. processes for making preparations are essentially the same as the British formula, no remarks have been made on them, but when they differ, they have been separately explained and commented on, and in all instances the U. S. Pharmacopœia has been brought prominently into the foreground. A few of the articles, as those on Sago and Tapioca, are mere condensations of those published in the edition edited by Prof. Carson; many others, as that on Wild Cherry Bark, have been in great part rewritten; and very many others are entirely or almost entirely new. As an example of the last, Veratrum Viride may be quoted. When no authority is given for the characters of indigenous plants, they are substantially those of Prof. Gray (Manual of Botany), although often less technically worded.

The additions thus made have increased the original work by about a third. They will be found distinguished from the English text by inclosure in brackets and the letter W. Matter embraced in quotation marks is extracted without alteration from the U. S. Pharmacopœia. A large number of additional illustrations have also been introduced, some of them from the previous edition, some selected from other standard works, and some especially engraved for the purpose.

The office of the American Editor has been no sinecure; it is often almost as difficult and laborious satisfactorily to enlarge and improve an old work, as to prepare a new one; but if the book is really improved and made more valuable, the labor has brought its own reward.

HORATIO C. WOOD, Jr.

University of Pennsylvania,
August, 1866.

# PREFACE.

THE GREAT WORK on Materia Medica, which I have undertaken to reduce to a more convenient size and to adapt for more general use, is a mine of wealth which probably few readers have yet exhausted. The incessant labors of its late author, the extent to which he pushed his inquiries, and the pains which he took to verify all the information which he collected, give to his work a peculiar value and authority. Its copiousness, however, had become embarrassing; not, indeed, to those who desired to study the subject in the comprehensive spirit of the author, but to the majority of medical practitioners, pharmaceutical chemists, and medical and pharmaceutical students, who, having only a limited portion of time at their disposal, were obliged to be content with such an amount of information as they could reasonably hope to acquire, and such as would most assist them in their daily occupations. Bearing this in mind, I have reduced the large work to about one-third of its size, without, I trust, diminishing—may I venture to hope with some increase of—its general utility. This, however, could not be done without strictly adhering to the following rules:—

1. To omit all remedial agents, except those which the author termed pharmacological, such as mental, physical but imponderable, and hygienic remedies, or, to be more specific, the influence of the mind, of light, heat, electricity, food, exercise, climate, &c.

2. To omit all pharmacological remedies which are not officinal, or contained in the British Pharmacopœia.

3. To omit all classifications of medicines except the two classifications which the author himself adopted: one founded on the chemical classification of the inorganic bodies, and on the botanical and zoological classifications of the plants and animals which yield the organic bodies; the other founded on their physiological effects. These rules could not be carried out without excluding much valuable matter; but it appeared to me the wisest course to act like a judicious horticulturist, who, in reducing a tree to the necessary limits, removes

the too luxuriant branches, rather than prune too closely those which bear the most valuable fruit. I have also somewhat abridged the botanical and zoological characters, and even in many cases the descriptions of the drugs themselves, important as the latter are, in order to avoid all unnecessary repetition. In doing this, I have sometimes made the author's descriptions appear more scanty and incomplete than he left them. My reason, however, is easily explained. The British Pharmacopœia contains, in addition to the names and definition of articles of the Materia Medica, short descriptive characters and tests. These are frequently original, but have frequently also been taken from standard works on Materia Medica, and from none more largely than from the author's. When his remarks have thus been made to contribute to form the "*officinal character*," they have not been repeated in the subsequent "*description*." In selecting the most important parts of the work, I have experienced another difficulty. There are some opinions expressed—for example on the subject of bleeding—which will hardly find acceptance at the present time, and which the author, if living, would probably himself have modified. But the present opinions and practice are still recent, and may in their turn yield to further experience. I have therefore avoided, as far as I could, interfering with the opinions expressed by the author, while I have not hesitated to alter whatever was decidedly erroneous. On the other hand, although my chief object has been to prepare a smaller work, by excluding the least important parts of the "Elements," much new matter has at the same time been introduced into the abridgment, in order that it may represent more correctly the present state of our knowledge. The new matter is occasionally indicated by (Ed.), but far more frequently it is introduced without notice. The *Physiological Classification of Medicines* I have removed from the situation where the author placed it to the end of the work, conceiving that it would be better understood after some knowledge had been acquired of the individual medicines. This part of the work is of great practical use; but it appeared to me that it might still be rendered more intelligible and more convenient for reference. I have retained nearly all of the author's classes and orders, but I have broken up the class *Ecritics*, because the orders of medicines which influence respectively the secretion of the bowels, liver, salivary glands, bronchi, kidneys, skin, &c., are, I think, more conveniently considered in connection with those orders of medicines which influence other functions of the same organs. The classification of the author is in fact rather anatomical than physiological, being constructed, for example, not on the *functions* of digestion and respiration, but on the digestive and respiratory *organs*. I have placed after most of the orders another order of medicines which produce an opposite effect; as, after emetics, which cause vomiting, antemetics, which control or prevent it; after sialagogues, antisialics, &c. In doing this, I am only carrying out the plan of the author, who placed in juxtaposition acrids and emollients, tonics and relaxants, hypnotics and agrypnotics; but it has compelled me to introduce some new terms. Ischurotics is hardly new, for ischuria is an old term for suppression of urine; paregorics is also an old name occasionally employed by the author, and urinogenitals is applicable to medicines as well as to organs; but I must apologize for the terms antemetics, antisialics, contrapituitants, antasthmatics, and anthidrotics; their meaning, however, is sufficiently obvious. I have also confined myself in this part of the work to the therapeutic use of medicines, and have omitted all other effects (perhaps poisonous) which they are capable of producing, but for which they are not employed in medicine. The antidotes also I have classified instead of the poisons, the former being the proper subjects of classification in a work on Materia Medica.

It remains for me to acknowledge the valuable assistance I have received from Professor Bentley and Mr. Warington. The former has assisted me chiefly in the description of the organic bodies, and of the plants and animals which produce them; the latter chiefly in the inorganic bodies. The extensive knowledge of these gentlemen in their respective departments has greatly contributed to the accuracy of the work. I am also indebted to Dr. Black, for revising the article on Chloroform, and to Mr. J. E. Howard, for the information he has communicated respecting the Cinchona barks and their alkalies, and for the care and attention which he has paid to the sheets relating to these subjects.

Such as it now is, I venture to offer this Abridgment to the profession, hoping that I have not altogether failed in the object which I had in view, and only regretting that I cannot longer delay its publication, in order to make it more worthy of their acceptance.

FREDERIC JOHN FARRE, M.D. CANTAB.

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# INTRODUCTION.

Before I describe the several officinal articles, it may be useful to make some preliminary observations on the Pharmacopœia itself.

The British Pharmacopœia describes the articles of the Materia Medica more fully and more systematically than the Pharmacopœias of London, Edinburgh, and Dublin. The Preface to the Pharmacopœia mentions the rule which has been adopted in compiling the list; namely, that it has been made to contain, "*in its simplest pharmaceutical form*, every definite medicinal substance" which has received the sanction of the Medical Council. By "its simplest pharmaceutical form" is meant the simplest state in which the substance is employed in medicine. In accordance with this rule, solution of ammonia is placed in the Materia Medica, because the solution of the gas is the simplest form in which ammonia can be conveniently kept or used; while the solutions of potash and soda are only found among the preparations, and caustic potash and caustic soda are placed in the Materia Medica as being more simple pharmaceutical forms of these alkalies than their watery solutions. It appears, however, to have been difficult to carry out this rule in all cases, as, if it had been strictly followed, acetic acid, for instance, should not have been placed in the Materia Medica as well as glacial acetic acid. The apparent object of the rule is to set before the practitioner a list of the substances selected for medicinal use, the second part of the Pharmacopœia containing merely the mode of forming these substances, when artificial, and preparations and compounds of them, *i. e.*, forms for administering them in their most efficient states.

Each article of the Materia Medica is distinguished (1) by a Name, (2) by a Definition, (3) by Descriptive Characters, (4) by Tests, and, if organic, (5) by the Name of the plant or animal which yields it; and (6) by a reference to a Figure of the same; or if inorganic and of definite composition, (7) by its Chemical Symbol.

The *Nomenclature* of the Pharmacopœia is a subject of some importance, as the changes of names appear to be rather numerous. The three national Pharmacopœias frequently employed each a different name to indicate the same article; hence the adoption of one of these involved the change of two others. Some new names have also been introduced. In selecting names, however, whether new or old, the framers of the

Pharmacopœia have generally preferred such as are likely to be permanent, and have avoided those which, as they express a hypothetical composition, are more liable to future alteration. Red oxide of mercury has been preferred to binoxide, the green and red iodides to iodide and biniodide, acid tartrate of potash to bitartrate, and subacetate of lead to diacetate. The names of calomel and corrosive sublimate have, for a similar reason, been preferred to chloride and bichloride of mercury; names which were supposed to convey a false idea of the composition of these salts. The first of these names is unobjectionable, but the latter, at least in its Latin form of hydrargyrum corrosivum sublimatum, is both inelegant and inconveniently long. The Pharmacopœia might in this case have adopted with advantage the names employed by Dr. Pereira, of subchloride and perchloride of mercury; names which are generally understood to indicate the lowest and the highest combination of chlorine with mercury, and which are therefore not liable to future alteration. Another feature in the nomenclature of the British Pharmacopœia is that it boldly throws aside disguise, and no longer conceals from the uninitiated eye, under a harmless name, the presence in a medicine of an active and even poisonous ingredient. Thus pulvis kino compositus, pulvis ipecacuanhæ compositus, pilula saponis composita, and tinctura camphoræ composita, are now designated by names in which opium is conspicuously mentioned. In an English Pharmacopœia in which aconitia, strychnia, and hydrocyanic acid are openly named, disguise in minor matters could hardly be any longer justified. The term *compositus* was formerly added to the names of those medicines which contained a second or third ingredient, which was not expressed in the name. In the British Pharmacopœia it is only employed when two or more ingredients combine to produce its *principal* effects. Thus, tinctura iodinii composita (L. D.) is now termed tinctura iodi, and unguentum iodinii compositum (L. D.) should have been termed unguentum iodi, because the iodide of potassium is added, not to increase the effect of the iodine, but merely to assist its solution. Infusum sennæ compositum (L. D.) and tinctura sennæ composita (L. D.) are called infusum sennæ and tinctura sennæ, because they contain no other purgative than senna. Pilula saponis composita (L. E.) is named pilula opii, because the opium is the only active ingredient. The *cerates* are judiciously merged in the ointments, from which they did not materially differ, and the *conserves* and *electuaries* in the confections. Lastly, the *essences* of the Dublin Pharmacopœis are termed spirits, the far weaker, but otherwise corresponding, spirits of London and Edinburgh having been omitted.

The *Chemical Definition* of officinal articles must not be confounded with their names. The definitions and chemical symbols are intended to represent the present views of chemists, and may be altered at any future time, if necessary, without inconvenience.

The descriptive *Characters* are short, being intended to distinguish each article, not from all other bodies, but only, as the Preface states, "from all other articles of the Materia Medica." These characters indicate the nature of the article described, its sensible qualities and chemical reactions, and, in the case of salts, they show by a single character the nature of each constituent.

The *Tests*, on the other hand, show exclusively the presence or absence both of impurities in general and of the most common special impurities and adulterations.

The *Preparations* consist, not necessarily of medicines prepared from the article under which they are enumerated, but, as the Preface states, of the medicines of which that article is an active ingredient. Accordingly, potassa caustica, though really prepared from liquor potassæ, is not regarded as a preparation of the solution, but liquor potassæ is mentioned as a preparation of potassa caustica.

The second part, or *Preparations and Compounds*, contains, in addition to the proper pharmaceutical processes, a mode of preparing or forming nearly all the inorganic bodies of the Materia Medica, except a few commercial articles of which the preparation was too complicated, or otherwise unsuited, for the Pharmacopœia. The London College has always adopted the opposite course, of omitting the mode of preparing the chemical articles of the Materia Medica whenever these could be readily obtained in commerce sufficiently pure for medical use, and has relied on tests as affording sufficient indications of their purity. The latter appears to me the wiser course, for the reasons long ago assigned by the London College, that chemical manufacturers, operating on a large scale, and employing experienced operators, can frequently prepare these substances, equally pure, by less expensive and more convenient processes than the Pharmacopœia can supply.

The *test solutions for volumetric analysis*, placed in the Appendix, are valuable additions, affording a more sure and ready means of estimating the strength and purity of chemical bodies than the old but more tedious and uncertain method of drying and weighing a precipitate.

*Of weights and measures* little need be said. The measures are still the imperial measures. The weights are no longer the troy or apothecaries' weights hitherto employed in the London and Edinburgh Pharmacopœias, but the imperial or avoirdupois weights, which had been already adopted in the Dublin Pharmacopœia. The avoirdupois weights directed to be employed are the pound, the ounce, and the grain. The use of the old troy drachm of sixty, and the scruple of twenty grains is recommended to be discontinued; but no error can arise from their use, at least by dispensers, so long as they are not regarded as integral parts of the avoirdupois ounce. Some inconvenience may be caused by the ounce itself not being a simple multiple of the grain (the want of a similar relation between the ounce and the drachm and scruple having been considered of sufficient importance to require the disuse of the two latter weights), and by the want of some intermediate weight between the ounce and the grain. A dec (10 grains) and a cent (100 grains), or some similar weights, might have been authorized. The use, however, of the half and quarter ounce will in some degree supply this deficiency.

# TABLE

SHOWING

## THE DIFFERENCE IN THE NOMENCLATURE OF THE BRITISH AND OF THE LONDON, EDINBURGH, AND DUBLIN PHARMACOPŒIAS.

| *Former Names.* | *Present Names.* |
|---|---|
| Acidum aceticum, E. | Acidum aceticum glaciale. |
| Acidum aceticum e ligno venale, E. | Acidum aceticum. |
| Acidum arseniosum purum, D. | Acidum arseniosum. |
| Acidum hydrocyanicum, E. | Acidum hydrocyanicum dilutum. |
| Acidum muriaticum purum, E. D. | Acidum hydrochloricum. |
| Acidum nitricum purum, E. | Acidum nitricum. |
| Acidum pyroligneum, D. | Acidum aceticum. |
| Acidum sulphuricum purum, E. D. | Acidum sulphuricum. |
| Adeps suillus præparatus, D. | Adeps præparatus. |
| Ærugo, L. | Subacetate of copper of commerce. |
| Æther sulphuricus, E. D. | Æther. |
| Alcohol amylicum, D. | Fousel oil. |
| Ammoniæ murias, E. D. | Ammoniæ hydrochloras. |
| Ammoniæ sesquicarbonas, L. D. | Ammoniæ carbonas. |
| Antimonii oxysulphuretum, L.<br>Antimonii sulphuretum aureum, E.<br>Antimonii sulphuretum præcipitatum, D. | Antimonium sulphuratum. |
| Antimonii potassio-tartras, L.<br>Antimonium tartarizatum, D. | Antimonium tartaratum. |
| Aqua ammoniæ, E. | Liquor ammoniæ. |
| Aqua ammoniæ acetatis, E. | Liquor ammoniæ acetatis. |
| Aqua calcis, E. | Liquor calcis. |
| Aqua chlorinii, E. D. | Liquor chlori. |
| Aqua potassæ, E. | Liquor potassæ. |
| Arsenicum album, E. | Acidum arseniosum. |
| Axungia, E. | Adeps præparatus. |
| Balsamum canadense, E. | Terebinthina canadensis. |
| Barytæ murias, E. | Chloride of barium. |
| Bismuthi nitras, L.<br>Bismuthi subnitras, D. | Bismuthum album. |
| Buchu, D.<br>Bucku, E. | Bucco. |
| Calcis murias, E. | Chloride of calcium. |
| Calx chlorinata, L. E. D. | Calx chlorata. |
| Cataplasma sodæ chlorinatæ, L. | Cataplasma sodæ chloratæ. |
| Ceratum plumbi compositum, L. | Unguentum plumbi subacetatis |
| Ceratum sabinæ, E. | Unguentum sabinæ. |
| Chloroformyl, L. | Chloroformum. |

| *Former Names.* | *Present Names.* |
|---|---|
| Cinchona coronæ, E. | Cinchona pallida. |
| Confectio amygdalæ, L. | Pulvis amygdalæ compositus. |
| Confectio aromatica, L. | Pulvis cretæ aromaticus. |
| Confectio rosæ, L. D. | Confectio rosæ gallicæ. |
| Confectio rosæ fructus, E. | Confectio rosæ caninæ. |
| Conserva amygdalæ, E. | Pulvis amygdalæ compositus. |
| Conserva rosæ, E. | Confectio rosæ gallicæ. |
| Conserva rosæfructus, E. | Confectio rosæ caninæ. |
| Decoctum aloes, E. | Decoctum aloes compositum. |
| Decoctum cinchonæ, L. | Decoctum cinchonæ flavæ. |
| Diosma, L. | Bucco. |
| Electuarium piperis | Confectio piperis. |
| Electuarium sennæ, E. | Confectio sennæ. |
| Emplastrum plumbi, L. | Emplastrum lithargyri. |
| Emplastrum resinosum, E. | Emplastrum resinæ. |
| Enema catharticum, E. D. | Enema magnesiæ sulphatis. |
| Enema fœtidum, E. D. | Enema assafœtidæ. |
| Essentia menthæ piperitæ, D. | Spiritus menthæ piperitæ. |
| Essentia myristicæ moschatæ, D. | Spiritus myristicæ. |
| Essentia rosmarini, D. | Spiritus rosmarini. |
| Extractum opii aquosum, D. | Extractum opii. |
| Extractum styracis, E. | Styrax præparatus. |
| Ferri ammonio-citras, L. D. | Ferri et ammoniæ citras. |
| Ferri filum, E. | Iron wire. |
| Ferri potassio-tartras, L. | Ferrum tartaratum. |
| Ferri pulvis, D. | Ferrum redactum. |
| Ferri sesquioxidum, L. | Ferri peroxidum. |
| Ferrugo, E. | Ferri peroxidum hydratum. |
| Ferrum in fila tractum, L. | Iron wire. |
| Ferrum tartarizatum, E. D. | Ferrum tartaratum. |
| Guaiacum, L. | Guaiaci resina. |
| Hepar sulphuris, D. | Potassa sulphurata. |
| Hydrargyri ammonio chloridum, L. D. | Hydrargyrum ammoniatum. |
| Hydrargyri bichloridum, L. | Hydrargyrum corrosivum sublimatum. |
| Hydrargyri biniodidum, E. | Hydrargyri iodidum rubrum. |
| Hydrargyri chloridum, L. | Calomelas. |
| Hydrargyri iodidum, L. | Hydrargyri iodidum viride. |
| Hydrargyri nitrico-oxidum, L. | Hydrargyri oxidum rubrum. |
| Hydrargyri præcipitatum album, E. | Hydrargyrum ammoniatum. |
| Hydrargyrum purum, D. | Hydrargyrum. |
| Infusum cinchonæ, L. | Infusum cinchonæ flavæ. |
| Infusum diosmæ, L. | Infusum bucco. |
| Infusum rosæ compositum, L. | Infusum rosæ acidum. |
| Infusum sennæ compositum, L. D. | Infusum sennæ. |
| Iodinium, L.<br>Iodinium purificatum, D. | Iodum. |
| Lichen islandicus, D. | Cetraria. |
| Linimentum hydrargyri compositum, D. | Linimentum hydrargyri. |
| Liquor chlorinii, L. D. | Liquor chlori. |
| Liquor hydrargyri pernitratis, D. | Liquor hydrargyri nitratis acidus. |
| Liquor plumbi diacetatis, L. D. | Liquor plumbi subacetatis. |

| *Former Names.* | *Present Names.* |
|---|---|
| Liquor potassæ arsenitis, L. | Liquor arsenicalis. |
| Liquor potassæ causticæ, D. | Liquor potassæ. |
| Liquor sodæ causticæ, D. | Liquor sodæ. |
| Liquor sodæ chlorinatæ, L. D. | Liquor sodæ chloratæ. |
| Magnesia, L. | Magnesia levis. |
| Magnesiæ carbonas, L. | Magnesiæ carbonas levis. |
| Magnesiæ carbonas ponderosum, D. | Magnesiæ carbonas. |
| Mistura acaciæ, L. | Mucilago acaciæ. |
| Mistura camphoræ, L. E. D. | Aqua camphoræ. |
| Morphiæ murias, E. D. | Morphiæ hydrochloras. |
| Mucilago, E. | Mucilago acaciæ. |
| Myristicæ oleum, L. | Myristicæ adeps. |
| Pilula aloes composita, L. | Pilula aloes socotrinæ. |
| Pilula aloes cum sapone, L. | Pilula aloes barbadensis. |
| Pilula colocynthidis composita, L. | Extractum colocynthidis compositum. |
| Pilula hydrargyri chloridi composita, L. | Pilula calomelanos composita. |
| Pilula saponis composita, L. E. | Pilula opii. |
| Pilulæ aloes, E. | Pilula aloes socotrinæ. |
| Pilulæ plumbi opiatæ, E. | Pilula plumbi cum opio. |
| Pilulæ scillæ, E. | Pilula scillæ composita. |
| Plumbi oxidum, L. D. | Lithargyrum. |
| Potassa, E. | Potassa caustica. |
| Potassæ et sodæ tartras, E. | Sodæ et potassæ tartras. |
| Potassæ hydras, L. | Potassa caustica. |
| Potassæ bitartras, L. E. D. | Potassæ tartras acida. |
| Potassæ nitras purificatum, D. | Potassæ nitras. |
| Potassii sulphuretum, L. E. | Potassa sulphurata. |
| Pulvis antimonii compositus, L. | Pulvis antimonialis. |
| Pulvis cretæ compositus, E. D. | Pulvis cretæ aromaticus. |
| Pulvis cretæ compositus cum opio, L.<br>Pulvis cretæ opiatus, E. D. | Pulvis cretæ aromaticus cum opio. |
| Pulvis ipecacuanhæ compositus, L. E. D. | Pulvis ipecacuanhæ cum opio. |
| Pulvis kino compositus, L. | Pulvis kino cum opio. |
| Quinæ disulphas, L.<br>Quinæ sulphas, E. D. | Quiniæ sulphas. |
| Rosæ fructus, E. | Rosa canina. |
| Sacchari fæx, L. | Theriaca. |
| Saccharum purificatum, D. | Saccharum album. |
| Sapo, L. | Sapo durus. |
| Sodæ biboras, D. | Borax. |
| Sodæ murias, E. | Sodii chloridum. |
| Sodæ carbonas siccatum, D. | Sodæ carbonas exsiccata. |
| Sodæ potassio-tartras, L. | Sodæ et potassæ tartras. |
| Solutio plumbi diacetatis, E. | Liquor plumbi subacetatis. |
| Spiritus ætheris nitrici, L. E. | Spiritus ætheris nitrosi. |
| Spiritus lavandulæ compositus, E. | Tinctura lavandulæ composita. |
| Sublimatum corrosivum, E. D. | Hydrargyrum corrosivum sublimatum. |
| Syrupus rosæ, L. | Syrupus rosæ gallicæ. |
| Thus, L. | Thus americanum. |
| Tiglii oleum, L. | Oleum crotonis. |
| Tinctura camphoræ composita, L. | Tinctura camphoræ cum opio. |

| *Former Names.* | *Present Names.* |
|---|---|
| Tinctura cinchonæ, L. . . . . | Tinctura cinchonæ flavæ. |
| Tinctura cocci cacti, D. . . . . | Tinctura cocci. |
| Tinctura colchici, L. . . . . | Tinctura colchici seminis. |
| Tinctura ferri sesquichloridi, L. . | Tinctura ferri perchloridi. |
| Tinctura ferri muriatis, D. . . | Tinctura ferri perchloridi. |
| Tinctura iodinii composita. . . . | Tinctura iodi. |
| Tinctura opii camphorata. . . . | Tinctura camphoræ cum opio. |
| Tinctura sennæ composita. . . . | Tinctura sennæ. |
| Unguentum antimoniale, E. . . | Unguentum antimonii tartarati. |
| Unguentum antimonii potassio-tartratis, L. . . . . | Unguentum antimonii tartarati. |
| Unguentum citrinum, E. D. . . . | Unguentum hydrargyri nitratis. |
| Unguentum hydrargyri ammonio-chloridi, L. . . . . | Unguentum hydrargyri ammoniati. |
| Unguentum hydrargyri nitrico-oxidi, L. | Unguentum hydrargyri oxidi rubri. |
| Unguentum iodinii compositum, L. D. | Unguentum iodi compositum. |
| Unguentum oxidi hydrargyri, E. . . | Unguentum hydrargyri oxidi rubri. |
| Unguentum resinosum, E. . . . | Ungnentum resinæ. |
| Ungnentum præcipitati albi, E. . . | Unguentum hydrargyri ammoniati. |
| Uvæ passæ, E. D. . . . . . | Uvæ. |
| Vinum album, E. . . . . | Vinum xericum. |
| Vinum hispanicum, L. . . . | Vinum xericum. |

## THE WEIGHTS AND MEASURES OF THE BRITISH PHARMACOPŒIA, WITH THEIR SYMBOLS.

### WEIGHTS.

| | | | | |
|---|---|---|---|---|
| 1 pound | lb. | = 16 ounces | = | 7000 grains |
| 1 ounce | oz. | = | = | 437.5 grains |
| 1 grain | gr. | = | = | 1 grain |

### MEASURES.

| | | | |
|---|---|---|---|
| 1 gallon | C. | = 8 pints | O. viij |
| 1 pint | O. | = 20 fluidounces | fl. oz. xx |
| 1 fluidounce | fl. oz. | = 8 fluidrachms | fl. drs. viij |
| 1 fluidrachm | fl. drm. | = 60 minims | min. lx |
| 1 minim | min. | = 1 minim | min. j |

## RELATION OF MEASURES TO WEIGHTS OF THE BRITISH PHARMACOPŒIA.

| | | | | |
|---|---|---|---|---|
| 1 gallon | = | the measure of | 10 pounds | of water |
| 1 pint | = | " | 1.25 pounds | " |
| 1 fluidounce | = | " | 1 ounce | " |
| 1 fluidrachm | = | " | 54.68 grains | " |
| 1 minim | = | " | 0.91 grains | " |

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

| | |
|---|---|
| 1 pound | = 453.5925 grammes |
| 1 ounce | = 28.3495 " |
| 1 grain | = 0.0648 " |

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

| | |
|---|---|
| 1 gallon | = 4.543487 litres |
| 1 pint | = 0.567936 " |
| 1 fluidounce | = 0.028396 " |
| 1 fluidrachm | = 0.003549 " |
| 1 minim | = 0.000059 " |

Temperature in all cases is to be determined by Fahrenheit's thermometer, and the specific gravity of liquids is to be taken at the temperature of 60°. All liquids are ordered by measure, unless it is stated otherwise.

## [UNITED STATES PHARMACOPŒIA WEIGHTS AND MEASURES.

The weights of the United States Pharmacopœia are derived from the TROY POUND. They are as follows:—

| | | | | |
|---|---|---|---|---|
| The pound, ℔ | contains | twelve ounces, | ℥ | = grs. 5760 |
| The ounce | contains | eight drachms, | ʒ | = grs. 480 |
| The drachm | contains | three scruples, | ℈ | = grs. 60 |
| The scruple | contains | twenty grains, | gr. | |

The troy weights of the United States Pharmacopœia differ, it will be seen, essentially from the British weights, in its OUNCE containing 480 GRAINS, instead of 437.5, and its POUND 5760, instead of 7000 GRAINS. *This must always be borne in mind when comparing the processes of the two Pharmacopœias.* The avoirdupois ounce contains 437.5 grains.

The measures of the United States Pharmacopœia are derived from the WINE GALLON. They are as follows:—

| | | | |
|---|---|---|---|
| The gallon, C. | contains | eight pints, | O. |
| The pint | contains | sixteen fluidounces, | f℥ |
| The fluidounce | contains | eight fluidrachms, | fʒ |
| The fluidrachm | contains | sixty minims, | ♏ |

At a temperature of 60° a pint of distilled water weighs 7291.2 grains; a fluidounce 455.7 grains.

## RELATIVE VALUE OF APOTHECARIES' AND IMPERIAL MEASURES (U. S. D.).

| APOTHECARIES' MEASURE. | | IMPERIAL MEASURE. Pints. | Fluidoz. | Fluidrms. | Minims. |
|---|---|---|---|---|---|
| 1 gallon . . . | = | 6 | 13 | 2 | 23 |
| 1 pint . . . . | = | | 16 | 5 | 18 |
| 1 fluidounce . . | = | | 1 | 0 | 20 |
| 1 fluidrachm . | = | | | 1 | 2.5 |
| 1 minim . . . | = | | | | 1.04 |

| IMPERIAL MEASURE. | | APOTHECARIES' MEASURE. Gallon. | Pints. | Fluidoz. | Fluidrms. | Minims. |
|---|---|---|---|---|---|---|
| 1 gallon . . . | = | 1 | 1 | 9 | 5 | 8 |
| 1 pint . . . . | = | | 1 | 3 | 1 | 38 |
| 1 fluidounce . . | = | | | | 7 | 41 |
| 1 fluidrachm . | = | | | | | 58 |
| 1 minim . . . | = | | | | | 0.96 |

### APPROXIMATE MEASURES.

| | | |
|---|---|---|
| One teaspoonful . . . . . . . . . . . | = | fʒj |
| One dessertspoonful . . . . . . . . . . | = | fʒij |
| One tablespoonful . . . . . . . . . | = | fʒiv or f℥ss |
| One wineglassful . . . . . . . . . . . | = | f℥ij—W.] |

# ELEMENTS

OF

# MATERIA MEDICA.

THE term MATERIA MEDICA is used to designate that department of medicine which is devoted to the consideration of remedies or medicines. In the British Pharmacopœia it embraces the name, definition, character, and tests of strength and purity, of every definite medicinal substance which has been admitted into that work.

PHARMACY (from φάρμακον, *a medicine*) treats of the collection, preparation, preservation, and dispensing of medicines.

THERAPEUTICS (from θεραπεύω, *I cure*) treats of the use and administration of medicines in the cure of disease.

MEDICINES are substances used in the treatment of diseases, which, when applied to the body, alter or modify its vital actions.

I shall arrange the MATERIA MEDICA in two groups—the *inorganic* and the *organic*, the former of which will be subdivided according to the chemical relations of its members; the latter according to their external, or, as they are usually called, natural history characters.

## INORGANIC BODIES.

Of the *inorganic* substances used in medicine, some are simple, others are compound.

At the present time sixty-six simple or elementary substances are known; and of these, thirty-one enter into the Materia Medica, &c., of the Pharmacopœia.

*Elementary Bodies of the Pharmacopœia, their Symbols and Equivalents.*

| Elementary Bodies. | Symbols. | Equivalent Weights. |
|---|---|---|
| Oxygen | O | 8 |
| Hydrogen | H | 1 |
| Carbon | C | 6 |
| Boron | B | 11 |
| Phosphorus | P | 31 |
| Sulphur | S | 16 |
| Iodine | I | 127 |
| Bromine | Br | 80 |
| Chlorine | Cl | 35.5 |
| Nitrogen | N | 14 |
| Potassium (Kalium) | K | 39 |
| Sodium (Natrium) | Na | 23 |
| Lithium | L | 7 |

| Elementary Bodies. | Symbols. | Equivalent Weights. |
|---|---|---|
| Barium | Ba | 68.5 |
| Calcium | Ca | 20 |
| Magnesium | Mg | 12 |
| Aluminum | Al | 13.75 |
| Chromium | Cr | 26.25 |
| Manganese | Mn | 27.5 |
| Arsenic | As | 75 |
| Antimony (Stibium) | Sb | 122 |
| Bismuth | Bi | 210 |
| Zinc | Zn | 32.5 |
| Tin (Stannum) | Sn | 59 |
| Lead (Plumbum) | Pb | 103.5 |
| Iron (Ferrum) | Fe | 28 |
| Copper (Cuprum) | Cu | 31.75 |
| Mercury (Hydrargyrum) | Hg | 100 |
| Silver (Argentum) | Ag | 108 |
| Gold (Aurum) | Au | 196.5 |
| Platinum | Pt | 98.5 |

## OXYGEN. O=8.

*Natural History.*—Oxygen is found in both kingdoms of nature, constituting at least three-fourths of the known terraqueous globe. Thus water contains eight-ninths of its weight of oxygen; and the solid crust of our globe probably consists of at least one-third part, by weight, of this principle. Of the atmosphere, oxygen constitutes nearly twenty-one per cent. by volume, or about twenty-three per cent. by weight. It is also an essential constituent of all living bodies. It is disengaged by plants, and absorbed by animals. The former obtain it by the decomposition of water and carbonic acid; the latter consume it in the oxidizement of hydrogen and carbon, and the consequent formation of water and carbonic acid. Thus the two kingdoms of the organized world bear an important relation to each other. Vegetables may have been the original producers of atmospheric oxygen, as they are now the purifiers of the air. In the sun's rays they absorb carbonic acid, decompose it, retain the carbon, and emit the oxygen.

*Therapeutics.*—Soon after the discovery of oxygen, the most exaggerated notions prevailed as to its remedial powers. Various diseases (scorbutus, for example) were thought to be dependent on a deficiency of it; and it was, in consequence, submitted to a considerable number of trials, with, as it was at first asserted, remarkable success. But Chaptal and Fourcroy declared that it was injurious in phthisis. In England it was tried by Beddoes and Hill. The latter states that he found it beneficial in asthma, debility, ulcers, gangrene, white swelling, and scrofulous diseases of the bones. The beneficial results obtained by the use of acids (especially nitric acid), of the oxides of mercury, chlorate of potash, vegetable food, &c., were referred to the oxygen which these substances contained, and which they were supposed to communicate to the system. These notions are now exploded.

In asphyxia arising from a deficiency of atmospheric air, or from breathing noxious vapors, the inhalation of oxygen gas has been said to be, and probably is, useful. On the same principle it may be employed during an attack of spasmodic asthma when there is danger of suffocation; but it is at best only a palliative, and has no power of preventing the occurrence of other attacks. Chaussier has recommended its use in children apparently stillborn; I have known it used without benefit.

To combat the asphyxia of malignant cholera, inhalations of oxygen were tried in Russia, Poland, Prussia, and France, but without success. On the whole, then, I believe oxygen to be almost useless as a remedy.

*Pharmaceutic Uses.*—Oxygen is not employed in Pharmacy in its free state, but is liberated in several pharmaceutical operations; from *nitric acid*, in the production of phosphoric acid, nitrate of silver, and several other preparations; from *water*, in sulphate of iron, and sulphate of zinc; from *sulphuric acid*, in sulphate of mercury; from *chromic acid*, in valerianate of soda; from *chloric acid*, in permanganate of potash; and from other sources.

---

## HYDROGEN. H=1.

*Natural History.*—It is found in both kingdoms of nature, and next to oxygen may be regarded as the most important constituent of the terraqueous globe; it constitutes 11.1 per cent. by weight of water.

*Preparation.*—Hydrogen is always procured from water by means of some metal (and an acid) which combines with the oxygen of the water: *e. g.* by means of zinc, and sulphuric acid, in the preparation of *reduced iron* ($Zn+HO+SO_3=ZnO,SO_3+H$), of sodium, and sulphuric acid, in *hydrochloric acid*, and of potassium, and sulphuric acid, in *hydrocyanic acid.*

*Properties.*—Hydrogen is combustible, burning with a pale flame, does not support combustion, and yields, when exploded with half its volume of oxygen, water only.

*Therapeutics.*—A *flame of hydrogen* has been employed as a cautery, to form issues. It is not otherwise used therapeutically.

*Pharmaceutic Uses.*—It is only required in its free state in the preparation of *reduced iron*, where it is used as a deoxidizing agent. In the other two instances it combines with chlorine and with cyanogen to form *hydrochloric* and *hydrocyanic acids.*

### **Aqua** [Mat. Med. List, U.S.], *Water.* HO=9.

Natural water, HO, the purest that can be obtained, cleared, if necessary, by filtration.

*Tests.*—Free from odor, taste, and visible impurity.

*Natural History.*—The varieties of water in common use are derived from rain-fall, rivers, and springs. When *rain* is collected, before it touches the earth, or from a granitic or siliceous surface, it is very pure and soft; but if it absorbs carbonic acid, and falls upon limestone, chalky or clayey districts, it rapidly becomes impregnated with carbonate and sulphate of lime and magnesia salts. The purity of *river* and *spring* water depends, therefore, entirely upon the nature of the soil over which it flows, or out of which it rises. *Spring* water, in particular, is often highly charged with such saline ingredients as render it *hard*, that is to say, capable of curdling a large quantity of soap without producing a lather; this curdling arises from the formation of insoluble compounds with the lime and magnesia.

*Purification.*—Various methods are resorted to for the purpose of purifying common water; those which require to be noticed are *subsidence*, *filtration*, *ebullition*, and *distillation.*

1. *Subsidence.*—By allowing water to remain for some time in perfect repose, various impurities mechanically suspended in it gradually subside; and from these the water is decanted. In this way accumulations of filth are formed in the tanks and cisterns employed for the reception

of common river water. This method of purification is sometimes the only one resorted to, and at other times is preliminary to further purifications by the following processes.

2. *Filtration.*—By this process water is rendered clear and transparent. It removes living beings and other suspended impurities, and is also capable of removing certain substances held in solution. The materials employed for the filtration of water are perforated plates of metal or stoneware, unsized or bibulous paper, flannel, cloth, or other tissues, sponge, porous stone (filtering stone), charcoal (animal charcoal is more effective than vegetable), and beds of sand. In the stoneware filtering machines usually sold in the shops, a combination of filtering materials (*viz.* sponge, sand, and charcoal) is generally employed. Paper is only fitted for operations on the small scale. Two kinds of filter paper are usually kept—a coarser and a finer kind; the former for the separation of the grosser particles, the latter for the removal of finely-divided matters.

3. *Ebullition* destroys the vitality of both animals and vegetables, expels air or carbonic acid, and causes the precipitation of carbonate of lime.

4. *Distillation.*—When properly conducted this is the most effectual method of purifying water. But distilled water is in general contaminated by traces of organic matter. (See **Aqua Destillata.**)

*Therapeutics.*—Water is employed both cold and hot, and also in the state of ice and of aqueous vapor.

a. *Cold Water.*

*Internally*, α. *Cold Drinks.*—Hippocrates, Celsus, and other ancient writers, employed cold water in *ardent fever*. In modern times, also, it has been extensively used in the same malady. When exhibited under proper circumstances, cold water operates as a real refrigerant, reducing preternatural heat, lowering the pulse, and disposing to sweating. Besides fever, there are several other affections in which cold water is a useful remedy. For example: to facilitate recovery from *epilepsy*, *hysteria*, and *fainting;* and to alleviate *gastric pain* and *spasm*, and *hiccup*. Large draughts of it have sometimes caused the expulsion of *intestinal worms* (*Tænia* and *Ascaris vermicularis*).

The copious use of water augments the quantity of liquid thrown out of the system by the cutaneous and pulmonic surfaces, and by the kidneys. If our object be to promote diaphoresis, external warmth should be conjoined with the internal use of diluents; whereas, when we wish to excite the renal vessels, the skin should be kept cool. In inflammatory affections of the urinary passages, we advise the free employment of aqueous fluids, with the view of diluting the urine, and thereby of rendering it less acrid and irritating.

β. *Cold Injections.*—Cold water is thrown into the *rectum* to check hemorrhage, to expel worms, to allay local pain, to rouse the patient in poisoning by opium, to relieve the pain of hemorrhoids, and to diminish vascular action in enteritis. Dr. A. T. Thomson speaks very favorably of the effects of cold water introduced into the *vagina*, by means of the stomach-pump, in uterine hemorrhage.

*Externally*, α. *The Cold Bath.*—The temperature of this ranges from 33° to about 75° F.; when below 50° F. the bath is considered very cold. Its primary effects constitute the *shock;* its secondary effects, the *reaction* or *glow*. The immediate effects of the cold bath are—a sensation of cold (speedily followed by one of warmth), contraction of the cutaneous vessels, paleness of the skin, diminution of perspiration, and reduction of the volume of the body. Shivering and, as the water rises to the chest, a kind of convulsive sobbing are also experienced. If the immersion be only temporary, reaction quickly follows. The cutaneous circulation is speedily re-established; a glow is felt, perspiration comes on, the pulse becomes full and frequent, and the body feels invigorated.

The cold bath is employed with the view of obtaining the nervous impression or shock—the refrigeration—or the reaction or glow; but principally for the latter purpose in cases where it is desirable to increase the tone and vigor of the body.

In weakly and debilitated subjects, the reaction or glow is imperfectly effected, and in such the cold bath acts injuriously. Whenever cold bathing is followed for several hours by coldness of surface, blueness of lips, feeble pulse, reduction of strength, and headache, its use should be prohibited. In pregnancy and in diseases of the heart and lungs it is a dangerous remedy; as also in persons disposed to apoplexy, and who are unaccustomed to cold bathing. It is a common opinion that immersion in cold water is dangerous when the body is heated by exercise or other exertion, and hence it is customary with bathers to wait until they become cool.

β. *Cold Affusion* (*Perfusio*).—Hippocrates used it, and Celsus recommends it in some affections of the head.

The affusion on the head is thus effected: The water is to be poured on the head (inclined over a pan or tub), by means of an ewer or pitcher, from a height of one to three feet. If the patient be confined to his couch, the head should be inclined over the side of the bed. In children it is sufficient to squeeze a large sponge, previously soaked in water, at some height above the head, as recommended by Dr. Copland. When the object is to apply affusion to the whole body, the patient is placed in a large tub or pan (*e. g.* a bathing tub or washing pan), and then an attendant, standing on a chair, may readily effect it. The time that the affusion should be continued varies, according to circumstances, from a quarter of a minute to two or three minutes; but in some cases it has been employed for twenty minutes. After the affusion the body should be carefully wiped dry, the patient wrapped up warm, and placed in bed.

The effects of affusion depend partly on the temperature of the liquid, and partly also on the sudden and violent shock given to the system by the mechanical impulse; hence the reason why the effects vary according to the height from which the water is poured. When water whose temperature is between 32° and 60° F. is used, we denominate the affusion *cold*.

Cold affusion is used with advantage in numerous diseases: as in *syncope;* in *poisoning* by hydrocyanic acid, alcohol, opium, belladonna, &c.; in *asphyxia*, caused by the inhalation of carbonic acid, the fumes of burning charcoal, sulphuretted hydrogen, &c.; in *hysteria* and *epilepsy*, and in *spasmodic closure of the glottis.* Cold, in these cases, excites a sudden act of inspiration. "The influence of cold water dashed on the face in exciting sudden sobbing acts of inspiration is well known." (M. Hall.) It has also been recommended, and with great show of reason, to dash cold water over the faces of children stillborn, with the view of exciting the respiratory act. [Cold affusion may be applied to young children suffering from *convulsive fits*, while the body is placed in the warm bath, attention having been previously paid to the state of the gums and the bowels. It frequently acts as a soporific in *delirium tremens* and the *delirium of fever*, when opium has failed, the patient falling asleep as soon as his head is replaced on the pillow.—Ed.]

*Cool and tepid affusions* are employed as substitutes for cold affusion where dread is entertained of the effect of the latter. They are safer, though less powerful agents.

γ. *The Shower-bath* (*Impluvium*).—The shower-bath is very similar in its effects to, but milder than affusion, and is frequently employed as a hygienic agent to promote the tone and vigor of the body. In chorea and hysteria it is particularly useful. In insanity it is used with the greatest benefit to allay mental excitement. In violent cases, "the application of the shower-bath, the patient being up to the middle in warm water, seldom fails to subdue the paroxysms." (CONOLLY.) The period during which it should be continued is a circumstance of some moment. Dr. Conolly observes that it "should be suspended when the patient appears overcome, and instantly renewed when symptoms of violence recur. A strong shower continued even for a minute has sometimes considerable effect;" and it should never be "many minutes prolonged without careful observation of the patient's state," as even a fatal result has been known to follow its excessive use. "After four or five applications of this kind, the patient becomes entirely subdued, and should then be taken out of the bath, rapidly dried, warmly covered up, and put into bed with every possible demonstration of kind attention. Calmness and sleep are the usual results, and more permanent effects frequently follow. A bath of this kind appears to produce a moral as well as a physical impression, being succeeded, in recent cases, by tranquillity for a few days, and in chronic cases by quietness and improved behavior for many weeks, and sometimes even for months." An extemporaneous shower-bath, produced by the aid of a cullender, may be used to allay the violent delirium of fever; and is rendered more beneficial if the patient can be persuaded to sit in a semicupium of warm water.

δ. *Washes.*—Cold, cool, or tepid washing or sponging may be used in febrile diseases, with great advantage. A little vinegar is frequently mixed with the water, to make the effect more refreshing. Cold washing is also used to lessen the susceptibility of the skin, and diminish the liability to rheumatism and catarrh.

One method of treating burns is by the application of cold water to the injured part. In modern times, Sir James Earle was the great advocate for this plan, which proves more successful in scalds and slight burns. The burnt part should be covered with rags, and kept constantly wetted with water, in which ice is placed from time to time; "care being taken never to remove the rags from the burnt surface."

If the cold fluid be continually renewed, the practice has been called *irrigation*. It is effected either by allowing cold water to drop on the affected part from a stopcock inserted in the side of a bucket of water, or by conducting a stream of water from a vessel by means of a strip of cloth on the principle of a syphon.

What is called *waterdressing* may be regarded as a modified and improved form of poultice. It consists in the application of two or three layers of soft lint dipped in water and applied to inflamed parts, wounds and ulcers, the whole being covered with oiled silk or Indian rubber, which should project beyond the margin of the lint, to retain the moisture and prevent evaporation. Dr. Macartney considers it to operate differently from a poultice: unlike the latter, he says it prevents or diminishes the secretion of pus, checks the formation of exuberant granulations, and removes all pain. Moreover, the water is not apt to become sour, like a poultice, and does not injure the sound part.

b. *Ice and Snow.*

The temperature of these agents does not exceed 32° F. They are employed both internally and externally, to obtain sometimes the primary, at other times the secondary, effects of cold.

*Externally.*—Ice is used to check hemorrhage, more especially when the bleeding vessel cannot be easily got at and tied; as after operations about the rectum, more especially for piles and fistula. Ice has also been applied in prolapsus of the rectum or vagina, when inflammation has come on which threatens to terminate in mortification.

The *ice-cap* (*i. e.* a bladder containing pounded ice) is applied to the head with great benefit in inflammation of the brain; in fever, where there is great cerebral excitement, with a hot dry skin; and in acute hydrocephalus. In apoplexy, likewise, it might be useful; as also in delirium tremens, and in mania with great mental excitement. In the retention of urine to which old persons are liable, ice-cold water applied to the hypogastrium is sometimes very effective in causing the evacuation of this secretion. Dr. Todd found ice very useful in *tetanus*, when applied to the whole length of the spine. Friction with ice or snow is also used as an application to *frost-bitten parts.* The feet, hands, tip of the nose, and pinnæ of the ears, are the organs most frequently attacked. In order to guard against mortification, and other ill effects arising from too rapid change of temperature, the vital properties must be slowly and gradually recalled. In order to effect this, the frost-bitten part should be rubbed with snow or pounded ice, or bathed in ice-cold water, very gradually raising the temperature of the applications until the part acquires its natural heat.

A mixture of pounded ice and salt is sometimes used, as recommended by Dr. Arnot, in 1849, as a *local anæsthetic*, which has the advantage of destroying the sensation of the part to which it is applied without occasioning loss of consciousness.

*Internally.*—Ice, or ice-cold water, is swallowed to cause contraction of the gastric vessels, and thereby to check or stop hemorrhage from the mucous membrane of the stomach. It has also been found beneficial in nasal, bronchial, and uterine hemorrhage. In the latter cases, the constriction of the bleeding vessels must be effected through the sympathetic relations which exist between the stomach and other organs. Ice is also employed to relieve cardialgia, vomiting, and spasmodic pain of the stomach. In the latter stage of typhus fever its internal use is sometimes beneficial. It was most acceptable, and afforded great relief in cholera.

c. *Warm and Hot Water.*

*Externally*, α. *Baths of Tepid, Warm, or Hot Water.*—The practice of bathing is of great antiquity. In the writings ascribed to Hippocrates we find baths mentioned, and their effects described. They are also noticed by Celsus, Pliny, and other Roman writers.

*The Tepid Bath* has a temperature of from 85° to 92° F. It gives rise to a sensation of either heat or cold, according to the temperature of the body at the time of immersion. It cleanses the skin, promotes perspiration, and allays thirst. It is sometimes employed as a preparative to the temperate, cool, or cold bath. When there is a tendency to apoplexy, the simultaneous immersion in the tepid bath, and affusion of cold water over the head, have been recommended.

*The Warm Bath* has a temperature of from 92° to 98° F. In general it causes a sensation of warmth, which is more obvious when the body has been previously cooled. It renders the pulse fuller and more frequent, accelerates respiration, and augments perspiration. It causes languor, diminution of muscular power, faintness, and a tendency to sleep. As it increases perspiration, it is useful in acute anasarca, in the anasarca of scarlatina, and in chronic renal anasarca, if the patient has sufficient power to bear it. In diabetes with a dry skin it is sometimes useful. As a relaxant, it is employed to assist reduction in dislocations of the larger joints, and in herniæ. In the passage of calculi, whether urinary or biliary, it is used with the greatest advantage: it relaxes the ducts, and thereby alleviates the pain, and facilitates the passage of the concretion. In gastritis, enteritis, cystitis, and nephritis, it proves a valuable and powerful agent. In exanthematous diseases, when the eruption has receded from the skin, in chronic cutaneous diseases, rheumatism, amenorrhœa, and dysmenorrhœa, it is highly serviceable. The *coxæluvium*, or *hip-bath*, is resorted to in inflammatory or spasmodic affections of the abdominal and pelvic viscera, and in amenorrhœa and in dysmenorrhœa. It is also sometimes employed as a substitute for the general bath, where some affection of the lungs, heart, or great vessels, prohibits the use of the latter. The *bidet* is employed in piles, prolapsed rectum, strangury, ischuria, &c. The *pediluvium*, or *foot-bath*, is used as a revulsive or counter-irritant, in slight colds; to promote the menstrual and hemorrhoidal discharges; and for various topical purposes. The *brachiluvium*, or *arm-bath*, and *manuluvium*, or *hand-bath*, are principally applied in topical affections of the upper extremities.

*The Hot Bath* has a temperature of from 98° to 112°. It causes a sensation of heat, renders the pulse fuller and stronger, accelerates respiration, occasions intense redness of the skin, and subsequently copious perspiration; gives rise to violent throbbing, and a sensation of distension of the vessels of the head, with a feeling of suffocation and anxiety. Long immersion in it sometimes causes apoplexy. Being a powerful excitant, its use requires caution. It is principally employed in paralysis, rheumatism, and some other chronic diseases, also in collapse, &c.

β. *Warm Fomentations.*—Warm fomentations are employed to lessen inflammation, and to relieve pain, tension, and spasm. In inflammation of the abdominal and pelvic viscera, and in strangury, they are highly serviceable. My friend and colleague, Mr. Luke, has for several years employed, at the London Hospital, warm water as an emollient application to burns and scalds. In almost every instance it soothes and mitigates pain. Mr. Luke thinks that it exerts a beneficial influence in mitigating the consecutive inflammation, rendering the after consequences less severe locally, and the reparative process more speedy, than under other modes of treatment. The water has generally been used in the form of fomentations; repeatedly changing the flannels, and taking care that the surface of the skin was exposed to the air as little as possible.

*Internally.*—Tepid or warm water is *taken into the stomach* to promote vomiting; to dilute the contents of the stomach, in cases of poisoning by acrid substances; to excite diaphoresis, in rheumatism, catarrh, gout, &c.; and to allay troublesome cough, especially when dependent on irritation at the top of the larynx. Warm water is *injected into the rectum* to excite alvine evacuations; to promote the hemorrhoidal flux; to diminish irritation in the large intestine, or in some neighboring organs, as the uterus, bladder, prostate gland, &c.; and to bring on the menstrual secretion. *Thrown into the vagina*, it is used to allay uterine irritation and pain, and to promote the lochial discharge. *Injected into the bladder*, it is sometimes employed to relieve vesical irritation, to distend the bladder previously to the operation of lithotrity, or when exploring for calculi.

d. *Aqueous Vapor.*

1. *The Vapor Bath.*—The general effects of the vapor bath are those of a powerful stimulant and sudorific. It softens and relaxes the cutaneous tissue, expands the superficial vessels, accelerates the circulation of blood, augments the frequency of the pulse and respiration, and produces copious perspiration. These effects are succeeded by a feeling of languor and a tendency to sleep. If the whole body be immersed in vapor, which is constantly inhaled, the temperature should be a little less than if the trunk and limbs alone are subjected to its influence; because the inhalation of vapor stops the cooling process of evaporation from the lungs. The following is a comparative view of the heating powers of water and of vapor, distinguishing the latter according as it is or is not breathed:—

| | Water. | Vapor. | |
|---|---|---|---|
| | | Not breathed. | Breathed. |
| Tepid bath . . | 85°— 92° | 96°—106° | 90°—100° |
| Warm bath . . | 92 — 98 | 106 —120 | 100 —110 |
| Hot bath . . . | 98 —106 | 120 —160 | 110 —130 |

The vapor bath is very useful when our object is to relax the skin, and to produce profuse sweating; as in chronic rheumatism and gout, in slight colds from checked perspiration, and in chronic skin diseases accompanied with a dry state of the cutaneous surface. In old paralytic cases, without signs of vascular excitement of the brain; in some uterine affections, as chlorosis, amenorrhœa, and irritation of the womb; in dropsy of aged and debilitated subjects; in old liver complaints; and in some scrofulous affections, it is occasionally employed with advantage.

*Topical* or *local vapor baths* are employed in the treatment of local diseases; as affections of the joints. Dr. Macartney recommends the topical use of vapor, as a soothing and anodyne application, in painful wounds, contusions, and fractures.

2. *Inhalation of Warm Vapor.*—The inhalation of warm aqueous vapor proves highly serviceable, as an emollient remedy, in irritation or inflammation of the tonsils, or of the membrane lining the larynx, trachea, or bronchial tubes, as in the sore throat of scarlatina and in croup. It may be employed by Mudge's inhaler, or by inspiring the vapor arising from warm water.

## Aqua Destillata [U.S.], *Distilled Water.*

*Preparation.*—Take of water, free from taste and odor, ten gallons. Distil from a copper still, connected with a block-tin worm; reject the first half gallon, and preserve the next eight gallons. ["Take of water eighty pints. Distil two pints, using a tin or glass condenser, and throw them away; then distil sixty-four pints, and keep them in glass bottles." U.S.]

The first distilled portion is to be rejected, as it may contain carbonic acid, ammonia, and other volatile impurities. The latter portions are not to be distilled, to guard against empyreuma from the charring of organic matters. The still in which the operation is conducted ought not to be employed for any other purpose, otherwise the water is apt to acquire a faint odor, and taste of the last matters subjected to distillation.

*Tests.*—A fluidounce of it evaporated in a clean glass capsule leaves no visible residue. It is not affected by sulphuretted hydrogen, oxalate of ammonia, nitrate of silver, chloride of barium, or solution of lime.

If turbidness, milkiness, or precipitate be occasioned by any of these, we may infer the existence of some impurity in the water. But water which has been repeatedly distilled gives traces of acid and alkali when examined by the agency of voltaic electricity, which, therefore, is the most delicate test of the purity of water. Distilled water also usually contains traces of organic matter. Nitrate of silver is the most delicate test of its presence. A solution of this salt in pure water, preserved in a well-stoppered bottle, undergoes no change of color by exposure to light; but if any vegetable or animal matter be present, the metal is partially reduced, and the liquid acquires a dark or reddish tint.

*Properties.*—Distilled water has the following properties: At ordinary temperatures it is a transparent liquid, colorless, tasteless and inodorous, and miscible with alcohol in all proportions, with ether in certain proportions, not miscible with the fixed oils. Water rapidly absorbs some gases, as hydrochloric acid, ammonia, &c. It is neither combustible nor a supporter of combustion. A cubic inch at 62° F., Bar. 30 inches, weighs 252.458 grains, so that this fluid is about 815 times heavier than atmospheric air; but being the standard to which the gravities of solids and liquids are referred, its specific weight is usually said to be 1. An imperial gallon weighs, at 62°, 10 lbs. or 70,000 grs. Water has the greatest density at 39.2° F. At a temperature of 32° it crystallizes, and in so doing expands. The sp. gr. of ice is 0.916. The fundamental form of crystallized water (ice) is the rhombohedron. Water evaporates at all temperatures; but when the barometer stands at 30 inches, water boils at 212° and is converted into steam, whose bulk is about 1700 times that of water, and whose sp. gr. is 0.622 (that of atmospheric air being 1).

In its chemical relations water may be regarded as a neutral body. It reacts neither as an acid nor as an alkaline or basic body. It combines with acids, alkalies, and many salts, either as *water of hydration*, as in caustic potash ($KO,HO$), or of *crystallization*, as in carbonate of soda ($NaO,CO_2+10HO$). If a saline compound absorbs water from the atmosphere, it is said to be *deliquescent*, as acetate of potash; if under the same circumstances it loses water, as in the case of phosphate of soda, it is termed *efflorescent.*

The quantity of water contained in solid bodies is frequently determined by drying them, and ascertaining the loss which they in consequence suffer. Desiccation may be effected by heat, either alone or aided by a current of artificially dried air; or by a vacuum, either alone or aided by the presence of oil of vitriol. In some cases these methods fail to expel the whole of the water, which can only be got rid of by the substitution of another substance for it. Such water must be regarded as an essential constituent of the substance, and its removal (without substitution) would completely alter the properties of the compound. Thus the oxygen-acids, when deprived of water, no longer present the qualities which characterize acids. Anhydrous sulphuric acid does not redden litmus, and exhibits a disposition to unite with salts rather than with bases. In organic analysis the quantity of water produced is determined by passing the volatile products of combustion over chloride of calcium contained in a tube, and ascertaining the increase of weight which this salt thereby gains.

*Composition.*—The composition of water is determined both by analysis and synthesis. If this liquid be submitted to the influence of a galvanic battery, it is decomposed into two gases; namely, one volume of oxygen and two volumes of hydrogen. These gases, in the proportions just mentioned, may be made to recombine, and form water, by heat, electricity, or spongy platinum.

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Hydrogen . . . . . . . . . | 1 | 11.11 |
| 1 | Oxygen . . . . . . . . . | 8 | 88.89 |
| | Water . . . . . . . . . | 9 | 100.00 |

*Uses.*—Distilled water is used as the solvent in the following preparations.

AQUÆ, *Waters.*—These are saturated aqueous solutions of essential oils, obtained by submitting fresh or dried vegetables, or their essential oils, to distillation with water, or, in one instance, *camphor water*, by solution. [*Aquæ* (U.S.) are aqueous solutions of volatile substances and gases.—W.]

INFUSA, *Infusions*, are aqueous solutions of certain constituents of vegetable substances obtained without the aid of ebullition. They are prepared by digesting distilled water (cold or hot) on the substance sliced, bruised, or reduced to coarse powder, usually in a glazed earthenware or porcelain vessel fitted with a cover. Polished metal vessels retain the heat better, but are objectionable on account of their ready corrosion. Cold water is used when the active principle is very volatile, or when it is desirable to avoid the solution of any substance soluble in hot water. Thus when the object is to extract the bitter principle from columbo or quassia without taking up the starchy matter, cold water is preferred. In most cases, however, boiling water is used. Infusions are preferred to decoctions when the active principle is either volatilized by a boiling heat, as in the case of orange-peel and buchu, or readily undergoes some chemical change by ebullition, as in the case of senna.

DECOCTA, *Decoctions*, are aqueous solutions of certain constituents of organic substances obtained with the aid of ebullition. In this operation the volatile constituents of vegetables are dissipated; and hence, when these are the active principles, the process is an objectionable one. It is obvious that the saffron in the *compound decoction of aloes* and the sassafras in the *compound decoction of sarsaparilla* are deprived of their volatile oils by boiling, and, therefore, these preparations are on that account deteriorated.

LIQUORES, *Solutions*, consist of substances dissolved in, or diluted with, water. [*Liquores* (U. S.) are aqueous solutions of non-volatile substances.—W.]

MUCILAGINES, *Mucilages*, are amylaceous or gummy substances either dissolved or suspended in water.

MISTURÆ, *Mixtures*, are mostly aqueous preparations containing earthy salts or other ingredients suspended by means of sugar or gum. In scammony mixture the resin is suspended in milk.

SYRUPI, *Syrups*, are infusions or aqueous solutions of organic or inorganic bodies saturated with sugar.

Distilled water is also employed in the making of extracts and other preparations.

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## CARBON. C=6.

*Natural History.*—Carbon is found in both kingdoms of nature; and is an essential constituent of all organized beings, both vegetable and animal.

## **Carbo Ligni,** *Wood Charcoal.*

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

*Preparation.*—Ordinary wood charcoal is prepared on the large scale, for the purposes of fuel, by burning billet-wood (oak, beech, hazel, and sometimes willow), piled in a conical heap, covered with turf and sand, to prevent the access of atmospheric air, a few holes being left near the bottom and one at the top, to occasion a draught. The heap is then set fire to, and when the flame has pervaded the whole mass, the holes are closed. When cooled, the billets are found converted into charcoal.

*Officinal Characters.*—In black, brittle, porous masses, without taste or smell, very light, and retaining the shape and texture of the wood from which it was obtained; insoluble in water and in close vessels neither melted nor volatilized by the most intense heat.

*Properties.*—Wood charcoal is easily pulverized, especially when hot. Its specific gravity varies according to the substance from which it has been obtained. A remarkable property possessed by it is that of abstracting certain substances (such as sulphuretted hydrogen, organic coloring principles, various odorous matters, &c.) from liquids in which they are dissolved, or through which they are diffused. Another curious quality is that of condensing within its pores a certain quantity of any gas with which it may be placed in contact. Thus one volume of boxwood charcoal absorbs 1.75 volumes only of hydrogen gas, but 90 volumes of ammoniacal gas. The use of charcoal for respirators, disinfecting purposes, &c., depends upon this property of absorbing various gases, which appear also in some cases to undergo slow combustion in its pores, similar to that observed with spongy platinum. Some of the properties now mentioned (as that of decolorizing) are possessed, in a more eminent degree, by animal charcoal. By combustion in oxygen gas, wood charcoal yields carbonic acid gas—a property by which it is shown to consist of carbon.

*Tests.*—When burned at a high temperature, with free access of air, it leaves not more than two per cent. of ash; which dissolved in sulphuric acid yields a bitterish solution, containing sulphates of potash, magnesia, and lime.

*Therapeutics.*—In this country, charcoal is used as a therapeutic agent, principally as a disinfectant and antiseptic, to absorb the fetid odor evolved by gangrenous and phagedenic ulcers. For this purpose it may be used in the form of powder or of poultice. Its disinfecting and antiseptic powers, however, are much inferior to those of chlorine, or of chlorinated lime and soda. As a *tooth-powder* it is a valuable agent, freeing the teeth from the foreign matters which cover them, and at the same time counteracting the unpleasant smell of the breath arising from decayed teeth or disordered stomach: but it is apt to lodge in the space between the gum and tooth, forming an unsightly livid circle.

Internally, charcoal has been exhibited in various affections of the alimentary canal, such as dyspepsia, cardialgia, diarrhœa, cholera, and dysentery. The beneficial effects said to have been produced in these cases can only be referred to the action of charcoal on the secretions of the bowels; an explanation apparently supported by Dr. Chapman's statement, that in dysentery, when the stools are highly acrid and offensive, charcoal entirely divests them of the bad smell and acrimony. [I have frequently observed this effect of charcoal injections both in cholera and dysentery.—Ed.] It has also been used in various other diseases, but experience has not confirmed its efficacy.

The *Dose* of charcoal, as ordered by different writers, varies from ten grains to a tablespoonful or more.

*Pharmaceutic Uses.*—Wood charcoal is used as a deoxidizing agent, in the preparation of sulphurous acid, bromide and iodide of potassium, and nitrite of soda.

CATAPLASMA CARBONIS, *Charcoal Poultice.*—Take of wood charcoal, in powder, half an ounce; bread, two ounces; linseed meal, one ounce and a half; boiling water, ten fluidounces. Macerate the bread in the water a short time near the fire, then mix, and add the linseed meal gradually, stirring the ingredients, that a soft poultice may be formed. Mix with this half the charcoal, and sprinkle the remainder on the surface of the poultice.

The charcoal poultice is applied to foul, unhealthy, and gangrenous ulcers, to destroy their fetor and improve their appearance. As an antiseptic, however, it is inferior to chlorinated lime and soda.

### **Bone Black**, *Animal Charcoal, Ivory Black.* (Appendix A.)

### [**Carbo Animalis,** Mat. Med. List, U. S.]

The residue of ox and sheep bones which have been exposed to a red heat without the access of air, reduced to powder.

*Properties.*—In its general properties animal charcoal agrees with charcoal procured from wood. It is denser and less combustible than wood charcoal, but greatly exceeds the latter in its power of destroying color and odor. It yields, when burnt in oxygen gas or atmospheric air, carbonic acid, like other forms of carbon. From vegetable charcoal it may be distinguished by its texture and appearance, as also by the properties of its ashes, which are very sparingly affected by sulphuric acid, and form with it a compound having a very different taste from that obtained when the ashes of wood charcoal are thus treated.

*Composition.*—Animal charcoal, prepared by calcining the bones of the ox and sheep, consists of the following ingredients:—

| | |
|---|---|
| Phosphate of lime, Carbonate of lime | 88.0 |
| Charcoal | 10.0 |
| Carburet of iron | 2.0 |
| Sulphuret of calcium or iron | traces |
| Common bone black | 100.0 |

The proportion of charcoal here stated is certainly small. Dr. Christison states that he has found, in the animal black of this country usually about 20 per cent. of charcoal. When bone black is calcined in the open air, the carbon is burnt off, and a whitish residue is obtained, called *bone ash.*

For the ordinary purposes of the arts, as sugar-refining, crude animal charcoal answers very well, because the earthy salts in no way affect the process. But in various pharmaceutical operations the presence of phosphate and carbonate of lime would preclude its use, on account of the free acid in the liquids to be decolorized. Hence the necessity of the purification of animal charcoal.

[*Pharmaceutical Uses.*—As a purifier in the preparation of cinchoniæ sulphas, U. S., and other alkaloids and alkaloid salts of the U. S. P.—W.]

### **Carbo Animalis Purificatus** [U. S.], *Purified Animal Charcoal.*

Bone black deprived of its earthy salts.

*Preparation.*—Take of bone black sixteen ounces; hydrochloric acid, ten fluidounces; distilled water, a sufficiency. Mix the hydrochloric acid with a pint of the water, and add the bone black, stirring occasionally. Digest at a moderate heat for two days, agitating from time to time; collect the undissolved charcoal on a calico filter, and wash with distilled water till what passes through gives scarcely any precipitate with nitrate of silver. Dry the charcoal, and then heat it to redness in a covered crucible.

["Take of animal charcoal, in fine powder, muriatic acid, each twelve troyounces; water, twelve fluidounces. Pour the muriatic acid, previously mixed with the water, gradually upon the charcoal, and digest with a gentle heat for two days, occasionally stirring the mixture. Having allowed the undissolved portion to subside, pour off the supernatant liquid, wash the charcoal frequently with water until the washings cease to afford a precipitate with nitrate of silver, and dry it." U. S.]

In this process the hydrochloric acid dissolves the phosphate of lime, and decomposes the carbonate of lime and sulphuret of calcium, evolving carbonic acid and sulphuretted hydrogen gases, and forming chloride of calcium, which remains in solution.

*Officinal Characters.*—A black pulverulent substance. It is perfectly dry, the tincture of litmus, diluted with twenty times its bulk of water, agitated with it and thrown upon a filter, passes through colorless.

*Tests.*—When burned at a high temperature, with free access of air, it leaves scarcely any residue.—It causes no effervescence when mixed with hydrochloric acid, by which the absence of carbonate of lime is shown. Nor is any precipitate produced by the addition of ammonia, or its carbonate, to the acid which has been digested in the charcoal, by which the absence of any dissolved calcareous matter is shown: caustic ammonia would precipitate any phosphate of lime in solution, while its carbonate would yield a white precipitate with chloride of calcium.

*Therapeutics.*—Dr. Garrod has proposed purified animal charcoal as a general antidote in cases of poisoning; but I agree with Dr. Taylor in regarding the experiments adduced in favor of it as inconclusive. Like many other agents, it is certainly capable of acting mechanically, and of thereby impeding the action of poisons, but beyond this there is no evidence of its antidotal power.

*Pharmaceutic Uses.*—The principal uses of animal charcoal is as a decolorizing agent in various pharmaceutical processes, as in the preparation of hydrochlorate of morphia, veratria, santonin, &c. The property possessed by minute particles of charcoal, of abstracting coloring matter from liquids, depends, probably on some chemical affinities existing between carbon and coloring matter. It has been stated that charcoal which has been once used cannot have its decolorizing property restored, by a fresh ignition, unless it be mixed with some inorganic substance. This, however, is an error. The animal charcoal, which has been used in sugar-refining, is returned to the maker to be freshly ignited, and is then employed again, and this process of reigniting is repeated many times, without any loss of decolorizing power. The effect of animal charcoal in removing substances from their solutions is not limited to coloring matters. Warington has shown that it also deprives liquids of their bitter principles, alkaloids, resins, tannin, and even some metallic salts. It is obvious, therefore, that it cannot be employed to decolorize poisonous liquids, since it deprives the solution of more or less of its deleterious ingredient, as well as of its coloring matter. Moreover, it is clear that manufacturers, who employ animal charcoal to decolorize their solutions, must lose part of their product, and hence, in the preparation of hydrochlorate of morphia, &c., a loss must be sustained by the employment of charcoal as a decolorizer. By macerating the charcoal in appropriate solvents, the whole or greater part of the absorbed alkaloids, &c. may, in most cases, be recovered unchanged.

## Carbonic acid. $CO_2=22$.

*Preparation.*—Carbonic acid gas may be procured in various ways, but for ordinary purposes is usually obtained by the action of a mineral acid on carbonate of lime. Soda-water makers and the preparers of the alkaline bicarbonates obtain it by the action of sulphuric acid on common whiting. In the Pharmacopœia, hydrochloric acid and white marble are directed to be employed, the hydrochloric acid being diluted with twice its volume of water.

$$CaO,CO_2+HCl=CaCl+HO+CO_2.$$

For therapeutic purposes it is frequently liberated from the bicarbonates of potash and soda by the action of citric and tartaric acids.

*Properties.*—At ordinary temperatures and pressures, carbonic acid is gaseous. It is invisible, irrespirable, has a faint odor and a sharp taste. Its specific gravity is 1.5245. It is neither combustible, nor a supporter of combustion, except in the case of potassium, which, when heated in this gas, takes fire, the products of the combustion being carbon and carbonate of potash. It extinguishes most burning bodies when introduced into it in the ignited condition. It reddens litmus feebly, is readily absorbed by a solution of caustic potash, and forms, with a solution of lime or of baryta, a white precipitate, soluble in acetic acid, or in excess of carbonic acid. The *carbonates* effervesce on the addition of hydrochloric acid. The evolved gas is known to be carbonic acid by the characters before stated.

At the ordinary temperature and pressure of the atmosphere, one volume of water absorbs one volume of carbonic acid gas, and acquires a sp. gr. of 1.0018. By doubling the pressure, the quantity of gas absorbed by the water is doubled, and so on for other degrees of pressure. In the United States Pharmacopœia, five volumes of gas are directed to be condensed in one volume of water. Mr. Webb tells me that a pressure of eleven atmospheres is used in the preparation of his soda water. The *Bottle Soda Water* of the shops is, in general, carbonic acid water only. Some manufacturers introduce a small portion of soda. Carbonic acid water is a brisk sparkling liquid. It has a pungent acidulous taste; reddens litmus, and causes, with lime-water, a white precipitate (*carbonate of lime*), which is redissolved by an excess of carbonic acid water. By the aid of it, extemporaneous imitations of carbonated magnesian and carbonated chalybeate water may be readily made. Some of the bottle soda water sold in the shops is contaminated with lead, which it derives either from being prepared in leaden vessels, or from its passage through leaden pipes. The presence of lead may be detected by the addition of sulphuretted hydrogen or hydrosulphuret of ammonia, which occasions a dark color or black precipitate (*sulphuret of lead*). For domestic use, especially in the sick chamber, Mayo's *patent siphon vase* is a convenient receptacle for carbonic acid water. From this vessel the effervescing liquid may be drawn off at pleasure, in any required quantity, without explosion, loss, or injury to the residue in the vase.

*Composition.*—By burning charcoal in one volume, or 16 parts by weight, of oxygen gas, we procure one volume, or 22 parts by weight, of carbonic acid gas.

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Carbon | 6 | 27.27 |
| 2 | Oxygen | 16 | 72.73 |
| | Carb. Acid | 22 | 100.00 |

*Physiological Effects.*—Taken into the stomach, dissolved in water, or in the form of effervescing draughts, it allays thirst, and diminishes preternatural heat, thus acting like other dilute acids. If it be evolved in the stomach, it distends this viscus, excites eructations, and checks both nausea and vomiting. It appears to promote the secretions of the alimentary tube, to assist the digestive process, to allay irritation, and to act as a refreshing and exhilarating substance. When drunk quickly, and in large quantity, water impregnated with this gas has been known to excite giddiness and intoxication; and it is probable that champagne is indebted to this substance for part of its intoxicating powers.

*Therapeutics.*—Carbonic acid is a most valuable remedy for checking vomiting, and diminishing irritable conditions of this viscus. In fever it is an excellent refrigerant; being especially serviceable in those cases which are accompanied with gastric irritation. In that form of lithiasis attended with a white or phosphatic deposit in the urine, carbonic acid water may be taken with advantage; but in this case the common effervescing draught (made of a vegetable acid and a carbonated alkali) must not be substituted for it, on account of the alkaline property communicated by the latter to the urine. It is, however, by no means correct to ascribe a mischievous action to remedies which render the urine alkaline in all cases of phosphatic diathesis. The greatest benefit is occasionally derived from them where the phosphatic deposit occurs, in consequence of disease of the lining mucous urinary surfaces, which secrete alkaline fluid, and so render the urine alkaline.

*Administration.*—Carbonic acid may be administered under the form of *carbonic acid water* or the *effervescing draught.* The best mode of exhibiting it is, I believe, in the form of an effervescing draught, composed of citric acid and bicarbonate of potash.

*Antidotes.*—In accidents arising from the inhalation of carbonic acid gas proceed as follows: Remove the patient immediately into the open air, and place him on his back, with his head somewhat elevated. Produce artificial respiration by pressing down the ribs, forcing up the diaphragm, and then suddenly removing the pressure. Dash cold water over the body, and abstract a small quantity of blood either by venesection or cupping. Apply bottles of hot water to the feet. Stimulants of various kinds may be employed, either internally by the stomach, or in the form of frictions, or inhalations of ammonia, or air impregnated with chlorine gas.

*Pharmaceutic Uses.*—Carbonic acid is employed in the production of the bicarbonates of potash and soda.

### [**Aqua Acidi Carbonici,** U. S., *Carbonic Acid Water.*

"By means of a proper apparatus, impregnate water, contained in a suitable receiver, with a quantity of carbonic acid, equal to five times the bulk of the water. Carbonic acid may be obtained from bicarbonate of soda, or from marble, by means of dilute sulphuric acid." U. S.

As carbonic acid water is liable to be contaminated with copper as well as lead, the U. S. P. requires that there be no precipitate thrown down by the addition of ferrocyanide of potassium. If the least copper be present, the latter reagent will afford a brownish precipitate.—W.]

**Oxalic Acid of Commerce.** (Appendix B. I.)

*Natural History.*—Oxalic acid is found, in combination with bases, in many plants. Oxalate of lime is found in rhubarb, bistort, and many lichens. Combined with potash, it is found in *Oxalis acetosella*, *Rumex acetosa*, and rhubarb. Oxalate of soda is found in *Salsola*.

*Preparation.*—Oxalic acid is formed by the action of nitric acid on sugar or potato starch. Treacle is usually employed in this country as a substitute for solid sugar. The process is generally conducted in open earthenware jars, heated by a warm water-bath. One part of sugar, or, better still, of potato starch, is heated with 5 parts of nitric acid of sp. gr. 1.42, diluted with ten parts of water, as long as gaseous products are evolved; by evaporation the acid is obtained in crystals, which may be purified by a second crystallization, after being well dried on paper or porous earthenware. From 12 parts of potato starch, 5 of the acid are obtained. The mother liquor should be treated with an additional quantity of acid, and again warmed, when a second crop of crystals will be obtained: this is repeated till the solution is quite exhausted. One equivalent of anhydrous sugar ($C_{12}H_9O_9$), and eighteen equivalents of oxygen ($O_{18}$), contain the elements of six equivalents of anhydrous oxalic acid ($6C_2O_3$), and nine equivalents of water (9HO). But the process is not so simple as this calculation would lead us to suppose. Part of the carbon of the sugar escapes in the form of carbonic acid gas. The mother liquor contains, besides some acetic acid, saccharic acid ($C_{12}H_5O_{11}$); which, when acted on by a further portion of nitric, is converted into oxalic and carbonic acids. If the nitrous vapors be conveyed into a condenser, nitric and nitrous acids may be collected. It is also, now, manufactured extensively by the action of caustic alkalies on vegetable fibre (sawdust), as suggested by Gay-Lussac.

*Impurity.*—The crystals of oxalic acid of commerce are sometimes contaminated with nitric acid. In this state they have usually a faint odor, and stain the cork of the bottle in which they are kept, yellow. If they be exposed to a warm atmosphere, the nitric acid escapes along with the water of crystallization, and may be detected by boiling the crystals with a weak solution of sulphate of indigo. The color is discharged.

**Oxalic Acid, Purified.** (Appendix B. I.)—$HO,C_2O_3+2HO=63$.

*Preparation.*—Take of oxalic acid of commerce, one pound; boiling distilled water thirty fluidounces. 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.

*Properties.*—Exposed to warm air they effloresce, evolve 28 per cent. of water, and become a pulverulent residue (*hydrate of oxalic acid*). When heated rapidly to 350° F. they fuse, evolve water, and the hydrate of the acid sublimes, a portion of it at the same time undergoing decomposition, but no residue being left if the acid be quite pure. They dissolve in from 8 to 11 parts of water at 60° F., in their own weight of boiling water, and in 4 parts of alcohol at 60° F. By the action of oil of vitriol, aided by heat, they are resolved into water, which remains with the sulphuric acid, and equal volumes of carbonic acid and carbonic oxide gases. Nitrate of silver added to a solution of it yields a white precipitate (*oxalate of silver*), which is soluble in nitric acid, and when dried and heated on the point of a knife, by the flame of a candle or spirit lamp, becomes brown on the edge, very feebly detonates, and is completely dissipated, being converted into water, carbonic acid, and metallic silver. With solution of lime, of sulphate of lime, or of chloride of calcium, oxalic acid yields a white precipitate (*oxalate of lime*), insoluble, or nearly so, in excess of oxalic acid, readily soluble in nitric acid, and slightly so in hydrochloric acid. If the precipitate be collected, dried, and calcined, it yields quicklime. With sulphate of copper, oxalic acid yields a bluish-white precipitate (*oxalate of copper*). It reduces the terchloride of gold, and deoxidizes iodic acid on boiling.

*Composition.*—Anhydrous oxalic acid, as it exists in dry oxalate of lead, has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Carbon | 12 | 33.3 |
| 3 Oxygen | 24 | 66.6 |
| Anhydrous Oxalic Acid | 36 | 100.0 |
| 1 Anhydrous Oxalic Acid | 36 | 57.14 |
| 3 Water | 27 | 42.86 |
| Crystallized Oxalic Acid | 63 | 100.00 |

*Test.*—Is entirely dissipated by a heat below 350°.

VOLUMETRIC SOLUTION OF OXALIC ACID. (Appendix B. III.)—Take of purified oxalic acid in crystals, quite dry, but not effloresced, 551.25 grains; distilled water, a sufficiency. Dissolve the oxalic acid in eighteen fluidounces of the water, and when the solution is complete, add as much distilled water as will make its bulk exactly twenty fluidounces at 60°. The quantity of this solution which fills the volumetric tube to 0, includes exactly sixty-three grains of crystallized oxalic acid, and is therefore capable of neutralizing an equivalent in grains of any alkali, or alkaline carbonate.

## BORON. B=11.

### Boracic Acid. (Appendix B. I.) $BO_3+3HO=62$.

*Natural History.*—Boracic acid is peculiar to the inorganized kingdom. It is obtained in the free state from the boracic acid *lagoons* of Tuscany, which are spread over a surface of about thirty miles. Boracic acid is also found native combined with soda (forming *tincal*), and with magnesia (constituting *boracite*).

*Preparation.*—Tuscany boracic acid has a slight yellow or buff tint, and is purified, after its arrival in this country, by solution and crystallization. Boracic acid may also be obtained by dissolving borax in hot water, and adding half its weight of oil of vitriol. As the solution cools, crystals of boracic acid (retaining a little sulphuric acid) are deposited, which must be well washed. Or borax may be decomposed by hydrochloric acid, by which a purer boracic acid is procured.

*Properties.*—It occurs in the form of white, transparent, pearly hexagonal scales, which are odorless, have a weak, scarcely acid taste, and communicate a wine-red tint to litmus. A hot aqueous solution of the acid renders turmeric paper brown, like the alkalies. The color of rhubarb paper is unchanged by it. At 60° the crystallized acid requires 25.66 times its weight of water to dissolve it, but only 2.97 times at 212°. When its solution is boiled, a portion of the acid is volatilized along with the water. When sufficiently heated, it evolves its water of crystallization, melts, forming a transparent liquid, which, by cooling, becomes a brittle glass (*vitrified boracic acid*). A red hot platinum wire dipped into a pulverized mixture of equal parts of a boracic salt and bisulphate of potassa gives a green tint to the flame of the blowpipe.

*Composition.*—The following is the composition of boracic acid:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Boron | 11 | 31.43 |
| 3 Oxygen | 24 | 68.57 |
| Dry Boracic Acid | 35 | 100.00 |
| 1 Dry Boracic Acid | 35 | 56.45 |
| 3 Water | 27 | 43.55 |
| Crystallized Boracic Acid | 62 | 100.00 |

*Tests.*—Soluble in alcohol. The solution burns with a green flame.

*Uses.*—It is considered to be inert, or nearly so. It is, therefore, not employed directly in medicine; but it is extensively used in the manufacture of borax.

Solution of Boracic Acid. (Appendix B. II.)—Take of boracic acid, fifty grains; rectified spirit, one fluidounce. Dissolve.

Used as a test for rhubarb, which is not turned brown by it, as is the case with turmeric.

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**PHOSPHORUS.** [Mat. Med. List, U. S.] (Appendix A.) P=31.

*Natural History.*—Phosphorus is found in the mineral kingdom pretty plentifully, chiefly as phosphate of lime, which is also an important constituent of the organic exuviæ entombed in the fossiliferous rocks. Phosphorus likewise exists in considerable quantities in bones, urine, &c., in the form of phosphate of lime and phosphate of ammonia and magnesia.

*Properties.*—It is colorless, and when it has been solidified slowly it is transparent; but when rapidly, it is cloudy, and has a waxy lustre. Its sp. gr. is 1.896. At 32° F. it is brittle, but at ordinary temperatures is somewhat flexible. At 94° it is very brittle, and may be easily pulverized; at 110° F. it melts, and forms an oily-like liquid. At ordinary temperatures it evolves a small quantity of vapor. In the atmosphere its fumes are luminous in the dark, in consequence of slow combustion, and they have the odor of garlic. By friction at a gentle heat it inflames and burns with an intense white light, producing phosphoric acid. Phosphorus is insoluble in water, but soluble in ether and in the oils both fixed and volatile.

*Preservation.*—In consequence of its strong affinity for oxygen it should be kept under water in well-closed bottles.

*Impurities.*—Commercial phosphorus sometimes contains sulphur or arsenic, or both. Occasionally, also, it contains antimony and some other metals. Probably all these impurities are derived from the sulphuric acid employed in decomposing the bone ash. When this acid has been prepared from arsenical pyrites it contains arsenious acid, which becomes reduced in the process for making phosphorus. A solution of pure phosphorus in diluted nitric acid yields, with a solution of barytic salt, a precipitate which is soluble in excess of nitric acid. But if phosphorus yield a precipitate insoluble in this acid, the presence of sulphuric acid (formed by the oxidation of sulphur) may be inferred. The presence of arsenic in phosphorus may be detected as follows: Convert the phosphorus into phosphoric acid by boiling in nitric acid; dilute the solution with water, and transmit sulphuretted hydrogen through it; if arsenic be present, a yellow precipitate is obtained. By evaporating a solution of phosphorus in dilute nitric acid, a blackish arsenical deposit is obtained: the phosphorous acid contained in the solution deoxidizes the arsenic.

*Test.*—Entirely soluble in boiling oil of turpentine.

*Physiological Effects.*—Phosphorus is thrown out of the system as phosphorous acid, and perhaps also as phosphoric acid and phosphuretted hydrogen.

*Therapeutics.*—In this country phosphorus is rarely employed. It has been strongly recommended in cases attended with great prostration of the vital powers, as in the latter stages of typhus fever, dropsies, &c.; in some chronic diseases of the nervous system (as epilepsy, paralysis, melancholy, mania, amaurosis, &c.) occurring in debilitated subjects. In some of the exanthemata, as measles, it has been administered to promote the re-appearance of the eruption, when this, from some cause, has receded from the skin.

*Administration.*—Phosphorus cannot be given with safety in the solid form. It may be administered dissolved in ether, or, still better, in oil. *Dose*, gr. $\frac{1}{20}$.

*Antidotes.*—In poisoning by phosphorus, large quantities of mild demulcent liquids are to be exhibited, so as to envelop the phosphorus and exclude it from the air contained in the alimentary canal. Magnesia should be given, in order to neutralize the phosphorous and phosphoric acids which may be formed. Parts burned with phosphorus are to be washed with a weak alkaline solution, to remove any adherent acid which might serve to keep up irritation.

*Pharmaceutic Uses.*—It is used in the formation of *Dilute Phosphoric Acid.*

## [Hypophosphorous Acid. PO.

Neither this acid or its salts are officinal, but the latter have attracted so much attention as to make mention of them here necessary. Hypophosphorous acid is very prone to absorb more oxygen, and is therefore a powerful deoxidizing agent. It may be obtained by decomposing the hypophosphite of lime with sulphuric acid, separating the precipitated sulphate and evaporating to a syrupy consistency, $CaOPO+SO_3=CaOSO_3+PO$. Its salts are all soluble in water. The most important of them is the hypophosphite of lime. If phosphorus be boiled with lime, a chemical reaction ensues, which results in the decomposition of water, the evolution of phosphuretted hydrogen, and the formation of hypophosphite and phosphate of lime.

Hypophosphite of lime is a white salt, with a pearly lustre, crystallizing in flattened prisms. Sp. gr. .835. From it may be prepared the hypophosphites of soda, potassa, and ammonia, by double decomposition with the respective carbonates. Thus $KOCO_2+CaOPO_2HO=CaO\,CO_2+KO\,PO_2HO$. The hypophosphite of the sesquioxide of iron may be prepared by decomposing the sulphate of the sesquioxide. When taken into the system these salts absorb oxygen and are changed into nascent phosphates.

*Therapeutics.*—The hypophosphites have been brought into notice by Dr. Churchill as an almost specific remedy in tuberculosis. He says: "The effects of these salts upon the tubercular diathesis is immediate, all the general symptoms of the disease disappearing with a rapidity which is really marvellous. . . . On the one hand, they increase the principle, whatever that may be, which constitutes nervous force; and, on the other hand, they are the most powerful of hæmatogens, being infinitely superior to medicines of that class hitherto known. . . . The hypophosphites of soda and lime are certain prophylactics against tubercular disease." (*Amer. Jour. Pharm.*, 1858, p. 143.) More recent experience has certainly not justified these over sanguine opinions; but the salts may be used in combination with other remedies in tubercular and scrofulous diseases, rickets, &c.

*Administration.*—They may be given in 5 to 20 grain doses dissolved in syrup. The following elegant formula has been proposed by the eminent pharmaceutist, Mr. Procter, of Philadelphia:—

Hypophosphite of lime 256 grs.; of soda 192 grs.; of potassa 128 grs.; of iron (recently precipitated) 96 grs.; hypophosphorous acid q. s.; white sugar 12℥; extract of vanilla ℥ss; water q. s. to make 9 f℥. *Dose*, fʒj to f℥ss t. d. These salts may also be exhibited dissolved in cod-liver oil. —W.]

## Phosphoric Acid. $PO_5=71$.

This acid is susceptible of three modifications, designated as *metaphosphoric acid* $HO,PO_5$, *pyrophosphoric acid* $2HO,PO_5$, and *common phosphoric acid* $3HO,PO_5$. The first combines with *one*, the second with *two*, the third with *three* atoms of water or base: hence the first is denominated *monobasic*, the second *bibasic*, the third *tribasic* phosphoric acid.

*Natural History.*—Phosphoric acid occurs both in the inorganized and organized kingdoms. All the phosphoric salts of the mineral kingdom contain the common or tribasic phosphoric acid.

*Composition.*—Pure anhydrous phosphoric acid is thus composed:—

| Eq. | Eq. Wt. | Per. Cent. |
|---|---|---|
| 1 Phosphorus . . . . . . . . | 31 | 43.66 |
| 5 Oxygen . . . . . . . . | 40 | 56.34 |
| Phosphoric acid . . . . . . | 71 | 100.00 |

A watery solution of tribasic phosphoric acid ($3HO,PO_5$), is the only modification of phosphoric acid employed in medicine.

## [Acidum Phosphoricum Glaciale. $PO_5HO$. Mat. Med. List, U. S.

Glacial phosphoric acid occurs in transparent, colorless, glass-like masses, slowly deliquescent in the air and soluble in water and alcohol. It is generally obtained by treating bone with sulphuric acid and water; then precipitating with carbonate of ammonia, the resulting superphosphate of lime. The phosphate of ammonia thus obtained is then heated in a platina crucible, until the ammonia and all the water but the one equivalent are driven off.

It is distinguished from the bibasic and tribasic acids by coagulating albumen and giving white, gelatinous, uncrystallizable compounds with soluble salts of baryta, lime, and silver.

The U. S. Pharm. directs that its aqueous solution should yield no precipitate with hydrosulphuric acid, even after the liquid has stood for forty-eight hours, showing the absence of metals; should cause a white precipitate with chloride of barium soluble in an excess of acid; with ammonia in excess should manifest only a slight turbidness, showing the almost total absence of earthy salts; and with caustic potassa in excess evolve no ammonia. Glacial phosphoric acid is probably itself never administered.—W.]

**Acidum Phosphoricum Dilutum** [U. S.], *Dilute Phosphoric Acid.*

Phosphoric Acid, $3HO,PO_5=98$, dissolved in water.

*Preparation.*—Take of phosphorus, four hundred and thirteen grains; nitric acid, four fluidounces; distilled water, one pint, or a sufficiency. Place the nitric acid diluted with ten ounces of the water in a tubulated retort connected with a Liebig's condenser, and, having added the phosphorus, apply a very gentle heat until five fluidounces of liquid have distilled over. Return this to the retort, and renew and continue the distillation until the phosphorus has entirely dissolved. Transfer the contents of the retort to a porcelain capsule, and evaporate the liquid, raising the heat a little towards the close of the process, until bubbles of orange vapor cease to form, and a colorless liquid of syrupy consistence is obtained. Dissolve this when cool in such an amount of distilled water that the volume will become one pint.

["Take of phosphorus three hundred and sixty grains; nitric acid five troyounces, or a sufficient quantity; distilled water a sufficient quantity. Mix five troyounces of nitric acid with half a pint of distilled water, in a porcelain capsule, of the capacity of two pints. Add the phosphorus, and invert over it a glass funnel of such dimensions that its rim may rest on the inside of the capsule, near the surface of the liquid. Place the capsule on a sand-bath, and apply a moderate heat until the phosphorus is dissolved, and red vapors cease to arise. If the reaction become too violent, add a little distilled water; and, if the red vapors cease to be evolved before the phosphorus is all dissolved, gradually add nitric acid, diluted to the same extent as before with distilled water, until the solution is effected. Then, removing the funnel, continue the heat until the excess of nitric acid is driven off, and a syrupy liquid, free from odor and weighing two ounces, remains. Lastly, mix this when cold, with sufficient distilled water to make it measure twenty fluidounces, and filter through paper.

"Diluted phosphoric acid may also be prepared by dissolving a troyounce of glacial phosphoric acid in three fluidounces of distilled water, adding to the solution forty grains of nitric acid, boiling it until reduced to a syrupy liquid, free from the odor of nitric acid, and then adding sufficient distilled water to make the diluted acid measure twelve fluidounces and a half." U. S.]

By the mutual action of phosphorus and dilute nitric acid, phosphorous acid ($PO_3$) as well as phosphoric acid ($PO_5$), is produced, while binoxide of nitrogen is evolved. The formation of phosphorous acid may be accounted for by the mutual reaction of three equivalents of nitric acid and three equivalents of phosphorus: $3P+3NO_5=3PO_3+3NO_2$. Phosphoric acid is formed by the action of three equivalents of phosphorus on five of nitric acid: $3P+5NO_5=3PO_5+5NO_2$. If strong nitric acid be employed, instead of the dilute acid ordered in the Pharmacopœia, the reaction is so energetic that explosion and combustion are sometimes the consequence. In such cases some ammonia is usually developed; being formed by the union of the nitrogen of the acid with the hydrogen of the water. By concentrating the solution of phosphorous and phosphoric acid, the phosphorous acid is converted into phosphoric acid by the free nitric acid present: $3PO_3+2NO_5=3PO_5+2NO_2$. The excess of nitric acid is driven off by evaporation.

*Officinal Characters.*—A colorless liquid with a sour taste, and strong acid reaction. With ammonio-nitrate of silver it gives a canary-yellow precipitate ($3AgO,PO_5$) soluble in ammonia, and in dilute nitric acid.

Evaporated it leaves a residue, which melts at a low red heat, and upon cooling exhibits a glassy appearance.

The tribasic modification of phosphoric acid is distinguished from the others by its yellow compound with oxide of silver, that of the others being white. By the action of heat it is converted first into pyrophosphoric, and then into metaphosphoric acid.

*Tests.*—Specific gravity, 1.080. It is not precipitated by sulphuretted hydrogen, chloride of barium, nitrate of silver acidulated with nitric acid, or by the solution of albumen. When mixed with an equal volume of pure sulphuric acid, and then introduced into the solution of sulphate of iron, it does not communicate to it a dark color. Six fluidrachms poured upon 180 grains of litharge in fine powder, leave after evaporation a residue, which heated to dull redness weighs 215.5 grains.

["One hundred grains of it are saturated by twenty-three and four-tenths grains of bicarbonate of potassa, and no precipitate is produced." U. S.]

The non-precipitation by sulphuretted hydrogen shows the absence of arsenic and other metallic impurities, by chloride of barium the absence of sulphuric acid, by nitrate of silver of hydrochloric, by albumen of the monobasic variety. The noncoloration of the sulphate of iron indicates the absence of nitric acid. The increase in weight of the oxide of lead implies the presence of $13\frac{3}{4}$ per cent. by weight of tribasic, or 10 of anhydrous acid.

*Therapeutics.*—Phosphoric acid has been employed in the same cases in which sulphuric and other mineral acids have been used, and under the same regulation. It may be employed for a longer period, without disturbing the digestive functions, than the other agents, of this class. Thus its power of dissolving phosphate of lime has led to its employment in those forms of lithiasis attended with phosphatic deposits in the urine. Dr. Paris found it to assuage the thirst so commonly present in diabetes, more effectually than any other acidulated drink.

*Administration.*—Internally the dilute phosphoric acid should be given in doses of from twenty minims to a fluidrachm, properly diluted.

*Pharmaceutic Uses.*—Dilute phosphoric acid is used in the production of phosphate of ammonia and syrup of phosphate of iron.

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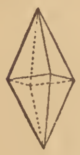
## SULPHUR. S=16.

*Natural History.*—It is found in both kingdoms of nature. *Native sulphur* is found either imbedded in rocks, or produced by sublimation (*volcanic sulphur*). Sulphur is also found in the mineral kingdom in a state of combination, as in the various forms of pyrites. It is also a constituent of various animal and vegetable substances, such as albumen, &c.

*Preparation.* Sulphur is procured in two ways: by the purification of native sulphur, or by the decomposition of the native sulphurets. The sulphur of British commerce is almost exclusively obtained in the first way. It is brought principally from Sicily. Crude or rough sulphur comes over in irregular blocks or masses, whose color is somewhat paler than that of refined sulphur. Fine Sicilian sulphur contains not more than 3 per cent. of foreign matter, chiefly earthy, but not at all arsenical. Vauquelin distilled 200 grains of rough sulphur, and obtained a residuum of 0.82, composed of silica, carbonate of lime, iron, bituminous charcoal, alumina, and magnesia; but the proportion of earthy matter is generally more considerable. Sulphur obtained from pyrites usually contains orpiment ($AsS_3$).

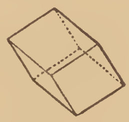
*Refining.*—There are three modes of refining sulphur: viz., first, fusion and decantation; secondly, distillation: thirdly, sublimation. Formerly, sulphur was refined by fusing it in an iron caldron, allowing the earthy impurities to subside, and ladling out the supernatant liquid sulphur. At present, sulphur is refined by distillation and sublimation: by distillation, *massive sulphur* is obtained: by sublimation, *flowers of sulphur.*

Fig. 1.



*Acute rhombic octohedron* (the principal form of native sulphur).

Fig. 2.

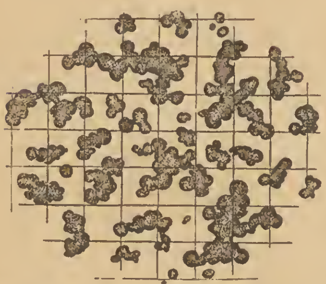


*Oblique rhombic prism* (principal form of sulphur by fusion and slow cooling.)

## Sulphur Sublimatum [U. S.], *Sublimed Sulphur.*

*Officinal Characters.*—A slightly gritty powder of a fine greenish-yellow color; without taste, and without odor unless heated; burning in open vessels with a blue flame and the evolution of sulphurous acid.

Fig. 3.



*Microscopic appearance of sublimed sulphur.* (The micrometer squares are equal to those seen in Figs. 5 and 6.)

As usually prepared, sublimed sulphur is apt to be contaminated with a little adhering acid (formed by the oxidation of sulphur), which may be removed by washing. When thus purified it is called *washed sulphur* (*sulphur lotum*).

*Tests.*—Entirely volatilized by heat; does not redden moistened litmus paper. Solution of ammonia, agitated with it and filtered, does not on evaporation leave any residue.

The tests indicate the absence of earthy matters, of adhering acid, and of sulphuret of arsenic. Pure sulphur is also entirely soluble in boiling oil of turpentine.

[Sublimed sulphur is very generally contaminated with sulphuric acid, and therefore reddens litmus paper; the officinal test for *sulphur lotum* of the U. S. Pharmaeopœia is that it does not alter litmus paper.—W.]

*Physiological Effects.*—Sulphur taken into the stomach is, for the most part, evacuated by the bowels; but a portion becomes absorbed, and may be detected in the secretions; in the urine it is found as sulphate and sulphuret (Wöhler). It is probable, therefore, that, by the mutual action of sulphur and the soda of the bile, sulphuret of sodium and sulphate of soda are formed, and that these are subsequently absorbed.

In *small* and *repeated doses*, sulphur acts as a gentle stimulant to the secreting organs, especially to the skin and mucous membranes, particularly the bronchial membrane. It promotes the capillary circulation of these parts, and increases their secretions. Sundelin says it operates specifically on the mucous membrane of the rectum, and thereby promotes critical hemorrhoidal secretions. That it becomes absorbed is shown by the odor of sulphuretted hydrogen which it communicates to the sweat, urine, and milk, and by silver articles becoming blackened in the pockets of patients who are under the influence of it.

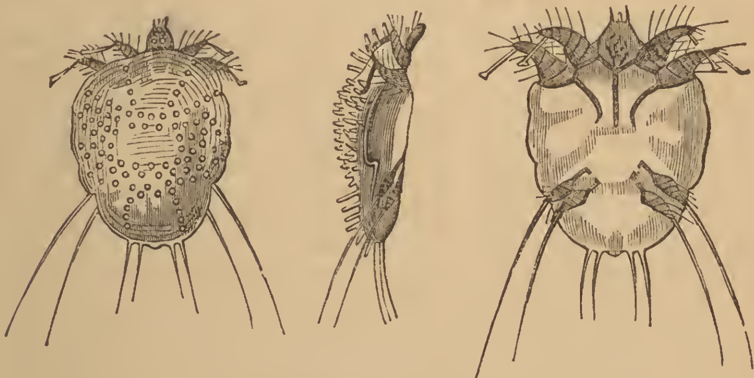
In *larger doses* sulphur acts as a mild purgative, without exciting the pulse or occasioning griping. As the stools are usually solid, Dr. Paris concludes that the action of sulphur on the bowels is confined to the muscular coat.

*Therapeutics.*—Sulphur is employed both internally and externally.

*Internally.*—It is given for various purposes. *In diseases of the rectum*, as stricture, hemorrhoids, and prolapsus, it is a valuable agent as a mild purgative: I have frequently employed it in these cases as a substitute for castor oil. In order to promote its purgative effect, it is sometimes necessary to conjoin magnesia or the bitartrate of potash, as in *confection of sulphur*. *In chronic cutaneous diseases*, more especially prurigo, impetigo, and scabies, the internal use of sulphur is attended with great benefit. *In pulmonary affections*, as chronic catarrhs and asthma, it is sometimes useful. *In rheumatic and gouty affections* also. After an attack of acute rheumatism, when the joints are left in a swollen and painful state, I have seen sulphur prove highly useful. It is popularly taken with ardent spirit (gin) in this complaint. Dr. Graves and Brown-Séquard have derived advantage from it in *paralysis* from softening.

*Externally.*—Sulphur is a most valuable remedy in various skin diseases, more especially *scabies*. It is supposed by some that its curative power depends on its poisonous influence over the so-called *itch insect*, *Sarcoptes hominis* of Raspail, the *Acarus scabiei* of other writers [or

Fig. 4.



*Sarcoptes Hominis.*—(Raspail.)

rather on the poisonous influence of the sulphuretted hydrogen formed in the cells of the cuticle after the use of sulphur ointment, for Küchenmeister found that the itch insect can live some days in sulphur.—Ed.]. But some doubts have been entertained whether this animal be the cause, effect, or mere accompaniment of itch. Rayer observes, that it is indubitable that the number of these insects bears no proportion to that of the vesicles. "It is, further," he observes, "rare to discover these insects on the abdomen and on groins, where the eruption of scabies is nevertheless very common and very apparent; moreover scabies is known to continue when no more acari are to be discovered." Sulphur is also a most valuable application in various other skin diseases, as porrigo, impetigo, &c.

*Administration.*—It is usually given with syrup or treacle, or suspended in milk. The dose of it as a purgative, is from sixty grains to a quarter of an ounce. As an alterative or sudorific, the dose is about twenty or thirty grains.

*Pharmaceutic Uses.*—Sublimed sulphur is used in the preparation of *sulphurated potash*, the *ammoniac and mercury plaster*, and the following:—

CONFECTIO SULPHURIS, *Confection of Sulphur.*—Take of sublimed sulphur, four ounces; acid tartrate of potash, in powder, one ounce; syrup of orange peel, four fluidounces. Rub them well together.

Laxative or mildly purgative. *Dose*, gr. lx. to gr. cxx.

UNGUENTUM SULPHURIS [U. S.], *Ointment of Sulphur.*—Take of sublimed sulphur one ounce; prepared lard, four ounces. Mix thoroughly. ["Take of sublimed sulphur, a troyounce; lard, two troyounces. Mix them." U. S.]

Chiefly employed in scabies. Mr. Erasmus Wilson recommends it to be diligently rubbed in, before the fire, night and morning for two days, the patient to wear a flannel shirt, and to take a warm wash bath on the third day, when the cure is generally completed. Sometimes three days' rubbing is required.

### **Sulphur Præcipitatum** [U. S.], *Precipitated Sulphur.*

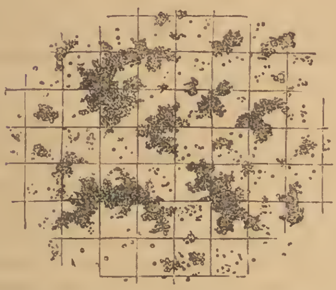
*Preparation.*—Take of sublimed sulphur, five ounces; slaked lime, three ounces; hydrochloric acid, eight fluidounces, or a sufficiency; distilled water, a sufficiency. Heat the sulphur and lime, previously well mixed, in a pint of the water, stirring diligently with a wooden spatula; boil for fifteen 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°. ["Take of sublimed sulphur, twelve troyounces; lime, eighteen troyounces; muriatic acid, water, each, a sufficient quantity. Pour sufficient water on the lime to slake it, and, having mixed the sulphur with it, add fifteen pints of water to the mixture; then boil for two hours, occasionally adding water to preserve the same measure, and filter. Dilute the filtered liquid with an equal bulk of water, and drop into it muriatic acid so long as a precipitate is produced. Lastly, wash the precipitated sulphur repeatedly with water until the washings are nearly tasteless, and dry it." U. S.]

According to L. Gmelin, when sulphur, excess of lime, and water, are boiled together, hyposulphite of lime is formed in solution, along with a compound either of pentasulphuret of calcium and of lime, or of pentasulphuret of hydrogen and lime: $13CaO+12S=2(5CaO,CaS_5)+CaO,S_2O_2$; or $13CaO+12S+2HO=2(6CaO,HS_5)+CaO,S_2O_2$. When hydrochloric acid is added to this solution, water, chloride of calcium, and sulphur are formed: $2(5CaO,CaS_5)+CaO,S_2O_2+13HCl=13HO+13CaCl+12S$; or $2(6CaO,HS_5)+CaO,S_2O_2+13HCl=13HO+13CaCl+12S+2HO$.

*Officinal Characters.*—A grayish-yellow soft powder, free from grittiness, and with no smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid.

*Tests.*—Entirely volatilized by heat; under the microscope it is seen

Fig. 5.



*Microscopic appearance of pure precipitated sulphur.* (The micrometer squares are equal to those seen in Figs. 3 and 6.)

Fig. 6.

*Microscopic appearance of commercial* (i. e. *impure*) *precipitated sulphur, showing the crystals of sulphate of lime* (*selenite*).

to consist of opaque globules without any admixture of crystalline matter. Otherwise corresponds with sublimed sulphur.

It should contain no crystals of sulphate of lime, which are present in much of the precipitated sulphur of commerce, in consequence of sulphuric acid having been used instead of hydrochloric acid in its preparation.

The *Physiological Effects*, *Uses*, and *Dose* are the same as those of Sublimed Sulphur.

## **Sulphuric Acid of Commerce**, *Oil of Vitriol.* (Appendix A.)

*Preparation.*—This acid is made by burning sulphur or sulphuret of iron (pyrites) and a little nitrate of potash or soda in atmospheric air, and conveying the sulphurous and nitrous acids with vapor of water into leaden chambers, when a transfer of oxygen from the nitrous acid vapors ensues, and sulphuric acid is formed. This combines with the water, placed in small quantity at the bottom of the chambers, and is afterwards concentrated by evaporation.

*Composition.*—It is constituted very nearly as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Real sulphuric acid . . . . . . | 40 | 78 |
| $1\frac{1}{4}$ | Water . . . . . . . . . . | 11.25 | 22 |
| | Oil of vitriol, sp. gr. 1.8433 . . . . . | 51.25 | 100 |

*Tests.*—Specific gravity 1.84 to 1.85. When the acid, mixed with six times its volume of distilled water, is placed in contact with pure zinc, and the hydrogen evolved is ignited as it escapes from the capillary extremity of a glass tube, if a dark stain is formed on a piece of porcelain held low down on the flame, the acid contains arsenic, and is to be rejected. When a solution of sulphate of iron is poured cautiously on the surface of the undiluted acid, if a red tint appears at the surface of contact, the acid contains nitrous acid, and if the acid, diluted as above, becomes turbid, it contains other impurities, and in either case requires purification.

The arsenic arises generally from the use of pyrites containing that metal in the manufacture. The red or purple brown tint is due to the action on sulphate of iron of the binoxide of nitrogen given off when nitrous or nitric acid converts protoxide of iron into peroxide. The turbidity on dilution is due to sulphate of lead previously held in solution. In order to free the oil of vitriol of commerce from its fixed impurities, it must be subjected to distillation. Should oil of vitriol be colored either brown or black, contact with some organic substance (as straw, &c.) may be inferred. The best commercial acid is perfectly colorless.

**Acidum Sulphuricum** [Mat. Med. List, U. S.], *Sulphuric Acid.*

Monohydrated sulphuric acid, $HO,SO_3=49$. ["Sulphuric acid, of the specific gravity 1.843." U. S.]

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

The sulphate of ammonia is added to purify the sulphuric acid from nitric acid, binoxide of nitrogen, &c., which are resolved into nitrogen and water, the sulphuric acid of the sulphate being liberated, thus $NO_5+2NO_2+3(NH_4O,SO_3)=6N+9HO+3(SO_3,HO)$. The platinum foil is to prevent too violent or sudden ebullition, which is also effected by using a ring gas burner, so that the heat may be applied to the sides of the retort.

*Officinal Characters.*—A colorless liquid of oily appearance, intensely acid and corrosive. It evolves much heat on the addition of water, and, when thus diluted, gives a copious precipitate with chloride of barium. It boils at 620°, and freezes at 29° F., yielding often regular six-sided prisms of a tabular form.

*Composition:*—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Real sulphuric acid | 40 | 81.6 |
| 1 | Water | 9 | 18.4 |
| | Monohydrate of sulphuric acid | 49 | 100.0 |

*Tests.*—Specific gravity, 1.846. One fluidrachm requires for neutralization 206 measures of the volumetric solution of soda. Evaporated in a platinum crucible it leaves no residue. When a solution of sulphate of iron is poured upon it, no purple ring is formed at the surface of the two solutions. Diluted with six times its volume of distilled water, it gives no precipitate with sulphuretted hydrogen.

These tests indicate freedom—1st, from fixed ingredient; 2d, from nitrogen acids; 3d, from metallic impurities.

*Physiological Effects.*—The concentrated sulphuric acid is a powerful corrosive or escharotic. It abstracts and unites with water and bases contained in the tissues and secretions, coagulates albuminous liquors, combines with albumen, fibrine, and mucus, and darkens the coloring matter of the blood. If its action be carried further, it dissolves and decomposes the organic constituents of the tissues, charring or carbonizing them.

The parts to which the acid is applied become, in the first place, white by the formation of sulphate of albumen. By the more prolonged action of the poison, they assume a brownish or blackish appearance. Black spots are frequently observed in the stomach of those who have swallowed the acid; and in the surrounding parts the blood is usually coagulated in the bloodvessels. Such are the topical chemical effects of this acid.

When strong sulphuric acid has been swallowed, the symptoms of poisoning are the following: Alteration, or even destruction of the soft parts about the mouth; burning pain in the throat, stomach, and bowels; frequently alteration of the voice, from the swelling and disorganization of the parts about the larynx; breath fetid, from the decomposed tissues; constant and abundant vomiting of matters which may be bloody or otherwise, but which effervesce by falling on a marble hearth; bowels variously affected, sometimes constipated, though usually purged, the stools being bloody. The constitutional symptoms are principally those arising from depression of the vascular system: thus the pulse is frequent and irregular, feeble, often imperceptible; extremities cold; great feebleness, or even fainting, with cold sweats. One remarkable characteristic is, that the mental faculties are usually unaffected, even up to a few minutes before death.

Diluted sulphuric acid is a thirst-quenching, refrigerant spanæmic. It sharpens the appetite, checks profuse sweating, and not unfrequently reduces the frequency and volume of the pulse. Under its use, the milk of nurses frequently acquires a griping quality.

After the use of the acid for a few days, especially if it be exhibited in full doses, patients frequently complain of abdominal pain and griping. If its use be persevered in, these effects augment, heat and pain in the throat and stomach are experienced, the digestive functions are disturbed, and sometimes purging with febrile symptoms occurs.

*Therapeutics.*—As a local agent, sulphuric acid is employed as a caustic, irritant, or astringent. As a caustic it has no advantage over many other agents, except that which arises from its liquid form, which would be an advantage in applying it to wounds caused by rabid animals or poisonous serpents, since the liquidity of the acid enables it to penetrate into all parts of the bites. In entropium this acid has been employed as a caustic to destroy a portion of the skin, so that by the subsequent cicatrization the lid may be turned outwards. This plan of treatment has been practised successfully by several eminent oculists, among whom I may name Mr. Guthrie and Mr. Lawrence. So also in ectropium, Mr. Guthrie has applied the acid to the inner side of the everted lid with advantage. When the liquid form is inconvenient, it has been made into a paste with an equal quantity of charcoal.

Dilute sulphuric acid may be administered in *febrile diseases*, as a refrigerant, to diminish thirst and preternatural heat; though, in most of these cases, the vegetable acids are to be preferred. In the latter stage of fever, considerable benefit is sometimes gained by the use of a vegetable bitter (as calumba or cinchona), in combination with the diluted sulphuric acid. To assist the appetite and promote digestion, it is administered to patients recovering from fever. *To check profuse sweating* in pulmonary and other affections, whether phthisical or not, it is sometimes a valuable agent. No other remedy is so efficacious in relieving colliquative sweatings as this. In *hemorrhages*, as those from the nose, lungs, stomach, and uterus, it is commonly administered as an astringent, but it is obvious that it can only act as such when it can come in contact with the bleeding surface, as where it is administered in hemorrhage from the stomach. In hemorrhage from the nose, lungs, and uterus, its efficacy is therefore doubtful. So also in purpura hæmorrhagica it is given with the same intention; but, though I have several times employed it, I have not observed any evident benefit derived therefrom. In *skin diseases*, especially lichen, prurigo, and chronic nettle-rash, it is sometimes highly serviceable. No remedy is so successful in relieving the distressing itching, formication, and tingling of the skin, as diluted sulphuric acid taken internally. In those forms of *dyspepsia* connected with an alkaline condition of the stomach, as in pyrosis, the sulphuric has been found to succeed better than hydrochloric acid. Dilute sulphuric acid in full doses of half a fluidrachm to one fluidrachm, and repeated at short intervals of half an hour or an hour, with or without a few drops of tincture of opium, has been strongly recommended by several practitioners in the treatment of *cholera*. [Probably no single mode of treating this formidable disease has been found so generally useful. It was largely used at St. Bartholomew's Hospital, for patients suffering from the premonitory symptoms of cholera (diarrhœa, &c.), and almost always with success; but it was also used in advanced cases, and cases of collapse, with marked advantage. In obstinate *diarrhœa* and chronic *dysentery* it is frequently used; and the diarrhœa of phthisis and of typhoid fever, arising from ulceration of the bowels, is often more effectually checked by this means than by chalk and astringents.—Ed.]

In *lead colic* it is employed by M. Gendrin at Paris. The internal treatment consists in administering sulphuric acid largely diluted. Forty drops of dilute sulphuric acid, or four drops of the strong acid, are mixed with a pint of water, and two or three pints are given daily. The abdominal pains generally cease after the second day, and with the pains the constipation ceases also. Sulphur baths are used at the same time. Out of a large number of cases witnessed by Dr. H. Bennet, all with one or two exceptions got well in from three to six days. The sulphuric acid drink not only cures but prevents lead colic. The manager of the British Lead Works at Birmingham states (*Lancet*, Dec. 17, 1842) that, after the employment of the sulphuric acid drink for fifteen months, there did not occur a single case of colic, though it was previously of constant occurrence amongst his men.

*Pharmaceutic Uses.*—The great affinity of sulphuric acid for bases renders it a valuable reagent for the elimination of other acids from their compounds. It is thus used in the production of glacial acetic acid, citric, hydrochloric, nitric, and tartaric acids; of nitrous acid in spirit of nitrous ether, of acid phosphate of lime in the process for phosphate of soda, &c. Its affinity for water renders it useful for dehydrating operations, as in the production of ether.

Acidum Sulphuricum Dilutum [U. S.], *Dilute Sulphuric Acid.*—Take of sulphuric acid, three fluidounces; distilled water, thirty-five fluidounces. Mix gradually the sulphuric acid and the water, and preserve the product in a stoppered bottle. ["Take of sulphuric acid two troyounces; distilled water a sufficient quantity. Add the acid gradually to fourteen fluidounces of distilled water, and mix them. Then filter through paper, and pass sufficient distilled water through the filter to make the diluted acid measure a pint." U. S.]

*Tests.*—Specific gravity 1.087. Six fluidrachms require for neutralization 100 measures of the volumetric solution of soda. [The specific gravity of the U. S. acid is 1.082. It is not quite so strong as the corresponding preparation of the British Pharmacopœia, but the difference is scarcely sufficient to affect the dose.—W.]

It is about $\frac{1}{12}$th weaker than the dilute acid of Lond. Pharm.

*Dose.*—Min. x to min. xxx in some aromatic water. It may be conveniently given in, or added to, the acid infusion of roses.

ACIDUM SULPHURICUM AROMATICUM [U. S.], *Aromatic Sulphuric Acid.*—Take of sulphuric acid three fluidounces, rectified spirit, two pints, or a sufficiency; cinnamon, in coarse powder, two ounces; ginger, in coarse powder, one ounce and a quarter. Mix the sulphuric acid gradually with thirty-five ounces of the spirit, then add the cinnamon and the ginger, and digest for seven days, agitating frequently. Filter, and add sufficient rectified spirit to make up the bulk of two pints. ["Take of sulphuric acid six troyounces; ginger, in coarse powder, a troyounce; cinnamon, in coarse powder, a troyounce and a half; alcohol a sufficient quantity. Add the acid gradually to a pint of alcohol, and allow the liquid to cool. Mix the ginger and cinnamon, and, having put them into a percolator, pour alcohol gradually upon them until a pint of tincture is obtained. Lastly, mix the diluted acid and the tincture." U. S.]

*Tests.*—Specific gravity 0.935. Six fluidrachms require for neutralization 84.75 measures of the volumetric solution of soda.

It is about $\frac{1}{7}$th weaker than dilute sulphuric acid. In consequence of the aromatics it is more agreeable and less liable to gripe. It may be administered in the same, or rather larger doses, in water. [Aromatic sulphuric acid of the U. S. P. is one-third stronger than the corresponding preparation of the Br. Pharm. It is frequently called, in this country, the elixir of vitriol.—W.]

## **Acidum Sulphurosum** [U. S.], *Sulphurous Acid.*

Sulphurous acid, $SO_2=32$, dissolved in water.

*Preparation.*—Take of sulphuric acid, four fluidounces; wood charcoal, recently burned, dry, and in coarse powder, one ounce; water, two fluidounces; distilled water, one pint. Put the charcoal and the sulphuric acid into a glass flask; heat by a gas lamp, and pass the evolved gas first through a small wash bottle containing the two ounces of water, and afterwards to the bottom of a pint bottle containing the distilled water, which must be kept cold. Continue the distillation until the bubbles of gas in the wash bottle appear to be equalled by those passing through the fluid in the larger bottle. The product should be kept in a stoppered bottle, and in a cool place.

In this process the sulphuric acid is deoxidized by the charcoal giving rise to carbonic acid. $2SO_3+C=2SO_2+CO_2$. ["Take of sulphuric acid, eight troyounces; charcoal, in coarse powder, a troyounce; distilled water, thirty-six fluidounces. Pour the acid upon the charcoal, previously introduced into a matrass, and shake them together. Connect the matrass with a washing bottle, and this by means of a bent glass tube reaching nearly to the bottom of it, with a two-necked bottle containing the distilled water. To the other neck of this bottle attach another bent tube, and let it dip slightly into a solution of carbonate of soda. All the joints having been properly luted, apply heat to the matrass until gas ceases to be evolved, preventing the temperature of the distilled water from rising, by means of cold water applied to the bottle containing it. Lastly, pour the sulphurous acid into half-pint bottles, which must be well stopped, and kept in a cool place." U. S.]

*Officinal Characters.*—A colorless liquid with a strong suffocating sulphurous odor. 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—the sulphite of baryta formed being converted into sulphate. [Owing to the chlorine taking the H away from the water, to form HCl, and the nascent oxygen uniting with the elements of the salt.—W.] [A colorless liquid, having the odor of burning sulphur, and a sulphurous, sour, and somewhat astringent taste. Its specific gravity is about 1.035. When saturated with ammonia, and then treated with an excess of chloride of barium, it should afford a clear or nearly clear solution on the addition of muriatic acid in excess." U. S.]

*Properties of the gaseous acid.*—At ordinary temperatures and pressures it is a colorless and transparent gas, and has a remarkable and well-known odor—that of burning brimstone. It is neither combustible nor a supporter of combustion. It reddens litmus, and bleaches some coloring matters, especially infusion of roses, but the color is restored by sulphuric acid. It is irrespirable, and has a sp. gr. of 2.2. It readily dissolves in water; recently boiled water takes up 33 times its volume of this gas.

*Composition.*—If 16 parts by weight of sulphur be burned in one volume or 16 parts by weight of oxygen gas, we obtain one volume or 32 parts by weight of sulphurous acid gas. The composition of this substance may, therefore, be thus expressed:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Sulphur | 16 | 50 |
| 2 | Oxygen | 16 | 50 |
| | Sulphurous acid gas | 32 | 100 |

*Properties of the aqueous acid.*—An aqueous solution of this acid reddens blue litmus paper; it deoxidizes iodic acid, and sets iodine free, which may be recognized by its producing a blue color with starch. It decomposes sulphuretted hydrogen, causing the precipitation of sulphur, and reduces solutions of gold. The sulphites evolve sulphurous acid by the action of strong sulphuric acid.

*Tests.*—Specific gravity 1.04. One fluidrachm mixed with a little mucilage of starch does not acquire a permanent blue color with the volumetric solution of iodine, until 164 measures of the latter have been added to it. When evaporated, it leaves no residue.

The 1st test shows the quantity of sulphurous acid, the starch not being permanently colored by the iodine until the whole of the sulphurous acid is converted into sulphuric by the oxygen of the water, thus $I + HO + SO_2 = HI + SO_3$. The 2d shows the absence of saline matters.

*Therapeutics.*—The gaseous acid has been used as a remedy for the cure of the *itch.* Baths, or fumigations of sulphurous acid gas are commonly termed *sulphur baths*, and may be had at most of the bathing establishments of the principal towns of this country. At the Hôpital St. Louis, in Paris, a very complete apparatus for the application of this remedy in diseases of the skin has been erected by D'Arcet. It is a kind of box, inclosing the whole body, with the exception of the head. The sulphur is placed on a heated plate in the lower part of the box. From ten to twenty baths, or even more, are requisite for the cure of itch. "Sulphurous fumigations," says Rayer, "which are employed in some hospitals, are not attended with expense, leave no unpleasant smell, and do not soil the linen; but the long continuance of the treatment necessary to relieve the disease more than counterbalances these generally insignificant recommendations." There are various other diseases of the skin in which baths of sulphurous acid have been found more or less successful, such as chronic eczema, lepra, psoriasis, impetigo, and pityriasis. Both the gaseous and liquid acids are destructive to vegetation; hence, perhaps, their utility in the treatment of skin diseases connected with vegetable growths, as porrigo and pityriasis. Sulphur vapor baths are also used to detect the presence of lead on the skin of persons suffering from any of the forms of lead poisoning; but they are less convenient and less frequently used than baths of sulphurated potash, which are also called sulphur baths. The liquid acid may be applied, as suggested by Dr. Garrod, mixed with an equal bulk of glycerine.

### **Sulphuretted Hydrogen.** (Appendix B. I.) $HS=17$.

*Preparation.*—Take of sulphuret of iron, half an ounce; water, four fluidounces; sulphuric acid of commerce, a sufficiency. Place the sulphuret of iron and the water in a gas-bottle, closed with a cork perforated by two holes, through one of which 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 develop the sulphuretted hydrogen according as it is wanted. $FeS+SO_3+HO=FeO,SO_3+HS$.

*Properties.*—It is a colorless, transparent gas, having the odor of rotten eggs, and a sp. gr. of 1.17. It reddens litmus, and burns in the air with a bluish flame, depositing sulphur on the sides of the glass vessel in which it is burned, and disengaging sulphurous acid. It blackens white lead and solutions of the salts of lead, copper, and bismuth. When mixed with 20,000 volumes of air, hydrogen, or carburetted hydrogen, its presence may be detected by the discoloration it effects in white lead mixed with water, and spread on a card. Sulphuretted hydrogen consists of 16 parts, by weight, of sulphur to one of hydrogen.

*Pharmaceutic Uses.*—Sulphuretted hydrogen is used as a means of estimating the quantity of antimony in solution of terchloride of antimony and tartarated antimony; also as a test for the presence of arsenic, lead, copper, and other metallic impurities in various materials, such as vinegar, hydrochloric, phosphoric, sulphuric, and tartaric acids, sulphate of iron, acetate of zinc, &c.

*Antidote.*—See **Chlorine.**

### [**Sulphuris Iodidum,** U. S., *Iodide of Sulphur.*

Take of iodine four troyounces, sublimed sulphur a troyounce. Rub them together until they are thoroughly mixed. Introduce the mixture into a flask, close the orifice loosely, and apply a gentle heat so as to darken the mass without melting it. When the color 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 portions of 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. U. S. P.

Iodide of sulphur occurs in grayish-black masses with a radiated crystalline structure. When taken internally its action resembles, if it be not identical with, that of iodine. Its principal use is as an external application in the form of the ointment. It is a very stimulant local remedy, adapted to cases of chronic skin diseases, which have survived the stage of inflammation or have been dry and free from inflammation during their whole course, such as psoriasis, lepra, &c.

Unguentum Sulphuris Iodidi, U. S., *Ointment of Iodide of Sulphur.*—"Take of iodide of sulphur thirty grains; lard a troyounce. Rub the iodide of sulphur, first reduced to a fine powder, with a little of the lard, then add the remainder, and thoroughly mix them." U. S. P.—W.]

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## CHLORINE. Cl=35.5.

*Natural History.*—Chlorine (from χλωρὸς, greenish-yellow) is found in both kingdoms of nature.

In the inorganic kingdom it exists principally in combination with sodium, either dissolved in the water of the ocean or forming deposits of rock salt. Chlorine occurs also in combination with magnesium, calcium, lead, silver, &c. In the organic kingdom it is found, in combination, in both animals and vegetables. Hydrochloric acid, in the free state, exists, according to Dr. Prout, in the stomach of animals during the process of digestion.

*Properties.*—Chlorine, at ordinary temperature and pressure, is a gaseous substance, having a yellowish-green color, a pungent suffocating odor, and an astringent taste. Its sp. gr., according to Gay-Lussac, is 2.47. It is not combustible but is a supporter of combustion. Phosphorus and powdered antimony take fire spontaneously when introduced into it; and a taper burns in it, with the evolution of a red light and much smoke. When water is present it destroys vegetable colors, organic odors, and infectious matters. Hence its use as a bleaching agent, a deodorizer, and a disinfectant. Chlorine combines with water to form a solid crystalline *hydrate*, 10HO,Cl. This is pale yellow and transparent. When chlorine gas is prepared over water nearly at the freezing point (32° F.), bubbles of gas in their passage through the water, sometimes become enveloped with a crystalline coating of the hydrate of chlorine. At the temperature of 60° F., and when the mercury in the barometer is standing at 30 inches, water takes up about twice its bulk in chlorine gas.

*Therapeutics.*—*As a fumigating agent*, *disinfectant*, and *antiseptic*, chlorine, I believe, stands unrivalled. For destroying miasmata, noxious effluvia, and putrid odors, it is the most powerful agent known; and is, therefore, well adapted for disinfecting prisons, ships, hospitals, dissecting rooms, and all other places, the air of which requires purification. The ingredients for producing the gas should be contained in saucers placed in the higher parts of the room, as the gas which is developed will descend by its density, and soon become mixed with the surrounding air. The following is the method adopted by Dr. Faraday at the General Penitentiary at Milbank. One part of common salt was intimately mixed with one part of the black oxide of manganese, then placed in a shallow earthen pan, and two parts of oil of vitriol, previously diluted with two parts (by measure) of water, poured over it, and the whole stirred with a stick. Chlorine continued to be liberated from this mixture for four days. The disinfecting power of chlorine is supposed to depend on its affinity for hydrogen, by which it effects the decomposition of water or aqueous vapor, with the hydrogen of which it unites, while the nascent oxygen oxidizes the organic matter; or it may act merely by abstracting hydrogen from the putrid miasmata.

*As an antidote in poisoning by hydrocyanic acid, sulphuretted hydrogen, or hydrosulphuret of ammonia*, chlorine gas is a very valuable agent. I believe, however, that chloride of lime will be found a more convenient, safe, and opportune substance. The beneficial influence of chlorine in the treatment of animals asphyxiated by sulphuretted hydrogen, doubtless arises, in part at least, from its chemical properties; for when mixed with sulphuretted hydrogen it forms chloride of sulphur and hydrochloric acid. The best method of applying the remedy is to diffuse a little chlorine in the air and then to effect artificial respiration.

*Pharmaceutic Uses.*—It is liberated from common salt to form, with a solution of carbonate of soda, *chlorinated soda.*

**Liquor Chlori**, *Solution of Chlorine.* [**Aqua Chlorini,** U. S.]

Chlorine gas dissolved in half its volume of water, and constituting 0.006 of the weight of the solution.

*Preparation.*—Take of hydrochloric acid, six fluidounces; black oxide of manganese, in fine powder, one ounce; distilled water, thirty-four fluidounces. Introduce the oxide of manganese into a gas-bottle, and, having poured upon it the hydrochloric acid diluted with two ounces of the water, apply a gentle heat, and, by suitable tubes, cause the gas, as it is developed, to pass through two ounces of the water placed in an intermediate small phial, and thence to the bottom of a three-pint bottle containing the remainder of the water, the mouth of which is loosely plugged with tow. As soon as the chlorine ceases to be developed, let the bottle be disconnected from the apparatus in which the gas has been generated, corked loosely, and shaken till 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. $2ClH + MnO_2 + HO = ClMn + Cl + 3HO$. [" Take of black oxide of manganese, in fine powder, half a troyounce; muriatic acid three troyounces; water four fluidounces; distilled water twenty fluidounces. Introduce the oxide into a flask, add the acid previously diluted with two fluidounces of the water, and apply a gentle heat. Conduct the generated chlorine, by suitable tubes, through the remainder of the water contained in a small intermediate vessel, to the bottom of a four-pint bottle containing the distilled water, and loosely stopped with cotton. When the air has been entirely displaced by the gas, disconnect the bottle from the apparatus, and, having inserted the stopper, agitate the contents, loosening the stopper from time to time, until the gas ceases to be absorbed. Lastly, pour the chlorine water into a bottle, of just sufficient capacity to hold it, stop it securely, and keep it in a cool place, protected from the light." U. S.]

*Officinal Characters.*—A yellowish-green liquid, smelling strongly of chlorine, and immediately discharging the color of a dilute solution of sulphate of indigo. At about 32° it freezes and separates into the solid hydrate of chlorine ($10HO,Cl$) and ice free from chlorine. It bleaches vegetable colors, as tincture of litmus, turmeric, &c. By exposure to light, the water is decomposed, oxygen is evolved, and hydrochloric acid formed in solution, $HO + Cl = O + HCl$. Hence the solution should be kept in bottles excluded from the light. It forms a white curdy precipitate (*chloride of silver*) with the nitrate of silver. This precipitate blackens by exposure to light (from the escape of some chlorine and the formation of a subchloride of silver); is insoluble in nitric acid, cold or boiling; readily dissolves in liquid ammonia; when heated in a glass tube fuses, and, on cooling, concretes into a gray semi-transparent mass (*horn silver*); and lastly, when heated with potash, yields metallic silver and chloride of potassium. An aqueous solution of chlorine dissolves leaf gold; a piece of silver plunged into it is immediately blackened; it liberates both bromine and iodine from their combinations.

*Tests.*—Specific gravity, 1.0033. Evaporated it leaves no residue. When twenty grains of iodide of potassium, dissolved in an ounce of distilled water, are added to a fluidounce of this preparation, the mixed solution acquires a deep red color, which requires for its discharge seventy-five measures of the volumetric solution of the hyposulphite of soda.

The tests prove, first, freedom from saline impurity; and, secondly, the quantity of chlorine present in solution, the chlorine replacing the iodine of the iodide of potassium, and the free iodine reacting upon the hyposulphite of soda to form iodide of sodium and tetrathionate of soda; thus $Cl,HO+KI=KCl+HO+I$; then $I+2(NaO,S_2O_2)=NaI+NaO,S_4O_5$.

[In order to insure the strength of this preparation the U. S. P. directs that, if a fluidounce of it be mixed with a solution of ten grains of pure sulphate of protoxide of iron in two fluidrachms of water, the mixture should not produce a blue precipitate with ferridcyanide of potassium (red prussiate of potassa); that is, that there be sufficient chlorine present to convert the protoxide of iron into a peroxide, which will not give a precipitate on the addition of the prescribed reagent.—W.]

*Therapeutics.*—It has been used diluted with six volumes of water as a gargle in *putrid sore throat*, as a local bath in *liver diseases*, and as a deodorizing application to *cancerous and other ulcers attended with a fetid discharge;* in the latter case I have repeatedly employed it with advantage, though I give the preference to the solution of chlorinated soda. Internally it has been administered in *typhus*, in *scarlet fever*, and in *malignant sore throat.*

*Dose.*—One to two fluidrachms properly diluted.

*Antidote.*—White of egg in milk, or even flour, chlorine forming, with albumen, caseine, and gluten, a harmless compound.

*Pharmaceutic Uses.*—It is used with ammonia as a characteristic test of sulphate of quinia.

**Hydrochloric Acid of Commerce**, *Muriatic Acid.* (Appendix A.)

*Preparation.*—This watery or liquid acid, formerly called *spirit of salt*, is obtained by submitting a mixture of common salt (chloride of sodium) and oil of vitriol to distillation in a proper apparatus, and condensing the hydrochloric acid gas which passes over in water contained in the receiver. Manufacturers of hydrochloric acid generally employ an iron or stoneware pot set in brickwork over a fire-place, with a stoneware head luted to it, and connected with a row of double-necked bottles, made of the same material, and furnished with stopcocks of earthenware. The last bottle is supplied with a safety-tube, dipping into a vessel of water. The liquid obtained by this process is yellow, and constitutes *commercial muriatic acid* (*hydrochloric acid of commerce*).

*Impurities.*—Commercial hydrochloric acid is always more or less impure. The substances with which it has been found to be contaminated are *sulphuric acid*, *sulphurous acid*, *nitrous acid*, *chlorine*, *chloride of arsenic*, and *perchloride of iron.*

1. *Sulphuric acid* (free or combined) may be detected by adding to the suspected acid a solution of chloride of barium (or nitrate of baryta); if sulphuric acid be present a heavy white precipitate of sulphate of baryta is procured, which is insoluble in nitric acid. In applying this test the suspected acid should be diluted with five or six times its volume of water; otherwise a fallacy may arise from the crystallization of the chloride of barium.

2. *Sulphurous acid* (formed by the action of sulphuric acid on the iron pot, $2SO_3+Fe=SO_2+FeO,SO_3$) is detected by protochloride of tin, which, after some time, yields a yellow, then a brown precipitate of sulphuret of tin.

3. *Nitrous acid* is detected by pure oil of vitriol and sulphate of iron.

4. *Chlorine* gives a yellow color to hydrochloric acid, and arises from the action of the hydrochloric acid on the peroxide of iron of the pot in the manufacture; $3HCl+Fe_2O_3=2FeCl+Cl+3HO$. It may be detected by its odor, by its enabling the liquid to dissolve leaf-gold, and by its decolorizing a solution of sulphate of indigo. A solution of protochloride of tin is the readiest test for detecting any gold which may be dissolved, with which it forms a purplish or blackish precipitate.

5. The presence of *iron* (derived from the iron pot) is shown by saturating the acid with carbonate of soda, and then applying tincture of galls, which produces a black tint. Another mode is to supersaturate the liquid with ammonia or its sesquicarbonate, by which the red or peroxide of iron will be precipitated.

6. *Arsenic* has been occasionally found in hydrochloric acid. It is derived from the employment of arsenical oil of vitriol in its manufacture; and is doubtless in the state of chloride of arsenic. It may be detected by Marsh's test, or by diluting the acid and transmitting sulphuretted hydrogen through it, by which orpiment ($AsS_3$) is precipitated.

7. *Fixed impurities* are found in the residue after the distillation of the acid.

The *strength* of the acid is determined by its sp. gr. and saturating power.

## **Acidum Hydrochloricum,** *Hydrochloric Acid.*

[**Acidum Muriaticum,** *Muriatic Acid.* Mat. Med. List, U. S. P.

An aqueous solution of hydrochloric acid gas, of the specific gravity 1.160. U. S.]

*Synonym.*—Acidum Muriaticum purum, *Ed.*, *Dub.*

Hydrochloric Acid gas, $HCl=36.5$, dissolved in water.

*Preparation.*—Take of chloride of sodium dried, three pounds; sulphuric acid, forty-four fluidounces; water, thirty-six fluidounces; distilled water, fifty fluidounces. Dilute the sulphuric acid with thirty-two ounces of the water, and when the mixture has cooled pour it upon the chloride of sodium previously introduced into a flask having the capacity of at least one gallon. Connect the flask by corks and a bent glass tube with a three-necked bottle, furnished with a safety tube, and containing the remaining four ounces of the water; then applying heat, conduct the gas into a second bottle, containing the distilled water, by means of a bent tube dipping about half an inch below its surface; and let the process be continued, until the product measures sixty-eight ounces. The bottle containing the distilled water must be carefully kept cool during the whole operation.

In the above operation, the proportions of acid and salt are according to the formula $NaCl+2(HO,SO_3)=(NaO,HO,2SO_3)+HCl$. Here, 2 eq. of acid are employed for one of salt, for two reasons: 1st, a much lower heat is required; and 2dly, the resulting salt, bisulphate of soda, is easily got out without risking the flask, which is not the case when 1 eq. of acid is used, and neutral sulphate is left. The addition of the water facilitates the operation, and renders the resulting mass more soluble and manageable.

*Officinal Characters.*—A colorless and strongly acid liquid, emitting at ordinary temperatures white vapors having a pungent odor. It gives with nitrate of silver a curdy white precipitate ($AgCl$), soluble in excess of ammonia, but not in nitric acid.

*Properties.*—Pure liquid hydrochloric acid possesses the usual characteristics of a strong acid; is decomposed by some metals (*e. g.* zinc and iron), hydrogen being evolved, and a metallic chloride formed. When it acts on a metallic oxide, water and a metallic chloride are produced. It is without action on gold leaf, and does not decolorize sulphate of indigo. A rod dipped in a solution of caustic ammonia produces white fumes when brought near strong liquid hydrochloric acid.

*Tests.*—Specific gravity, 1.17. One fluidrachm of the acid requires for neutralization 60.25 measures of the volumetric solution of soda. When evaporated it leaves no residue. When diluted with four volumes of distilled water, it gives no precipitate with chloride of barium, or sulphuretted hydrogen, and does not tarnish bright copper foil when boiled with it (proving its freedom from sulphuric acid, metallic impurities, and arsenic).

*Therapeutics, Internal Use.*—Hydrochloric acid has been employed in the so-called putrid and petechial fevers, malignant scarlatina, and ulcerated sore throat. It is usually administered in these cases in conjunction with the vegetable tonics; as cinchona or quassia. It is frequently employed to counteract phosphatic deposits in the urine. After a copious evacuation, it is, according to Dr. Paris, the most efficacious remedy for preventing the generation of worms; for which purpose a strong infusion of quassia is the best vehicle. It has been employed with benefit in some forms of dyspepsia. Two facts give a remarkable interest to the employment of this acid in dyspeptic complaints—namely, that it is a constituent of the healthy gastric juice; and secondly, when mixed with mucus, it has a solvent or digestive power in the case of various articles of food. Lastly, hydrochloric acid has been used in scrofulous and venereal affections, in hepatic disorders, &c. It is administered in the form of the dilute acid.

*External Use.*—In the concentrated form it is employed as a caustic to destroy warts, and as an application in sloughing phagedena, though for the latter purpose it is inferior to nitric acid. Van Swieten employed it in cancrum oris; and more recently Bretonneau has spoken in the highest terms of its efficacy in angina membranacea, commonly termed diphtheria. It is applied to the throat by a sponge. Properly diluted, it forms a serviceable gargle in ulceration of the mouth and throat. The objection to its use as a gargle is its powerful action on the teeth: to obviate this as much as possible, the mouth is to be carefully rinsed each time after using the gargle. It is sometimes applied to ulcers of the throat by means of a sponge.

*Antidotes.*—In a case of poisoning by hydrochloric acid, the antidotes are chalk, whiting, magnesia or its carbonate, and soap; and in the absence of those, oil, the bicarbonated alkalies, milk, white of egg, or demulcents of any kind. Of course the gastro-enteritis is to be combated in the usual way.

*Pharmaceutic Uses.*—Hydrochloric acid is used in the production of solution of perchloride of iron, also as a solvent for phosphate and carbonate of lime in the processes for precipitated phosphate of lime and animal charcoal. It is also employed as a source of chlorine in nitro-hydrochloric acid, and the process for solution of chlorine.

ACIDUM HYDROCHLORICUM DILUTUM [ACID. MURIATICUM DILUTUM, U. S.], *Dilute Hydrochloric* [*Muriatic*, U. S.] *Acid.*—Take of hydrochloric acid, three fluidounces; distilled water, eight fluidounces; mix and preserve in a stoppered bottle.

*Tests.*—Specific gravity, 1.05. Six fluidrachms require for neutralization 99 measures of the volumetric solution of soda.

It is about $\frac{1}{8}$th stronger than the dilute acid of Lond. Pharm.

["Take of muriatic acid, four troyounces; distilled water, a sufficient quantity. Mix the acid in a glass vessel, with sufficient distilled water to make the diluted acid measure a pint." U. S. This acid is considerably weaker than the corresponding preparation of the present Br. Pharm. Its strength is more nearly that of the dilute hydrochloric acid of the former London Pharm. Its specific gravity is 1.038.—W.]

*Dose.*—Min. xx to min. xl, in infusion of roses.

## IODINE. I=127.

*Natural History.*—Iodine (from Ἰώδης, violet) exists in both kingdoms of nature. It is found in a few minerals, but rarely; sea-water likewise contains it, probably in the state of iodide of sodium or magnesium; it is also found in many mineral waters and brine springs. A very considerable number of vegetables, particularly those belonging to the family Algæ, yield it. The following are some instances: *Fucus vesiculosus*, *F. serratus*, and *F. nodosus; Laminaria saccharina*, and *L. digitata; Halidrys siliquosa; Chorda Filum; Gelidium cartilagineum; Halyseris polypodioides; Phyllophora rubens; Rhodomenia palmata; Ulva Linza; Porphyra umbilicalis; Padina pavonia; Gigartina helminthocorton;* and some of the marine *Confervæ.*

The following table drawn up by Mr. Whitelaw, a manufacturer in Glasgow, from his own experiments, shows the proportion of iodine contained in some of the most common algæ on our sea-coasts:—

| | Ratios of Iodine. |
|---|---|
| Laminaria digitata | 100 |
| Laminaria bulbosa | 65 |
| Laminaria saccharina | 35 |
| Fucus serratus | 20 |
| Fucus bulbosus | 15 |

The quantities of chloride of potassium in these algæ follow nearly the same ratio. Professor Graham states that, according to Mr. Whitelaw, the long elastic stems of the *Rhodomenia palmata* afford most of the iodine contained in kelp.

### Iodine of Commerce. (Appendix A.)

*Preparation.*—The kelp is broken into pieces and lixiviated in water, to which it yields about half its weight of salts. The solution is concentrated by evaporation, and thereby deposits soda salts (common salt, carbonate and sulphate of soda), and on cooling also lets fall crystals of chloride of potassium. The mother liquor (called *iodine ley*) is dense, dark-colored, and contains the iodine, in the form, it is believed, of iodide of sodium. Sulphuric acid is added, to render the liquid sour, by which carbonic acid, sulphuretted hydrogen, and sulphurous acid gases are evolved, and sulphur is deposited. The acid ley is then introduced into a leaden still, and heated to 140° F., when black oxide of manganese is added. A leaden head having two stoppers is then adapted and luted with pipe clay, and to the neck of the head is fitted a series of spherical glass condensers, each having two mouths opposite to each other, and inserted the one into the other. Iodine is evolved, and is collected in the condensers. The process is watched by occasionally removing the stopper, and additions of sulphuric acid or manganese are made if deemed necessary.

The following is the mutual reaction of sulphuric acid, black oxide of manganese, and iodide of sodium: $NaI + MnO_2 + 2SO_3 = NaO,SO_3 + MnO,SO_3 + I$.

*Impurities.*—The iodine of commerce is always contaminated with variable proportions of *water*. An ounce, if very moist, may contain a drachm, or perhaps even a drachm and a half, of water. This fraud is detected by compressing the iodine between folds of blotting-paper. In this moist state it is unfit for making pharmaceutical preparations of fixed and uniform strength.

Various substances, such as *coal*, *plumbago*, *black oxide of manganese*, *sand*, and *charcoal*, are also said to have been employed for the purpose of adulterating iodine; but in no samples of iodine which I have examined have I ever found any of these substances. Dr. Herzog mentions, as accidental adulterations, water, chloride of iodine, clay, and iodide of cyanogen, the latter formed by the decomposition of marine animals in the kelp-coal. Sulphuret of antimony, galena, and acid tartrate of potash, are quoted by him as intentional adulterations, in addition to those above mentioned.

The following method is given in the Pharmacopœia for the purification of iodine:—

## **Iodum**, *Iodine*. [**Iodinium**. Mat. Med. List, U. S. P.]

*Preparation.*—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 colorless acicular prisms of a pungent odor 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 inclosed in a bottle furnished with an accurately ground stopper.

*Officinal Characters.*—Laminar crystals of a peculiar odor, dark color, and metallic lustre, which, when heated, yield a beautiful violet-colored vapor; 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 color with starch.

*Properties.*—Iodine is a crystallizable solid, its primary form being a rhombic octahedron. It is usually met with in micaceous, soft, friable scales, having a grayish-black color, an acrid, hot taste, and a disagreeable odor, somewhat similar to that of chlorine. It fuses at about 245° F., and at 347° is volatilized, though the vapor rises along with that of water at 212°. Iodine vapor has a great specific gravity—namely, 8.716, according to Dumas. Iodine requires 7000 times its weight of water to dissolve it. In the free state it is distinguished from most other bodies by its forming the blue compound with starch. So delicate is this test, that, according to Stromeyer, water which does not contain more than one four-hundred-and-fifty-thousandth part of its weight of iodine acquires a perceptibly blue tinge on the addition of starch. This blue color is destroyed by heat; and, therefore, in testing for iodine, the liquids employed should be cold; an excess of alkali also destroys it by forming two salts, an iodate and an iodide, but by supersaturating with acid the color is restored. The action of iodine on starch is also impeded by some organic constituents of plants.

*Tests.*—Entirely soluble in ether. It sublimes without leaving any residue, and the portion which first comes over does not include any slender colorless prisms emitting a pungent odor. 12.7 grains dissolved in an ounce of water containing fifteen grains of iodide of potassium require for complete decoloration 100 measures of the volumetric solution of hyposulphite of soda.

The colorless crystals sometimes found in subliming iodine consist of iodide of cyanogen.

*Physiological Effects.*—That iodine becomes absorbed, when employed either externally or internally, we have indisputable evidence by its detection, not only in the blood, but in the secretions, the urine, sweat, saliva, and milk. In all cases it is found in the state of iodine. It may be readily detected in the urine of patients who have been using iodine, by adding a cold solution of starch and a few drops of nitric acid, when the blue iodide of starch is produced. The *local* action of iodine is that of an irritant. Applied to the skin, it stains the cuticle orange-yellow, causes itching, redness, and desquamation. If the vapor of it, mixed with air, be inhaled, it excites cough and heat in the air-passages. The *general* effects of iodine are these: In *small medicinal doses*, its action is *alterative*, as we sometimes obtain the palliation, or even the removal of disease, as scrofulous diseases, and visceral and glandular enlargements, without any perceptible alteration in the functions of the body. By some unexplained influence, it sometimes not only puts a stop to the further progress of disease, but apparently restores the part to its healthy state. It is usually given with the view of exciting the action of the absorbents; but its influence is not limited to this set of vessels. It exercises a controlling and modifying influence over the bloodvessels of the affected part, and is in the true sense of the word an *alterative*. Sometimes it increases the appetite, from which circumstance it has been denominated a *tonic*. But in irritable subjects, and those disposed to dyspepsia, it occasions nausea, sickness, heat of stomach, and loss of appetite, especially after its use has been continued for some days, and the bowels are oftentimes slightly relaxed. Rapid emaciation is said to have been occasionally produced by iodine; but Lugol asserts that, instead of producing emaciation, it encourages growth and increase of size. [Lugol, however, while he employed iodine largely, gave it cautiously and in small doses; and by simply altering the morbid actions which interfere with the healthy nutrition of the body, may have improved its condition, while in other hands the production by iodine of either local or general irritation may have impaired it.—Ed.] Two most remarkable effects which have been produced by iodine are *absorption of the mammæ and wasting of the testicles.* With regard to wasting of the testicles, I suspect it to be very rare. I have seen iodine administered in some hundreds of cases, and never met with one in which atrophy either of the breast or testicle occurred. Magendie also never saw these effects, though they are said to be common in Switzerland. "Iodine," says Lugol, "is a powerful *diuretic*. All the patients using it have informed me that they pass urine copiously." Coindet, however, expressly says that it does not increase the quantity of urine. In some cases in which I carefully watched its results, I did not find any diuretic effect.

It frequently acts as an *emmenagogue*. In some instances the continued use of iodine has given rise to a disordered state of system, which has been denominated *Iodism*. The symptoms (termed by Dr. Coindet *iodic*) are violent vomiting and purging, with fever, great thirst, palpitation, rapid and extreme emaciation, cramps, and small and frequent pulse, occasionally with dry cough, and terminating in death. This condition, however, must be a very rare occurrence; for it is now hardly ever met with, notwithstanding the frequency and freedom with which iodine is employed. The daily experience of almost every practitioner proves that the dangers resulting from the use of iodine have been much exaggerated, and we can hardly help suspecting that many symptoms which have been ascribed to the injurious operation of this remedy ought to have been referred to other causes; occasionally, perhaps, they depended on gastro-enteritis. In some cases the remarkable activity of iodine may have arisen from some idiosyncrasy on the part of the patient. M. Velpeau stated recently at the Académie Impériale de Médecine of Paris, that he had treated 15,000 persons with iodine, externally or externally, but had never seen anything exactly resembling constitutional *iodism*. He had seen irritation of the throat and digestive organs, mouth and nose, and ptyalism, but never rapid emaciation, wasting of the breasts or testicles, or bulimia; in short, symptoms of poisoning, such as M. Rilliet has described at Geneva. The difference, he thinks, may depend either on the doses employed, or on the quality of the iodized preparations. *In very large doses*, iodine has acted as an irritant poison, causing inflammation of the bowels, and death.

*Therapeutics.*—As a remedial agent iodine is principally valuable for its resolvent influence in chronic, visceral, and glandular enlargements, indurations, thickening of membranes (as of the periosteum), and in tumors. In comparing its therapeutical power with that of mercury, we observe, in the first place, that it is not adapted for febrile and acute inflammatory complaints, in several of which mercury proves a most valuable agent. Indeed, the existence of inflammatory fever is a contra-indication for the employment of iodine. Secondly, iodine is especially adapted for scrofulous, mercury for syphilitic, maladies; and it is well known that in the former class of diseases mercurials are for the most part injurious. Thirdly, the influence of iodine over the secreting organs is much less constant and powerful than that of mercury; so that in retention or suppression of the secretions mercury is for the most part greatly superior to iodine. Fourthly, iodine evinces a specific influence over the diseases of certain organs (*e.g.* the thyroid body), which mercury does not. These are some only of the peculiarities which distinguish the therapeutical action of iodine from that of mercury.

α. In *bronchocele.*—Of all the remedies yet proposed for bronchocele, this has been by far the most successful. Indeed, judging only from the numerous cases cured by it, and which have been published, we should almost infer it to be a sovereign remedy. I much regret, however, that my own experience does not accord with this inference. I have repeatedly seen iodine, given in conjunction with iodide of potassium, and used both externally and internally, fail in curing bronchocele; and I know others whose experience has been similar. Dr. Copland thinks where it fails it has been given in "too large and irritating doses, or in an improper form; and without due attention having been paid to certain morbid and constitutional relations of the disease during the treatment." But, in two or three of the instances before mentioned, I believe the failure did not arise from any of the circumstances alluded to by Dr.

Copland, and I am disposed to refer it to some peculiar condition of the tumor, or of the constitution. Sometimes the thyroid gland is enlarged, but has a healthy structure. In others, the tumefaction of the gland is only temporary, and may arise from increased vascularity and effusion of serum. A third class of bronchoceles consists of an enlargement of the thyroid gland from the development of certain fluid or solid substances in its interior, and which may be contained in cells, or be infiltrated through its substance. Now it is impossible that all these different conditions can be cured with equal facility by iodine; those having solid deposits are, of course, most difficult to get rid of. If the swelling be tender to the touch, and have other marks of inflammation, the usual local antiphlogistic measures should precede the employment of iodine.

β. In *scrofula.*—Dr. Coindet was, I believe, the first to direct public attention to this remedy in the disease in question. Three memoirs on the effects of iodine in scrofula have been subsequently published by Lugol, physician to the Hôpital St. Louis, serving to confirm the opinions already entertained of its efficacy. From the first memoir it appears that in seventeen months 109 scrofulous patients were treated by iodine only; and that of these 36 were completely cured, and 30 relieved; in 4 cases the treatment was ineffectual, and 39 cases were under treatment at the time of the report. In his illustrative cases we find glandular swellings, scrofulous ophthalmia, abscesses, ulcers, and diseases of the bones, were beneficially treated by it. Lugol employs iodine internally and externally. His local external treatment consists in employing ointments or solutions of iodine, cataplasms, and local baths. His external general treatment consists in the employment of ioduretted baths. In the treatment of cutaneous scrofula I have seen the most beneficial results from the application of the tincture of iodine by means of a camel's-hair pencil. It dries up the discharge and promotes cicatrization. The successful results obtained by Lugol in the treatment of this disease cannot, I think, in many instances, be referred to iodine solely. Many of the patients were kept several months (some as much as a year) under treatment in the hospital, where every attention was paid to the improvement of their general health by warm clothing, good diet, the use of vapor and sulphur baths, &c.; means which of themselves are sufficient to ameliorate, if not cure, many of the scrofulous conditions before alluded to. Whether it be to the absence of these supplementary means of diet and regimen, or to some other cause, I know not: but most practitioners will, I think, admit, that they cannot obtain, by the use of iodine, the same successful results which Lugol is said to have met with, though in a large number of cases this agent has been found a most useful remedy.

γ. In *chronic diseases of various organs, especially those accompanied with induration and enlargement*, iodine has been eminently successful when employed as a resolvent. In chronic inflammation, induration, and enlargement of the *liver*, after antiphlogistic measures have been adopted, the two most important and probable means of relief are iodine and mercury, which may be used either separately or conjointly. If the disease admits of a cure, these are the agents most likely to effect it. Several cases of enlarged *spleen* relieved, or cured, by iodine, have been published. In chronic diseases of the *uterus*, accompanied with induration and enlargement, iodine has been most successfully employed by Dr. Thetford and by Dr. Ashwell. Besides the internal use of iodine, this substance was employed in the form of ointment (composed of iodine gr. xv, iodide of potassium oz. $\frac{1}{4}$, spermaceti oint. oz. $1\frac{1}{2}$), of which a portion (about the size of a nutmeg) was introduced into the vagina, and rubbed into the affected cervix for ten or twelve minutes every night. It may be applied by the finger, or by a camel's-hair pencil, or sponge mounted on a slender piece of cane. The average time in which resolution of the induration is accomplished varies, according to Dr. Ashwell, from eight to sixteen weeks. "In hard tumors of the walls or cavity of the uterus, resolution, or disappearance, is scarcely to be expected;" but "hard tumors of the cervix, and indurated puckerings of the edges of the os (conditions which most frequently terminate in ulceration) may be melted down and cured by the iodine." In *ovarian* tumors, iodine has been found serviceable. In the chronic *mammary* tumor, described by Sir A. Cooper, I have seen it give great relief, alleviating pain, and keeping the disease in check. In indurated enlargements of the *parotid*, *prostate*, and *lymphatic glands*, several successful cases of its use have been published.

δ. As an *emmenagogue*, iodine has been recommended by Coindet, Magendie, and others.

ε. *Chronic diseases of the nervous system*, such as *paralysis and chorea*, have been successfully treated by iodine, by Dr. Manson.

ζ. In some forms of the *venereal disease*, iodine has been found a most serviceable remedy. De Salle cured chronic venereal affections of the *testicles* with it.

η. In checking or controlling *the ulcerative process*, iodine is, according to Mr. Key, one of the most powerful remedies we possess. "The most active phagedenic ulcers, that threaten the destruction of parts, are often found to yield in a surprising manner to the influence of this medicine, and to put on a healthy appearance.

θ. *As an injection for the cure of hydrocele*, Velpeau has employed a mixture of the tincture of iodine with water, in the proportion of from one to two drachms of the tincture to an ounce of water; of this mixture from one to four ounces are to be injected and immediately withdrawn.

ι. *Inhalation of iodine vapor* has been used in phthisis. I have repeatedly tried it in this complaint, but never with the least benefit.

κ. As a *topical remedy* iodine is exceedingly valuable in several classes of diseases. The part affected is painted with the tincture or liniment, by means of a camel's-hair pencil. In some few cases only, where the skin is very delicate, it will be necessary to dilute the tincture. When it is required to remove the stain which its use gives rise to, a poultice or gruel should be applied. In *lupus* it proves highly beneficial. My attention was first drawn to its efficacy in this disease by my colleague Mr. Luke. Under its employment the process of ulceration is generally stopped, and cicatrization takes place. The tincture should be applied, not only to the ulcerated portion, but to the parts around. In *eczema* it also is an excellent application. In *cutaneous scrofula*, likewise, as I have already remarked. In several other cutaneous diseases, such as *lichen*, *prurigo*, *pityriasis*, *psoriasis*, *impetigo*, *porrigo*, *ecthyma*, and *scabies*, Dr. Kennedy has found its use beneficial. According to the testimony of Dr. Davies and an anonymous writer, it is a valuable application to *chilblains*. In the treatment of *diseases of the joints* it is used with great advantage. In *erysipelas* I have seen it highly beneficial. In *phlegmonous inflammation*, *sloughing of the cellular membrane*, *inflammation of the absorbents*, *gout*, *carbuncle*, *whitlow*, *lacerated*, *contused*, and *punctured wounds*, and *burns* and *scalds*, it is most highly spoken of by Dr. Davies. [I have seen bursæ on the instep, which had resisted more than one surgical operation, entirely removed by the daily application of iodine for several months.—Ed.] In *acute rheumatism* and *gout* the application of iodine to the affected parts gives unquestionable relief. Either tincture or liniment of iodine should be applied to the affected joints, and repeated daily until the cuticle begins to peel off. According to my experience, no remedy gives so much relief as this: I have rarely found it fail. It deserves, however, especial notice, that the skin of different invalids is most unequally susceptible of its influence; in some few it excites so much pain that a second application of it is with difficulty permitted, and it occasionally causes an herpetic eruption. In others, however, it produces scarcely any painful effects. In *diseases of the lungs and bronchial tubes* simulating phthisis, and also in incipient protracted phthisis, it may be applied to the outside of the thorax with great benefit. It is usually a much less painful application than emetic tartar or croton oil, though, as I believe, equally effective. [It is equally useful, when daily applied over the larynx, in *chronic laryngitis*, whether phthisical or not. In *scrofulous ophthalmia*, if painted daily over and round the eyelids, it greatly contributes to relieve the excessive intolerance of light.—Ed.] Another and most effectual method of employing iodine externally is to apply the ointment to the cutis vera, the epidermis being previously removed by a blister. But the method more usually followed is to rub the ointment into the affected part, without the epidermis being previously removed. Its topical uses are, therefore, nearly as extensive as those of nitrate of silver. Moreover, it is used very much in the same classes of cases, and with the same views.

*Administration.*—Iodine is rarely administered alone, but generally in conjunction with iodide of potassium. The tincture [*Compound Tincture.* U. S.—W.] is a good form for internal use. For inhalation, a few drops of the tincture may be added to hot water, and the vapor inhaled in the ordinary way. A little tincture of conium is sometimes added, to prevent irritation. In the administration of iodine, care should be taken to avoid gastric irritation. On this account we should avoid giving it on an empty stomach. Exhibited immediately after a meal, its topical action is considerably diminished. This is especially the case when amylaceous substances (as potatoes, bread-pudding, sago, tapioca, and arrowroot) have been taken, as the iodine forms with them an iodide of starch.

*Pharmaceutic Uses.*—Iodine is used in the production of iodide of iron, pill and syrup of iodide of iron, green iodide of mercury, iodide of potassium, and solution of iodate of potash, besides the following preparations:—

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.

The proportion of iodide of potassium is only one-fourth as much as in the London tincture. It is chiefly useful in facilitating the solution of the iodine.

The tincture is intended both for internal and external use. *Dose* for internal use, min. v to min. xx (= about gr. $\frac{1}{8}$ to gr. $\frac{1}{2}$ of iodine) in water.

[Tinctura Iodinii, U. S., *Tincture of Iodine.*—"Take of iodine, a troyounce; alcohol, a pint. Dissolve the iodine in the alcohol." U. S. P. This preparation is essentially different from the *tinctura iodi* of the British Pharmacopœia in not containing iodide of potassium. It is of a deep-brown color, and contains one grain of iodine in every sixteen minims or about thirty-five drops. When kept for a long time, and especially when exposed to solar light, the iodine acts upon the alcohol, decomposing it, and forming several complex ioduretted compounds; these are soluble, and consequently the tincture in which such reaction has occurred does not yield a precipitate on the addition of water. Tincture of iodine is not used internally, because it is thought to irritate the stomach more than the compound tincture. The reason of its doing this is supposed to be the precipitation of its iodine in the stomach, by the watery fluids present there. It is largely employed as an external application; but in most cases should be diluted before being applied, lest it cause inflammation and desquamation of the cuticle.—W.]

[TINCTURA IODINII COMPOSITA, U. S.—"Take of iodine, half a troyounce; iodide of potassium, a troyounce; alcohol, a pint. Dissolve the iodine and iodide of potassium in the alcohol." The United States tincture is somewhat stronger than the corresponding preparation of the British Pharmacopœia (the tinctura iodi), but not enough so to affect materially the dose.—W.]

[LIQUOR IODINII COMPOSITUS, U. S. *Compound Solution of Iodine.*—"Take of iodine, three hundred and sixty grains; iodide of potassium, a troyounce and a half; distilled water, a pint. Dissolve the iodine and iodide of potassium in the distilled water." In this preparation advantage is taken of the solvent power on iodine of a watery solution of iodide of potassium. It is commonly known as Lugol's solution. *Dose*, gtt. v to gtt. xv.—W.]

LINIMENTUM IODI, *Liniment of Iodine.*—Take of iodine, one ounce and a quarter; iodide of potassium half an ounce; rectified spirit, five fluidounces. Dissolve the iodine and iodide of potassium in the spirit.

This liniment contains ten times as much iodine as the tincture, and is only intended for external use. It should not be applied to tender skins.

[UNGUENTUM IODINII, U. S.—"Take of iodine, twenty grains; iodide of potassium, four grains; water, six minims; lard, a troyounce. Rub the iodine and iodide of potassium first with the water, and then with the lard, until they are thoroughly mixed." This ointment seems to differ from the compound ointment only in not being quite so strong; otherwise the two preparations are almost identical.—W.]

UNGUENTUM IODI COMPOSITUM, *Compound Ointment of Iodine.*—Take of iodine, thirty-two grains; iodide of potassium, thirty-two grains; proof spirit, one fluidrachm; 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.

The proportion of iodide of potassium is less by one-half than in the London ointment.

[UNGUENTUM IODINII COMPOSITUM, U. S.—"Take of iodine, fifteen grains; iodide of potassium, thirty grains; water, thirty minims; lard, a troyounce. Rub the iodine and iodide of potassium first with the water, and then with the lard, until they are thoroughly mixed."]

VOLUMETRIC SOLUTION OF IODINE (Appendix B. III.).—Take of pure iodine, in powder, 111.125 grains; iodide of potassium, 150 grains; distilled water, a sufficiency. Mix the iodide of potassium and iodine in a bottle with eighteen ounces of the water; agitate until both are dissolved, and, when the solution is complete, add as much more distilled water as will make the total bulk exactly one pint.

This solution may be employed for determining the amount of sulphuretted hydrogen or of a metallic sulphuret in a fluid, but is chiefly used for the estimation of sulphurous and arsenious acids. It is dropped from the volumetric tube into the liquid to be tested, until free iodine (known by its brown color) begins to appear in the solution. 100 volumetric measures of it include 12.7 grains ($\frac{1}{10}$ of an equivalent) of iodine, and therefore correspond to 1.7 grains of sulphuretted hydrogen, 3.2 grains of sulphurous, and 4.95 grains of arsenious acid.

[**Acidum Hydriodicum Dilutum,** U. S., *Diluted Hydriodic Acid.*

"Take of iodine, in fine powder, a troyounce; distilled water, a sufficient quantity. Mix thirty grains of the iodine with five fluidounces of distilled water in a tall glass-stoppered bottle having the capacity of half a pint, and pass into the mixture hydrosulphuric acid gas until the color of the iodine entirely disappears, and a turbid liquid remains. Detach the bottle from the apparatus employed for introducing the gas, and gradually add the remainder of the iodine, stirring at the same time. Then reattach the bottle, and again pass the gas until the liquid becomes colorless. Decant the liquid into a small matrass which it is nearly sufficient to fill, boil it until it ceases to emit the odor of hydrosulphuric acid, and filter through paper. Then pass sufficient distilled water through the filter to bring the filtered liquid to the measure of six fluidounces. Lastly, keep the liquid in a well-stopped bottle."

"The hydrosulphuric acid gas, required in this process, may be obtained by mixing, in a suitable apparatus, a troyounce and a half of sulphuret of iron, two troyounces of sulphuric acid, and six fluidounces of water."

In this process the sulphuret of hydrogen is decomposed, the sulphur being liberated, and the hydrogen combining with the iodine. Thus, $SH+I=HI+S$.

Pure hydriodic acid is a colorless, highly acid gas, with an odor resembling that of hydrochloric acid. Its sp. gr. is about 4.4. Like hydrochloric acid, it is very soluble in water, forming, when the latter is saturated, a solution with the sp. gr. of 1.7.

*Officinal Characters.*—"Diluted hydriodic acid is a sour liquid, colorless when recently prepared, and having the sp. gr. 1.112. It is wholly volatilized by heat, and is decomposed by nitric and sulphuric acids, with the liberation of iodine. When kept in contact with the air, it gradually becomes brown, and acquires an iodine odor." U. S.

This change is owing to absorption of oxygen, water being formed and iodine liberated.

*Therapeutics.*—Hydriodic acid has been recommended as a medicine by Dr. A. Buchanan, of Glasgow, on account of his believing it the best form for introducing iodine into the circulation. The indications for its use are precisely those for other preparations of iodine. Each fluidrachm contains ten grains of iodine. *Dose,* f℥ss t. d. in water.—W.]

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## BROMINE. (Appendix A.) Br=80.

## [BROMINIUM. Mat. Med. List, U. S. P.]

*Natural History.*—Bromine (from βρῶμος, a stench) is found in both kingdoms of nature, but never in the free state. It exists in sea-water and many mineral waters, especially brine springs, in combination with either sodium, magnesium, or calcium. The saline springs near Kreuznach, in Germany, are especially rich in it. Bromine has also been found in the sea-plants of the Mediterranean, and in the mother-waters of Kelp.

*Preparation.*—When the mother-liquor of sea-water, or bittern, has been deprived, as much as possible, of its other salts by crystallization, chlorine is developed in it (either by binoxide of manganese and hydrochloric acid; or, when the quantity of metallic chloride is sufficient, by binoxide of manganese and sulphuric acid). This decomposes the bromide of magnesium contained in the liquor, and sets free bromine, which distils over: $MgBr+Cl=MgCl+Br$. The bromine thus obtained requires to be subsequently purified.

*Properties.*—At ordinary temperatures, bromine is a dark-colored, very volatile liquid, which, seen by reflected light, appears blackish red, but viewed in thin layers, by transmitted light, is hyacinth red. Its odor is strong and unpleasant; its taste acrid. When exposed to a cold of —4° F. it is a yellowish-brown, brittle, crystalline solid. At ordinary temperatures, liquid bromine evolves ruddy vapors similar to those of nitrous acid, so that a few drops put into a small vessel immediately fill it with the vapor of bromine. At 116½° F. bromine boils. The vapor is not combustible: a lighted taper plunged into it is immediately extinguished; but before the flame goes out, it becomes red at the upper and green at the lower part. Antimony and arsenic take fire when dropped into liquid bromine; when potassium or phosphorus is used, a violent explosion takes place. Bromine is a bleaching agent; it is soluble in about 34 parts of water, more so in alcohol, and much more so in ether. It communicates a fine orange color to starch; and causes a yellowish-white precipitate (*bromide of silver*) with a solution of the nitrate of silver. In its external appearance it resembles the terchloride of chromium and the chloride of iodine. I have known it confounded with tincture of iodine. It should be preserved under a layer of water in a stoppered bottle, to prevent evaporation.

*Tests.*—Specific gravity, 2.966. Agitated with solution of soda in such proportion that the fluid remains very slightly alkaline, it forms a colorless liquid, which, if colored by the addition of a small quantity of chlorine, does not become blue on the subsequent addition of starch (showing the absence of iodine).

*Uses.*—Bromine is only employed pharmaceutically, to form bromide of potassium, and the following test solution.

[During the late rebellion, bromine was extensively tried as a local application to hospital gangrene, and has been more relied on than any other remedy. It was applied pure, by means of a glass rod or a splinter of wood, after the dead tissue had been cut away by the scalpel and scissors. One or two applications, if thoroughly made, in most cases procured a healthy granulating surface. It certainly is one of the most terribly powerful and deep-reaching escharotics known, exceeding in its powers even nitric acid. Its application should be made with great care; and in order, to prevent its inordinate action, every precaution should be taken by greasing the parts, but more especially by applying it in very small quantities. I have seen horribly deep sores caused by its running over the edge of an ulcer, mixed with the discharge, even when the sound tissue had been thoroughly smeared with oil. Its corrosive power is shown by its rapidly destroying the splinter of wood with which it is applied. The fumes given off by it sometimes cause intense irritation, and even inflammation, of the eyes of the operator. It has also been used, much diluted with water, as a stimulant to indolent, unhealthy ulcers.—W.]

Solution of Bromine (Appendix B. II.).—Take of bromine, ten minims; distilled water, five fluidounces. Place the bromine in a bottle furnished with a well-fitting stopper, pour on the water, and shake several times.

*Used* for detecting iodine in bromide of potassium.

## NITROGEN. N=14.

*Natural History.*—Nitrogen is a constituent of coal, of nitrates, of ammoniacal salts, and of some mineral waters. It forms about 79 per cent. of the atmosphere. It is a constituent of various organic principles, as the alkaloids, albuminous principles, gelatine, mucus, urea, uric acid, &c. It is found in the swimming bladders of fishes.

*Preparation.*—The readiest method of procuring it is to burn a piece of phosphorus in a confined portion of atmospheric air. The phosphorus combines with the oxygen of the air and forms metaphosphoric acid. The residual gas, after being thoroughly washed, is nearly pure nitrogen.

*Properties.*—It is a colorless, odorless, tasteless gas; is without action on vegetable colors; and is neither combustible nor a supporter of combustion. It does not precipitate solution of lime. Its sp. gr. is 0.971. It is very slightly absorbed by water. It is usually distinguished by its negative properties just described. In organic analysis the nitrogen is estimated either in the free state, as gas, or in the form of ammonia. If an organic substance containing nitrogen be heated with a mixture of caustic soda and quicklime, the nitrogen is evolved in the form of ammonia.

### [Nitrous Oxide. NO.

This is a colorless gas, almost inodorous, but with a sweetish taste. It may be obtained by heating the nitrate of ammonia, which resolves itself into water and the gas. Thus $NH_4O,NO_5=2(NO)+4HO$. Cold water absorbs nearly its own volume of it. When nitrous oxide is inspired it produces intoxication, which rapidly passes into anæsthesia if no air be mixed with it. Its anæsthetic effects are characterized by the rapidity with which they are induced, and by their transientness. There are no marked after-effects. As far as I know of, no very serious symptoms have been as yet produced by its inhalation. The transientness of its operation makes it unsuitable for use in the major operations of surgery; for if by any accident it be momentarily intermitted the patient awakens, it may be in the midst of the cutting. But this very rapidity of action fits it for use in teeth-drawing, opening of abscesses or felons, and other very short operations. Water impregnated by pressure with five times its bulk of the gas has been used both in England and this country internally. According to Dr. Zeigler, it is a powerful nervous and arterial stimulant, possessing the power of revivifying animals when asphyxiated with carbonic acid gas.—W.]

### Nitric Acid. $NO_5=54$.

*Natural History.*—It is found in both kingdoms of nature, generally combined with potash, soda, lime, or magnesia, as nitrates. These are found on the surface of the earth in various parts of the world, also in some few mineral waters, and occasionally in well waters as a result of animal decomposition. Nitrates are also a frequent constituent of vegetable juices.

*Preparation.*—Anhydrous nitric acid has been prepared lately by M. Deville. He obtained it by subjecting nitrate of silver to the action of chlorine gas. The result was—chloride of silver, oxygen, and anhydrous nitric acid.

*Composition.*—Its composition is—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Nitrogen | 14 | 25.9 |
| 5 | Oxygen | 40 | 74.1 |
| | Nitric acid | 54 | 100.0 |

*Properties.*—Anhydrous nitric acid is colorless, crystallizing in 6-sided columns, which fuse at 86° Fahr., and boil between 113° and 122°, at which temperature they begin to decompose. Anhydrous nitric acid has been known to explode spontaneously. It dissolves in water, producing much heat, and forming the hydrated acid.

**Acidum Nitricum** [Mat. Med. List, U. S. P.], *Nitric Acid.* $3HO,2NO_5$=135 (2 Eq.).

*Preparation.*—Take of nitrate of potash, two pounds; sulphuric acid, seventeen fluidounces. 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.

The changes which occur will be as follows: $2KO,NO_5 + 4HO,SO_3 = 2KO,4SO_3 + HO + 3HO,2NO_5$. This acid is one-third stronger than the London nitric acid ($HO,NO_5 + 3HO = 90$, sp. gr. 1.42). [The officinal acid, U. S., is of the same strength as the London acid, sp. gr. 1.42.—W.]

*Officinal Characters.*—A strongly acid and corrosive yellowish liquid. When diluted with three times its volume of water and poured upon copper, it gives off a colorless gas ($NO_2$), which, upon contact with the air, becomes an orange vapor ($NO_4$), and when conducted into a solution of sulphate of iron, communicates to it a dark color.

*Properties.*—At 40° F. the concentrated acid congeals. Nitric acid has a powerful affinity for water; and, when mixed with it, heat is evolved. Nitric acid is easily deoxidized. Thus, exposure to solar light causes the evolution of oxygen and the production of nitrous acid, which gives the liquid a yellow, orange, or reddish-brown color. The acid thus colored may be rendered colorless, but of course weaker, by the application of a gentle heat, to drive off the nitrous acid. Several of the non-metallic combustibles rapidly decompose the nitric acid; as charcoal, phosphorus, sugar, alcohol, volatile oils, resins, &c. The acid has no action upon leaf-gold. If, however, hydrochloric acid be added to nitric acid, the mixture acquires the power of dissolving leaf-gold: the presence of gold in solution may be recognized by the protochloride of tin, with which it strikes a purple or blackish color. Nitric acid decolorizes sulphate of indigo. Morphia or brucia communicates a red color to nitric acid, which is heightened by supersaturating the liquid with ammonia: powdered nux vomica renders this acid yellow or orange-colored.

*Composition.*—Liquid or watery nitric acid (sp. gr. 1.5) is composed of real nitric acid and water, in the proportion of 2 equivalents of the former to 3 of the latter:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Real Nitric Acid | 54 | 80 |
| 1½ | Water | 13.5 | 20 |
| | Liquid Nitric Acid | 67.5 | 100 |

*Tests.*—Specific gravity, 1.5. One fluidrachm of the acid requires for neutralization 121.5 measures of the volumetric solution of soda. Evaporated it leaves no residue. Diluted with six volumes of distilled water, it gives no precipitate with chloride of barium, or nitrate of silver (showing its freedom from sulphuric and hydrochloric acids).

*Physiological Effects.*—In the concentrated form the acid is powerfully escharotic and corrosive, which property it derives in part from its affinity for water, but more especially from the facility with which it gives out oxygen; so that the appearances caused by its action on some of the tissues are different from those produced by sulphuric acid. The permanent yellow stain which it communicates to the cuticle is peculiar to it. Both iodine and bromine stain the skin yellow or brown, but a little caustic potash readily removes the stain when recent; whereas the yellowish stain produced by nitric acid becomes orange on the addition of an alkaline soap. The yellow or citron stain communicated to the lining membrane of the tongue, pharynx, &c., by nitric acid, has been well represented by Dr. Roupell in his work on poisons. A preparation, presenting similar appearances, is preserved in the anatomical museum of the London Hospital. Nitric, like sulphuric acid, also chars the animal tissues; and thus, after the ingestion of it, the stomach is sometimes found blackened, as if sulphuric acid had been swallowed. The symptoms are similar to those produced by sulphuric acid. The yellow, citron, or orange spots sometimes observed on the lips, chin, or face, will, when present, at once indicate the kind of acid swallowed. Sometimes the binoxide of nitrogen is evolved by the mouth. Properly diluted, nitric acid produces effects similar to those of the other mineral acids. It is said, however, to act less evidently as a tonic, and to be more apt to disagree with the stomach, so that it cannot be employed for so long a period.

*Therapeutics. Internal.*—As nitric acid produces certain effects, in common with other mineral acids, it may be used, in the form of *dilute nitric acid*, as a substitute for the latter in various diseases. Thus, it is administered in conjunction with the bitter infusions in those conditions admitting of, or requiring, the use of tonics. Properly diluted, it is employed as a refrigerant in febrile disorders. In lithiasis, attended with phosphatic deposits in the urine, it has been used instead of the sulphuric or hydrochloric acid. As a lithonlytic injected into the bladder, very dilute nitric acid has been successfully employed by Sir B. Brodie. In some obstinate cutaneous diseases, as impetigo, it is given to the extent of half a drachm daily in barley water. It may be employed, also, to relieve heartburn. In 1793 this acid was used by Mr. Scott, a surgeon at Bombay, as a substitute for mercurial preparations. Mr. Scott first tried it in chronic hepatitis, and with considerable success. He then extended its use to venereal diseases, and obtained the happiest results from it. Subsequently it has been most extensively employed in the last-mentioned diseases; but the success attending its use has been variable. That it has been and is frequently serviceable, no one can doubt who reads the immense body of evidence offered in its favor by Scott, Kellie, Albers, Prioleau, Rollo, Cruickshank, Beddoes, Ferriar, and others. But, on the other hand, it is equally certain that on very many occasions it has been useless. The same remark, indeed, may be made of mercury, or of any other remedy; but as an anti-venereal medicine it does not admit of comparison with this metal. However, we frequently meet with syphilitic cases in which the employment of mercury is either useless or hurtful. Thus it can rarely be employed with advantage in scrofulous subjects; or in persons whose idiosyncrasies render them peculiarly susceptible to the influence of this metal; and in sloughing sores it is inadmissible. Now, these are the cases in which nitric acid may be employed with benefit; and I believe the best mode of administering it is in conjunction with the compound decoction of sarsaparilla. For further information respecting its employment, I must refer to the works of Holst and Mr. Samuel Cooper.

*External.*—In the *concentrated* state, nitric acid has been employed as a powerful escharotic, to destroy warts, and as an application to parts bitten by rabid animals or venomous serpents, to phagedenic ulcers, &c. In order to confine the acid to the spot intended to be acted on, the neighboring parts may be previously smeared with some resinous ointment. In sloughing phagedena, the application of strong nitric acid. as recommended by Mr. Welbank, is attended with the most successful results, as I have on several occasions witnessed. The best mode of applying it is by a piece of lint tied round a small stick or skewer. When the slough is very thick, it is sometimes necessary to remove part of it with a pair of scissors, in order to enable the acid to come in contact with the living surface. Largely *diluted* (as 50 or 60 drops of strong acid to a pint or quart of water), it is recommended by Sir Astley Cooper as a wash for sloughing and other ill-conditioned sores.

*Pharmaceutic Uses.*—Nitric acid is used as an oxidizing agent in the production of dilute phosphoric acid, solution of perchloride of iron, and solution of persulphate of iron, without itself entering into the preparation. In other cases, it is both an oxidizer and an essential constituent of the product, as in nitrate of silver, white bismuth, acid solution of nitrate of mercury, solution of pernitrate of iron, and ointment of nitrate of mercury. [In preparing acidum hydrocyanicum dilutum, acidum phosphoricum dilutum, antimonii oxidum, bismuthi subcarbonas, cadmii sulphas, ferri chloridum, hydrargyri oxidum rubrum, liquor ferri subsulphatis, liquor ferri tersulphatis, tinctura ferri chloridi, zinci chloridum of the U. S. Ph. Off. Preparations of the U. S. Ph.—Argenti nitras, bismuthi subnitras, liquor ferri nitratis, liquor hydrargyri nitratis, spiritus ætheris nitrosi, unguentum hydrargyri nitratis.—W.] It is also used in the following preparations:—

Acidum Nitricum Dilutum [U. S.], *Dilute Nitric Acid.*—Take of nitric acid, two fluidounces; distilled water, thirteen fluidounces. Mix, and preserve in a stoppered bottle.

*Tests.*—Colorless. Specific gravity, 1.101. Six fluidrachms require for neutralization 100 measures of the volumetric solution of soda.

It is nearly one-fourth stronger than the dilute acid of the London Pharmacopœia.

*Dose.*—Fifteen to twenty-five minims.

["Take of nitric acid, three troyounces; distilled water, a sufficient quantity. Mix the acid in a glass vessel with sufficient distilled water to make the diluted acid measure a pint." U. S. The specific gravity of this preparation is 1.068. It is considerably weaker than the dilute nitric acid of the British Pharmacopœia. The dose is from twenty to forty minims or drops.—W.]

[Acidum Nitro-Muriaticum, U. S.—"Take of nitric acid, three troyounces; muriatic acid, five troyounces. Mix the acids in a glass vessel, and, when effervescence has ceased, keep the product in a well-stoppered bottle, in a cool place, protected from the light." U. S. Nitro-muriatic acid of the U. S. P. is a deep golden-yellow liquid, with a strong odor of chlorine. Owing to the presence of chlorine, which is liberated by the reaction of the two acids on one another, it readily dissolves gold, and was for this reason formerly known as aqua regia. Dose gtt. v—x.—W.]

Acidum Nitro-Hydrochloricum Dilutum, *Dilute Nitro-hydrochloric Acid* [Acidum Nitro-Muriaticum Dilutum, *Dilute Nitro-Muriatic Acid*, U. S.]—Take of nitric acid, two fluidounces; hydrochloric acid, four fluidounces; distilled water, twenty-six fluidounces. Add to the water first the nitric, and then the hydrochloric acid. Mix, and preserve in a stoppered bottle. (It contains both chlorine and nitrous acid: thus, $NO_5+HCl=NO_4+Cl+HO$.) ["Take of nitric acid, a troyounce and a half; muriatic acid, two troyounces and a half; distilled water, a sufficient quantity. Mix the acids in a well-stoppered bottle, having the capacity of a pint. Shake them together occasionally during twenty-four hours, and then add sufficient distilled water to make the diluted acid measure a pint. Lastly, keep it in a cool place, protected from the light." U. S. The strength of this and that of the British acid are about equal.—W.]

*Tests.*—Specific gravity, 1.074. Six fluidrachms require for neutralization 93.88 measures of the volumetric solution of soda.

*Therapeutics.*—It has been employed *internally* in the same cases as nitric acid, more especially in syphilis, diseases of the liver, and some of the exanthemata. *Externally* it has been used as a bath, either local or general, in the proportion of six or eight fluidounces of the acid to each gallon of water, in syphilis and hepatic affections. Dr. Lendrick has more recently noticed the utility of the general nitro-muriatic acid bath, at a temperature of 90° or 95°, in syphiloid and mercurial cachexiæ, and liver consumption. In India, the whole body (the head excepted) is immersed; but in this country pediluvia are usually employed, or the body is merely sponged with it. [Nitro-muriatic acid is often very useful in cases of indigestion, dependent upon a want of tone of the mucous membrane of the alimentary canal. There is a peculiar condition of the system, characterized by debility, lassitude, weakness in the lower limbs, low spirits, dyspeptic symptoms, &c., together with the presence of crystals of oxalate of lime, either octohedral or dumb-bell, in the urine; in which nitro-muriatic acid acts almost as a specific, especially when combined with proper hygienic measures.—W.]

*Administration.*—When taken internally, the *dose* is ten or fifteen minims, properly diluted, and carefully increased.

*Antidote.*—Poisoning by this acid is to be treated in the same way as that by hydrochloric acid.

*Pharmaceutic Uses.*—Nitro-hydrochloric acid is used in the preparation of the solutions of bichloride of platinum and terchloride of gold.

## Ammonia. $NH_3=17$.

*Natural History.*—Ammonia, free or combined, exists in both kingdoms of nature. Hydrochlorate and sulphate of ammonia are met with native usually in the neighborhood of volcanoes. Aluminous sulphate of ammonia (or ammonia alum) occurs in Bohemia. Carbonate of ammonia is a constituent of the atmosphere, and is, therefore, found in rain water. Ammonia is found in vegetables in small quantities only, but is developed during the decomposition (spontaneous or artificial) of most vegetable substances, as gluten. It is one of the bases found in the urine of man, where it exists in combination with phosphoric, hydrochloric, and uric acids. Ammonia is also a product of the putrefaction of animal matters.

*Preparation.*—Ammoniacal gas is obtained by heating a mixture of one part of powdered sal ammoniac and two parts of dry quicklime in a glass retort, the products being ammonia, chloride of calcium, and water. $NH_4Cl+CaO=NH_3+HO+CaCl$.

*Properties.*—Ammonia is a colorless invisible gas, having a strong and well-known odor. It reddens turmeric paper, and changes the color of violet juice to green; but by exposure to the air, or by application of heat, both the turmeric paper and violet juice are restored to their original color. The specific gravity of this gas is 0.59. Ammoniacal gas is not a supporter of combustion, but is slightly combustible in the atmosphere, and, when mixed with air or oxygen, it forms an explosive mixture. Every two volumes of it require one and a half volumes of oxygen for their complete combustion. The results of the explosion are a volume of nitrogen and some water. It forms white fumes when brought into contact with hydrochloric acid gas or chlorine. Dissolved in water, it communicates a deep blue color to the salts of copper; throws down with the bichloride of platinum a yellow precipitate; with chloride of mercury, a white precipitate; with protonitrate of mercury a black precipitate; and with a concentrated solution of tartaric acid, a crystalline precipitate.

*Composition.*—Ammonia is composed of hydrogen and nitrogen in the following proportions:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Nitrogen | 14 | 82.35 |
| 3 Hydrogen | 3 | 17.65 |
| 1 Ammonia | 17 | 100.00 |

## Liquor Ammoniæ Fortior, *Strong Solution of Ammonia.*

## [Aqua Ammoniæ Fortior, *Stronger Water of Ammonia*, Mat. Med. List, U. S.]

Ammoniacal gas dissolved in water, and constituting 32.5 per cent. of the solution.

[An aqueous solution of ammonia of the specific gravity 0.900, and containing 26 per cent. of the gas.—Mat. Med. List, U. S. P.]

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

Bottles 1 and 2 will now include, the first about sixteen, the second about ten fluidounces of a colored 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 colored liquid which 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.

*Officinal Characters.*—A colorless liquid, with a characteristic and very pungent odor, and strong alkaline reaction.

*Tests.*—Specific gravity, 0.891. One fluidrachm requires for neutralization 102 measures of the volumetric solution of oxalic acid. When diluted with four times its volume of distilled water, it does not give precipitates with solution of lime, oxalate or hydrosulphuret of ammonia, or ammonio-sulphate of copper; and, when treated with an excess of nitric acid, is not rendered turbid by nitrate of silver, or by chloride of barium (showing the absence of carbonic acid, of lime, of ordinary metallic impurities, of sulphur, hydrochloric acid, and sulphuric acid).

*Physiological Effects.*—The local action of strong solution of ammonia is exceedingly energetic. Applied to the skin it causes pain, redness, vesication, and destruction of the part; thus acting first as a rubefacient, then as a vesicant, and lastly as a caustic, or corrosive. Its emanations are also irritant: when they come in contact with the conjunctival membrane, a flow of tears is the result; when inhaled, their powerful action on the air-passages is well known. Persons in syncope are observed to be almost immediately raised from a death-like state merely by inhaling the vapor of this solution. In cases of insensibility it must be employed with great caution; for, if used injudiciously, serious or even fatal consequences may be the result. When swallowed it acts as a powerfully corrosive poison. *In small* or *therapeutic* doses, such as we are accustomed to employ in the treatment of diseases, ammonia acts as a diffusible stimulant, excitant, or calefacient. It produces a sensation of warmth in the mouth, throat, and epigastrium, frequently attended with eructations. A temporary excitement of the vascular system succeeds, but this quickly subsides. The heat of the skin is sometimes increased, and there is a tendency to sweating, which, if promoted by the use of warm diluents and clothing, frequently terminates in copious perspiration. But the skin is not the only secreting organ stimulated to increased exertion; we observe the kidneys produce more urine, and frequently the quantity of bronchial mucus is increased. The nervous system is also affected, and the activity of its functions heightened. Ammonia does not render the urine alkaline.

If we compare the effects of ammonia with those of other stimulants, as camphor, wine, and opium, we observe, in the first place, that the influence of ammonia is principally manifested in the ganglionic and true spinal systems, while the other stimulants above mentioned affect the cerebral system. Thus the effects of ammonia are usually exhibited on the circulation, respiration, secretion, and spasmodic actions; but camphor, wine, and opium, though they also affect these functions, yet they principally affect the intellectual functions. Secondly, the effects of ammonia are more transient than those of the other agents just referred to. Thirdly, the vascular excitement caused by wine and opium, is attended by diminished mucous secretion, and is allied more to an ordinary febrile attack.

*Therapeutics.*—Ammonia is adapted for speedily rousing the action of the vascular and respiratory systems, and for the prompt alleviation of spasm. It is more especially fitted for fulfilling these indications when our object is at the same time to promote the action of the skin. It is calculated for states of debility with torpor or inactivity. It is also used as an antacid and local irritant.

(1.) *As a stimulant and sudorific, or expectorant.*—Ammonia is given with manifest advantage in many cases, of which the following are illustrations: In *continued, especially typhoid, fever*, when its diaphoretic action should be promoted by diluents and warm clothing; in the *exanthemata*, when the eruption has receded from the skin and the extremities are cold; and in *pneumonia*, and some other inflammatory diseases, when the violence of the vascular action has been reduced by proper evacuations, or when the disease has assumed an asthenic character from the commencement. In the *chronic bronchitis* of old persons, when the power to expectorate is deficient, ammonia combined with infusion of senega is a valuable stimulant expectorant.

(2.) *As a nervine stimulant, and antispasmodic*, ammonia is frequently employed with the greatest benefit. In *poisoning* by those cerebro-spinants commonly called sedatives—such as digitalis, tobacco, and hydrocyanic acid, it is a most valuable agent. I believe the efficiency of ammonia as an antidote to poisoning by hydrocyanic acid arises, not from its neutralizing the acid, for hydrocyanate of ammonia is also highly poisonous, but from its exerting an influence of an opposite nature to that of the poison. In poisoning by the oil of bitter almonds, or other agents supposed to contain this acid, ammonia is equally serviceable. The antidote should be given by the stomach, if the patient can swallow, and the vapor should be cautiously inhaled. Ammonia is also used to remove the cerebral disorder of intoxication, and nervous headache. This remedy has been supposed to possess a specific influence in relieving those disorders of the nervous system accompanied with spasmodic or convulsive symptoms; and hence it is classed among the remedies denominated *antispasmodic.*

*The vapor of the solution of ammonia may be inhaled* when we wish to make a strong impression on the nervous system, as in syncope, or to prevent an attack of epilepsy. To guard against or relieve fainting, ammoniacal inhalations are very powerful and useful. Their instantaneous operation is frequently astonishing. In asphyxia, ammoniacal inhalations have been strongly recommended by Sage. That they may sometimes be of service I can readily believe, but they must be employed with great caution.

(3.) *As a remedy for the bites of poisonous animals*—as serpents and insects—ammonia is frequently employed with the best effects. It was strongly recommended for this purpose by Dr. Meade. There does not appear, however, any ground for the assertion of Sage that it is a specific. [It probably benefits by stimulating the vascular and nervous systems until the depressing influence of the poison has subsided.—Ed.]

(4.) *As an antacid in dyspeptic complaints, accompanied with preternatural acidity of stomach and flatulence*, but without inflammation, a properly diluted solution of ammonia may be employed with a twofold object—that of neutralizing the free acid, and stimulating the stomach. It must be remembered that the healthy secretions of the stomach are of an acid nature, and that the continued use of ammonia, or any other alkali, must ultimately be attended with injurious results, more especially to the digestive functions. While, therefore, the occasional employment of alkalies may be serviceable, their constant or long-continued use must ultimately prove deleterious. Ammonia may, under some circumstances, be employed to neutralize acids introduced into the stomach from without, as in *poisoning by the mineral acids;* though chalk and magnesia would be more appropriate, being less irritant.

(5.) *As a local irritant.*—As a local agent, ammonia has been employed in a variety of diseases—sometimes as a rubefacient or irritant, sometimes as a vesicant, and occasionally as a caustic. Thus it is employed as a rubefacient in rheumatic and neuralgic pains, and as a counter-irritant to relieve internal inflammations. Employed as a vesicant it has two advantages over cantharides, a more speedy operation, and non-affection of the urinary organs. If a piece of lint, soaked in a strong solution of ammonia, is placed on the skin and covered with a watch-glass to prevent evaporation, a blister will rise in a few minutes. As a caustic it may be used with advantage in the bites of serpents and rabid animals.

*Administration.*—Employed in solution or vapor: *Dose* of the *strong* solution from three to ten minims well diluted; but the weaker solution is the one usually administered internally.

*Antidotes.*—The diluted acids, as vinegar, lemon, or orange-juice, &c., are antidotes for ammonia. To abate the inflammatory symptoms caused by the inhalation of its vapor, blood-letting has been found serviceable.

*Pharmaceutic Uses.*—Strong solution of ammonia is employed in the formation of phosphate of ammonia, solution of acetate of ammonia and aromatic spirit of ammonia. It is also an ingredient in compound liniment of camphor and in the following:—

LIQUOR AMMONIÆ, *Solution of Ammonia* [AQUA AMMONIÆ, *Water of Ammonia*, U. S.]—Take of strong solution of ammonia, one pint; distilled water, two pints. Mix and preserve in a stoppered bottle. ["Take of muriate of ammonia, in small pieces, lime, each, twelve troyounces; water, six pints; distilled water, a sufficient quantity. Pour a pint of the water upon the lime, in a convenient vessel; and, after it has slaked, stir the mixture so as to bring it to the consistence of a smooth paste. Then add the remainder of the water, and mix the whole thoroughly together. Decant the milky liquid from the gritty sediment into a glass retort, of the capacity of sixteen pints, and add the muriate of ammonia. Place the retort on a sand-bath, and adapt to it a receiver, previously connected with a two-pint bottle, containing a pint of distilled water, by means of a glass tube, reaching nearly to the bottom of the bottle. Surround the bottle with ice-cold water; and apply heat, gradually increased, until ammonia ceases to come over. Remove the liquid from the bottle, and add to it sufficient distilled water to raise its specific gravity to 0.960. Lastly, keep the liquid in small bottles, well stopped." U. S.]

*Tests.*—Specific gravity, 0.959. One fluidrachm requires for neutralization 30.8 measures of the volumetric solution of oxalic acid. ["One hundred grains of it saturate thirty grains of officinal sulphuric acid." U. S.]

*Administration.*—This solution of ammonia is the one commonly employed for internal use. *Dose*, ten to thirty minims properly diluted. It is also used externally in the form of liniment.

*Pharmaceutic Uses.*—Solution of ammonia is used in the extraction and purification of many vegetable alkaloids and active principles, as aconitia, hydrochlorate of morphia, strychnia, veratria, &c., in the formation of benzoate of ammonia, citrate of iron and ammonia, ammoniated mercury, and is an ingredient in liniment of mercury, and the following preparations:—

LINIMENTUM AMMONIÆ [U. S.], *Liniment of Ammonia.*—Take of solution of ammonia, one fluidounce; olive oil, three fluidounces. Mix together with agitation. ["Take water of ammonia, a fluidounce; olive oil, two troyounces. Mix them." U. S.]

**Ammoniæ Carbonas** [Mat. Med. List, U. S. P.], *Carbonate of Ammonia.*

*Synonym.*—Ammoniæ Sesquicarbonas, *Lond.*, *Dub.*
Sesquicarbonate of Ammonia, $2NH_4O,3CO_2=118$ (2 Eq.).

*Preparation.*—Manufacturers prepare it by submitting to sublimation a mixture of sal ammoniac, or impure sulphate of ammonia, and chalk. In a manufactory which I inspected a few years since, it is prepared as follows: The retorts in which the sublimation is effected are of cast iron, and similar in shape and size to those employed in the manufacture of coal gas. Each retort communicates posteriorly with a leaden receiver, with which is connected a second receiver of the same size and shape. The receivers have the form of square prisms placed endways, and are supported in a wooden framework. In some manufactories they are cylindrical, and have movable tops and bottoms. The impure carbonate thus obtained is contaminated with carbonaceous matter, which it deposits when dissolved in acids. It is redistilled in iron pots surmounted with leaden heads, and heated by the flue of the retort furnace. A little water is introduced into the pots to render the sesquicarbonate translucent. In some cases the pots are heated by a water bath; a temperature of 150° F. being sufficient for this process. In this way *refined sesquicarbonate of ammonia* is obtained. If sal ammoniac (hydrochlorate of ammonia) be employed, the decomposition in this process may be represented thus, $3NH_4Cl + 3(CaO,CO_2) = 2NH_4O,3CO_2 + 3CaCl + NH_4O$. According to Rose, sesquicarbonate of ammonia cannot be resublimed unchanged. Hence in the process of refining, its constitution changes; every two equivalents lose an equivalent of carbonic acid, and the product is a hydrated five-fourth carbonate of ammonia. $2(2NH_4O,3CO_2) = 4NH_4O,5CO_2 + CO_2$.

*Officinal Characters.*—In translucent crystalline masses, with a strong ammoniacal odor, and alkaline reaction; soluble in cold water, more sparingly in spirit; and readily dissolved by acids with effervescence.

*Properties.*—When exposed to the air it evolves mono-carbonate of ammonia, and is converted into bicarbonate of ammonia: so that its vapor has a pungent odor, and strongly reddens turmeric paper. The resulting hydrated bicarbonate is opaque, pulverulent, and much less pungent, from which it has been termed *mild carbonate of ammonia.* Carbonate of ammonia is soluble in four times its weight of cold water; but boiling water or alcohol decomposes it, with the evolution of carbonic acid.

*Composition.*—This salt consists of carbonic acid, ammonia, and water, in the following proportions:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 3 | Carbonic acid | 66 | 55.93 |
| 2 | Ammonia | 34 | 28.81 |
| 2 | Water | 18 | 15.26 |
| 1 | Hydrated Sesqui-Carbonate of Ammonia | 118 | 100.00 |

*Impurities.*—The carbonate of ammonia of commerce is sometimes contaminated with empyreumatic oil, and in this state it yields a more or less deeply-colored, or even blackish, solution when dissolved in dilute acid. The pure salt, on the other hand, yields a colorless solution. If any hyposulphite of ammonia be present, the salt, when neutralized by acetic acid, yields with the nitrate of silver a precipitate which is at first white, but becomes black. The presence of lead (derived from the leaden receivers used in its manufacture) is recognized by dissolving the salt in diluted nitric acid, and testing with sulphuretted hydrogen, which produces a dark or black color or precipitate, if lead be present.

*Tests.*—Volatilizes entirely when heated; when treated with an excess of dilute nitric acid, it gives no precipitate with chloride of barium or nitrate of silver. 50 grains are exactly neutralized by 84.74 measures of the volumetric solution of oxalic acid.

*Physiological Effects.*—In small doses it proves antacid, stimulant, and sudorific, usually increasing the frequency of the pulse. By repeated use it operates as a resolvent or liquefacient spanæmic, like the other alkalies, though much less intensely so. In doses of thirty grains or more it is apt to occasion vomiting. The effects of an over-dose are abdominal pains, and other symptoms of inflammation, convulsions, and other phenomena indicative of its action on the nervous system.

*Therapeutics.*—It is used in similar cases to those which are benefited by solution of ammonia, but it is less caustic and also less stimulant. In *epilepsy* I have extensively employed it, and in many cases with obvious benefit. It should be given in large doses in properly diluted solutions: to adults from ten grains to a scruple. It frequently proves successful in hysterical epilepsy, and in that syncopal form of epilepsy which Sauvages called lipothymia, and which patients describe as "dying away," but the connection of which with ordinary epilepsy is shown by its occasional transition into the latter. In *hysteria* also it is one of our most useful and valuable remedies; given either alone or in combination with a bitter infusion. In *asthenic pneumonia* and in *chronic bronchitis* of old persons it affords the same relief as solution of ammonia; and in the latter disease, when expectoration is difficult, it is sometimes used as an *emetic.* In *diabetes* this salt has been recommended by Dr. Barlow, and several cases of this disease are said to have been relieved, if not cured by it. I regret that I cannot confirm Dr. Barlow's favorable notice of it. Although in some cases I have seen patients temporarily improve under its use, yet the amendment has been brief, and was probably referable to other circumstances. In some cases it failed to give any relief, even after a very prolonged trial. In some cases of *scrofula* it has been employed with excellent effect. It is best adapted for those cases attended with a languid circulation and a dry state of skin. Combined with citric or tartaric acid it is a useful remedy in febrile cases, where the object is to promote cutaneous circulation and exhalation. Full doses of this salt have been employed in *paralysis*, to occasion vomiting. Mixed with some aromatic oil (as the oil of bergamot or lavender), it is used as a *smelling salt*, against syncope, hysteria, &c. As a topical agent it has been employed in aqueous solution, or made into ointment with lard. Its operation in these cases is that of a topical stimulant and rubefacient. It proves useful in rheumatic pains, sprains, &c.

*Administration.*—As a stimulant and diaphoretic, it is used in doses of from five to twenty grains. It is usually given in solution, but sometimes in the form of pill. As an emetic, the dose is thirty grains, properly diluted, and repeated if necessary.

*Pharmaceutic Uses.*—It is frequently employed for the preparation of *effervescing draughts.* The following are the relative proportions of acid and base to be used:—

| | |
|---|---|
| 20 grains of Carbonate of Ammonia require | 6 fluidrachms of Lemon Juice, or<br>24 grains of crystallized Citric Acid, or<br>25½ grains of crystallized Tartaric Acid. |

Solution of Carbonate of Ammonia. (Appendix B. II.)—Take of carbonate of ammonia in fine powder, half an ounce; distilled water, a sufficiency. Shake the carbonate of ammonia in a bottle with eight fluidounces of the water until it is dissolved, and by the addition of more of the water make up the bulk of the solution to ten fluidounces.

*Pharmaceutic Uses.*—Used as a test for the purity of carbonate and oxide of zinc.

SPIRITUS AMMONIÆ AROMATICUS [U. S.], *Aromatic Spirit of Ammonia.*—Take of carbonate of ammonia, eight ounces; strong solution of ammonia, four fluidounces; volatile oil of nutmeg, four fluidrachms; oil of lemon, six fluidrachms; rectified spirit, six pints; water, three pints. Mix, and distil seven pints.

This is a solution of the monocarbonate of ammonia, $NH_3,CO_2 + NH_4O,CO_2$ in spirit. It is more than one half stronger in carbonate of ammonia (containing in each fluidrachm 3.5 grains of the salt), and one-fourth stronger in spirit than the preparation of the London Pharmacopœia. The solution of ammonia is added to convert the sesquicarbonate into monocarbonate, thus $2(2NH_4O,3CO_2) + 2NH_3 = 3(NH_3,CO_2 + NH_4O,CO_2) + HO$.

["Take of carbonate of ammonia, a troyounce; water of ammonia, three fluidounces; oil of lemon, two fluidrachms and a half; oil of nutmeg, forty minims; oil of lavender, fifteen minims; alcohol, a pint and a half; water, a sufficient quantity. Dissolve the carbonate in the water of ammonia, previously mixed with four fluidounces of water. Dissolve the oils in the alcohol, mix the two solutions, and add sufficient water to make the whole measure two pints." U. S. The dose of this is the same as that of the corresponding preparation of the Br. Pharm.—W.]

*Tests.*—Specific gravity, 0.870.

*Therapeutics.*—It is popularly known as *spirit of sal volatile;* it is less powerful than solution of ammonia, but is used in similar cases as an antacid and stimulant. *Dose*, half a drachm to a drachm.

*Pharmaceutic Uses.*—It is employed in the preparation of the ammoniated tinctures of guaiacum and of valerian.

## **Ammoniæ Hydrochloras,** *Hydrochlorate of Ammonia.*

## [**Ammoniæ Murias,** *Muriate of Ammonia*, Mat. Med. List, U. S. P.]

*Synonym.*—Ammoniæ Murias, *Ed.*, *Dub.*

$NH_4Cl = 53.5$.

*Preparation.*—In Egypt, sal ammoniac, or hydrochlorate of ammonia, is obtained by sublimation from the soot afforded by the combustion of camel's dung. Some years ago this salt was manufactured in London from the soot of coals. At the latter end of the last century it was made in Paris by the union of ammoniacal vapor (obtained by the decomposition of animal matters, in iron cylinders placed in a furnace) with muriatic acid gas. At Liége it is obtained by sublimation from the soot obtained by burning, in peculiar ovens, a mixture of coals, common salt, animal matter and clay (L. Gmelin). At the present time sal ammoniac is manufactured in this country from the impure ammoniacal liquors obtained as secondary products in the manufacture of coal gas and animal charcoal. The ammonia contained in these liquors is either at once converted into the hydrochlorate by the addition of hydrochloric acid, the liquors evaporated and the impure crystals purified by sublimation; or it is first treated with sulphuric acid, and the resulting sulphate is mixed with common salt and sublimed, when sulphate of soda remains behind, and hydrochlorate of ammonia rises in vapor, thus, $NH_4O,SO_3 + NaCl = NH_4Cl + NaO,SO_3$.

*Officinal Characters.*—In colorless, inodorous translucent fibrous masses, tough, and difficult to powder; soluble in water and rectified spirit. Its aqueous solution when heated with caustic potash evolves ammonia, and when treated with nitrate of silver forms a copious curdy precipitate, AgCl.

*Properties.*—Hydrochlorate of ammonia usually occurs in commerce in the form of large hemispherical cakes, which have a round hole in the centre. They are translucent, and by exposure to the atmosphere become slightly moist. By solution or resublimation it may be obtained in regular octahedral, cubic, or plumose crystals, formed of rows of minute octahedrons, attached by their extremities. The sp. gr. of sal ammoniac is 1.450. Its taste is saline and acrid; it has no odor. It is soluble in about 3 parts of cold and one of boiling water: cold being produced during the solution. With bichloride of platinum it yields a yellow precipitate which, when collected, dried, and ignited, yields spongy platinum.

*Composition.*—The following is the composition of this salt:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Chlorine . . . . . . . | 35.5 | 66.35 |
| 1 Ammonium . . . . . . . | 18 | 33.65 |
| Chloride of Ammonium . . . . | 53.5 | 100.00 |

*Tests.*—When heated it volatilizes without decomposition, and leaves no residue.

*Physiological Effects.*—In this country it is so rarely employed internally that we have very slight experience either of its physiological or of its therapeutical effects. But in Germany, where it is supposed to promote the disappearance of indurations and the products and results of chronic inflammation, it is regarded as a powerful alterative, a stimulant to the absorbents, and a promoter of healthy secretion.

*Therapeutics.*—It is employed in Germany to restore secretions and exhalations which have been arrested by inflammation, and which have not returned when the violence of the inflammation has been subdued; or to improve their quality; as in pulmonary and vesical catarrh, mucous discharges from the urethra and vagina, dysentery, peritonitis, and pleurisy. In these cases it is used as a substitute for mercury. It is also used in chronic inflammation of the lungs, liver, and spleen; enlargement of the mesenteric glands; induration of the prostate, uterus, and ovaries; and chronic ulceration of the uterus. [I have occasionally found it useful in ascites. A boy, aged 10, who was under my care five months for ascites, who had valvular disease and enlarged liver, and had been twice tapped with only temporary relief, recovered rapidly from the ascites under the use of this remedy.—Ed.] [Muriate of ammonia is certainly one of our very best remedies in chronic bronchitis.—W.] Its solution is employed *locally* in headache, inflammatory affections of the brain, mania, and apoplexy. When used for this purpose, it must be employed as soon as the salt is dissolved. Mr. Walker found that five parts of this salt, with five parts of nitrate of potash, and sixteen parts of water, lowered the thermometer from 15° to 10° F. A *freezing mixture* of this kind placed in a bladder, has been recommended by Sir A. Cooper as an application (*ice-poultice*) to hernial tumors. It may be applied to the head instead of the ice-cap already noticed.

*Administration.*—For internal use the dose of it is from five to thirty grains every two or three hours, either in a pulverulent form, combined with sugar or gum, or in solution with some saccharine or mucilaginous substance, to which an aromatic should be added. For an ordinary lotion one ounce may be dissolved in ten ounces of water.

*Pharmaceutic Uses.*—Employed as a source of ammonia in the production of strong solution of ammonia.

Solution of Hydrochlorate of Ammonia. (Appendix B. II.)—Take of hydrochlorate of ammonia, one ounce; distilled water, a sufficiency. Dissolve the hydrochlorate of ammonia in eight fluidounces of the water, and with distilled water make up the bulk to ten fluidounces.

*Pharmaceutic Uses.*—Employed (with solution of ammonia) in the test for magnesia to insure the precipitation of the ammonio-phosphate of magnesia.

[Spiritus Ammoniæ, U. S., *Spirit of Ammonia.*—"Take of muriate of ammonia, in small pieces, lime, each, twelve troyounces; water, six pints; alcohol, twenty fluidounces. Upon the lime, in a convenient vessel, pour a pint of the water, and stir the mixture so as to bring it to the consistence of a smooth paste. Then add the remainder of the water, and mix it well with the lime. Decant the milky liquid from the gritty sediment into a glass retort, of the capacity of sixteen pints, and add the muriate of ammonia. Place the retort on a sand-bath, and adapt to it a receiver, previously connected with a two-pint bottle containing the alcohol, by means of a glass tube reaching nearly to the bottom of the bottle. Surround the bottle with ice-cold water, and apply a gradually increasing heat until ammonia ceases to be given off. Lastly, remove the liquid from the bottle, and introduce it into small bottles, which must be well stopped." U. S.

Spirit of ammonia is a simple alcoholic solution of ammonia of varying strength. It has similar therapeutical powers to the aromatic spirit, but is seldom or never used internally, the latter being preferred because more agreeable and of more definite strength. It is sometimes added to liniments, in order to increase their rubefacient power. If given internally, the dose would be 10—30 drops in a wineglassful of water.—W.]

## Solution of Hydrosulphuret of Ammonia. (Appendix B. II.)

Hydrosulphuret of ammonia, $NH_4S,HS=51$.

*Preparation.*—Take of solution of ammonia, one fluidounce. Conduct into this a stream of sulphuretted hydrogen so long as this gas continues to be absorbed, and then transfer the solution to a green-glass bottle furnished with a well-ground stopper.

The gas should be washed before it passes into the ammoniacal solution by passing it through water contained in a small bottle. The sulphuretted hydrogen gas, when conveyed into solution of ammonia, combines with it to form hydrosulphuret of ammonia. $NH_4O+2HS.=NH_4S,HS+HO$. When the solution of ammonia is completely saturated with sulphuretted hydrogen gas, it ceases to occasion a precipitate in a solution of sulphate of magnesia. If, however, it be incompletely saturated, it produces a precipitate with, or renders turbid a solution of this salt.

*Properties.*—Solution of hydrosulphuret of ammonia is a liquid having a very fetid odor and an acrid disagreeable taste. The mineral acids decompose it, and evolve sulphuretted hydrogen gas. It forms, with a considerable number of metallic solutions, precipitates. With the salts of lead, bismuth, silver, and copper, the precipitates are blackish; with those of antimony, orange; with those of cadmium and tin (persalts), and with the arsenites (on the addition of an acid), yellow; lastly, with the salts of zinc, white. In these cases, the precipitates are either sulphurets or hydrated sulphurets of the respective metals. By keeping in bottles made of flint-glass, it gives rise to the formation of a thin coating of black sulphuret of lead on the inside of the bottle. It should, therefore, be kept in a green glass bottle or in one made of glass free from lead.

*Composition.*—Hydrosulphuret of ammonia has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Sulphuretted Hydrogen | 17 | 33.33 |
| 1 Sulphuret of Ammonium | 34 | 66.66 |
| Hydrosulphuret of Ammonia | 51 | 100.00 |

*Pharmaceutic Uses.*—It is used, like sulphuretted hydrogen, as a test for metallic impurities, precipitating some metals (as iron, zinc, &c.), which the former does not. Several of the metallic sulphurets, however (as those of arsenic, antimony, tin, &c.), are soluble in an excess of this reagent.

### Ammoniæ Phosphas, *Phosphate of Ammonia.*
$3NH_4O,PO_5+5HO=194.$

*Preparation.*—Take of strong solution of ammonia, eight fluidounces; dilute phosphoric acid, twenty fluidounces. Add the solution of ammonia to the phosphoric acid; dissolve by a gentle heat the crystalline precipitate which forms; and set the solution aside that crystals may again form. Remove the crystals, and, having dried them quickly on filtering paper placed on a porous brick, preserve them in a stoppered bottle. The mother liquor, if evaporated to half its bulk, will upon being mixed with two fluidounces of strong solution of ammonia give additional crystals.

*Officinal Characters.*—In colorless transparent prisms, which upon exposure to air lose water and ammonia and become opaque; soluble in water, insoluble in rectified spirit. It evolves ammonia when heated with caustic potash; gives a canary-yellow precipitate with nitrate of silver ($3AgO,PO_5$); and when acidulated with hydrochloric acid is not affected by sulphuretted hydrogen (showing its freedom from arsenic, lead, copper, &c.).

As usually met with, this salt has the formula $2NH_4O,HO+PO_5=132$.

*Tests.*—If twenty grains of this salt be dissolved in water, and the solution of ammonio-sulphate of magnesia be added, a crystalline precipitate falls (ammonio-phosphate of magnesia), which, when well washed upon a filter with solution of ammonia diluted with an equal volume of water, dried, and heated to redness, leaves 11.44 grains.

*Therapeutics.*—Dr. Garrod states that "it is capable of dissolving a considerable amount of urate of soda, and clinical experience has shown that it is of great value in the treatment of certain urinary diseases when a tendency to uric acid calculi exists, and also in certain conditions of the gouty habit." *Dose*, gr. v to gr. xx.

### Sulphate of Ammonia. (Appendix A.) $NH_4O,SO_3$.

### [Ammoniæ Sulphas, Mat. Med. List, U. S.]

*Prepared*, by the aid of sulphuric acid, from the ammoniacal liquors obtained in the distillation of coal, &c., and purified by crystallization or sublimation.

[*Officinal Characters.*—"In colorless, prismatic crystals, freely soluble in water, and decomposed and totally dissipated by a red heat. When rubbed with hydrate of lime or hydrate of potassa, the salt emits the smell of ammonia. Its solution yields a white precipitate with chloride of barium. In dilute solution it is scarcely precipitated by nitrate of silver." U. S.]

*Used* for the purification of commercial sulphuric acid. (See **Acidum Sulphuricum**.)

**Liquor Ammoniæ Acetatis** [U. S.], *Solution of Acetate of Ammonia.*
Acetate of Ammonia $NH_4O,\bar{A}(C_4H_3O_3)$, dissolved in water.

*Preparation.*—Take of strong solution of ammonia, three fluidounces and a half, or a sufficiency; acetic acid, ten fluidounces, or a sufficiency. Mix gradually, and if the product is not neutral to test papers, make it so by the addition of the proper quantity of either liquid.

This solution contains about five times as much acetate of ammonia as liquor ammoniæ acetatis, *Lond.*, and six times as much as liquor ammoniæ acetatis, *Dub.*, *Ed.*

["Take of diluted acetic acid, two pints; carbonate of ammonia, a sufficient quantity. Add the carbonate gradually to the acid until this is saturated, and filter. This preparation, when dispensed, should be freshly made." U. S. This solution is commonly known as the spirit of Mindererus. The British preparation is about five times stronger than that of the U. S. Pharmacopœia. The dose of the latter is from half a fluidounce to a fluidounce and a half.—W.]

*Officinal Characters.*—A transparent colorless liquid, with a saline taste. Treated with caustic potash it gives off an ammoniacal, and with sulphuric acid an acetous odor.

*Tests.*—Specific gravity, 1.060. One fluidounce treated with excess of hydrochloric acid, and evaporated to dryness by a water bath, leaves a residue of hydrochlorate of ammonia weighing 100 grains. It has no action on litmus, and is not rendered turbid by solution of lime. Diluted with four volumes of water, it gives no precipitate with chloride of barium or nitrate of silver.

The tests show the absence of carbonic, sulphuric, and hydrochloric acids. Dilution is necessary in testing for the latter, as the acetate of silver is only sparingly soluble. The neutrality of the preparation should be tested both with reddened and blue litmus, as an excess of ammonia is even more to be avoided than of acid. It may also be tested with sulphuretted hydrogen, to insure the absence of lead, copper, &c.

*Therapeutics. Internal Use.*—It is employed in febrile and inflammatory diseases, and forms a constituent of the ordinary saline draught. It is given in conjunction with nitrate of potash, or tartar emetic, and sometimes with camphor and opium. When administered as a diaphoretic, its operation should be promoted by the use of tepid diluents and external warmth. Used thus, it is of the greatest value as a remedy in Morbus Brightii. Its diuretic effect is assisted by keeping the skin cool, and conjoining the spirit of nitric ether.

*External Use.*—Diluted with water it is sometimes employed as a discutient wash to inflamed and bruised parts. Fifteen minims mixed with an ounce of rose-water, may be employed as a collyrium in chronic ophthalmia. It has also been employed with benefit in porrigo and other cutaneous diseases, and for inflamed nipples.

*Administration.*—It is given *internally* in doses of a fluidrachm to half a fluidounce every five or six hours.

**Ammoniæ Benzoas**, *Benzoate of Ammonia.*
$NH_4O,\bar{B}(C_{14}H_5O_3)+HO=148.$

*Preparation.*—Take of solution of ammonia, three fluidounces; benzoic acid, two ounces; distilled water, eight fluidounces. Dissolve the benzoic acid in the solution of ammonia previously mixed with the water; evaporate at a gentle heat; and set aside, that crystals may form.

*Officinal Characters.*—In colorless laminar crystals, soluble in water and alcohol. It gives a bulky yellow precipitate with persalts of iron (basic benzoate of iron). Its aqueous solution, when heated with caustic potash, evolves ammonia; and when acidulated with hydrochloric acid, gives a deposit of benzoic acid.

*Tests.*—When heated it sublimes without any residue.

*Physiological Effects.*—Benzoate of ammonia, being more soluble in water than benzoic acid, is more readily absorbed, and is converted in the body into hippuric acid, which is found in the urine. It is slightly stimulant to the urinary organs, and is one of the most effectual means of rendering the urine acid, which it will sometimes do even when the urine is alkaline in consequence of disease of the spine.

*Therapeutics.*—Employed in chronic inflammation of the bladder, and when the urine is alkaline, or phosphates are deposited.

*Dose.*—Gr. x to gr. xx.

### [**Ammoniæ Valerianas,** U.S., *Valerianate of Ammonia.*

"Take of valerianic acid, four fluidounces. From a mixture, placed in a suitable vessel, of muriate of ammonia, in coarse powder, and an equal weight of lime, previously slaked and in powder, obtain gaseous ammonia, and cause it to pass, first through a bottle filled with pieces of lime, and afterwards into the valerianic acid, contained in a tall, narrow, glass vessel, until the acid is neutralized. Then discontinue the process, and set the vessel aside that the valerianate of ammonia may crystallize. Lastly, break the salt into pieces, drain it in a glass funnel, dry it on bibulous paper, and keep it in a well-stopped bottle."

*Officinal Characters.*—Valerianate of ammonia is a white salt in the form of quadrangular plates, having the disagreeable odor of valerianic acid, and a sharp, sweetish taste. It deliquesces in a moist air, but effloresces in a dry one, and is very soluble in water and in alcohol. It is decomposed by potassa with evolution of ammonia, and by the mineral acids with separation of the valerianic acid, which rises to the surface in the form of an oil.

*Therapeutics.*—Valerianate of ammonia is a quite powerful diffusible nervous stimulant, which was first recommended by M. Pierlot as having remarkable remedial powers, more especially in controlling neuralgia. Since then it has been used extensively in hysteria, chorea, and allied affections. It seems to exercise more control over simple so-called nervous headaches than almost any other remedy. It may be administered in pill, but, owing to its volatility, as well as its tendency to deliquesce or effloresce, is better exhibited in solution. The dose is 5–10 grains. The following recipe has been much employed under the name of elixir of valerianate of ammonia: ℞.—Ammoniæ valerianatis ʒj; tr. cardamom. comp. fʒvj; extract. vanillæ fl. f℥ss; curacoa fʒij; aquæ f℥iv. M. S.—Dose, one teaspoonful to a tablespoonful.—W.]

### **Oxalate of Ammonia.** $NH_4O,\bar{O}(C_2O_3)+HO=71.$

*Preparation* (Appendix B. II.).—Take of purified oxalic acid, one ounce; boiling distilled water, eight fluidounces; carbonate of ammonia, in powder, a sufficiency. Dissolve the oxalic acid in the water, neutralize the solution with the carbonate of ammonia, filter, cool, and crystallize.

Solution of Oxalate of Ammonia (Appendix B. II.).—Take of the crystals of oxalate of ammonia, first dried on filtering paper by simple exposure to the air, and free from efflorescence, half an ounce; warm distilled water, one pint. Dissolve.

*Uses.*—Employed as a test for lime.

### Cyanogen. $C_2N$ or $Cy=26$.

Cyanogen (from κύανος, blue) is derived from the carbonization of animal matters rich in nitrogen. It is a colorless gas, having a sp. gr. 1.8, and burns with a violet-colored flame. It is usually prepared by heating dry cyanide of mercury, and in combination with hydrogen, sulphur, and iron, forms hydrocyanic, sulphocyanic, and ferrocyanic acids.

### Hydrocyanic Acid. $HC_2N$ or $HCy=27$.

*Natural History.*—Hydrocyanic acid (prussic acid) is a product peculiar to the organized kingdom. It may be readily procured from many *vegetables*, more especially those belonging to the sub-orders *Amygdaleæ* and *Pomeæ:* as from bitter almonds, apple-pips, the kernels of peaches, apricots, cherries, plums, and damsons; the flowers of the peach, cherry-laurel, and bird-cherry; the bark of the latter, and the root of the mountain ash. In some vegetables hydrocyanic acid does not exist ready formed, but is a product of the process by which it is obtained. This has been fully proved in the case of the bitter almond, and is inferred in other instances.

### Acidum Hydrocyanicum Dilutum [U.S.], *Dilute Hydrocyanic Acid.*

Hydrocyanic acid dissolved in water, and constituting 2 per cent. of the solution.

*Preparation.*—Hydrocyanic acid is usually prepared for medicinal use from ferrocyanide of potassium by the action of water and sulphuric acid. Take of ferrocyanide of potassium two ounces and a quarter; sulphuric acid seven fluidrachms; distilled water thirty fluidounces, or a sufficiency. Dissolve the ferrocyanide of potassium in ten ounces of the water, then add the sulphuric acid previously diluted with four ounces of the water and cooled. Put them into a retort, and adapt this to a receiver containing eight ounces of the water, which must be kept carefully cold. Distil with a gentle heat by the aid of a sand bath, until the fluid in the receiver measures seventeen ounces. Add to this three ounces of the water, or as much as may be sufficient to bring the acid to the required strength of two per cent. ["Take of ferrocyanide of potassium, two troyounces; sulphuric acid, a troyounce and a half; distilled water a sufficient quantity. Mix the acid with four fluidounces of distilled water, and pour the mixture, when cool, into a glass retort. To this add the ferrocyanide of potassium, dissolved in ten fluidounces of distilled water. Pour eight fluidounces of distilled water into a cooled receiver, and, having attached this to the retort, distil, by means of a sand bath, with a moderate heat, six fluidounces. Lastly, add to the product five fluidounces of distilled water, or as much as may be sufficient to render the diluted hydrocyanic acid of such a strength that twelve and seven-tenths grains of nitrate of silver, dissolved in distilled water, may be accurately saturated by one hundred grains of the acid.

"Diluted hydrocyanic acid, when wanted for immediate use, may be prepared in the following manner: Take of cyanide of silver, fifty grains and a half; muriatic acid, forty-one grains; distilled water, a fluidounce. Mix the muriatic acid with the distilled water, add the cyanide of silver, and shake the whole together in a well-stopped vial. When the precipitate formed has subsided, pour off the clear liquid, and keep it for use.

Diluted hydrocyanic acid must be kept in well-stopped bottles, protected from the light." U.S.]

Ferrocyanide of potassium may be regarded as a compound of cyanide of potassium and cyanide of iron, 2KCy,FeCy,3HO. By the action of sulphuric acid and water, one-half of the cyanogen is eliminated in the form of hydrocyanic acid, the other half remains combined with the iron and one-fourth of the potassium as an insoluble yellow salt (KCy,2FeCy), which, however, rapidly decomposes into Prussian blue. The remainder of the potassium becomes united to the sulphuric acid, and forms bisulphate of potash, so that the whole decomposition may be represented thus, $2(2KCy,FeCy,3HO)+6(SO_3,HO)=3HCy+KCy,2FeCy+3(KO,HO,2SO_3)+6HO$. The bisulphate and the yellow salt remain in the retort, while the hydrocyanic acid, with some water, distils over. [In the second process given in the U. S. Pharmacopœia the hydrocyanic acid is made by the double decomposition of the two reagents, the resulting precipitate being the chloride of silver. Thus, $HCl+AgCy=AgCl+HCy$. The U.S. acid is of the same strength as the British.—W.]

*Officinal Characters.*—A colorless liquid with a peculiar odor, only slightly and transiently reddening litmus. Treated with a minute quantity of a mixed solution of sulphate and persulphate of iron, and afterwards with potash, and finally acidulated with hydrochloric acid, it forms Prussian blue.

The formation of Prussian blue is thus accounted for. When potash is added to hydrocyanic acid, water and cyanide of potassium are generated. By the reaction of this salt on a protosalt of iron the protocyanide of iron is produced, while with a persalt of iron it forms percyanide of iron. The two ferruginous cyanides, by their union, constitute the ferropercyanide or Prussian blue. The acid added removes the surplus oxide of iron.

This acid contains rather more than half as much anhydrous acid as acidum hydrocyanicum, *Ed.*

*Composition.*—The ultimate constituents of pure hydrocyanic are carbon, nitrogen, and hydrogen.

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Carbon | 12 | 44.4 |
| 1 Nitrogen | 14 | 51.9 |
| 1 Hydrogen | 1 | 3.7 |
| Hydrocyanic acid | 27 | 100.0 |

But it is more usual to regard this acid as a compound of cyanogen and hydrogen. On this view the composition will be as follows:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Cyanogen | 26 | 96.3 |
| 1 Hydrogen | 1 | 3.7 |
| Hydrocyanic acid | 27 | 100.0 |

*Tests.*—Specific gravity, 0.997. Half a fluidounce of the acid, when treated with an excess of solution of soda, requires the addition of 80.66 measures of the volumetric solution of nitrate of silver before a permanent precipitate (AgO) begins to form, which corresponds to two per cent. of anhydrous acid. (Thus $2NaO+2HCy=2NaCy+2HO$. Then $2NaCy+AgO,NO_5=AgCy,NaCy+NaO,NO_5$. The instant this double cyanide ceases to be formed, oxide of silver is precipitated.) It gives no precipitate with chloride of barium, but with nitrate of silver it gives a white precipitate (cyanide of silver), entirely soluble in boiling nitric acid (showing its freedom from sulphuric and hydrochloric acids).

*Physiological Effects. In small or medicinal doses.*—Small doses of hydrocyanic acid sometimes relieve certain morbid conditions (as of the stomach), without producing any remarkable alteration in the condition of the general system. If the dose be cautiously increased, and its operation carefully watched, the following effects are usually observed:—a bitter but peculiar taste; increased secretion of saliva; irritation in the throat; frequently nausea; disordered and laborious respiration; pain in the head, giddiness, obscured vision, and sleepiness.

*In poisonous doses.*—Immediately after swallowing the acid a remarkably bitter taste, sometimes described as hot, is experienced; this is soon followed by a sensation of faintness and giddiness, with salivation, and is succeeded by tetanic convulsions and insensibility; the respiration is difficult and spasmodic; the odor of hydrocyanic acid may be recognized in the breath; the pupils are usually dilated, though sometimes contracted; the pulse is small or imperceptible. When recovery takes place it is usually very rapid, and the whole period of suffering seldom exceeds half an hour. However, exceptions to this exist, in which the symptoms have been prolonged for several hours. Very strong acid, in large doses, begins to operate very speedily, especially if its vapor be inhaled, and death occurs very rapidly. The diluted acid, on the other hand, sometimes does not produce any obvious effect for several minutes, and death may not occur for nearly half an hour.

*Local action.*—Dr. Christison says that Robiquet's fingers became affected with numbness, which lasted several days, in consequence of their exposure for some time to the vapor of this acid. This effect would appear to depend on the local action of the poison on the nerves, —a mode of action which we are constrained likewise to admit in the case of some other narcotics. The alleviation of gastrodynia by hydrocyanic acid depends probably on this benumbing effect. Some of the local effects produced by hydrocyanic acid are those of an irritant: such are, the acrid impression made by the vapor on the nose and mouth, the ptyalism, the vomiting and purging, and the redness of the mucous membrane of the stomach.

*Absorption.*—That hydrocyanic acid becomes absorbed is proved by its having been detected in the blood of animals poisoned with it, and by the odor of it exhaled by the breath and from various parts of the body.

*Organs affected.*—The parts specifically affected by this acid are the brain and true spinal system. The pain in the head, the insensibility, and the coma, are evidence of the cerebral affection; while the tetanic convulsions depend on the disorder of the true spinal system.

*Cause of death.*—In most cases the immediate cause of death is obstruction of respiration. In some instances it is stoppage of the heart's action. There are cases, however, in which the death is too immediate to be produced by obstructed respiration, while, on opening the chest, the heart is found still beating. This I have observed in experiments on rabbits with strong hydrocyanic acid.

*Therapeutics.*—In this country, the reputation of hydrocyanic acid as a medicinal agent is chiefly founded on its effects in alleviating certain painful (neuralgic) and spasmodic stomach complaints. Every practitioner is familiar with a stomach complaint, usually termed *gastrodynia*, in which pain of a spasmodic character is the leading symptom. It is not unfrequently accompanied by vomiting and præcordial tenderness, which, however, cannot be regarded as indicative of inflammation, for various reasons; one of which is the alleviation of it often obtained by the use of stimulants and antispasmodics. What may be the precise pathological condition of this malady I know not, but I conceive the affection to be, essentially, a disordered condition of the nerves supplying the stomach, or of the nervous centres from whence those nerves are derived; in other words, it is a gastric neuralgia. It is frequently, but not invariably, accompanied by the irritation of stomach alluded to by Dr. Barlow. But be the proximate cause of the disease what it may, the beneficial effects of the hydrocyanic acid, in some instances of it, are most astonishing; while in others it totally fails. In all the cases in which I have tried it, I have obtained either perfect success or complete failure. I have met with no cases of partial relief. It not only allays pain, but relieves vomiting; and in the latter cases, frequently when all other remedies fail. Dr. Elliotson mentions the following as the stomach affections relieved by it: 1st, those in which pain at the stomach was the leading symptom; 2dly, those in which the gastrodynia was accompanied by a discharge of fluid, constituting what is called pyrosis, or the water-brash; 3dly, when the excessive irritability of the stomach produces vomiting; and, 4thly, those disorders of the stomach which, in some of their symptoms, resemble affections of the heart. The late Dr. Prout found it useful in gastrodynia connected with colica pictònum. I have also found it useful in a painful affection of the bowels analogous to that of the stomach, and which, therefore, might with propriety be termed *enterodynia.* I have seen hydrocyanic acid used with great success to allay vomiting and purging in severe forms of the ordinary English cholera, when opium has completely failed. In Asiatic or malignant cholera it has occasionally appeared to be serviceable. I have found it successful in checking the diarrhœa of phthisical subjects, when logwood, chalk, and opium had failed. In allaying cough, especially the kind called spasmodic, I have on several occasions found it useful, but it has so frequently disappointed my expectations that I now rarely employ it in any pulmonary diseases. Dr. Roe ascribes to this acid the power of curing simple hooping-cough. He gives it with ipecacuanha and tartarated antimony. I have not found this practice so successful as Dr. Roe's report would lead us to expect.

The *local* employment of the acid has not been attended with very great success. In chronic skin diseases, especially impetigo, prurigo, and psoriasis, the acid has been employed to allay pain and irritation. On several occasions I have tried hydrocyanic washes in prurigo, but without obtaining any relief.

*Administration.*—It may be given internally in doses of from three to seven minims. As a wash, two fluidrachms of the diluted acid may be employed, mixed with half a pint of distilled or rose water, as a lotion, in skin diseases. Frequently about half an ounce of rectified spirit is added; and Dr. A. Thomson recommends, in addition to this, sixteen grains of acetate of lead. The external use of this acid, in all cases (more especially if there be sores) requires great caution.

*Antidotes.*—The most important agents in the treatment of poisoning by hydrocyanic acid, as well as by the substances which contain it (as cherry-laurel water), are *chlorine*, *ammonia*, *cold affusion*, and *artificial respiration.*

*Chlorine* is the most powerful of these. It has been strongly recommended by Buchner and Orfila. If solution of chlorine be at hand, this should be given in doses of one or two teaspoonfuls, properly diluted with water. In the absence of this, weak solutions of chlorinated lime, or chlorinated soda, may be administered. The patient should be allowed to inhale, very cautiously, air impregnated with chlorine gas (developed by the action of dilute hydrochloric acid on solution of chlorinated lime).

*Ammonia.*—The "spirit of sal ammoniac" was proposed by Mead as an antidote for laurel water; and its value has been admitted by Buchner, Orfila, and Herbst; but it is certainly inferior to chlorine, and, therefore, should be used only in the absence of this. If the patient should be able to swallow, solution of ammonia, diluted with eight or ten parts of water, should be exhibited, and the vapor of ammonia or its carbonate inhaled; the latter practice is most important, and should not be omitted. Orfila says that ammonia is of no use when introduced into the stomach, but that inhalation of the vapor will sometimes preserve life. Great caution is requisite in the employment of it.

*Cold Affusion* has been strongly recommended by Herbst, and is admitted by Orfila to be a valuable remedy. Herbst says that its efficacy is almost certain when it is employed before the convulsive stage of poisoning is over, and that it is often successful even in the stage of insensibility and paralysis. Dr. Taylor also speaks favorably of it.

*Artificial Respiration* ought never to be omitted. Of its efficacy I am convinced from repeated experiments on animals. To produce respiration, make powerful pressure with both hands on the anterior surface of the chest, the diaphragm being at the same time pushed upward by an assistant. Inspiration is effected by the removal of the pressure, and the consequent resiliency of the ribs.

## POTASSIUM (*Kalium*). K=39.

Procured for commercial purposes by decomposing potash with carbon. It is a bluish-white metal of great lustre. Its specific gravity is 0.86507. Its consistence is that of wax, it burns in air with a violet flame, rapidly attracts oxygen from the air and from moisture, and takes fire when thrown on water or ice. It is usually preserved in Persian naphtha.

### Potash. KO=47.

*Natural History.*—Potash in combination with acids is found in both kingdoms of nature; in the mineral kingdom, in combination with sulphuric, nitric, silicic, and perhaps carbonic acids. As an ingredient of rocks, it is more abundant than soda. It forms from eleven to fourteen per cent. of the felspar of granite. In organized beings, potash is met with in combination with phosphoric, sulphuric, nitric, carbonic, and various organic acids. It occurs more abundantly in vegetables than in animals.

*Preparation.*—Anhydrous potash is obtained by heating potassium in a current of dry oxygen, or by heating one atom of hydrate of potash with one of potassium; $K+KO,HO=2KO+H$.

*Properties.*—It is a hard, white, brittle substance, fusible at a bright red heat, and volatile at a higher temperature, sp. gr. about 2.656, odorless, extremely caustic, and powerfully alkaline. A solution of potash or of a neutral potash salt is recognized by the following characters: Solutions of the hydrosulphurets, ferrocyanides, and carbonates, produce no precipitate with it. Solution of tartaric acid in excess occasions a crystalline precipitate of the acid tartrate of potash. Solution of bichloride of platinum, with a little hydrochloric acid, produces a yellow precipitate of double chloride of platinum and potassium. Lastly, potash and its salts communicate a violet tinge to the flame of alcohol.

Free potash is distinguished from its salts by its communicating a green color to the infusion of red cabbage or syrup of violets; by its reddening turmeric, and restoring the blue color of litmus reddened by an acid; by its not effervescing on the addition of an acid; by its yielding a brownish-black precipitate with nitrate of silver; by its soapy feel; by its solubility in alcohol; and by its dissolving recently precipitated hydrate of alumina. Anhydrous potash is more difficultly fusible and harder, and is a worse conductor of electricity than the hydrate of potash.

*Composition.*—Pure anhydrous potash has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Potassium | 39 | 82.98 |
| 1 | Oxygen | 8 | 17.02 |
| | Potash | 47 | 100.00 |

## Potassa Caustica, *Caustic Potash.*

## [Potassa, U. S., *Potassa.*]

*Synonyms.*—Potassæ Hydras, *Lond.* Potassa, *Ed.*

Hydrate of potash, KO,HO=56.

*Preparation.*—Take of solution of potash, two pints. Boil down the solution of potash rapidly in a silver or clean iron vessel, till all ebullition ceases, and a fluid of oily consistence remains. Pour this into proper moulds, and when it has solidified, and while it is still warm, put it into stoppered bottles.

[" Take of solution of potassa, eight pints. Evaporate it rapidly in an iron vessel, over the fire, until ebullition ceases and the potassa melts. Pour this into suitable moulds, and keep it, when cold, in a well-stopped bottle." U. S.]

During the preparation of the hydrate of potash, a portion of the potash becomes converted by the high temperature and access of air to peroxide of potassium; the additional oxygen thus acquired is expelled in the gaseous state during solution in water.

*Officinal Characters.*—In hard white pencils, very deliquescent, powerfully alkaline and corrosive. A watery solution acidulated by nitric acid gives a yellow precipitate with bichloride of platinum, and scanty white precipitates with nitrate of silver and chloride of barium.

*Properties.*—Pure hydrate of potash dissolves in both water and alcohol. During its solution in water, heat is evolved. Its solubility in alcohol enables us to separate it from the carbonate and bicarbonate of potash, both of which are insoluble in this liquid. When purified by solution in alcohol it constitutes the *potasse à l'alcool* of the French writers. It has a strong affinity for both water and carbonic acid, which it rapidly attracts from the atmosphere, and in consequence becomes liquid. At a low red heat it fuses, and at a higher temperature is volatilized. It is odorless, but has a caustic, urinous taste. It rapidly decomposes organic substances.

Its composition is as follows:—

| Eq. | | Eq Wt. | Per Cent. |
|---|---|---|---|
| 1 | Potash | 47 | 83.93 |
| 1 | Water | 9 | 16.07 |
| | Hydrate of Potash | 56 | 100.00 |

*Impurities.*—Caustic potash of the shops contains various impurities, such as peroxide of iron, oxide of manganese, carbonate of potash, and silica; and traces of sulphates and chlorides. These, however, do not materially affect its medicinal value, and are easily detected by their insolubility in rectified spirit.

*Tests.*—Fifty-six grains dissolved in water leave only a trace of sediment, and require for neutralization at least ninety measures of the volumetric solution of oxalic acid.

*Therapeutics.*—Caustic potash is sometimes used *as an escharotic*, though its employment is not free from objection; for its great deliquescence occasions some difficulty in localizing its action. It may be employed for the production of an issue, and is used thus: Apply to the part one or two layers of adhesive plaster, in the middle of which is an aperture of the exact size of the intended issue. Then moisten the *potash* and rub it on the part until discoloration is observed. Wash and apply a linseed-meal poultice, and when the eschar is detached, insert the pea. Issues, however, are more speedily and more conveniently made by the lancet than by caustic. In bites by poisonous animals, as venomous serpents, mad dogs, &c., this caustic may be used with advantage. There are many other cases in which this substance is employed as a caustic, for example, to destroy warts and fungoid growths of various kinds, to destroy varicose veins, and to open abscesses; but for the latter purpose the lancet is generally to be preferred. Its deliquescence may be remedied by the addition of an equal weight of lime as in the potossa cum calce of the London Pharmacopœia (Vienna paste), which, when required for use, is made into a paste with spirit of wine.

[Potassa Cum Calce, U. S., *Potassa with Lime.*—"Take of potassa, lime, each, a troyounce. Rub them together so as to form a powder, and keep it in a well-stopped bottle."

*Officinal Characters.*—A grayish-white powder, which, when mixed with water, does not effervesce on the addition of an acid.

*Therapeutics.*—This is a milder and more manageable caustic than the pure potassa—the action of the latter being rendered slower and less energetic by the lime. When used it is generally made into a paste with alcohol, and in this form is widely known as *Vienna Paste.*

It has also been made into sticks and used in that form. When employed the same precautions should be taken as in the case of caustic potash, for it is possessed of very great escharotic powers.—W.]

Liquor Potassæ [U. S.], *Solution of Potash.*—Take of carbonate of potash, one pound; slaked lime, twelve ounces; distilled water, one gallon. Dissolve the carbonate of potash in the water; and, having heated the solution to the boiling point in a clean iron vessel, gradually mix with it the slaked lime; and continue the 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.

["Take of bicarbonate of potassa, fifteen troyounces; lime, nine troyounces; distilled water, a sufficient quantity. Dissolve the bicarbonate in four pints of distilled water, and heat the solution until effervescence ceases. Then add distilled water to make up the loss by evaporation, and heat the solution to the boiling point. Mix the lime with four pints of distilled water, and, having heated the mixture to the boiling point, add it to the alkaline solution, and boil for ten minutes. Then transfer the whole to a muslin strainer, and, when the liquid portion has passed, add sufficient distilled water, through the strainer, to make the strained liquid measure seven pints. Lastly, keep the liquid in well-stopped bottles of green glass. Solution of potassa, thus prepared, has the specific gravity 1.065, and contains five and eight-tenths per cent. of hydrate of potassa.

"Solution of potassa may also be prepared in the following manner: Take of potassa a troyounce; distilled water a pint. Dissolve the potassa in the distilled water, and allow the solution to stand until the sediment subsides. Then pour off the clear liquid, and keep it in a well-stopped bottle of green glass." [U. S.]

The U. S. Ph. prefers the bicarbonate to the carbonate of potash, because, being more free from impurities itself, it makes a purer preparation. The U. S. preparation is somewhat the stronger.—W.]

In this process the lime abstracts carbonic acid from the carbonate of potash, forming carbonate of lime, and the potash thus set free dissolves in the water; $KO,CO_2+CaO=KO+CaO,CO_2$. As more lime is employed than is sufficient to saturate the carbonic acid of the carbonate of potash, a portion of lime remains in solution. This may be got rid of by the addition of a solution of carbonate of potash as long as a precipitate forms. By occasional exposure to air, as in opening the bottle, it is slowly precipitated as carbonate of lime. The liquid is to be drawn off by a siphon, filters being objectionable, as the potash decomposes and partially dissolves them. The ebullition directed to be employed has three advantages: it accelerates the chemical changes; it augments the density, and thereby promotes the subsidence, of the carbonate of lime; and, lastly, it yields a purer product, as it effects the separation of the silica usually contained in the carbonate of potash, by giving rise to an insoluble combination of silica with lime and potash.

*Properties.*—Solution of potash is a limpid, colorless, transparent, inodorous liquid, having an acrid, urinous taste. It has a soapy feel when rubbed between the fingers, and reddens turmeric paper. It strongly attracts carbonic acid from the atmosphere, and, therefore, should be kept in closed vessels. It corrodes flint glass, and rapidly dissolves the oxide of lead; hence it should always be preserved in green glass bottles.

*Tests.*—Specific gravity, 1.058. One fluidounce requires for neutralization 48.25 measures of the volumetric solution of oxalic acid. It does not effervesce when added to an excess of dilute hydrochloric acid, nor give a precipitate with solution of lime or oxalate of ammonia. When it is treated with an excess of dilute nitric acid, and evaporated to dryness, the residue forms with water a nearly clear solution, which is only slightly precipitated by chloride of barium and nitrate of silver, and is rendered very slightly turbid by ammonia.

The non-effervescence with acids indicates freedom from carbonic acid, as does also the absence of any precipitate on the addition of lime. Oxalate of ammonia shows its freedom from lime. The other tests are merely to detect any excessive admixture of foreign matters, since it is impossible to prepare solution of potash from ordinary carbonate of potash and lime, without the introduction of small portions of silica, sulphates, chlorides, and alumina. These should, however, be present only in very minute proportions. Another frequent impurity in solution of potash is oxide of lead. This is owing to the solution having been kept in a flint glass bottle, or to its having been prepared in a badly glazed vessel. Pure solution of potash should acquire no change of color by passing into it a current of washed sulphuretted hydrogen, or by adding to it a drop of a solution of hydrosulphuret of ammonia. A brown or black discoloration indicates at once the presence of oxide of lead.

*Physiological Effects.*—Potash, and its basis potassium, are essential constituents of the human body. They preponderate in the juice of flesh and in the milk. It is obvious, therefore, that they are necessary ingredients of our food; and that, if they be deficient or absent, nutrition will be imperfect. It follows, also, that for the cure of disorders resulting from the use of food deficient in potash, among which Dr. Garrod places scurvy, the administration of this alkali or its salts, and food containing them, is requisite. The local action of potash is exceedingly energetic. It neutralizes any free acid in the part to which it is applied; decomposes whatever ammoniacal salts may be present, causing the evolution of ammoniacal gas; and dissolves fibrin, albumen, gelatin, and mucus. Hence, rubbed between the fingers, it corrodes and destroys the epidermis, and thereby gives rise to a soapy feel. As, then, potash forms soluble compounds with substances which enter largely into the composition of the organized tissues, we can readily explain Orfila's observation, that alkalies are of all corrosive poisons those which most frequently perforate the stomach. Nevertheless, Drs. Rees and Taylor assert, in opposition to this statement, that in the few cases that have occurred of poisoning by potash, the stomach has *not* been found perforated. When solution of potash is taken in small doses, and properly diluted, it destroys the acidity of the contents of the stomach, which is essential to the digestion of the albuminous substances. Hence the continued use of it is liable to prove injurious, by altering the chemical properties of the healthy ventricular secretion. Like other alkalies, it may perhaps aid the digestion and absorption of fatty substances. In somewhat larger doses, it acts as a slight irritant, augments the secretions of the alimentary canal, becomes absorbed, and communicates an alkaline quality to the urine. Moreover, the modification thus produced in the quality of the renal secretion is accompanied by an increase in the quantity. By continued use, potash acts as a resolvent, and impoverisher of the blood. The energetic action of solution of potash arises from its causticity, for it is a weak solution, containing only 5.8 per cent. of potash, while carbonate of potash contains 55 per cent.; hence the effect of this carbonate on the urine is much greater.

*Therapeutics.*—1. As an *antacid*, we resort to the solution of potash in various affections of the digestive organs which are attended with an inordinate acidity of stomach, known by acid eructations, cardialgia, and other dyspeptic symptoms. It must, however, be evident, that the neutralization of the acid is merely palliative. But the continued employment of alkalies frequently diminishes, temporarily, the tendency to acid secretion. Commonly, it is found that the cases calling for their employment are those benefited by tonics, and hence they are usually given in some tonic infusion; as the infusion of calumbo, or of gentian, or of quassia. Their beneficial effects are frequently manifested in those forms of dyspepsia which result from the use of spirituous liquors. It is also used *to render the urine alkaline, or to diminish its acidity*, in preternatural acidity of urine, especially in lithic acid deposits. But in general, I believe the carbonate or vegetable salts of the alkalies are preferable, in these cases, to the caustic alkalies; as they, especially the latter, are far more effective in rendering the urine alkaline, and are less injurious to the digestive organs. Solution of potash is well known only to render the urine alkaline after long use. [I have given it in 2-drachm doses, three times a day for six weeks, or longer, without producing this effect. —Ed.] The alkalies act as solvents for lithic acid, as the alkaline lithates are more soluble than the free acid. They also probably prevent the formation of this acid, or neutralize the free acid in the urine, which is the immediate cause of the precipitation of the lithic acid. As a lithonlytic, caustic potash has been exhibited both by the mouth and by injection into the bladder. In *irritable conditions of the urinary organs*, a combination of solution of potash and opium will be frequently found most beneficial, notwithstanding that alkalies are classed among the incompatibles of the latter substance. This combination I have also frequently found useful in allaying *uterine irritation*. In *rheumatism* and *gout*, especially when attended with lithic acid deposits in the urine, it may be advantageously administered.

2. As a *resolvent* and alterative in *induration and enlargement of the lymphatic and secreting glands*, for example, in bronchocele, mammary tumors, affections of the testicle, diseases of the mesenteric glands, induration of the liver and salivary glands, &c., solution of potash has been used with benefit. Dr. Seymour recommends it in malignant disease of the ovaries, in as large doses as the stomach will bear. I have seen it remarkably beneficial in excessive enlargement of the lenticular or glandular papillæ at the base of the tongue. In *syphilis* and *scrofula*, it has been employed with advantage. Some of the most obstinate and troublesome forms of the venereal disease frequently occur in scrofulous subjects, in whom mercury is not only useless, but absolutely prejudicial. In cases of this kind, solution of potash, taken in the compound decoction of sarsaparilla, is often very serviceable. In scrofula, the long-continued use of potash has been attended with remarkably beneficial effects. Potash was most extensively employed by Mr. Brandish, during many years, in the treatment of scrofula and other chronic diseases, and, according to his report, with singular success. It is, however, more successful in young than in old persons, and in those of fair and light complexion than in the dark and the swarthy. In *chronic skin diseases*, especially psoriasis, pityriasis, lepra, acne, and lichen, the long-continued employment of potash is sometimes attended with relief. In acne punctata, a weak alkaline solution (as half a drachm of solution of potash in a pint of soft water) is often employed, with the aid of a coarse towel and friction, to remove the thick sebaceous secretion from the follicles.

3. As a *diuretic in dropsy*, solution of potash is often employed, especially when this disease arises from glandular enlargements, or other causes likely to be relieved by alkaline remedies. [I have seen ovarian dropsy disappear entirely under its use in full and long-continued doses, the urine continuing acid all the time.—Ed.]

4. As an *expectorant* in *chronic bronchitis* with a very rough and viscid secretion, solution of potash is used to diminish the viscidity of the mucus.

*Dose.*—Min. xx to fl. drs. ii in table-beer, milk, or with syrup of orange peel.

### [**Potassa Carbonas Impura**, *Impure Carbonate of Potassa*, Mat. Med. List, U. S. P.]

### Carbonate of Potash (Commercial).

[The impure carbonate of potassa, known in commerce by the name of pearlash. U. S.]

*Natural History.*—It is formed, during the combustion of inland plants, by the decomposition of the vegetable salts of potash (the acetate, the malate, and the oxalate, but principally the first). Hence it is procured in great abundance from wood-ashes.

*Preparation.*—Carbonate of potash is generally obtained from *wood-ashes*, which are procured by burning wood piled in heaps on the ground, sheltered from the wind, or in pits. The soluble constituents of the ashes are *carbonate, sulphate, phosphate, and silicate of potash, and chlorides of potassium and sodium.* The insoluble constituents are *carbonate and subphosphate of lime, alumina, silica, the oxide of iron and manganese, and a dark carbonaceous matter.* In America the ashes are lixiviated in barrels with lime, and the solution evaporated in large iron pots or kettles, until the mass has become of a black color and of the consistence of brown sugar. In this state it is called, by the American manufacturers, *black salts.* The dark color is said by Dumas to be owing to *ulmate of potash.* To convert this substance into the *potashes* of commerce it is heated for several hours, until the fusion is complete, and the liquid becomes quiescent. It is then transferred by large iron ladles into iron pots, where it congeals in cakes. These are broken up, packed in tight barrels, and constitute the *potashes* of commerce. Its color varies somewhat, but it is usually reddish, in consequence of the presence of peroxide of iron. To make the substance called *pearlash*, the mass called black salts, instead of being fused, is transferred from the kettle to a large oven-shaped furnace, constructed so that the flame is made to play over the alkaline mass, which in the meantime is stirred by means of an iron rod. The ignition is in this way continued until the combustible impurities are burnt out, and the mass, from being black, becomes dirty bluish-white, having somewhat of a pearly lustre, whence the name *pearlash.* The coloring matter is probably in this case manganate of potash. Carbonate of potash may also be obtained from various other salts of the alkali. When bicarbonate of potash is submitted to a low red heat, it loses half its carbonic acid, and is converted into the carbonate. When the acid tartrate is ignited, various volatile substances are evolved, and the residue in the crucible is a mixture of charcoal and carbonate of potash, and is denominated *black flux.* If made with crude tartar, which contains nitrogen, it is contaminated with cyanide of potassium. By roasting, the charcoal is burnt off, and nearly pure carbonate of potash is obtained from the residue by lixiviation. The carbonate thus produced is called *salt of tartar;* it is comparatively pure. By deflagrating a mixture of equal parts of acid tartrate of potash and nitrate of potash, we obtain carbonate of potash contaminated with hyponitrite and even with some undecomposed nitrate of potash. The residue is called *white flux.* The high price of pearlash has occasionally led to the manufacture of carbonate of potash from *sal enixum* (bisulphate of potash), by heating it in a reverberatory furnace with charcoal. This yields a sulphuret of potassium, in consequence of the carbon deoxidizing the bisulphate. By roasting, this sulphuret is decomposed, and converted into carbonate of potash; the sulphur being dissipated, and the potassium combining with oxygen and carbonic acid. Mr. Spence, of Manchester, has improved upon the process of procuring carbonate of potash, by passing carbonic acid into solutions of sulphuret of barium and sulphate of potash at the ordinary temperature, having previously raised the temperature of the gas to 200° Fahr. By this means the decomposition is effectually accomplished. The sulphate of baryta deposited may be reconverted into sulphuret of barium with carbonaceous matter in the usual way.

**Potassæ Carbonas** [U. S.], *Carbonate of Potash.* $KO,CO_2+2HO=87$.

*Preparation.*—Prepared from pearlash or any of the above impure carbonates, by evaporating to dryness, with frequent stirring, a cold saturated solution prepared with some excess of carbonate of potash to shut out sulphates and other less soluble impurities. ["Take of impure carbonate of potassa, thirty-six troyounces; water, two pints and a half.

Dissolve the impure carbonate in the water, and filter the solution; then pour it into an iron vessel, and evaporate over a gentle fire until it thickens. Lastly, remove it from the fire, and stir constantly with an iron spatula until it forms a granular salt." U. S.]

*Officinal Characters.*—A white crystalline powder, alkaline and caustic to the taste, very deliquescent, readily soluble in water but insoluble in spirit, effervescing with dilute hydrochloric acid, and forming a solution with which bichloride of platinum gives a yellow precipitate. As usually prepared (by the process of the London Pharmacopœia, 1836) it is a sesquihydrate, $2(KO,CO_2)+3HO$, equiv. 82.5.

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

If, before saturation with nitric acid, nitrate of silver gives with the solution a brown precipitate (oxide of silver), this would indicate the presence of free alkali. Other impurities mentioned by L. Gmelin are phosphate of potash, nitrate or hyponitrite of potash, cyanide of potassium, soda, and carbonate of lime. To detect the phosphate, boil with excess of hydrochloric acid to expel all the carbonic acid; then add some chloride of calcium and excess of ammonia: a flocculent precipitate of phosphate of lime is formed. If nitrate or hyponitrite be present, dissolve in oil of vitriol and add a solution of sulphate of iron, when a reddening is perceived. Cyanide of potassium is detected by adding a solution of the mixed sulphates of iron, and then hydrochloric acid; prussian blue is formed. To detect soda, saturate with acetic acid, evaporate to dryness, dissolve the residue in spirit of wine, and precipitate the potash by bichloride of platinum; add sulphuric acid to the filtered liquor and evaporate, and ignite the residue: then treat with water, evaporate the solution thus obtained, and by cooling easily-recognized crystals of sulphate of soda are obtained. The soda may be more readily detected by converting it into common salt by hydrochloric acid, and noticing the cubic form of the crystal and the intense yellow color given by it to the flame of alcohol. Some carbonate of lime is held in solution by carbonate of potash, but by long standing it is deposited. To detect it, saturate with acetic acid, and then add oxalic acid; a white precipitate of oxalate of lime is obtained.

*Physiological Effects.*—Its effects are in *quality* precisely those of caustic potash already described, but their *intensity* is much less, on account of the presence of carbonic acid, which diminishes the alkaline properties of the base. When it is taken into the stomach in large quantities, it acts as a powerfully caustic poison, sometimes inducing death in twelve hours, and producing symptoms of irritation somewhat resembling those caused by the mineral acids; at other times, however, the patient recovers from the immediate effects of the alkali, but, in consequence of the altered condition of the alimentary canal, the assimilative process cannot be carried on; and, after dragging on a miserable existence for a few weeks, the unfortunate sufferer dies of absolute starvation. And lastly, in some cases the caustic operation of the poison is principally confined to the œsophagus, causing stricture and death.

*Therapeutics.*—This salt is employed, in medicine, in most of the cases already mentioned when describing the uses of caustic potash. For an antacid in dyspeptic affections; in that form of lithiasis which is accompanied with an increased secretion of lithic acid, or the lithates; in gout, &c., and as a diuretic.

*Administration.*—Dose from gr. x to gr. xxx, in water or other liquid.

*Antidotes.*—When swallowed as a poison, the antidotes are oils or acids, as already mentioned for caustic potash.

*Pharmaceutic Uses.*—Carbonate of potash is used in the preparation of the compound decoction of aloes and arsenical solution; and is sometimes employed in the manufacture of the common effervescing draught, made with either the citric or tartaric acid.

| | |
|---|---|
| 20 grs. of Carbonate of Potash are saturated by about . . . | 16 grs. of commercial crystals of Citric Acid,<br>17 grs. of crystals of Tartaric Acid,<br>4 fluidrachms of Lemon Juice. |

### [**Potassæ Carbonas Pura**, U. S., *Pure Carbonate of Potassa.*

"Take of bicarbonate of potassa, in coarse powder, twelve troyounces. Put it into a capacious iron crucible; heat gradually until the water of crystallization is driven off; then raise the heat to redness, and maintain that temperature for half an hour. Having taken the crucible from the fire, and allowed it to cool, dissolve its contents in distilled water, and filter the solution. Then pour it into an iron vessel and evaporate over a gentle fire until it thickens. Lastly remove it from the fire and stir constantly with an iron spatula until it forms a granular salt."

This salt differs from the officinal carbonate in its aqueous solution not affording a slightly gelatinous precipitate when saturated with an acid; or in other words in its being free from the silica and other impurities, which so constantly exist in the latter salt.—W.]

### **Potassæ Bicarbonas** [U. S.], *Bicarbonate of Potash.*
### $KO,HO,2CO_2=100$.

Take of carbonate of potash, one pound; distilled water, two pints; hydrochloric acid of commerce, one pint and a half; water, three pints; white marble in fragments, one pound, or a sufficiency. Dissolve the carbonate of potash in the distilled water, and filter the solution into a three-pint bottle, capable of being tightly closed by a cork traversed by a glass tube sufficiently long to pass to the bottom of the fluid. Introduce the marble into another bottle, in the bottom of which a few small holes have been drilled, and the mouth of which is closed by a cork also traversed by a glass tube, and place the bottle in a jar of the same height as itself, but of rather larger diameter. Connect the two glass tubes airtight 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 in a capsule with twice their bulk of cold distilled water, and, after decantation of the water, drained, and dried on filtering paper by exposure to the air. The mother liquor filtered if necessary, and concentrated to one half, at a temperature not exceeding 110°, will yield more crystals. The tube immersed in the solution of carbonate of potash, which should have as large a diameter as possible, may require the occasional removal of the crystals formed within it, in order that the process may not be interrupted. ["Take of carbonate of potassa, forty-eight troyounces; distilled water, ten pints. Dissolve the carbonate in the distilled water, and pass carbonic acid through the solution until it is fully saturated. Then filter the liquid, and evaporate that crystals may form, taking care that the heat does not exceed 160°. Lastly, pour off the supernatant liquid, and dry the crystals on bibulous paper. Carbonic acid may be obtained from marble by the addition of dilute sulphuric acid." U. S.]

In this process each equivalent of carbonate of potash unites with an additional equivalent of carbonic acid, and thereby forms the bicarbonate.

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

*Properties.*—It is soluble in four times its weight of water at 60° F., but is insoluble in alcohol. When exposed to the air, it undergoes no change. At a red heat, it gives out half its carbonic acid, and becomes the carbonate. From the carbonate of potash it is best distinguished by a solution of corrosive sublimate, which causes only a slight white precipitate or opalescence with it; whereas with the carbonate it causes a copious brick-red precipitate. This test, however, will not, under all circumstances, detect the carbonate; as when the quantity is very small, or when chloride of sodium is present. Sulphate of magnesia, which precipitates the carbonate, gives no precipitate with the bicarbonate until the mixture has been boiled. Neither this nor any other test will prove the total absence of carbonate.

*Composition.*—The composition of this salt is as follows:—

| Eq. | | Eq. Wt. |
|---|---|---|
| 1 | Potash | 47 |
| 2 | Carbonic acid | 44 |
| 1 | Water | 9 |
| | Crystallized bicarbonate of potash | 100 |

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

*Physiological Effects.*—The effects of this salt are similar to those of carbonate of potash, except that its local action is much less energetic, in consequence of the additional equivalent of carbonic acid. Hence it is an exceedingly eligible preparation in cases where we want its constitutional, and not its local, action. The neutral salts of potash, combined with vegetable acids, undergo oxidation in the blood, and are transformed into bicarbonates.

*Therapeutics.*—It may be employed for the same purposes as caustic potash, except that of acting as an escharotic. Thus it is used as an antacid, to modify the quality of urine, in glandular diseases and affections of the urinary organs. But its most frequent use is that for making effervescing draughts, with either citric or tartaric acid. Where there is great irritability of stomach, I believe the effervescing draught, made with bicarbonate of potash and citric acid, to be more efficacious than that made with bicarbonate of soda and tartaric acid. The citrate of potash which is formed promotes slightly the secretions of the alimentary canal, the cutaneous transpiration, and the renal secretion; and, like other vegetable salts of potash, renders the urine alkaline.

*Administration.*—Dose, gr. x to gr. xxx or more.

*Pharmaceutic Uses.*—The proportions used in the effervescing draughts are as follows:—

| | |
|---|---|
| 20 grs. of Bicarbonate of Potash are saturated by about . . . . . | 14 grs. of Citric Acid.<br>15 grs. of Tartaric Acid.<br>$3\frac{1}{2}$ drachms of Lemon Juice. |

## **Potassa Sulphurata,** *Sulphurated Potash.*

## [**Potassii Sulphuretum,** U. S., *Sulphuret of Potassium.*]

*Synonyms.*—Potassii Sulphuretum, *Lond.*, *Ed.* Hepar Sulphuris, *Dub.* Tersulphuret of potassium, $KS_3$, with sulphate of potash.

*Preparation.*—Take of carbonate of potash, in powder, ten ounces; sublimed sulphur, four ounces and a half. Mix the carbonate of potash and the sulphur in a warm mortar, and, having introduced them into a Cornish or Hessian crucible, let this be heated, first gradually, until effervescence has ceased, and finally to dull redness, so as to produce perfect fusion. Let the liquid contents of the crucible be then poured out on a clean flagstone, and covered quickly with an inverted porcelain basin, so as to exclude the air as completely as possible while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately inclosed in a green-glass bottle, furnished with an air-tight stopper. ["Take of sublimed sulphur, a troyounce; carbonate of potassa, two troyounces. With the sulphur rub the carbonate, previously dried, and heat the mixture gradually in a covered crucible until it ceases to swell and is completely melted. Then pour out the liquid on a marble slab, and, when the mass is cold, break it into pieces, and keep these in a well-stopped bottle of green glass." U. S.]

When sulphur and carbonate of potash are fused together, water and carbonic acid are evolved. Part of the potash is decomposed, its potassium combining with sulphur to form a sulphuret of potassium; while its oxygen unites with sulphur to form one or more acids which combine with some undecomposed potash. A portion of the carbonate of potash remains undecomposed. Assuming that a tersulphuret of potassium and sulphate of potash are produced, the following equation represents the changes: $10S+4(KO,CO_2)=3KS_3+KO,SO_3+4CO_2$. The excess of carbonate of potash employed is presumed to remain unchanged. [In the U. S. process the heat probably never rises above 365° F., and, as a consequence, the hyposulphite of potassa is formed instead of the sulphate. Thus, $3(KO,CO_2)+8S=2KS_3+KO,S_2O_2+(3CO_2)$, which escapes. The difference in the chemical constitution of the two preparations causes little or no difference in their therapeutic effects.—W.]

*Officinal Characters.*—Solid greenish masses, liver-brown when recently broken, alkaline, and acrid to the taste, readily forming with water a yellow solution, which has the odor of sulphuretted hydrogen, and evolves it freely when excess of hydrochloric acid is dropped into it, sulphur being at the same time deposited. The acid fluid, when boiled and filtered, is precipitated yellow by bichloride of platinum, and white by chloride of barium.

*Properties.*—If quite dry it is inodorous, but when moistened it acquires the odor of sulphuretted hydrogen. Exposed to the air it undergoes decomposition, from the action of aqueous vapor and oxygen. It becomes green and moist, and ultimately whitish. This change depends on the absorption of oxygen, in consequence of which part of the sulphur is deposited, while a portion of the sulphuret of potassium is converted into hyposulphite, afterwards into sulphite, and ultimately into sulphate of potash. Sulphuret of potassium is soluble in water, and the solution has a strong alkaline reaction.

*Test.*—About three-fourths of its weight are dissolved by rectified spirit (showing a due proportion of sulphuret of potassium, which is soluble in spirit, the sulphate and carbonate of potash being insoluble).

*Physiological Effects.*—In *small doses* (as from four to ten grains) it acts as a general stimulant; increasing the frequency of the pulse, augmenting the heat of the body, promoting the different secretions, more especially those of the mucous membranes, and sometimes exciting local irritation, marked by pain, vomiting, and purging. In *large doses* it is an energetic narcotico-acrid poison. Its local action is that of a powerful irritant; hence the acrid taste, burning pain, and constriction in the throat, gullet, and stomach, with vomiting and purging. But the nervous system is also affected; as is proved by the faintness, the almost imperceptible pulse, the convulsions, and (in some cases) sopor. These symptoms are analogous to those caused by sulphuretted hydrogen, which, in fact, is copiously developed in the stomach. It probably acts chemically on the blood, like sulphuretted hydrogen.

*Therapeutics.*—Internally it has been administered in very obstinate skin diseases, such as lepra and psoriasis, which have resisted all the ordinary means of cure. It has also been employed as a resolvent in glandular enlargements. Externally it is applied in the form of lotions, baths, or ointment, in chronic skin diseases, such as eczema, scabies, lepra, and pityriasis, and in lead poisoning.

*Administration.*—Internally it may be administered in the *dose* of three or four grains gradually increased. It may be given either in solution, or in the form of a pill made with soap. For external use it is employed in solution in water, either as a bath or wash, or in the form of ointment. *Lotions* are sometimes made by dissolving an ounce of the sulphurated potash in two or three quarts of water. The *ointment* is composed of 30 grains of sulphurated potash to 1 ounce of lard. The *sulphur bath* is made by dissolving four ounces in thirty gallons of water.

*Antidotes.*—In the event of poisoning by this substance, the antidote is a solution of chlorinated soda or of chlorinated lime.

### **Residue of Nitric Acid Process.** (Appendix A.)

Bisulphate of potash, $KO,HO,2SO_3$, not quite pure.

*Used* in the formation of sulphate of potash.

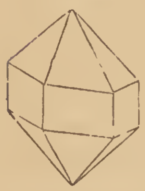
### **Potassæ Sulphas** [Mat. Med. List, U. S.], *Sulphate of Potash.* $KO,SO_3=87$.

*Preparation.*—Take of the residue of the process for nitric acid, one pound; slaked lime, eight ounces; boiling distilled water, half a gallon; carbonate of potash, sixty grains; dilute sulphuric acid, six fluidrachms, 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 color. 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.

The addition of the lime removes the second equivalent of sulphuric acid in the bisulphate, forming sulphate of lime, which is removed by filtration, $KO,2SO_3 + CaO = KO,SO_3 + CaO,SO_3$. The excess of lime used is then precipitated as carbonate by the carbonate of potash, also removed by filtration, and the remainder of the carbonate of potash converted into sulphate by the sulphuric acid. This would be better effected by adding carbonate of potash to the bisulphate.

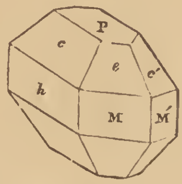
*Officinal Characters.*—In colorless, hard, six-sided prisms terminated by six-sided pyramids, which decrepitate strongly when heated, and are

Fig. 7.



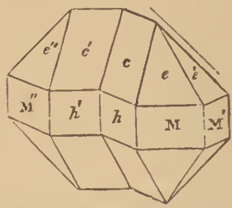
*Common bipyramidal crystal with short intervening prism.*

Fig. 8.




*Ditto modified.*

Fig. 9.




*Compound crystal composed of three so united that their upper edges meet at angles of 120°.*

Fig. 10.

*Tessellated appearance of a plate of sulphate of potash seen by polarized light.*

sparingly soluble in water. Its solution, acidulated with hydrochloric acid, is precipitated white by chloride of barium ($BaO,SO_3$), and yellow by bichloride of platinum ($KCl,PtCl_2$).

*Properties.*—Crystals of sulphate of potash are inodorous, have a saline bitter taste, and are unchanged by exposure to the air. At 60° F. they require sixteen times their weight of water to dissolve them; they are insoluble in alcohol. A solution of them is decomposed by tartaric acid, which forms crystals of acid tartrate of potash.

*Composition.*—The crystals contain no water of crystallization. They are thus composed:—

| Eq. | | Eq. Wt. | Per. Cent. |
|---|---|---|---|
| 1 | Sulphuric acid . . . . . | 40 | 45.977 |
| 1 | Potash . . . . . . . . | 47 | 54.023 |
| | Sulphate of Potash . . . . . | 87 | 100.000 |

*Tests.*—Neutral to test paper; its solution is not affected by oxalate of ammonia (showing its freedom from lime).

*Physiological Effects.*—Sulphate of potash, when given in moderate doses, usually operates as a mild purgative, without occasioning heat, pain, or any other symptoms of irritation. In doses of from fifteen to thirty grains, I have used it in hundreds of cases, in combination with a third part of powdered rhubarb, without having ever witnessed any injurious effects therefrom. I have also given it, but more rarely, in doses of a drachm, also combined with rhubarb, and without any ill consequences. Many of the patients to whom I have administered it were laboring under mild diarrhœa. In all cases it has appeared to me to act as a mild and safe purgative. The objections to its employment are its slight solubility, and that when given in large doses to children it is apt to produce vomiting. Recently evidence has been adduced of its poisonous and even fatal effects when administered in large doses. In some of these cases one or two ounces were taken. The symptoms were scarcely those of inflammation, but rather resembled those of cholera—abdominal pain, vomiting, purging, cramps of the extremities, and great exhaustion. The immediate cause of death was not obvious, but on the whole I am disposed to attribute it to the absorption of the salt.

*Therapeutics.*—Sulphate of potash has been found serviceable as a mild *laxative* in disordered conditions of the alimentary canal, as at the commencement of mild diarrhœa, in dyspepsia, hepatic disorders, and hemorrhoidal affections. It is best given in these cases in combination with rhubarb. Thus from five to ten grains of rhubarb with from fifteen grains to a drachm of this salt will be usually found to act mildly and efficiently. As a *lactifuge*, or represser of the milk, it has been much used by some of the French accoucheurs of the last century. Levret also considered it a valuable purgative in the disorders of childbed, especially puerperal fever. It has been esteemed an excellent *aperient* for children. Its powder, on account of its hardness and solubility, is an excellent dentifrice; the only objection to its use is its taste.

*Pharmaceutic Uses.*—It is useful, on account of its hardness and dryness, for triturating and dividing powders, as in the powder of ipecacuan and opium, in which it serves to divide the opium.

*Dose.*—It is given in doses of from fifteen grains to sixty grains.

**Potassæ Chloras** [Mat. Med. List, U. S. P.], *Chlorate of Potash.* $KO,ClO_5=122.5$.

*Preparation.*—Take of carbonate of potash, twenty ounces; slaked lime, fifty-three ounces; distilled water, a sufficiency; black oxide of manganese, eighty ounces; hydrochloric acid of commerce, twenty-four pints. Mix the lime with the carbonate of potash, and triturate them with a few ounces of the water so as to make the mixture slightly moist. Place the oxide of manganese in a large retort or flask, and, having poured upon it the hydrochloric acid, diluted with six pints of water, apply a gentle sand heat, and conduct the chlorine as it comes over, first through a bottle containing six ounces of water, and then into a large carboy containing the mixture of carbonate of potash and slaked lime. When the whole of the chlorine has come over, remove the contents of the carboy, and boil them for twenty minutes with seven pints of the water; filter and evaporate till a film forms on the surface, 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 crystallizing.

Part of the chlorine evolved by the action of the hydrochloric acid upon the oxide of manganese combines with the potassium of part of the carbonate of potash, the carbonic acid combining with the lime, and the oxygen with the remainder of the chlorine, to form chloric acid, which combines with the remainder of the potash, so that $6(KO,CO_2)+6(CaO,HO)+6Cl=6(CaO,CO_2)+5KCl+KO,ClO_5+6HO$. By the action of water, the chlorate of potash and chloride of potassium are separated from the carbonate of lime, and the chlorate of potash crystallized out; the great difference in solubility between it and chloride of potassium rendering this an easy and perfect method of separation.

*Officinal Characters.*—In colorless 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 (AgCl), and yellow by bichloride of platinum ($KCl,PtCl_2$).

*Properties.*—When rubbed in the dark it becomes luminous. 100

parts of water at 32° F. dissolve 3.5 parts of chlorate; at 59° F. 6 parts; at 120° F. 19 parts. When thrown on a red-hot coal it deflagrates—a property, however, common to several other salts. Sulphuric acid gives it an orange color, evolves chlorous acid (peroxide of chlorine), known by its greenish-yellow color, and great explosive power when heated. Mixed with hydrochloric acid, and then with water, it evolves chlorine, dissolves gold, and forms a bleaching liquid.

*Composition.*—It is an anhydrous salt.

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Potash | 47 | 38.37 |
| 1 | Chloric acid | 75.5 | 61.63 |
| | Chlorate of potash | 122.5 | 100.00 |

*Tests.*—Its solution is not affected by nitrate of silver, or oxalate of ammonia (showing its freedom from chloride of potassium and from lime).

*Physiological Effects.*—It becomes absorbed into the blood, and is eliminated by the kidneys. It appears to act as a refrigerant and diuretic, like nitrate of potash. Wöhler and Stehberger recognized it in the urine of patients to whom it had been exhibited; so that it does not appear to undergo any chemical change in its passage through the system. This fact is fatal to the hypothesis of the chemico-physiologists, who fancied that it gave oxygen to the system.

*Therapeutics.*—Chlorate of potash was originally used as a medicine for supplying oxygen to the system, where a deficiency of that principle was supposed to exist. More recently, it has been used by Dr. Stevens and others as a remedy for fever, cholera, and other malignant diseases, which, he supposes, depend on a deficiency of the saline matters in the blood; but as it has been usually employed in conjunction with common salt and carbonate of soda, it is impossible to declare what share the chlorate had in producing the beneficial effects said to have been obtained by what is called the *saline* treatment of these diseases. [It certainly forms a very useful drink in fever, both relieving thirst and cleaning the tongue.—Ed.] It is chiefly, however, employed in scarlatina, cynanche maligna, stomatitis, and cancrum oris. [In follicular stomatitis it acts almost as a specific.—W.] Cotton wool impregnated with a concentrated solution has been employed as a moxa.

*Administration.*—The usual dose of it is from ten to fifteen grains to half a drachm. As a fever drink sixty grains may be dissolved in a pint of water, and drunk in the course of twenty-four hours.

### **Potassii Iodidum** [U. S.], *Iodide of Potassium.* KI=166.

*Preparation.*—Take of solution of potash, one gallon; iodine, in powder, twenty-nine ounces, or a sufficiency; wood charcoal, in fine powder, three ounces; boiling distilled water, a sufficiency. Put the solution of potash into a glass or porcelain vessel, and add the iodine in small quantities at a time with constant agitation, until the solution acquires a permanent brown tint. Evaporate the whole to dryness in a porcelain dish, pulverize the residue, and mix this intimately with the charcoal. Throw the mixture, in small quantities at a time, into a red-hot iron crucible, and, when the whole has been brought to a state of fusion, remove the crucible from the fire and pour out its contents. When the fused mass has cooled, dissolve it in two pints of boiling distilled water, filter through paper, wash the filter with a little boiling distilled water, unite the liquids, and evaporate the whole till a film forms on the surface.

Set it aside to cool and crystallize. Drain the crystals, and dry them quickly with a gentle heat. More crystals may be obtained by evaporating the mother liquor and cooling. The salt should be kept in a stoppered bottle. ["Take of potassa, six troyounces; iodine, in fine powder, sixteen troyounces, or a sufficient quantity; charcoal, in fine powder, two troyounces; distilled water, a sufficient quantity. To the potassa, dissolved in three pints of distilled water boiling hot, gradually add the iodine, stirring after each addition until the solution becomes colorless, and continue the additions until the liquid remains slightly colored from excess of iodine. Evaporate the solution to dryness, stirring in the charcoal towards the close of the operation, so that it may be intimately mixed with the dried salt. Rub this to powder, and heat it to dull redness in an iron crucible, maintaining that temperature for fifteen minutes; then, after it has cooled, dissolve out the saline matter with distilled water, filter the solution, evaporate, and set it aside to crystallize. An additional quantity of crystals may be obtained from the mother-water by evaporating and crystallizing as before." U. S.]

Part of the iodine combines with the potassium of a portion of the potash, and forms iodide of potassium, and the evolved oxygen combines with the remainder of the iodine and forms iodic acid, which combining with the remainder of the potash, forms iodate of potash. $6KO + 6I = 5KI + KO,IO_5$. To convert this iodate of potash into iodide of potassium, it is deflagrated with the charcoal and fused, carbonic acid escaping, $KO,IO_5 + 3C = KI + 3CO_2$.

*Officinal Characters.*—In colorless, 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 color on the addition of a minute quantity of solution of chlorine. It gives a crystalline precipitate with tartaric acid (showing that it is composed of iodine and potassium).

*Properties.*—Its taste is acrid saline, somewhat similar to common salt. It fuses at a red heat, and at a very high temperature volatilizes unchanged. It decrepitates when heated. Its aqueous solution dissolves iodine. Besides the starch test mentioned above, its character as an iodide may also be recognized by the following tests: A solution of corrosive sublimate occasions a vermilion-red precipitate (*red iodide of mercury*) soluble in excess of either reagent. A solution of acetate of lead produces a yellow precipitate (*iodide of lead*). Neutral nitrate of mercury or calomel occasions the formation of *green iodide of mercury.* When oil of vitriol and heat are applied to iodide of potassium a violet-colored vapor is evolved.

*Composition.*—This salt consists, as its name indicates, of iodine and potassium.

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Iodine | 127 | 76.50 |
| 1 Potassium | 39 | 23.50 |
| Iodide of Potassium | 166 | 100.00 |

The crystals often contain interstitial water, but no water of crystallization.

*Tests.*—The addition of tartaric acid and mucilage of starch to its watery solution does not develop a blue color. Solution of nitrate of silver added in excess forms a yellowish-white precipitate (AgI), 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 solution of lime.

The tests show the absence of iodates, chlorides, and carbonates. The addition of tartaric acid to a solution of iodide of potassium liberates, by the decomposition of water, hydriodic acid, which has no action on starch. It also sets free iodic acid, if iodates are present, which, reacting on the hydriodic acid, liberates iodine and develops the blue color. $IO_5+5HI=5HO+6I$. Iodide of potassium also sometimes contains sulphates and bromides. Sulphates may be detected by chloride of barium, which occasions a white precipitate, insoluble in nitric acid. Bromides may be detected as follows: Add to a solution of the suspected iodide a solution of one part of sulphate of copper and two and a quarter parts of sulphate of iron: the whole of the iodine is thrown down in the form of iodide of copper ($Cu_2I$), but the bromine, as well as any chlorine which may be present, remains in solution. The bromine is then to be detected in the mixed liquid by adding a solution of chlorine (or hydrochloric acid and chlorinated lime) and then some ether: the chlorine disengages the bromine, which dissolves in the ether, to which it communicates a hyacinth-red color. Iodide of potassium readily becomes contaminated with *metallic matter* derived from the vessels in which it is crystallized. I have procured samples of it, in octahedral crystals, which contain traces of lead and tin, derived, I presume, from the metallic vessels in which the salt had been prepared. Such impurities may easily be detected with sulphuretted hydrogen. [" Bichloride of platinum colors its solution reddish-brown without causing a precipitate, chloride of barium affects it but slightly, and sulphate of iron occasions no change. Ten grains of iodide of potassium yield, with an excess of nitrate of silver, a yellow precipitate, which, when washed and dried, weighs fourteen and one-tenth grains. If this precipitate be treated with ammonia, and nitric acid be added to the clear liquid, no precipitate will be produced. Exposed to a dull-red heat, iodide of potassium melts, and on cooling concretes into a crystalline pearly mass, without loss of weight; but, at a full-red heat, it is slowly volatilized without decomposition." U. S. P. If any carbonate of potash be present, the sulphate of iron throws down a precipitate of the carbonate of iron. The U. S. P. also states that if tartaric acid "is freely added to a strong solution, the supernatant liquid, if mixed with solution of starch, becomes first purple and finally blue;" this does happen when the iodide of potassium of the shops is employed, which almost always contains a trace of the iodate. Hydriodic acid is so unstable a substance, that it decomposes spontaneously when exposed to the atmosphere, so it seems probable that even if the iodide of potassium were perfectly pure, yet in a little time the purple and finally blue color would be produced. It often takes some little time for this test to react on ordinary iodide of potassium.—W.]

*Physiological Effects.*—Both the physiological effects and therapeutical uses of iodide of potassium show that its operation is analogous to that of iodine.

The *local action* of iodide of potassium is that of an irritant. When taken internally in large doses, it not unfrequently occasions nausea, vomiting, pain, and heat of stomach, and purging, but it is much less energetic in its action than free iodine; and, therefore, may be given in larger doses, and continued for a long period, without evincing the same tendency to produce disorder of the stomach and intestinal canal.

Iodide of potassium *becomes absorbed* and is carried out of the system by the different secretions, in which, as well as in the blood, it may be easily detected. Moreover, it deserves especial notice that it has been found in the urine several days after it has been swallowed. To detect it in the urine, add first starch to the cold secretion, then a few drops of nitric acid (or solution of chlorine), and the blue iodide of starch will be formed if an iodide be present.

The *remote* or *constitutional effects* of iodide of potassium are very analogous to those of iodine. Diuresis is a common consequence of its use. Relaxation of the bowels is not unfrequent. Occasionally ptyalism has been observed. Dr. Wallace mentions that irritation of the throat is produced by it. Increased secretion from, and pain of, the mucous membrane lining the nasal passages have been observed. I have repeatedly remarked, that the pocket-handkerchiefs used by patients who are taking this salt acquire a distinct odor of iodine.

Great discrepancy exists in the statements of authors as to the effects of given doses of iodide of potassium. "The average dose of this medicine," says Dr. Williams, "is eight grains; carried beyond that quantity it purges; and even limited to that quantity, it requires some management to obviate nausea." In two cases mentioned by Dr. Wallace, a drachm of this salt taken in divided doses causes vomiting, colicky pains, and slight diarrhœa. Mr. Erichsen has reported a case of extreme irritation of the nasal, conjunctival, and bronchial mucous membrane produced by five grains; and Dr. Laurie has known seven and a half grains, given in three doses, cause serious symptoms; and in two cases he thinks death was the consequence of small doses. On the other hand, Dr. Elliotson gave three quarters of an ounce daily (in doses of a quarter of an ounce), for many weeks without inconvenience; and Dr. Buchanan states that half an ounce may be given at a dose without producing pain of the stomach or bowels, purging, or any hurtful effect. Furthermore, both physicians vouch for the purity of the salt employed. Payen gave sixty grains daily, and Ricord one hundred and thirty-five, without any serious effects. It is difficult to explain such discrepancies. But I cannot help thinking that peculiarities of constitution and morbid conditions of system (especially affections of the stomach) are principally concerned in modifying the tolerance of this salt.

*Therapeutic Uses.*—Having so fully detailed the uses of iodine, it is unnecessary to notice at any length those of iodide of potassium, since they are for the most part identical. Thus it has been employed in bronchocele, scrofula, in chronic diseases, accompanied with induration and enlargement of various organs, in leucorrhœa, secondary syphilis, periostitis, articular rheumatism, and dropsies. As a remedy for the hard periosteal node brought on by syphilis, it was first employed by Dr. Williams, who obtained with it uniform success. At the end of from five to ten days its mitigating effects are felt; the pains are relieved, the node begins to subside, and in the majority of cases disappears altogether. In the tubercular forms of venereal eruptions, Dr. Williams found it beneficial. Syphilitic ulcers of the throat rapidly heal under its use. In Dr. Wallace's lectures are some valuable observations on the use of iodide of potassium in venereal diseases. In chronic rheumatism accompanied with alteration in the condition of the textures of the joint, it is, in some cases, remarkably successful. Iodide of potassium has been administered in ascites by Dr. Martin Solon, and subsequently by M. Thirion, of Namur. The medicine was given in two-grain doses several times a day, and its use continued for many weeks together. In one instance, eight hundred grains were taken in three months, effecting a permanent cure. Mr. Rodwell speaks of its beneficial effects in the treatment of housemaids' knee. A strong solution constantly applied (rest being enjoined) has, in the experience of Mr. Rodwell, caused the swelling to subside more rapidly than any other plan of treatment. One of the most important uses of this salt is in the treatment of chronic poisoning by lead and mercury. According to M. Melsens, the iodide of potassium dissolves the insoluble compounds formed in the body with albumen and fibrin, in chronic poisoning with lead and mercury. These combinations being dissolved by the iodide are excreted by the kidneys and other secretory organs, and may be detected in the urine, &c. Dr. Parkes relates a case of lead poisoning in which the metal was detected in the urine immediately after the administration of iodide of potassium. Dr. Budd, who has given a full translation of the memoir by M. Melsens, states that he has observed instances in which mercurial salivation has come on during the use of iodide of potassium; the mercury which had been previously fixed in the body having been liberated under the solvent influence of the iodide of potassium; the mercury thus set free having been the cause of the ptyalism. The excessive use of iodide of potassium has been frequently attended with serious effects. Dr. Flagg, of Charleston, U. S., has observed the following pathological effects of the long-continued use of the compound: tumefaction of the gums, salivation, epigastric pain, diarrhœa, diuresis, coryza, eczema, purpura, conjunctivitis, augmented secretion of the genital mucous membranes, and cerebral excitement.

*Administration.*—Iodide of potassium may be employed alone or in conjunction with iodine, forming what is called ioduretted iodide of potassium. If it occasions nausea, this effect may often be prevented by the addition of aromatic spirit of ammonia. It is usually given in doses of from three to ten grains.

*Pharmaceutic Uses.*—Iodide of potassium is contained in tincture of iodine [Compound Tincture, U. S.], liniment of iodine, and compound ointment of iodine, in all of which its principal use is to increase the solubility of the iodine. It is also employed in the following preparations:—

UNGUENTUM POTASSII IODIDI (U. S.), *Ointment of Iodide of Potassium.*—Take of iodide of potassium, sixty-four grains; distilled water, one fluidrachm; prepared lard, one ounce. Dissolve the iodide of potassium in the water, and mix thoroughly with the lard. [" Take of iodide of potassium, in fine powder, sixty grains; water, a fluidrachm; lard, a troyounce. Dissolve the iodide of potassium in the water, and mix the solution with the lard." U. S.]

In the preparation of this ointment two advantages are gained by dissolving the iodide in water previous to its admixture with the lard: it obviates the inconvenience of the small particles of iodide irritating the skin, and it facilitates the absorption of the salt. The weight of water required is somewhat less than that of the iodide employed. By keeping, this ointment is apt to acquire a yellowish color, obviously from a little iodine being set free. In some cases this may depend on the iodine being contaminated with a little iodate of potash. It usually, however, arises from the action of the fatty acid (contained in the rancid fat) on the potassium of the iodide. A. W. Krieger states that a few drops of liq. potassæ added to this ointment will preserve from four to eight ounces for months from the yellow discoloration, or restore the white in the ointment that has become yellow. When pure and fresh made, this ointment does not stain the skin like the ointment of iodine.

SOLUTION OF IODIDE OF POTASSIUM. (Appendix B. II.)—Take of iodide of potassium, one ounce; distilled water, a sufficiency. Dissolve the iodide of potassium in eight fluidounces of water, and by the addition of distilled water, make up the bulk of the solution to ten fluidounces.

Used as a test for the purity of the red iodide of mercury, which should be entirely soluble in it, also as a solvent for iodine in determining its oxidizing power, and as an indication of lead in litharge, and the acetate and carbonate of lead. Iodide of potassium is also used in still weaker solutions for determining the strength of chlorinated lime, solution of chlorine, and solution of chlorinated soda.

SOLUTION OF IODATE OF POTASH. (Appendix B. II.) (Iodate of Potash $=KO,IO_5$.)

Take of iodine, fifty grains; chlorate of potash, fifty grains; nitric acid, five minims; distilled water, ten fluidounces 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 color 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.

The iodine here replaces the chlorine of the chlorate of potash $KO,ClO_5+I=KO,IO_5+Cl$. The nitric acid is merely added to facilitate the action, and is all expelled, with the chlorine, by a heat of 212°. If a lower temperature be employed, the product is apt to contain some nitrate of potash, mixed with biniodate.

The solution of iodate of potash is used as a test for sulphurous acid in acetic acid, iodine being liberated, $KO,IO_5+5SO_2=KO,SO_3+4SO_3+I$.

**Potassii Bromidum** [U. S.], *Bromide of Potassium.* $KBr=119$.

*Preparation.*—Take of solution of potash, two pints; bromine, four fluidounces, 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.

The action here is exactly parallel to that which occurs in the production of iodide of potassium. The bromine, reacting upon the potash, forms bromide of potassium and bromate of potash, $6KO+6Br=5KBr+KO,BrO_5$; this latter is deoxodized by the charcoal into bromide of potassium, $KO,BrO_5+3C=KBr+3CO_2$. ["Take of bromine, two troyounces; iron, in the form of filings, a troyounce; pure carbonate of potassa, two troyounces and sixty grains; distilled water, four pints. Add the iron, and afterwards the bromine, to a pint and a half of the distilled water, stirring the mixture frequently with a glass rod for half an hour. Apply a gentle heat, and when the liquid assumes a greenish color, add gradually the pure carbonate of potassa, previously dissolved in a pint and a half of the distilled water, until it ceases to produce a precipitate. Continue the heat for half an hour, and then filter. Wash the precipitate with the remainder of the distilled water boiling hot, and again filter. Mix the filtered liquids, and evaporate that crystals may form. Lastly, pour off the mother water, and, having dried the crystals on bibulous paper, keep them in a well-stopped bottle." U. S. P. The first step in this process results in the formation of a solution of the bromide of iron. This is then decomposed by the action of the carbonate of potash—the bromide of potassium being left in solution and the carbonate of iron precipitated. Thus $KO,CO_2+FeBr=FeO,CO_2+KBr$.—W.]

*Officinal Characters.*—In white transparent cubical crystals, with no odor, but a pungent saline taste, readily soluble in water, less soluble in spirit. Its watery solution gives a white crystalline precipitate with tartaric acid ($HO,KO,\bar{T}$). When its solution in water is mixed with a little chlorine, ether agitated with it, on rising to the surface, exhibits a red color (Br). ["Ten grains of this salt require, for complete precipitation, fourteen and three-tenths grains of nitrate of silver; and the precipitate formed has a yellowish color." U. S. P.]

*Properties.*—It is permanent in the air, and is neutral to test papers. When heated it decrepitates, and at a red heat fuses without suffering decomposition.

*Composition.*—It consists of bromine and potassium in the following proportions:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Bromine | 80 | 67.22 |
| 1 | Potassium | 39 | 32.78 |
| | Bromide of Potassium | 119 | 100.00 |

The crystals may contain water lodged mechanically between their plates, but no water of crystallization.

*Tests.*—Ten grains require for complete decomposition eighty-four measures of the volumetric solution of nitrate of silver. A solution of this salt mixed with mucilage of starch and a drop of an aqueous solution of bromine, does not exhibit any blue color.

The latter test shows the absence of iodine. If more nitrate of silver than the quantity above stated be required, the presence of a chloride may be suspected. The method employed by Rose for detecting minute quantities of the chlorides in bromides, is the following: If pure bromide of potassium, mixed with an excess of bichromate of potash, be distilled with concentrated sulphuric acid in a tubulated retort, to which is adapted a receiver containing excess of solution of caustic ammonia, pure bromine distils over, and the ammoniacal liquor, which contains only hydrobromate of ammonia, remains perfectly colorless. But if the bromide contained a chloride, both bromine and the bichromate of the chloride of chromium distil over ($2CrO_3,CrCl_3$), or chloro-chromic acid ($CrO_2Cl$), and the ammoniacal liquor becomes yellow, owing to the presence of some chromate of ammonia: chromic acid may be detected in the solution by the usual tests. A solution of this salt should also give no precipitate with chloride of barium, thus showing the absence of carbonates and sulphates.

*Physiological Effects.*—Under the continued use of bromide of potassium, enlargements of the spleen and liver, and swellings of the lymphatic glands, have disappeared; so that it appears to agree with iodine, mercury, and the alkalies, in being liquefacient and resolvent. Dr. Williams thought that it possessed "unusual, if not specific powers in the cure of diseases of the spleen." I gave it in doses of five grains to a boy of about fourteen years old, affected with enlarged spleen, consequent on intermittent fever, for several weeks; but the boy derived but little benefit from the treatment. In most cases it acts as a diuretic. M. Huette states that this compound posseses narcotic and anæsthetic powers of a very peculiar and energetic kind, especially when taken in large doses for several days. The effects are dull headache, drowsiness, stupor, and delirium, general loss of sensibility, and loss of power in the lower extremities. These symptoms, however, rapidly subside under the use of purgatives, when the medicine is discontinued. But, even in small doses, it rapidly and completely annihilates, for a time, the sensibility of the pharynx and velum palati, to such an extent that those parts may be tickled without exciting the least effort at deglutition. It also diminishes excitement, and produces general torpor of the generative organs.

*Therapeutics.*—In 1828, Pourché employed this salt with benefit in the treatment of bronchocele and scrofula; it was taken internally, and applied externally in the form of ointment. In 1836 it was introduced into the London Pharmacopœia, in consequence of the great success obtained from the use of it in a case of enlarged spleen under the care of Dr. Williams. In this, and in three other successful cases of the same disease, it was used internally only. It did not, however, realize the expectations that had been formed of its powers, and in 1851 it was omitted from the Pharmacopœia. It is now again made officinal chiefly on account of its *sedative effects on the generative organs.* M. Thielman and Dr. Pfeiffer used it successfully, in doses of thirty grains, in painful erections and neuralgia of the neck of the bladder. In this country also it has been found to relieve nymphomania, priapism, certain forms of menorrhagia, and convulsive diseases dependent on uterine irritation. (GARROD.) [It would probably be useful in reflex paraplegia arising from the same cause.—ED.] Its peculiar *anæsthetic* effect on the laryngo-pharyngeal region greatly facilitates operations on that part.

[Bromide of potassium, given in large doses, exerts a wonderful power in subduing neuralgic pains, even at times when they are apparently dependent upon structural change of the spinal cord. I have seen cases yield immediately to it when opium and the whole list of narcotics had been exhibited in vain. It also seems to have a marked influence on epilepsy. To obtain these effects it must be given in doses of from ten to twenty grains—forty to sixty grains being exhibited in the twenty-four hours.—W.]

*Administration.*—It is exhibited in the form of a pill or solution, in doses of from four to ten grains three times a day.

**Ferrocyanide of Potassium**, *Yellow Prussiate of Potash.* (Appendix A.) $K_2FeCy_3+3HO=211.$

[**Potasii Ferrocyanidum**, Mat. Med. List, U. S. P. Potasii Ferrocyanuretum, U. S. Ph., 1850.]

*Prepared* by melting refuse animal matters, such as horns, hoofs, &c., with carbonate of potash in an iron pot until fetid vapors cease to be given off. The cool mass is lixiviated with water, filtered, and the salt separated and purified by crystallization.

*Properties.*—This salt crystallizes in large beautiful, lemon-yellow, transparent, permanent, inodorous, tabular crystals, whose form is the octohedron with a square base, usually more or less truncated. They have a peculiar toughness or flexibility somewhat analogous to selenite. Their sp. gr. is 1.832. They have a sweetish, yet somewhat bitter, saline taste. They are insoluble in alcohol, but dissolve readily in both hot and cold water. When moderately heated they evolve about 12 per cent. of water of crystallization, and are converted into a white powder (anhydrous ferrocyanide of potassium). When heated to redness in contact with air, the cyanide of iron of the salt is decomposed, and the residuum consists of cyanide of potassium, oxide of iron, and carbon. By a more continued heat hydrocyanic acid and ammonia are evolved, while the residue consists of peroxide of iron and carbonate of potash. Heated with dilute sulphuric acid, hydrocyanic acid is evolved, and a white precipitate formed, which, by exposure to the air, becomes blue. Sulphuretted hydrogen, the sulphurets, alkalies, and tincture of galls, give no precipitate with a solution of this salt; showing that the iron which it contains is in some remarkable state of combination. If a solution of the ferrocyanide of potassium be boiled with red oxide of mercury, percyanide of mercury is formed in the solution, and a mixture of peroxide and cyanide of iron is precipitated. The presence of potassium is best shown by calcining the salt, and detecting potash by the usual tests in the residuum.

*Composition.*—Crystallized ferrocyanide of potassium has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 3 | Cyanogen | 78 | 36.620 |
| 1 | Iron | 28 | 13.145 |
| 2 | Potassium | 78 | 37.560 |
| 3 | Water | 27 | 12.675 |
| | Ferrocyanide of Potassium | 211 | 100.000 |

*Pharmaceutic Use.*—Used in the formation of dilute hydrocyanic acid.

Solution of Ferrocyanide of Potassium. (Appendix B. II.)—Take of ferrocyanide of potassium, in crystals, a quarter of an ounce; distilled water, five fluidounces. Dissolve, and keep the solution in a stoppered bottle.

*Used* as a test for various metallic oxides, especially of the peroxide of iron. It throws down with the protosalts of that metal, a white precipitate (*ferrocyanide of potassium and iron*), which by exposure to the air becomes blue (*basic Prussian blue*). With the persalts of iron it forms a deep blue (*Prussian blue*); with the salts of copper a deep brown (*ferrocyanide of copper*); and with those of lead a white precipitate (*ferrocyanide of lead*).

**Ferridcyanide of Potassium,** *Red Prussiate of Potash.* (Appendix B. I.) $K_3,Fe_2Cy_6=329$.

*Prepared* by passing chlorine through a solution of the ferrocyanide, which abstracts one-fourth of the potassium $2(K_2FeCy_3)+Cl=KCl+K_3Fe_2Cy_6$.

*Properties.*—The crystals are known by their ruby-red color; they are slightly efflorescent. They are soluble in about four parts of water, but are insoluble in alcohol. They burn with brilliant scintillations, and when heated in close vessels give off cyanogen and nitrogen, and leave ferrocyanide of potassium and carburet of iron. They give a copious dark blue precipitate with the protosalts of iron.

*Test.*—Its solution in water gives no precipitate with persulphate of iron (thus distinguishing it from the ferrocyanide, and also showing its freedom from any traces of the latter left unchanged).

SOLUTION OF FERRIDCYANIDE OF POTASSIUM. (Appendix B. II.)—Take of ferridcyanide of potassium, in crystals, a quarter of an ounce; distilled water five fluidounces. Dissolve, and keep the solution in a stoppered bottle.

*Used* to indicate the perfect peroxidation of solution of persulphate of iron, citrate of iron and ammonia, and peroxide of iron, also to detect that the iron exists as protoxide in sulphate of iron, iodide of iron and saccharated carbonate of iron.

**Nitrate of Potash of Commerce,** *Nitre, Saltpetre.* (Appendix A.)

*Natural History.*—In the East Indies, Egypt, Persia, Spain, and other parts of the world, but especially in warm countries, large quantities of nitre are found in the soil. It would appear to be formed below, and to be brought to the surface of the soil by efflorescence. It is found either disseminated throughout the soil, or as an incrustation upon the surface. It is probable that it is formed by the oxidation of ammonia (which is a constant constituent of the atmosphere); the products being nitric acid and water: $NH_3+8O=3HO+NO_5$. The simultaneous oxidation of hydrogen is necessary to effect the union of oxygen with nitrogen. The cause of this is, that the acid and water unite, so that water may be said to be a condition of *nitrification*. Azotized animal or vegetable matter is no further necessary than as yielding ammonia. It has also been found in various plants.

*Production.*—The nitrate of potash employed in this country is obtained by the purification of the native nitre of India; but in some parts of the world it is procured by the purification of what is commonly called artificial nitre; that is, nitre obtained by cultivation. With few exceptions, the localities which naturally afford nitre are within the tropics; while the production of this salt in the temperate zones is effected chiefly by the intervention of man. In India the nitre is prepared from saline efflorescences scraped off old mud heaps, and buildings, &c. These are dissolved and filtered through a mud filter at the lower part of which is a layer of wood ashes, the carbonate of potash of which converts any nitrate of lime or magnesia into nitrate of potash. The liquor is then evaporated and crystallized, yielding a nitre containing from 45 to 70 per cent. of nitrate of potash. The purer and cleaner looking kinds are called *East India refined.* The loss which it suffers in refining—or, in other words, the impurities which it contains—are technically designated *refraction.* In the artificial production of nitre, animal refuse, and especially dung, urine, &c., are mixed with cinders, lime, marl, &c., and exposed in heaps for two or three years. The mass is lixiviated, treated with wood-ashes, and the liquors filtered off and crystallized.

**Potassæ Nitras,** *Nitrate of Potash* [Mat. Med. List, U. S. P.].
$KO,NO_5=101$.

*Preparation.*—Take of nitrate of potash of commerce four pounds; distilled water five pints, or a sufficiency. Having dissolved the commercial nitrate of potash in two pints of the water at a boiling temperature, let the heat be withdrawn, and the solution stirred constantly as it cools, in order that the salt may be obtained in minute granular crystals. Separate as much as possible of the uncrystallized solution by decantation and draining, and wash the crystals in a glass or earthenware percolator, with the remainder of the water, until the liquid which passes through ceases to give a precipitate on being dropped into a solution of nitrate of silver. The contents of the percolator are now to be extracted and dried in an oven.

*Officinal Characters.*—In white opaque masses or fragments of opaque striated six-sided prisms, colorless, of a peculiar cool saline taste. Thrown on the fire it deflagrates; warmed in a test-tube with sulphuric acid and copper filings it evolves ruddy fumes. Its solution acidulated with hydrochloric acid gives a yellow precipitate with bichloride of platinum.

*Properties.*—The crystals frequently have a portion of the mother liquid mechanically lodged in spaces in the crystals: hence dry nitre will sometimes yield a moist powder, in consequence of the escape of the liquor in the process of pulverization. When heated, this water is expelled, the nitrate of potash fuses, and when cast in moulds forms the *nitrum tabulatum;* or, from its having formerly been cast into small balls, and stained of a plum color, *sal prunella.* At a strong red heat it is decomposed, with the evolution of oxygen and the formation of hyponitrite of potash, which, when rubbed to powder and mixed with sulphuric acid, emits red fumes (composed of nitrous acid and binoxide of nitrogen). One hundred parts of water at 32° dissolve 13.32 parts of this salt, but at 77° they dissolve 38 parts; and at 212°, they dissolve 246 parts. During the solution cold is generated. In alcohol nitre is insoluble. ["If one hundred grains of nitrate of potassa, previously dried, be mixed with sixty grains of officinal sulphuric acid, and the mixture be kept at a red heat until the salt ceases to lose weight, the residue will weigh eighty-six grains." U. S.]

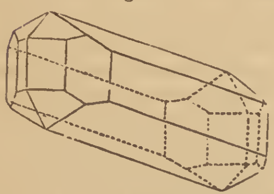
*Composition.*—Nitrate of potash has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Potash | 47 | 46.535 |
| 1 Nitric Acid | 54 | 53.465 |
| Nitrate of Potash | 101 | 100.000 |

*Test.*—Its solution is not affected by chloride of barium or nitrate of silver (showing its freedom from sulphates and chlorides).

Nitrate of potash, when pure, undergoes no change by exposure to the air; but if nitrate of soda be present, this absorbs moisture. The presence of nitrate of soda is detected by the yellow color which this salt communicates to flame; whereas that produced by potash only is violet. The crystalline form of nitrate of soda, as obtained on a microscope-slide, is a rhombic plate, that of nitrate of potash a slender fluted prism.

Fig. 11.



*Crystal of Nitrate of Potash.*

*Physiological Effects.*—In *moderate doses,* nitre acts as a refrigerant, diuretic, and diaphoretic. Its refrigerant properties are best seen when the body is preternaturally hot, as in febrile disorders. Mr. Alexander found, in most of his experiments, that it had a powerful influence over the vascular system. Thus, on several occasions, a drachm of this salt, within a few minutes, reduced the frequency of the pulse from 70 to 60 beats. Diuresis is another effect. As the nitre can be detected in the urine, its operation as a diuretic depends, perhaps, on the local stimulus which is communicated to the renal vessels while the salt is passing through them. Full doses frequently produce pain in the stomach. As a diaphoretic, it is usually given in combination with tartarated antimony. Various effects on the blood have been ascribed to nitre. Zimmerman has suggested, that in thoracic inflammation nitre promotes absorption of the effused products by preventing the coagulation of the fibrine, and rendering the effused plasma more soluble, and thereby more readily absorbable. Another effect which this, in common with other saline substances, produces on the blood, is that of diminishing the adhesiveness of the blood-corpuscles for each other. A third chemical effect is the change which it occasions in the color of the blood. If it be mixed with dark-colored venous blood out of the body, it communicates to it a florid or arterial hue. Now as this salt, when taken into the stomach, becomes absorbed, it is not unreasonable to suppose that while mixed with the circulating blood it might have an analogous effect. Dr. Stevens asserts, that in the last stage of fever, when the blood is black, it has this effect. Moreover, he tells us that in a case which occurred in America, where a person swallowed an ounce of nitre by mistake, in place of Glauber's salts, the blood when drawn from a vein was completely florid, and remained as fluid as if the nitre had been added to it out of the body.

In *very large doses* (such, for example, as one ounce or more), nitre has in several instances caused death; but the effects of it are not uniform, since, in other cases, this quantity has not appeared to have any very remarkable or obvious effect. It is probable that the operation of nitre is influenced by the quantity of aqueous liquid in which the salt is dissolved, and that the more we dilute, the less powerfully does it act as a poison. In no other way can we reconcile the discrepant statements in regard to the effects produced by an ounce of nitre.

*Therapeutics.*—It follows, from what has been stated in regard to the physiological effects of nitre, that the use of this substance is indicated when we wish to diminish preternatural heat, and to reduce the force and frequency of the pulse, as in febrile disorders, inflammatory affections (except, perhaps, those of the stomach, bowels, kidneys, and bladder), and hemorrhages (especially hæmoptysis).

In acute bronchitis it assists tartarated antimony in relieving congestion of the bronchial mucous membrane.

In acute rheumatism, large doses of nitre have been administered, apparently, in many cases, with great success. They were first employed about the middle of the last century by Dr. Brocklesby, who gave this salt to the extent of an ounce or more, dissolved in three, four, or five quarts of thin gruel, in twenty-four hours. Within three or four days the malady was much relieved, or even cured, under great sweating. Until the last ten or twelve years, this method of treatment had for the most part fallen into disuse. It has, however, lately been revived, principally by some French physicians. According to Dr. Henry Bennet, the revival is due to Gendrin. But Martin Solon, Stœber, Forget, and others, have borne evidence to the success of the practice. Bouchardat, however, observes that this method of treatment had been repeatedly tried in the practice of the Hôtel-Dieu; but the trials of it were not long continued. Aran states that the mean quantity employed in twenty-four hours was about one ounce. Bennet states that it should be given in a large quantity of weak lemonade or barley water, properly sweetened, in the proportion of about half an ounce of nitre to a pint and a half of gruel. Ill effects from its use are stated to be rare. In acute rheumatism, however, it sometimes fails to give any relief: in chronic rheumatism it is useless. According to Dr. Basham, nitrate of potash acts in cases of rheumatism by diminishing any excess of fibrin and by retarding or suspending its separation from the blood. He recommends one, two, or three ounces, largely diluted with water, to be given in the twenty-four hours. Dr. Rowland, of Charing Cross Hospital, states that the average duration of the disease after the commencement of the treatment by nitrate of potash was eight days. In some, relief was afforded almost immediately, in others later; in all, the occurrence of dangerous complications was less frequent. In no instance was there threatening of valvular disease. The dose never exceeded half an ounce; it was sometimes limited to 180 grains daily. By these smaller doses there is less risk of gastric or renal irritation than where ounce doses are given. No injurious consequences were observed in Dr. Rowland's cases. [I have often tried it, but believe it to be far less efficacious than bicarbonate of potash.—Ed.] It is not often used as a diuretic, because its activity in this respect is not very great; but it is adapted to those cases which are accompanied with arterial excitement. Dr. Young has successfully employed nitrate of potash in the treatment of incontinence of urine in children. It acts, he says, as a stimulant to the bladder or its sphincter. In sore-throat it is mixed with white sugar, and gradually swallowed. A mixture of nitre and powdered gum has long been a favorite remedy for diminishing the scalding of gonorrhœa. Nitre, in large doses, has been employed in the treatment of scurvy, and with considerable success, according to the statement of Mr. Cameron. This accords with the views of Dr. Garrod, who attributes the anti-scorbutic properties of lemon-juice to the potash salts contained in it. Some experiments have more recently been made on the relative value of nitrate of potash, citric acid, and lime-juice, as remedial agents in sea-scurvy; and the results have not been favorable to the use of nitrate of potash. Dr. Bryson, the Director-General of the Medical Department of the Navy, has published an account of these experiments, which were instituted upon instructions given to the surgeons of convict ships. He says: "There seems to be little reason to doubt, judging from the results in these trials, and from others, which were not so well conducted, that the alkaline salt (nitre) has not the anti-scorbutic properties which have been ascribed to it." Nitre was one of the salts employed by Dr. Stevens in the so-called saline treatment of fever, cholera and other malignant diseases, to increase the amount of saline matter in the blood. Nitre is rarely employed as an *external agent*, except as a means of producing cold. Thus, five ounces of nitrate of potash, with five ounces of sal ammoniac, dissolved in sixteen ounces of water, reduce the temperature 40° F.; that is, from 50° to 10°, according to Mr. Walker. Hence, therefore, we sometimes employ this mixture, placed in a bladder, as an external application.

*Administration.*—Nitrate of potash may be given in doses of from ten to thirty grains, in the form of powder, mixed with sugar, or in solution. Barley water is a good vehicle, and should not contain more than eight grains in the ounce. If administered as a refrigerant, it should be dissolved in water and immediately swallowed, in order that the coldness of the solution may assist the action of the salt. If it is employed as a diuretic, we ought to give mild liquids plentifully, and keep the skin cool.

*Pharmaceutic Use.*—It is used as the source of nitric acid.

### [**Potassæ Bichromas,** Mat. Med. List, U. S. P.]

### **Bichromate of Potash.** (Appendix A.) $KO,2CrO_3=147.5$.

*Properties.*—It forms orange-red anhydrous prismatic crystals, soluble in ten parts of water, insoluble in alcohol.

*Tests.*—The solution in water gives, with chloride of barium a yellowish-white, and with nitrate of silver an orange precipitate, both of which are entirely soluble in dilute nitric acid.

*Used* as a source of oxygen, as in the preparation of valerianate of soda.

[*Officinal Characters.*—"In orange-red, anhydrous, tabular crystals, soluble in ten parts of cold, and in much less of boiling water, forming a solution having an acid reaction. Exposed to a red heat it evolves oxygen; neutral chromate of potassa and sesquioxide of chromium being left. When the residue is acted on by water, the sesquioxide remains undissolved." U. S.]

Volumetric Solution of Bichromate of Potash. (Appendix B. III.)—Take of pure bichromate of potash, 129 grains; distilled water, one pint. Dissolve. The quantity of this solution which fills the volumetric tube to 0 contains $\frac{1}{10}$ of an equivalent, in grains, of the bichromate of potash, and, when added to a solution of a protosalt of iron acidulated with hydrochloric acid, is capable of converting $\frac{1}{10}$ of six equivalents of iron (16.8 grains) from the state of a protosalt to that of a persalt. In practising this volumetric process, it is known that the whole of the protosalt has been converted into a persalt when a minute drop of the solution, placed in contact with a drop of the solution of ferridcyanide of potassium on a white plate, ceases to strike with it a blue color.

**Potassæ Permanganas** [Mat. Med. List, U. S. P.], *Permanganate of Potash.* $KO,Mn_2O_7=158$.

*Preparation.*—Take of caustic potash, five ounces; black oxide of manganese, in fine powder, four ounces; chlorate of potash, three ounces and a half; dilute sulphuric acid, a sufficiency; distilled water, two pints and a half. Reduce the chlorate of potash to fine powder, and mix it with the oxide of manganese; put the mixture into a porcelain basin, and add to it the caustic potash, previously dissolved in four ounces of the water. Evaporate to dryness on a sand bath, stirring diligently to prevent spirting. Pulverize the mass, put it into a covered Hessian or Cornish crucible, and expose it to a dull red heat for an hour, or till it has assumed the condition of a semi-fused mass. Let it cool, pulverize it, and boil with a pint and a half of the water. Let the insoluble matter subside, decant the fluid, boil again with half a pint of the water, again decant, neutralize the united liquors accurately with the dilute sulphuric acid; and evaporate till the 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.

By the action of heat the chlorate of potash is resolved into oxygen and chloride of potassium. The oxygen unites with oxide of manganese to form manganic acid ($MnO_3$), which combines with the potash, $6MnO_2 + 6KO + KO,ClO_5 = 6(KO,MnO_3) + KCl$. On dissolving this in water, the manganate of potash is decomposed into permanganate, oxide of manganese and caustic potash, $6(KO,MnO_3) + 4HO = 2(KO,Mn_2O_7) + 2MnO_2 + 4(KO,HO)$. The alkaline solution is separated from the insoluble oxide, the free potash neutralized by sulphuric acid, and the permanganate crystallized out. If excess of sulphuric acid be used, the permanganate is decomposed. The solutions must be carefully preserved from contact with organic or other easily oxidizable substances (as filter paper, &c.) and the crystals from heat, both of which readily decompose it, abstracting oxygen, and leaving oxide of manganese and caustic potash, $KO,Mn_2O_7 = 2MnO_2 + KO + O_3$.

*Officinal Characters.*—Dark purple slender prismatic crystals, inodorous, with a sweet astringent taste, soluble in water. A single small crystal suffices to form with an ounce of water a rich purple solution, which, when mixed with a little 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, recognized by its alkaline reaction, and by its giving, when acidulated with hydrochloric acid, a yellow precipitate with bichloride of platinum. ["In needle-shaped crystals, of a deep purple color. It is soluble in sixteen parts of cold water, with the exception of a scanty brown matter. A very dilute solution has a rose color, free from green tinge, and is instantly decolorized by the officinal solution of arsenite of potassa, with the formation of a brown precipitate." U. S.]

*Tests.*—Entirely soluble in cold water. Five grains dissolved in water require for complete decoloration a solution of forty-four grains of granulated sulphate of iron acidulated with two fluidrachms of dilute sulphuric acid (persulphate of iron, sulphate of manganese, and sulphate of potash being formed).

Liquor Potassæ Permanganatis, *Solution of Permanganate of Potash.*—Take of permanganate of potash, four grains; distilled water, one fluidounce. Dissolve.

*Uses.*—Used for purposes of deodorizing, through the medium of its oxygen, part of which is retained in feeble combination, peroxide of manganese being formed. This latter, however, is liable to stain linen &c. of a dark-brown color.

[*Therapeutics.*—Permanganate of potash is one of the most agreeable and efficient deodorizers and disinfectants; destroying probably not only organic odors, but poisonous emanations, breaking up the organic compounds by means of the nascent oxygen or ozone, which it liberates at the slightest provocation. With these powers it unites the property of being a powerful stimulant to diseased surfaces, and is consequently a very useful agent as a local application in the treatment of gangrenous wounds, unhealthy ulcers, abscesses, and all affections accompanied with fetid discharges. I have seen a case of mild but obstinate false ozæna, which readily yielded to it in weak solution, after resisting more ordinary applications. It is used as an injection in fetid discharges from the uterus, such as are seen in cancer, &c. In very concentrated solution, or in a solid form, permanganate of potash acts as a very mild caustic and a powerful alterative stimulant. Its powers as an escharotic are, however, too feeble to bring it into use as such; but in mild cases of hospital gangrene, it seems to arrest the disease by its combination of properties. In these cases it should be applied frequently and plentifully, after the slough has been removed by the knife. When given internally permanganate of potash is believed to act by yielding nascent oxygen to the blood, and is given in purulent infection, scarlatina, diphtheria, &c. Cases of indisputable so-called pyæmia, with metastatic abscesses, &c., have certainly recovered whilst taking it, whether *post hoc* or *propter hoc*. The dose is from one to three grains every three hours.

When used as a disinfectant the solution ought not to be too strong, else it stains the hands, linen, &c.; when used as a local application the strength of solution must be proportioned to the effect desired. In ozæna the strength to commence with may be gr. ss to f℥j.—W.]

**Potassæ Acetas** [U. S.], *Acetate of Potash.* $KO,\overline{A}(C_4H_3O_3)=98$.

*Preparation.*—Take of carbonate of potash, twenty ounces; acetic acid, two pints, or a sufficiency. To the acetic acid, placed in a 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.

In this process the acid unites with the potash of the carbonate, and disengages carbonic acid; $KO,CO_2 + \overline{A} = KO,\overline{A} + CO_2$. To obtain a perfectly white mass, pure acetic acid should be used; and to prevent the salt from becoming yellow or brown during the evaporation of the solution, a slight excess of acid should be present. ["Take of acetic acid, a pint; bicarbonate of potassa a sufficient quantity. Add the bicarbonate gradually to the acid until this is saturated; then filter the solution, and evaporate cautiously, by means of a sand bath, until a dry salt remains. Lastly, keep this in a well-stopped bottle." U. S. The U. S. Ph. directs that the bicarbonate be used in order to insure greater purity. In dilute solution acetate of potash ought not to be precipitated by nitrate of silver; but when in concentrated solution, nitrate of silver yields with it a precipitate of the acetate of silver, which is redissolved by water or dilute nitric acid. Bichloride of platinum occasions a yellow crystalline precipitate, composed of bichloride of platinum and chloride of potassium, $PtCl_2KCl$.—W.]

*Officinal Characters.*—White foliaceous satiny masses, very deliquescent, with a watery solution of which tartaric acid causes a crystalline precipitate, sulphuric acid the disengagement of acetic acid, and a dilute solution of perchloride of iron strikes a blood-red color.

*Properties.*—It is odorless, but has a pungent saline taste and a soapy feel. It is very soluble both in water and alcohol; indeed, in water it is one of the most soluble salts we are acquainted with. At 60°, 100 parts of the salt will dissolve in 102 parts of water. A current of carbonic acid precipitates the potash as carbonate, from a strong alcoholic solution of this salt.

*Composition.*—The composition is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Potash | 47 | 47.96 |
| 1 | Acetic acid | 51 | 52.04 |
| | Acetate of Potash | 98 | 100.00 |

*Tests.*—Neutral to test paper, entirely soluble in rectified spirit. Its solution is unaffected by hydrosulphuret of ammonia.

The tests show its freedom from metallic impurities. The presence of chlorides may be detected by nitrate of silver; of sulphates, by chloride of barium.

*Physiological Effects.*—A quarter of an ounce causes purging, which is sometimes accompanied with griping. In smaller doses, more especially if largely diluted, it acts as a diuretic and mild diaphoretic. In its passage to the kidneys it becomes decomposed, and is converted into carbonate of potash, which may be detected in the urine.

*Therapeutics.*—In this country it was until lately rarely employed, except as a diuretic in dropsical complaints. It is a valuable adjunct to other renal excitants. On the continent it is administered in various diseases as an alterative or resolvent; for example, in scirrhus of the pylorus, chlorosis, and visceral and glandular enlargements. It may be employed in the uric acid diathesis, to render the urine alkaline. It is of course improper when phosphatic deposits are observed in the urine.

Acetate of potash has been usefully employed in some diseases of the skin. Dr. Easton, of Glasgow, has related a series of cases of psoriasis, eczema, and lepra, in which he has found the administration of acetate of potash attended with signal benefit. The cure was much more speedy than under the use of any other remedies. The salt was administered alone, and was followed by a great increase in the amount of urine. The smallest quantity passed in these cases was 54 oz. in the twenty-four hours, while the largest was 120 oz. Under the use of this salt, it was found that the urine was not only passed in larger quantity, but that the proportion of the solid constituents was increased. Mr. Hilton has given acetate of potash in doses of thirty grains with benefit in gonorrhœa. The antiphlogistic property of the salt, combined with its alkalizing effect on the urine, produced the good results. Acetate of potash has also been lately used in acute rheumatism in doses of thirty grains every four hours by several London physicians, and it is believed to exercise a very beneficial influence in the treatment of the disease. [It appears to me to be most beneficial in acute rheumatism when attended with synovial effusion, in which its diuretic action is useful, as well as its alkaline effect on the body.—Ed.] [Acetate of potash when given in very large amount seems to act almost as a specific in acute rheumatism. At least *an ounce* of it should be given in the twenty-four hours. Prof. Penrose informs me that he has given the citrate of potash dissolved in lemonade to patients objecting to the nauseous taste of the other salt, in the same dose and with the same effect as the acetate.—W.]

*Administration.*—It is given as a diuretic in doses of from twenty to sixty grains, dissolved in some mild diluent. In larger doses, as a quarter of an ounce, it acts as a purgative.

Solution of Acetate of Potash. (Appendix B. II.)—Take of acetate of potash, half an ounce; distilled water, five fluidounces. Dissolve.

*Used* as a test for tartaric acid, with whose solutions it gives a white crystalline precipitate of acid tartrate of potash.

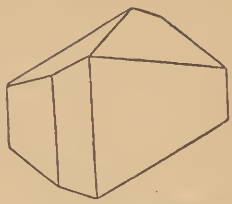
**Potassæ Tartras** [U. S.], *Tartrate of Potash.* $2KO,\overline{T}(C_8H_4O_{10})=226$.

*Preparation.*—Take of acid tartrate of potash, twenty ounces, or a sufficiency; carbonate of potash, nine ounces and a quarter, or a sufficiency; boiling distilled water two pints and a half. Dissolve the carbonate of potash in the water; add by degrees the acid tartrate of potash, and if, after a few minutes' boiling, the liquid is not neutral to test paper, make it so by the careful addition of more of the carbonate or of the acid tartrate. Then filter, concentrate till a pellicle forms on the surface, and set it aside to cool and crystallize. More crystals may be obtained by evaporating and cooling the mother liquor. Drain the crystals, dry them by exposure to the air in a warm place, and preserve them in a stoppered bottle. ["Take of carbonate of potassa, sixteen troyounces; bitartrate of potassa, in fine powder, thirty-six troyounces, or a sufficient quantity; boiling water, eight pints. Dissolve the carbonate of potassa in the water; then gradually add bitartrate of potassa to the solution until it is completely saturated, and boil. Filter the liquid, evaporate until a pellicle forms, and set it aside to crystallize. Lastly, pour off the mother water, and, having dried the crystals on bibulous paper, keep them in a well-stopped bottle." U. S.]

In this process the excess of acid tartrate is saturated by the potash of the carbonate: the carbonic acid escapes.

*Officinal Characters.*—In small colorless four or six-sided prisms. Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas and the odor of burned sugar. Hydrochloric acid added sparingly to its solution causes the separation of a white crystalline precipitate (of acid tartrate).

Fig. 12.



Crystal of Tartrate of Potash.

*Properties.*—To the taste this salt is saline, and somewhat bitter. It deliquesces when exposed to the air, and is neutral to test paper. When heated to redness it is decomposed, leaving as a residue charcoal and carbonate of potash. When heated, the salt evolves the odor of caramel. The tartrate is readily distinguished from the acid tartrate by its deliquescent property, its greater solubility, and its want of acidity. Chloride of calcium precipitates a solution of the tartrate, but not of the acid tartrate of potash.

*Composition.*—The following is the composition of this salt:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 2 | Potash | 94 | 41.593 |
| 1 | Tartaric acid | 132 | 58.407 |
| | Tartrate of Potash | 226 | 100.000 |

The large crystals contain, according to Dr. Thomson, four equivalents of water, $2KO,\bar{T}+4HO$.

*Tests.*—Entirely dissolved by its own weight of water. 113 grains, heated to redness till gases cease to be evolved, leave an alkaline residue, which requires for exact saturation 100 measures of the volumetric solution of oxalic acid.

It may contain excess of acid or of base, either of which is easily recognized; the one by litmus, the other by turmeric paper. The sulphates may be detected by chloride of barium throwing down a white precipitate insoluble in nitric acid. ["Acetate of lead occasions a white precipitate, wholly soluble in dilute nitric acid." U. S.]

*Physiological Effects.*—This salt is a gentle purgative and diuretic. Like the other vegetable salts of the alkalies, it is decomposed in the system, and converted into the carbonate, in which state it is found in the urine, to which it communicates alkaline properties. It is said to have the power of preventing the griping of other more active cathartics, as senna and scammony; but, from my own personal observations, I doubt the correctness of this statement.

*Therapeutics.*—It is employed as a mild purgative, or as an adjunct to other more active purgatives, as the infusion of senna. It may be used in lithiasis to render the urine alkaline, in which case it must be given in the form of a dilute solution.

*Administration.*—It may be administered as a purgative, in doses of from a quarter to half an ounce, or even an ounce.

## **Potassæ Tartras Acida,** *Acid Tartrate of Potash.*

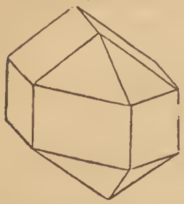
*Synonym.*—Potassæ Bitartras. $HO,KO,\bar{T}(C_8H_4O_{10})=188$.

[**Potassæ Bitartras,** *Bitartrate of Potassa.* Mat. Med. List, U. S. P.

*Synonym.*—Cream of Tartar.]

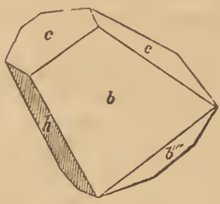
*Production.*—All the acid tartrate of commerce is obtained during the vinous fermentation. It exists in solution in grape-juice; but being very slightly soluble in a mixture of alcohol and water, it is deposited when sufficient alcohol is produced, and forms a crust on the sides of the cask. In this state it is known in commerce under the name of *crude tartar* or *argol*, which is termed *white* or *red*, according as it is obtained from white or red wine. *Argol*, or *crude tartar*, occurs in crystalline cakes of a brown or reddish color, and is composed of the acid tartrate of potash, tartrate of lime, coloring and extractive matter. It is purified by solution, treatment with charcoal and alumina (clay), to remove the coloring matter, and crystallization.

Fig. 13.



*An ordinary perfect Crystal of Bitartrate of Potash.*

Fig. 14.




*Common Crystal of ditto.*

*Officinal Characters.*—A finely gritty white powder, or fragments of cakes crystallized on one surface; of a pleasant acid taste, sparingly soluble in water, insoluble in spirit. Heated in a crucible it evolves inflammable gas and the odor of burned sugar, and leaves a black residue (*black flux*). This effervesces with dilute hydrochloric acid, and forms a solution which when filtered gives a yellow precipitate with bichloride of platinum, and when neutralized by ammonia is rendered slightly turbid by oxalic acid (from the presence of a small quantity of lime).

["Bitartrate of potassa is dissolved sparingly by water, but freely by a hot solution of potassa, which deposits it again upon the addition of an acid. Whatever remains undissolved by the alkaline solution is impurity. The precipitate produced with its aqueous solution by chloride of barium is soluble in nitric acid. It reddens litmus, and by a red heat is converted into carbonate of potassa." U. S.]

*Properties.*—Acid tartrate of potash is soluble in about 190 parts of cold, and 18 of boiling water; the addition of caustic potash increases its solubility, whereas alcohol diminishes it. Acetate of lead added to a solution of the acid tartrate forms a copious white precipitate, tartrate of lead: lime-water has the same effect; but the tartrate of lime is dissolved by an excess of the acid tartrate. Mixed with alkaline carbonates, it produces effervescence. The saturated aqueous solution gives no precipitate with bichloride of platinum. Potash can only be detected by this test after the conversion of the salt to carbonate by incineration. It is not precipitated by acids like a solution of the tartrate, and it is only sparingly precipitated by nitrate of silver, while the tartrate is copiously precipitated. This arises from many of the tartrates being soluble in tartaric acid.

*Composition.*—Crystallized acid tartrate of potash (cream of tartar) has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Potash | 47 | 25.00 |
| 1 | Basic water | 9 | 4.79 |
| 1 | Tartaric acid | 132 | 70.21 |
| | Acid Tartrate of Potash | 188 | 100.00 |

*Impurities.*—Acid tartrate of potash when pure is quite white. As found in commerce it usually contains from 2 to 5 per cent. of tartrate of lime, and sometimes a little sulphate of lime; and hence a little carbonate of lime may be detected in black flux. This is of no material consequence in a medicinal point of view. If the powdered acid tartrate be adulterated with either alum, bisulphate of potash, or sulphate of lime, the fraud may be detected by chloride of barium, which causes a white precipitate (*sulphate of baryta*) insoluble in nitric acid. Sulphuretted hydrogen and solution of ferrocyanide of potassium should produce no change in a solution of this salt. The addition of oxalate of ammonia to a saturated cold solution of the acid tartrate is sufficient for the detection of lime, as the oxalate of lime formed is quite insoluble in tartaric acid and acid tartrate of potash.

*Tests.*—188 grains heated to redness, till gas ceases to be evolved, leave an alkaline residue, which requires for exact saturation 100 measures of the volumetric solution of oxalic acid.

*Physiological Effects.*—When taken in *small doses*, diluted with water, it acts as a refrigerant and diuretic; in *larger doses* (as a quarter of an ounce) it purges, and frequently creates flatulence and griping. By continued use it disorders the digestive functions, and causes emaciation, most probably from defective nutrition. In *excessive doses* it produces inflammation of the stomach and intestines.

*Therapeutics.*—Acid or bitartrate of potash is frequently employed to form a refrigerant drink in febrile and inflammatory diseases. It allays thirst, diminishes preternatural heat, and reduces vascular action. As a *diuretic* in dropsical complaints, it is used either in the same way, or taken in the form of an electuary. As a *purgative* it is not usually exhibited alone, but, in general, with jalap, sulphur, senna, or some other purgative. Thus, in dropsical complaints, especially in acute anasarca, a very valuable hydragogue cathartic is a mixture of jalap and acid tartrate of potash (compound powder of jalap). In skin diseases and affections of the rectum (as piles, stricture, and prolapsus), a very useful purgative is an electuary composed of sulphur and acid tartrate of potash (confection of sulphur), and confection of senna. An effervescing aperient may be prepared by mixing 180 grains of the acid tartrate with 150 grains of carbonate of soda: the resulting salt is the tartrate of soda and potash. As a *tooth-powder*, acid tartrate of potash is sometimes used, on account of its gritty qualities: a very good dentifrice consists of equal parts of acid tartrate, powdered rhatany root, and myrrh.

*Administration.*—As a hydragogue cathartic, the dose is half an ounce; as an aperient, 60 to 120 grains; as a diuretic, 20 to 60 grains, in repeated doses. [As a diuretic, an ounce of the salt should be dissolved in a pint of infusion of juniper berry, and this be taken in 24 hours.—W.]

*Pharmaceutic Uses.*—Employed in the formation of tartaric acid, tartrate of potash, tartrate of soda and potash, tartarated iron, tartarated antimony, and is contained in confection of sulphur and the compound powder of jalap.

**Potassæ Citras** [U. S.], *Citrate of Potash.* $3KO,\bar{C}(C_{12}H_5O_{11})=306$.

*Preparation.*—Take of carbonate of potash, eight ounces, or a sufficiency; citric acid, in crystals, six ounces, or a sufficiency; distilled water, two pints. Dissolve the citric acid in the water; add the carbonate of potash gradually, and, if the solution be not neutral, make it so by the cautious addition of the acid or the carbonate of potash. Then filter, and evaporate to dryness, stirring constantly after a pellicle has begun to form, till the salt granulates. Triturate in a dry warm mortar, and preserve the powder in stoppered bottles. ["Take of citric acid, ten troyounces; bicarbonate of potassa, fourteen troyounces; water, a sufficient quantity. Dissolve the citric acid in two pints of water; add the bicarbonate gradually, and when effervescence has ceased, strain the solution, and evaporate to dryness, stirring constantly after a pellicle has begun to form, until the salt granulates. Then rub it in a mortar, pass it through a coarse sieve, and keep it in a well-stopped bottle." U. S.]

*Officinal Characters.*—A white powder of saline feebly acid taste, deliquescent, and very soluble in water. Heated with sulphuric acid it forms a brown fluid, gives off an inflammable gas, and evolves the odor of acetic acid. Its solution, mixed with a solution of chloride of calcium, remains clear till it is boiled, when a white precipitate separates (*citrate of lime*, which is less soluble in hot than in cold water), readily soluble in acetic acid. Its solution, acidulated with hydrochloric acid, gives a yellow precipitate with bichloride of platinum (chloride of platinum and potassium).

*Tests.*—102 grains heated to redness, till gas ceases to be evolved, leave an alkaline residue (carbonate of potash), which requires for exact saturation 100 measures of the volumetric solution of oxalic acid.

*Physiological Effects.*—Citrate of potash resembles the other vegetable salts of potash in being diuretic, but it is less liable to purge. It is converted, after absorption, into carbonate of potash, which is found in the urine, and renders that secretion alkaline.

*Therapeutics.*—Citrate of potash, in its solid state, is a new remedial agent in the Pharmacopœia, but it has been long used in the form of the effervescing draught made by adding citric acid to bicarbonate of potash. In that form, however, much of the value of the medicine was due to the carbonic acid evolved during the commixture of the two constituents. This salt is useful in febrile disorders, as a diuretic, in uric acid gravel, and generally in cases where it is desirable to diminish the acidity of the urine.

*Dose.*—Gr. xx to gr. lx.

[**Liquor Potassæ Citratis,** U. S., *Solution of Citrate of Potassa.*

"Take of citric acid, half a troyounce; bicarbonate of potassa, three hundred and thirty grains; water, half a pint. Dissolve the acid and bicarbonate in the water, and strain the solution through muslin." U. S.]

[**Mistura Potassæ Citratis,** U. S., *Mixture of Citrate of Potassa.*

Liquor Potassæ Citratis, *Pharm.*, 1850.

*Neutral Mixture.*—"Take of lemon juice, fresh, half a pint; bicarbonate of potassa, a sufficient quantity. Add the bicarbonate gradually to the lemon juice until the acid is completely saturated; then strain through muslin." U. S.

In these processes, as in several others, the U. S. Ph. directs the bicarbonate of potassa, on account of the carbonate so frequently containing the silicate, and therefore giving rise to a gelatinous precipitate of silica. More or less of the carbonic acid, set free by the action of the citric acid remains in solution, helping to make the preparation palatable. When lemon juice can be had, the mixture is the preferable preparation; and when this is not procurable, the liquor may be improved by rubbing up with the solution of the acid a few drops of the oil of lemon. The effervescing draught is the best method of exhibition of the citrate of potash, especially when there is any nausea or sick stomach. The following is the formula for its preparation: ℞. Potassæ bicarb. gr. xx; aquæ, f℥ss; M. et ft. sol. ℞. Suc. limonis, aquæ, āā f℥ss. M. S. Add them together, and drink while effervescing. If lemon juice cannot be had, the following may be substituted. ℞. Acid. citric. gr. xviij; ol. limonis, gtt. j; aquæ, f℥j. M. et ft. sol. If the lemon juice is very weak, some free citric acid should be added.

*Therapeutics.*—A very useful diaphoretic, which is less stimulating than sweet spirit of nitre or liquor ammoniæ acetatis. Under the name of neutral mixture and saline mixture, it is largely given in the United

States in cases of high fever, such as the paroxysm of an intermittent. It may be made more sedative by combining $\frac{1}{20}$—$\frac{1}{12}$ gr. of tartar emetic with each dose. It has no direct effect on the nervous system, and is not so well adapted to low fevers, such as typhus and typhoid, as sweet spirit of nitre. Dose, f℥ss."—W.]

[**Potassii Cyanidum,** U. S., *Cyanide of Potassium.*

Potassii Cyanuretum, *Pharm.*, 1850.

"Take of ferrocyanide of potassium, dried, eight troyounces; pure carbonate of potassa, dried, three troyounces. Mix the salts intimately, and throw the mixture into a deep iron crucible, previously heated to redness. Maintain the temperature until effervescence ceases, and the fused mass concretes, of a pure white color, upon a warm glass rod dipped into it. Then pour out the liquid carefully into a shallow dish to solidify, ceasing to pour before the salt becomes contaminated with the precipitated iron. Break up the mass while yet warm, and keep the pieces in a well-stopped bottle."

When the carbonate of potassa and ferrocyanide of potassium are heated together, two equivalents of each salt react on one another. The iron and carbonic acid are liberated, and a compound formed consisting of five eqs. of the cyanide of potassium and one of the cyanate of potassa. Thus, $2(2KCy,FeCy)+2(KOCO_2)=(5KCy+KOCyO)+(2Fe+CO_2)$.

*Officinal Characters.*—Cyanide of potassium, thus prepared, is in white, opaque, amorphous pieces, having a sharp, somewhat alkaline and bitter-almond taste, and an alkaline reaction. It is deliquescent in moist air, readily soluble in water when reduced to powder, and sparingly soluble in alcohol. Its solution exhales the odor of hydrocyanic acid when exposed to the air, effervesces on the addition of an acid, and, when added to a solution of nitrate of silver, yields a precipitate wholly soluble in ammonia.

*Therapeutics.*—The action of cyanide of potassium on the system is precisely that of hydrocyanic acid, for which it may be substituted in prescriptions. Indeed, that acid is formed from it in the stomach by the action of the hydrochloric and other acids of the gastric juice, and has been discovered in the blood of a person poisoned by the salt. According to Dr. Hornidge, three grains of the salt are sufficient to destroy life. A solution of it (gr. iij—f℥j) has been used as an external anodyne application in neuralgia, but even in this way it should be used cautiously. Dose, gr. $\frac{1}{8}$ in solution.—W.]

**Sapo Mollis,** *Soft Soap.* Soap made with Olive Oil and Potash.

*Preparation.*—The oil is boiled with a solution of caustic potash, until the whole has become saponified, and has the appearance of thin glue. The separation of the made soap from the glycerine and excess of water is then effected by means of a strong solution of potash, or by evaporation, since salt decomposes it into hard soap (soda soap) and chloride of potassium.

*Officinal Characters.*—Yellowish-white, inodorous, of the consistence of thick honey.

*Tests.*—Entirely soluble in rectified spirit; not imparting an oily stain to paper (showing its freedom from earthy admixture and unsaponified oil).

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## SODIUM (*Natrium*). Na=23.

Sodium, the metallic basis of soda, in color resembles silver, but is of a soft waxy consistence like potassium. Its specific gravity is 0.97. It rapidly oxidizes by exposure to the air, or when dropped upon water, but the action is seldom sufficiently violent to cause spontaneous inflammation. It burns with a brilliant yellow flame. It is best preserved under Persian naphtha.

### Soda. $NaO = 31$.

*Natural History.*—It is found in combination with acids, in the mineral kingdom, in plants (especially those which grow in or on the borders of the sea), and in many animal fluids.

*Preparation.*—It is obtained, in the anhydrous state, by the oxidation of sodium.

*Properties.*—In its general properties it agrees very much with potash, than which it is less caustic. Its solution, if pure, produces no precipitate with the hydrosulphurets, ferrocyanides, phosphates, or carbonates.

From a solution of potash it is distinguished by causing no precipitate with perchloric or tartaric acid (unless the solution be very concentrated), or with bichloride of platinum, and by the yellow tinge which it communicates to the flame of alcohol. The only substance capable of producing a precipitate in moderately dilute solutions of soda is antimoniate of potash, which causes a crystalline precipitate of antimoniate of soda. This test, however, is not applicable, if other bases than those now mentioned be present. Sometimes the crystalline form of soda salts (as of the sulphate and nitrate) is resorted to as a means of distinguishing them from the potash salts.

### Soda Caustica, *Caustic Soda.* Hydrate of Soda, $NaO,HO = 40$.

*Preparation.*—Take of the 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, and, as soon as it has solidified, break it in pieces, and preserve it in stoppered green-glass bottles.

*Officinal Characters.*—In hard grayish-white fragments of cakes, very alkaline and corrosive. It imparts a yellow color to flame, and its solution in water acidulated by nitric acid gives scanty white precipitates with nitrate of silver and chloride of barium (indicating traces of sulphates and chlorides).

*Tests.*—Forty grains dissolved in water leave scarcely any sediment, and require for neutralization about ninety measures of the volumetric solution of oxalic acid.

*Therapeutics.*—It may be used for the same purposes as caustic potash. It has the advantage of being less deliquescent, but is inferior in power as an escharotic.

Liquor Sodæ [U. S.], *Solution of Soda.*—Take of carbonate of soda, twenty-eight ounces; slaked lime, twelve ounces; distilled water, one gallon. Dissolve the carbonate of soda in the water; and, having heated the solution to the boiling point in a clean iron vessel, gradually mix 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.

The reaction here is exactly similar to that which occurs in the production of solution of potash: $NaO,CO_2 + CaO,HO = CaO,CO_2 + NaO,HO$.

This preparation contains 4 grs. less soda in the fluidounce than Liq. Sodæ, *Lond.*

["Take of carbonate of soda, twenty-six troyounces; lime, eight troyounces; distilled water, a sufficient quantity. Dissolve the carbonate in three pints and a half of distilled water, and heat the solution to the boiling point. Mix the lime with three pints of distilled water, and, having heated the mixture to the boiling point, add it to the solution of the carbonate, and boil for ten minutes. Then transfer the whole to a muslin strainer, and, when the liquid portion has passed, add sufficient distilled water, through the strainer, to make the strained liquid measure six pints. Lastly, keep the liquid in well-stopped bottles of green glass. Solution of soda has the specific gravity 1.071, and contains five and seven-tenths per cent. of hydrate of soda." U. S.]

*Tests.*—Specific gravity 1.047. One fluidounce requires for neutralization forty-seven measures of the volumetric solution of oxalic acid (equal to 14.56 gr. NaO). It does not effervesce when added to an excess of dilute hydrochloric acid, nor give a precipitate with (solution of) lime or oxalate of ammonia. When it is treated with an excess of dilute nitric acid, and evaporated to dryness, the residue forms with water a clear solution which is rendered turbid by chloride of barium and by nitrate of silver, but not by ammonia.

As in solution of potash, a small quantity of chlorides and sulphates is almost always present, indicated by the turbidity with nitrate of silver and chloride of barium. It is also liable to contain silica and alumina —the former indicated by the presence of an insoluble residue after evaporation with excess of nitric acid; the latter by the formation of a gelatinous precipitate on the addition of ammonia to this solution. Freedom from undecomposed carbonate of soda is shown by its non-effervescence with acids, and its non-precipitation by solution of lime; from excess of lime by its remaining clear on the addition of oxalate of ammonia.

*Therapeutics.*—Solution of soda was originally introduced into the London Pharmacopœia to be employed in the preparation of oxysulphuret of antimony. It is now placed in the Materia Medica of the British Pharmacopœia as a substance employed medicinally. It has not been much used at present, but as its action is probably very similar to that of solution of potash, it may be employed for the same purposes, or substituted for it, if solution of potash is found to disagree.

*Dose.*—Min. x to fl.drm. j.

*Pharmaceutic Uses.*—It is used in the preparation of sulphurated antimony, citrate of iron and quinia, magnetic oxide of iron, hydrated peroxide of iron, tartarated iron, sulphate of quinia, and valerianate of soda.

VOLUMETRIC SOLUTION OF SODA. (Appendix B. III.)—Take of solution of soda, a sufficiency; distilled water, a sufficiency. Fill the volumetric tube to 0 with the solution of soda, and drop this into sixty-three grains of purified oxalic acid dissolved in two fluidounces of the water, until the acid is exactly neutralized as indicated by litmus. Note the number of measures (N) of the solution used, and having then taken forty fluidounces of the solution of soda, augment this quantity by the addition of distilled water, until it becomes $\frac{4000}{N}$ fluidounces. If, for example, $N=93$, the 40 ounces of solution of soda should be diluted so as to become $\frac{4000}{93}=43.01$ fluidounces.

The quantity of this solution which fills the volumetric tube to 0, includes thirty-one grains of soda, and will therefore neutralize an equivalent in grains of any monobasic acid.

## **Sodæ Carbonas** [Mat. Med. List, U. S. P.], *Carbonate of Soda.* $NaO,CO_2+10HO=143$.

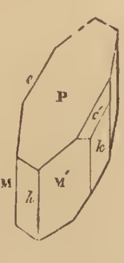
*Natural History.*—It is found in crystals, or in the form of an efflorescence, in several parts of the world; as in Egypt, Hungary, Bohemia, &c., commonly known under the name of Natron. In this state it appears to contain but one atom of water of crystallization, $NaO, CO_2+HO$.

*Production.*—The commercial sources of carbonate of soda are three—viz., native soda (natron), the ashes of marine plants, and common salt or sulphate of soda. The ashes of marine plants employed for this purpose are of two kinds—one, called *barilla*, obtained from phenogamous plants growing near the sea; the other, termed *kelp*, procured from cryptogamic plants growing in the sea; both these, as well as the native *natron*, containing large quantities of sulphate of soda, and other impurities. They may be purified by lixiviation and repeated crystallization. Carbonate of soda is now, however, almost wholly prepared from common salt (chloride of sodium). This is first converted into sulphate by the action of sulphuric acid, as in the process for making hydrochloric acid, $NaCl+SO_3HO=NaO,SO_3+HCl$. A good deal of sulphate of soda is also obtained as a waste product from the manufacture of chlorinated lime. The sulphate of soda is mixed with its own weight of ground chalk (carbonate of lime) and half its weight of coal dust, and the mixture strongly heated in a reverberatory furnace. In this process two consecutive changes occur: in the first place, the carbon of the coal deoxidizes the sulphate of soda, the products being carbonic oxide and sulphuret of sodium, $NaO,SO_3+4C=NaS+4CO$. In the second place, the sulphuret of sodium and carbonate of lime interchange their constituents, and give rise to carbonate of soda and sulphuret of calcium, $NaS+CaO,CO_2=NaO,CO_2+CaS$. But as a portion of the carbonate of lime has been burned or deprived of its carbonic acid before this interchange occurs, some caustic soda is also produced, $NaS+CaO=NaO+CaS$. To prevent, in the subsequent operation of lixiviation, the decomposition of the carbonate of soda by the sulphuret of calcium, twice as much carbonate of lime is used as is necessary to desulphurize the sulphuret of sodium: this excess of carbonate of lime is deprived of its carbonic acid by the heat, and the resulting lime combines with the sulphuret of calcium to form an oxysulphuret of calcium, $CaO+2CaS$. This has no further action on the sulphuret of sodium. The crude mass is lixiviated with water, and the carbonate of soda and caustic soda thereby separated from the more difficultly soluble oxysulphuret of calcium. The solution, by evaporation, deposits crystals of monohydrated carbonate of soda, and the mother-liquor yields a dark crystalline mass, composed of carbonate of soda, caustic soda, sulphuret of sodium, and some hyposulphite of soda ($NaO,S_2O_2$, formed by the oxidation of $NaS$). This is roasted in a reverberatory furnace, to get rid of the sulphur (probably in the form of sulphuretted hydrogen). Or it is calcined with coal-dust or saw-dust. The sulphate of soda is

Fig. 15.

*Ordinary Crystal.*

Fig. 16.




*Crystals reduced in height.*

converted into sulphuret of sodium, and subsequently into carbonate of soda; and the caustic soda combines with carbonic acid. The product is called *soda ash* or *soda salts*, and contains about fifty per cent. of alkali. From this, crystallized carbonate of soda is obtained by lixiviating it with water, straining the solution, and evaporating. The salt is usually crystallized in iron pans. It may be obtained pure by repeated crystallizations, but generally contains traces of sulphates.

*Officinal Characters.*—In transparent colorless laminar crystals of a rhombic shape, efflorescent, with a harsh alkaline taste and strong alkaline reaction. It imparts a yellow color to flame, and dissolves with effervescence in diluted hydrochloric acid, forming a solution which does not precipitate with bichloride of platinum. By heat it undergoes aqueous fusion, and loses sixty-three per cent. of its weight.

*Properties.*—Carbonate of soda is insoluble in alcohol. It is dissolved in twice its weight of water at 60°, and in less than its own weight at 212°F. It effloresces by exposure to dry air.

*Composition.*—The perfect crystals of the ordinary carbonate of soda of commerce have the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Soda | 31 | 21 68 |
| 1 | Carbonic acid | 22 | 15.39 |
| 10 | Water | 90 | 62 93 |
| | Crystallized Carbonate of Soda | 143 | 100.00 |

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

The tests show its freedom from sulphates and chlorides. The presence of hyposulphite of soda is detected by hydrochloric acid, which causes the evolution of sulphurous acid gas, and the precipitation of sulphur, or by the addition of a strong solution of nitrate of silver. If hyposulphite of soda be present a white precipitate, becoming rapidly yellow and brownish black (sulphuret of silver), is produced. Carbonate of lime and also carbonate of magnesia are sometimes kept in solution by carbonate of soda. If carbonate of lime be present, the solution deposits, at 32° F., a white crystalline powder, the hydrochloric solution of which yields a white precipitate with oxalate of ammonia.

*Physiological Effects.*—Carbonate of soda is less acrid and caustic, and has a milder and less unpleasant taste, than carbonate of potash; but in other respects the effects of these salts are very similar. On the other hand it is more caustic and irritant than the bicarbonate of soda, though in consequence of the large amount of its water of crystallization it contains little more than half as much soda.

*Therapeutics.*—Carbonate of soda is used in most of the same cases as carbonate of potash; it is far less frequently employed than the bicarbonate of soda; and, as its uses are the same, these will be stated under the latter salt.

*Administration.*—Crystallized carbonate of soda is exhibited in doses of from ten grains to thirty grains.

*Pharmaceutic Uses.*—Carbonate of soda is employed in the preparation of the carbonates of magnesia, carbonate of zinc, &c., and sometimes in the manufacture of the effervescing draught.

| | |
|---|---|
| 20 grains of crystallized Carbonate of Soda are saturated by about | $9\frac{3}{4}$ grains of crystals of Citric Acid,<br>$10\frac{1}{2}$ grains of crystals of Tartaric Acid,<br>$2\frac{1}{2}$ fluidrachms of Lemon Juice. |

SODÆ CARBONAS EXSICCATA [U. S.], *Dried Carbonate of Soda.* $NaO,CO_2=53$.—Take of carbonate of soda, eight ounces. Expose the carbonate of soda in a porcelain capsule to a rather strong sand heat until the liquid which first forms is converted into a dry cake; and, having rubbed this to powder, inclose it in a stoppered bottle. ["Take of carbonate of soda a convenient quantity. Expose it to heat, in an iron vessel, until it is thoroughly dried, stirring constantly with an iron spatula; then rub it into powder." U. S.]

This salt, having been deprived by heat of the water contained in the crystallized carbonate, contains 58.49 per cent. of soda, and is well adapted for administration in the form of pill.

*Dose.*—Four grains to ten grains.

**Sodæ Bicarbonas** [U. S.], *Bicarbonate of Soda.* $NaO,HO.2CO_2=84$.

*Natural History.*—It is a constituent of the mineral waters called *alkaline* or *acidulo-alkaline*, as those of Carlsbad and Seltzer.

*Preparation.*—Take of carbonate of soda, two pounds; dried carbonate of soda, three pounds; white marble, in fragments, four pounds; hydrochloric acid of commerce, one gallon; water, two gallons; distilled water, a sufficiency. Fill with the marble a tubulated glass bottle having a few small holes drilled in the bottom, connect the tubulure tightly by a bent tube and corks with an empty two-necked bottle, and connect this with another bottle filled with the carbonates of soda well triturated together, and let the tube be long enough to reach the bottom of the bottle. Before fixing the cork in the bottle containing the carbonate of soda, partially immerse the bottle containing the marble in the hydrochloric acid previously diluted with the water and placed in any convenient vessel. When the whole apparatus is filled with carbonic acid gas, fix in tightly the cork of the bottle containing the carbonate of soda, and let the action go on until the gas ceases to be absorbed. Agitate occasionally for half an hour the damp salt which is formed, with half its weight of cold distilled water, drain the undissolved portion, and dry it by exposure to the air on filtering paper placed on porous bricks. ["Take of carbonate of soda, a convenient quantity. Put the carbonate previously broken in pieces, into a wooden box, having a horizontal partition near the bottom, pierced with numerous small holes, and a cover which can be tightly fitted on. To a bottle having two tubulures, and half-filled with water, adapt two tubes; the first passing from an apparatus for generating carbonic acid, through one tubulure, to a point below the surface of the water in the bottle; the second reaching from the other tubulure to an opening near the bottom of the box, beneath the partition. Then lute all the joints, and cause a stream of carbonic acid to pass through the water into the box until the carbonate is fully saturated. Lastly, remove the product from the box, and, having dried it, rub it into powder. Carbonic acid may be obtained from marble by the addition of dilute sulphuric acid." U. S.]

The hydrochloric acid acting upon the marble forms chloride of calcium, and liberates carbonic acid, $CaO,CO_2+HCl=NaCl+HO+CO_2$, which passing into the solution of carbonate of soda is absorbed, producing bicarbonate, $NaO,CO_2+10HO+CO_2=NaO,HO.2CO_2+9HO$. The mixture of the dried and crystallized carbonates of soda is employed to avoid the presence of too much water, which would cause the bicarbonate to be deposited in large crystals instead of the usual crystalline powder. The salt is washed with cold distilled water to remove any unchanged neutral carbonate.

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

*Properties.*—Perfect crystals of bicarbonate of soda are, according to Dr. Thomson, oblique rectangular prisms. By others they are described as four-sided tables. By exposure to the air it effloresces superficially. When heated it evolves carbonic acid and water, and becomes the anhydrous carbonate. It dissolves in thirteen parts according to V. Rose, or eight parts according to Berthollet, of cold water. By heat, the solution loses first one quarter, and subsequently one-half of its carbonic acid. The bicarbonate is distinguished from the carbonate of soda by its more difficult solubility in water, by its causing neither a brick-red precipitate with the bichloride of mercury, nor a white precipitate with the sulphide of magnesia, and by the quantity of carbonic acid it evolves when sulphuric acid is added to it.

*Composition.*—Crystalline bicarbonate of soda has the following composition:—

| Eq. | | Eq Wt. | Per Cent. |
|---|---|---|---|
| 1 | Soda | 31 | 36.91 |
| 2 | Carbonic Acid | 44 | 52.38 |
| 1 | Water | 9 | 10.71 |
| | Bicarb. Soda | 84 | 100.00 |

*Tests.*—When supersaturated with nitric acid its solution scarcely precipitates with chloride of barium or nitrate of silver (showing its freedom from sulphates and chlorides). Eighty-four grains exposed to a red heat leaves fifty-three of an alkaline residue, which require for neutralization one hundred measures of the volumetric solution of oxalic acid.

When quite pure, a moderately dilute solution of this salt occasions no precipitate with perchloric acid, or tartaric acid, by which its freedom from potash is demonstrated. The *bicarbonate of soda* of the shops is usually a mixture of bicarbonate with some carbonate. To detect the presence of any carbonate of soda proceed thus: Pour a small quantity of distilled water over the suspected salt; shake and allow the mixture to stand for a few minutes, and then pour off the clear solution. If now a very dilute solution of bichloride of mercury be added to the clear liquor no precipitate is produced if only the bicarbonate be present; if the solution be more concentrated, an opalescence or white precipitate is formed, which in a few minutes becomes red. If any carbonate or sesquicarbonate be present, a red precipitate is formed immediately on the addition of the bichloride.

*Physiological Effects.*—The effects of this salt are analogous to those of bicarbonate of potash, than which it has a somewhat less disagreeable taste and a slighter local action. It is less caustic and irritant than the crystallized carbonate of soda, while its effect as an antacid is greater, in consequence of the larger percentage of soda.

*Therapeutics.*—It is employed as an *antacid* in those forms of dyspepsia which are attended with an inordinate quantity of acid in the stomach;

as a *lithonlytic* in those kinds of lithiasis which are accompanied with an excessive secretion of uric acid and the urates; as a *resolvent* or *alterative* in certain forms of inflammation, in glandular affections, in syphilis, and scrofula; and as a *diuretic* in some dropsical complaints. A mixture of an aqueous solution of the bicarbonate of soda with a vegetable acid, taken in a state of effervescence, is an agreeable and refreshing drink for allaying thirst, checking sickness, and diminishing febrile heat. The resulting soda-salt undergoes partial decomposition in its passage through the system, and is converted into carbonate, which is found in the urine. Hence, therefore, these effervescing preparations may be employed as diuretics and lithonlytics, instead of the simple carbonate or bicarbonate of soda, than which they are more agreeable. On the other hand they are highly objectionable, and are to be carefully avoided, in the treatment of phosphatic deposits in the urine. Alluding to these cases, Dr. Prout observes: "Were I required to name the remedy calculated to do the most mischief, I should name the common saline draught formed of potash or soda, and *some vegetable acid.*" This opinion, however, is stated by Dr. O. Rees and Dr. A. Taylor to be directly opposed to the views of others who have treated of the phosphatic diathesis, whose experience goes to show that the greatest benefit is occasionally observed from the use of the citrate and tartrate of potash in certain forms of phosphatic deposit.

*Administration.*—The dose of this salt is from ten grains to sixty grains. The principal consumption of bicarbonate of soda is in the preparation of the effervescing draught, soda powders, and Seidlitz powders: in these the bicarbonate is mixed with a vegetable acid (either citric or tartaric, usually the latter). In the preparation of effervescing draughts,

| | |
|---|---|
| 20 grains of Bicarbonate of Soda are saturated by about . . . | 18 grains of crystallized Tartaric Acid,<br>17 grains of crystallized Citric Acid,<br>4 fluidrachms of Lemon Juice. |

[TROCHISCI SODÆ BICARBONATIS, U. S., *Troches of Bicarbonate of Soda.*—"Take of Bicarbonate of soda, four troyounces; sugar, in fine powder, twelve troyounces; mucilage of tragacanth, a sufficient quantity. Rub the bicarbonate of soda with the sugar until they are thoroughly mixed; then with mucilage of tragacanth form a mass, to be divided into troches, each weighing ten grains."]

### [**Pulveres Effervescentes**, U. S., *Effervescing Powders.*

*Soda Powders.*—"Take of bicarbonate of soda, in fine powder, three hundred and sixty grains; tartaric acid, in fine powder, three hundred grains. Divide each of the powders into twelve equal parts, and keep the parts, severally, of the bicarbonate and of the acid in separate papers of different colors." U. S. Soda powders are alkaline and refrigerant, and offer perhaps the most acceptable method, to the stomach, of exhibiting soda. They should be taken in solution while effervescing.—W.]

### [**Pulveres Effervescentes Aperientes**, U. S., *Aperient Effervescing Powders.*

*Seidlitz Powders.*—"Take of bicarbonate of soda, in fine powder, a troyounce; tartrate of potassa and soda, in fine powder, three troyounces; tartaric acid, in fine powder, four hundred and twenty grains. Mix intimately the bicarbonate of soda with the tartrate of potassa and soda, and divide this mixture into twelve equal parts. Then divide the tartaric acid into the same number of equal parts. Lastly, keep the parts, severally, of the mixture and of the acid in separate papers of different colors." U. S. One of the papers contains forty grains of the bicarbonate of soda and two drachms of Rochelle salt, the other thirty-five grains of tartaric acid. These should be dissolved separately in a small quantity of water. When the solutions are mixed violent effervescence ensues—the tartrate of soda being formed and the carbonic acid liberated.

*Therapeutics.*—A mild saline cathartic, which is in most cases very acceptable to the stomach, by reason of its free carbonic acid. It is very frequently given following a mercurial. *Dose*, one-half to two of each powders taken while effervescing.—W.]

## **Borax**, *Borax.*

*Synonym.*—Sodæ Biboras, *Dub.*

Biborate of soda, $NaO,2BO_3+10HO=191$.

### [**Sodæ Boras**, Mat. Med. List, U. S. P.]

*Natural History.*—Borax is a substance peculiar to the mineral kingdom. It has been found in some mineral waters, as those of San Restituta, in Ischia. It occurs also in the waters of certain lakes, especially those of Thibet and Persia, crystallizing on the edges and shallows of the lake, whence it is taken up in large masses, which are broken and dried. It is usually imported from Calcutta, under the name of *tincal* or *crude borax*, in the form of flattened six-sided prisms, covered with a greasy unctuous substance, said by Vauquelin to be a fatty matter saponified by soda: the color is yellowish, bluish, or greenish. Mojon states that the greenish-gray matter which surrounds some kinds of rough borax contains native boron. Borax of a superior quality is said to be procured in China, where it is called *pong-cha* or *pounxa*.

*Preparation.*—Commercial borax is obtained either by the purification of native borax (tincal), or by saturating boracic acid with soda.

*Officinal Characters.*—In transparent colorless 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.

Fig. 17.

*Crystal of Borax.*

*Properties.*—Borax usually occurs in large, colorless, transparent prisms, belonging to the oblique prismatic system. In commerce we frequently meet with it in irregular-shaped masses. Its taste is saline, cooling, and somewhat alkaline. It reacts on turmeric paper like an alkali. By exposure to dry air, it effloresces slowly and slightly. When heated, it melts in its water of crystallization, swells up, and forms a light, white, porous substance, called *calcined borax*. At a higher temperature it fuses into a transparent glass, called *glass of borax*, which is anhydrous borax, $NaO,2BO_3$. It is soluble in twelve parts of cold, or in two parts of hot water.

*Composition.*—The following is the composition of borax:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Soda | 31 | 16.23 |
| 2 | Boracic acid | 70 | 36.65 |
| 10 | Water | 90 | 47.12 |
| | Crystallized Borax | 191 | 100.00 |

*Test.*—191 grains dissolved in 10 fluidounces of distilled water require for saturation 100 measures of the volumetric solution of oxalic acid.

*Physiological Effects.*—Its *local* action is that of a mild irritant: applied to sores, it excites smarting; and, when taken into the stomach in large doses, it causes vomiting. The *constitutional effects* are probably those of a mild refrigerant and diuretic. Wöhler and Stehberger detected it in the urine, so that it passes out of the system unchanged. Borax is usually regarded as an agent exercising a specific influence over the uterus; promoting menstruation, alleviating the pain which sometimes attends this process, facilitating parturition, diminishing the pain of accouchement, and favoring the expulsion of the placenta and lochia. Borax has been regarded as producing the effects of alkalies on the system. The conclusions drawn by Dr. Binswanger from his physiological and chemical researches on boracic acid and borax are as follows: In a pharmacological point of view, this salt resembles carbonate or bicarbonate of soda. Like the carbonate it has an alkaline reaction, acts as an antacid, and, when in solution, absorbs carbonic acid, and dissolves fibrin, albumen, casein, and uric acid. Swallowed in large doses it occasions oppression of stomach, nausea, and vomiting. It becomes absorbed, and is afterwards eliminated by the kidneys and other secreting organs. Binswanger detected it in the blood of the portal vein, in the bile, and the saliva. It has, therefore, doubtless, an influence on the process of chymification. In very large and repeated doses it produces the injurious effects of the alkalies; as inflammation of the stomach and bowels, disordered digestion, and a scorbutic condition. On Binswanger himself the use of it caused an impetiginous eruption. The author asserts that borax has no peculiar or specific effect on the nervous system, sexual organs, or mucous surfaces. It has no specific power of exciting uterine contractions, of promoting menstruation, or of curing aphthous affections; though, like the carbonated alkalies, it may, by relaxing muscular fibres, slightly relieve spasm of the uterus, or by its liquefacient properties promote the evacuation of menstrual blood, or by its mild alkaline qualities improve the condition of the skin and mucous surfaces. As a lithonlytic for uric acid, Binswanger considers it more useful than any other salt; for, though its solvent power for this acid is inferior to that of carbonate of lithia, the rarity of the latter salt renders it less available. Borax acts as a solvent for uric acid, by yielding up part of its soda to form the more soluble urate of soda; but it has no power of preventing the formation of this acid. It acts merely as a lithonlytic, that is, as a solvent for the already-formed acid.

*Therapeutics.*—As a *local agent*, borax is employed as a detergent in aphthæ and ulceration of the mouth. In some skin diseases it has been used with great benefit. In pityriasis versicolor (called also *liver spots* or *chloasma*), a strong solution of borax (as thirty grains of borax in an ounce of water) is a most valuable remedy. It should be applied by a sponge or rag. A solution of thirty grains of borax in eight ounces of rose-water is sometimes employed as a useful cosmetic. *Unguentum boracis* (composed of sixty grains of borax to one ounce of lard) has been applied to inflamed and painful hemorrhoidal tumors, and to cracked nipples.

*Internally*, it has been used as a lithonlytic; as a diuretic in dropsical affections; and with the view of influencing the uterus in the cases before mentioned. Dr. Copland recommends it, in conjunction with ergot of rye, to promote uterine contractions. I have occasionally employed it in amenorrhœa, but with doubtful success.

*Administration.*—The dose of it is from thirty to sixty grains. As a detergent in aphthæ, it may be used in powder, mixed with sugar or with honey.

Mel Boracis, *Borax Honey* [Mel Sodæ Boratis, U. S., *Honey of Borate of Soda*].—Take of borax, in fine powder, sixty-four grains; clarified honey, one ounce. Mix. ["Take of borate of soda, in fine powder, sixty grains; clarified honey, a troyounce. Mix them." U. S.]

A convenient form for the employment of borax in the aphthæ of children. Dissolved in water it may be employed as a gargle in ulceration of the mouth and throat.

## **Sodæ Phosphas** [U. S.], *Phosphate of Soda.*

$$2NaO,HO,PO_5+24HO=358.$$

*Natural History.*—Phosphate of soda occurs in both kingdoms of nature. It is a constituent of some mineral waters—viz., those of Steinbad at Töplitz, of Geilnau, Fachingen, Selters, and Neundorf.

It is found in the ashes of plants. It is a constituent of some animal fluids, as the blood and urine. According to Liebig, the blood owes its alkaline quality, and its powers of absorbing and of giving off again carbonic acid to this salt.

*Preparation.*—Take of bone ash, in powder, ten pounds; sulphuric acid of commerce, fifty-six fluidounces; 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. ["Take of bone, calcined to whiteness and in fine powder, one hundred and twenty troyounces; sulphuric acid, seventy-two troyounces; carbonate of soda, water, each, a sufficient quantity. Mix the powder with the sulphuric acid in an earthen vessel; then add eight pints of water, and, having stirred the mixture thoroughly, digest for three days, occasionally adding a little water to replace that which is lost by evaporation, and frequently stirring the mixture. At the expiration of that time, pour in eight pints of boiling water, and strain through muslin, gradually adding more boiling water until the liquid passes nearly tasteless. Set by the strained liquid that the dregs may subside, and, having poured off the clear solution, boil it down to eight pints. To the concentrated liquid, poured off from the newly formed dregs, and heated in an iron vessel, add by degrees carbonate of soda, previously dissolved in hot water, until effervescence ceases, and the phosphoric acid is completely saturated; then filter the liquid and set it aside to crystallize. Having removed the crystals, add, if necessary, a small quantity of carbonate of soda to the liquid, so as to render it slightly alkaline; then alternately evaporate and crystallize so long as crystals are produced. Lastly, keep the crystals in a well-stopped bottle." U. S.]

The products obtained by the mutual reaction of sulphuric acid and bone ash are carbonic acid, sulphate of lime, and a soluble superphosphate of lime; the latter remains in solution, while the sulphate is, for the most part, precipitated. On the addition of carbonate of soda to the liquor, phosphate of soda is formed in solution, subphosphate of lime is precipitated, and carbonic acid gas escapes. A slight excess of carbonate of soda promotes the formation of crystals of phosphate.

*Officinal Characters.*—In transparent colorless rhombic prisms, terminated by four converging planes. efflorescent, tasting like common salt. It imparts a yellow color to flame. Its solution gives a yellow precipitate with nitrate of silver ($3AgO,PO_5$), the resulting fluid acquiring an acid reaction. [" It yields with nitrate of silver a yellow precipitate, and with chloride of barium a white one, both soluble in nitric acid." U. S.]

*Properties.*—The crystals of phosphate of soda require for their solution four times their weight of cold, or twice their weight of hot water; they are nearly insoluble in alcohol. They react feebly on vegetable colors like alkalies. When heated, they undergo the watery fusion, give out both their basic water and water of crystallization, and form a white mass called pyrophosphate of soda ($2NaO,PO_5$). From this, and from metaphosphate of soda ($NaO,PO_5$), the officinal salt is distinguished by the yellow color of its precipitate with nitrate of silver, both of these affording white precipitates.

*Composition.*—The following is the composition of this salt :—

| Eq | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Soda . . . . . . . . | 62 | 17.39 |
| 1 Basic water . . . . . . | 9 | 2.51 |
| 1 Tribasic phosphoric acid . . . . | 71 | 19.90 |
| 24 Water of crystallization . . . . | 216 | 60.20 |
| Crystallized Phosphate of Soda . . . | 358 | 100.00 |

*Tests.*—Heated to dull redness it loses sixty-three per cent. of its weight, leaving a residue, which, when dissolved in water, gives with chloride of barium a precipitate entirely soluble in dilute nitric acid (showing its freedom from sulphates).

*Physiological Effects.*—In doses of an ounce or an ounce and a half, its acts as a mild antiphlogistic purgative, like sulphate of soda. In smaller doses it operates like other saline substances. Being an important and essential constituent of the healthy blood, it has been supposed that this salt would be less obnoxious to the organism than those salines which are not constituents of the body, and that it would pass into the system more readily. Moreover, some benefit has been expected from its influence as an agent acting on the blood, sometimes supplying a deficient ingredient and modifying its crasis.

*Therapeutics.*—As a purgative, it has been employed in the diseases of children and delicate persons, in preference to other saline substances, on account of its slight taste and mild action on the stomach. It is well adapted for febrile and inflammatory disorders. It is one of the substances which have been employed in cholera to restore to the blood its deficient saline matters. On account of its supplying phosphoric acid it has been supposed to be particularly applicable in those diseases in which there is a deficiency of phosphate of lime in the bones. There are two distinct diseases in which this deficiency of earthy matter exists—viz., *rachitis*, in which there is a defective deposition of phosphate of lime; and *mollities ossium*, in which the calcareous phosphate has been absorbed. In neither of these maladies, however, is there any evidence that the prime cause is a deficiency of material in the system; it seems referable rather to perverted vital action; and there is no evidence that this has been relieved by the use of phosphate of soda. It has been administered in *diabetes*. It has been resorted to for the purpose of supplying the system with an ingredient in which it was supposed to be deficient; in this malady the phosphates of the urine are stated to be diminished. Simon, however, declares that the amount of earthy phosphates in diabetic urine is not much below the normal average. Nicolas, Gneudeville, Dr. Latham, and Dr. Sharkey, have employed phosphate of soda in diabetes with asserted benefit. It is said to promote the healthy action of the stomach, to keep the bowels regular, and to lessen the discharge of urine. It is one of the substances which have been employed as a solvent for uric acid calculi.

*Administration.*—As a purgative, it is given in doses of from an ounce to an ounce and a half. It is best taken in broth or soup. As an alterative, the dose is from twenty to forty grains.

*Pharmaceutic Uses.*—It is used in the formation of phosphate of iron, and syrup of phosphate of iron.

Solution of Phosphate of Soda. (Appendix B. II.)—Take of phosphate of soda, in crystals, one ounce; distilled water, a sufficiency. Dissolve the phosphate of soda in eight fluidounces of the water, and add as much distilled water as will make the bulk of the solution ten fluidounces.

*Used*, with ammonia and hydrochlorate of ammonia, as a test for magnesia salts.

**Hyposulphite of Soda.** (Appendix B. I.) $NaO,S_2O_2+5HO=124$.

*Preparation.*—This salt may be readily obtained by passing sulphurous acid gas into a solution of carbonate of soda to which sulphur has been added; carbonic acid is evolved, and hyposulphite of soda remains in solution, $NaO,CO_2+S+SO_2=NaO,S_2O_2+CO_2$.

*Properties.*—The crystals are odorless, and have a cool, afterwards bitter, taste. They readily dissolve in water, but not in alcohol. If sulphuric, nitric, or hydrochloric acid be added to a strong solution of this salt, sulphurous acid is disengaged, and sulphur is precipitated. With nitrate of silver in excess the hyposulphite of soda yields a white precipitate ($AgO,S_2O_2$), which ultimately becomes black, owing to its conversion into sulphuret of silver, AgS (which precipitates), and sulphuric acid, $SO_3$ (which remains in solution). If the hyposulphite be in excess then the white hyposulphite of silver which is at first formed is immediately redissolved.

*Tests.*—24.8 grains decolorize 100 measures of the volumetric solution of iodine, $2(NaO,S_2O_2)+I=NaO,S_4O_5+NaI$.

Volumetric Solution of Hyposulphite of Soda. (Appendix B. III.)—Take of hyposulphite of soda, in crystals, 260 grains; distilled water, a sufficiency. Dissolve the hyposulphite of soda in one pint of the water, and drop the solution cautiously from the volumetric tube into one hundred measures of the volumetric solution of iodine, until the brown color of the iodine is just discharged. Note the number of measures (N) which have been used to produce this effect; and having then taken sixteen fluidounces of the same solution, augment this quantity by the addition of distilled water until it amounts to $\frac{1600}{N}$ fluidounces. If, for example, $N=96$, the sixteen ounces of the solution of the hyposulphite should be diluted with distilled water so as to become $\frac{1600}{96}$ 16.66 fluidounces.

This solution is used for estimating free iodine, an object which it accomplishes by forming with the iodine iodide of sodium and tetrathionate of soda. One hundred measures of it include $\frac{1}{10}$ of two equivalents of the hyposulphite in grains, and therefore correspond to 12.7 grains of free iodine.

[**Sodæ Sulphis,** U. S., *Sulphite of Soda*, Mat. Med. List, U. S. P. $NaO,SO_2+3HO$.

*Officinal Characters.*—In white, efflorescent, prismatic crystals, soluble in four parts of cold, and in less than one part of boiling water. It has a sulphurous taste, and a feeble alkaline reaction. Sulphuric acid, added to its solution, gives rise to the odor of burning sulphur, owing to the $SO_2$ being liberated, without impairing the transparency of the liquid.

Sulphite of soda has been introduced into the Pharmacopœia in consequence of its power of destroying cryptogamic growths and checking fermentation. It has been used in cases of dyspepsia with vomiting of a yeasty fluid containing the sarcina ventriculi, with the effect of killing that cryptogam and checking the fermentation in the stomach. It is used locally in all diseases, such as pityriasis versicolor, apthous sore mouth, &c., which are dependent upon the presence of a parasitic cryptogam. Its therapeutic powers probably depend upon the ease with which it yields its $SO_2$.

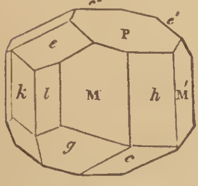
*Dose.*—ʒj thrice daily; when applied locally, strength of solution ʒj—f℥j.—W.]

[**Sodæ Sulphas,** U. S., *Sulphate of Soda*, Mat. Med. List, U. S. P.

*Synonym.*—Glauber Salts, $NaO,SO_3+10HO$.

This salt exists largely in the water of many mineral springs and in the ashes of some sea plants. It is obtained as a secondary product in the manufacture of hydrochloric acid from chloride of sodium by the action of sulphuric acid. $NaCl+SO_3+11HO=NaO,SO_3+10HO+HCl$.

Fig. 18.




*Prism of Sulphate of Soda.*

*Characters.*—It crystallizes in oblique rhombic prisms, which belong to the oblique prismatic system. To the taste this salt is cooling, nauseous, bitter, and saline. By exposure to the air, it effloresces. When heated, it undergoes the watery fusion, gives out its water of crystallization, and thereby becomes a white solid, and while at a red heat again becomes liquid. One part of it dissolves in three parts of water at 60° F., or one part of water at 212°. It is insoluble in alcohol.

*Tests.*—"With chloride of barium it yields a white precipitate insoluble in nitric acid. A dilute solution affords little or no precipitate with nitrate of silver. One hundred grains of the crystals lose fifty-five and a half grains by exposure to a strong heat." U. S. P. The precipitate is sulphate of baryta; the second test shows freedom from chloride of sodium.

*Therapeutics.*—It is a mild but efficient cooling laxative or purgative salt, promoting secretion and exhalation from the mucous membrane of the stomach and bowels, without causing inflammation or fever. Its action on the system is almost identical with that of the sulphate of magnesia. It is at present very rarely used, Epsom salts being preferred on account of its less nauseous taste.

*Dose.*—As a laxative, ʒj—ʒij; as a purgative, ℥ss—℥j.—W.]

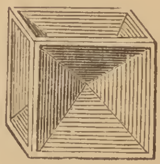
**Sodii Chloridum,** *Salt* [Mat. Med. List, U. S. P.]. $NaCl=58.5$.

*Natural History.*—It occurs in both kingdoms of nature. An enormous quantity of this salt is contained in the waters of the ocean. At an average calculation, sea water contains 2.5 per cent. of chloride of sodium. It is found also in great abundance in mineral waters. It has not hitherto been found in the oldest stratified rocks, but is met with, in various places, in all the later formations, either in solid masses (rock salt), or in brine springs. It is also found in plants which grow by the seaside, in the blood and urine of man, &c.

*Preparation.*—It is obtained chiefly by the evaporation of brine springs, or the lixiviation of rock salt; it is sometimes also procured from sea water.

*Officinal Characters.*—In small white crystalline grains, or transparent cubic crystals, with a purely saline taste, imparting a yellow color to flame, soluble in water. The solution is not precipitated by bichloride of platinum, but gives with nitrate of silver a white precipitate soluble in ammonia but insoluble in nitric acid ($AgCl$). [" The solution yields no precipitate with carbonate of soda, chloride of barium, or ferrocyanide of potassium." U. S.]

Fig. 19.



*Carvernous Cube of Common Salt.*

*Properties.*—The specific gravity of salt is 2.17. When free from all foreign matters, chloride of sodium is permanent in the air; but ordinary salt is slightly deliquescent, owing to the presence of small quantities of the chlorides of magnesium or calcium. When heated, it decrepitates (more especially the coarse-grained or bay salt); at a red heat it fuses; and at a still higher temperature it is volatilized. Hot and even boiling water dissolve very little more salt than cold water. At 60° it requires about twice and a half its weight of water to dissolve it.

*Composition.*—Pure chloride of sodium has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Sodium | 23 | 39.3 |
| 1 | Chlorine | 35.5 | 60.7 |
| | Chloride of Sodium | 58.5 | 100.0 |

The crystals contain no water in chemical combination with them, but a little is frequently mechanically lodged between their plates.

*Tests.*—Free from moisture. The solution is not rendered hazy by chloride of barium nor by phosphate of soda after the addition of a mixed solution of ammonia and hydrochlorate of ammonia.

Any haziness would indicate the presence of sulphates or magnesia salts; but the commercial salt of this country is sufficiently pure for all dietetical and therapeutical purposes; and its low price is a sufficient guarantee against adulteration. It is also commonly contaminated with lime, which may be detected by oxalate of ammonia.

*Physiological Effects.*—Salt is an irritant in its local operation. Thus, applied to the skin and the mucous membranes. it causes redness. Taken into the stomach in large quantity (as in the dose of a tablespoonful or more), it excites vomiting; and, when thrown into the large intestines, produces purging. In moderate quantities it promotes the appetite and assists digestion and assimilation. If used too freely it occasions thirst. In large doses it operates as an irritant poison.

*Therapeutics.*—The following are some of the most important therapeutical uses of chloride of sodium:—

As a *vomit*, it has been recommended in malignant cholera in preference to other emetics. In narcotic poisoning, in the absence of the stomach-pump and the ordinary emetic substances, it may also be employed. The dose of it is one or two tablespoonfuls in a tumblerful of water. A teaspoonful of flour of mustard assists its action. As a *purgative* it is seldom employed, except in the form of enema. One or two tablespoonfuls of common salt, dissolved in a pint of gruel, form a very useful clyster for promoting evacuations from the bowels. It has been used in some diseases with the view of *restoring the saline qualities of the blood*, especially in cholera. Properly diluted, and injected into the veins in cholera, it acts as a powerful stimulant and restorative; the pulse, which was before imperceptible, usually becomes almost immediately restored, and, in some cases, reaction and recovery follow. Common salt has been employed as an *anthelmintic*. For this purpose it is exhibited in large doses by the mouth; or, when the worms are lodged in the rectum, a strong solution is administered in the form of enema. When leeches have crept into the rectum, or have been accidentally swallowed, a solution of salt should be immediately used. As a *chemical antidote*, chloride of sodium may be administered in poisoning by nitrate of silver. As an *alterative and tonic*, it is useful in scrofula and glandular diseases. As an *astringent* in hemorrhages, dysentery, and diarrhœa, it has been administered in combination with lime-juice or lemon-juice. It is frequently employed as a *dentifrice*.

*Administration.*—As a tonic and alterative, the dose is from ten to sixty grains. As an emetic, from two to three tablespoonfuls in five or six ounces of warm water. As a cathartic, from half an ounce to an ounce.

*Pharmaceutic Uses.*—Employed in the production of hydrochloric acid, calomel, corrosive sublimate, and solution of chlorinated soda.

### **Liquor Sodæ Chloratæ [Liquor Sodæ Chlorinatæ,** U. S.], *Solution of Chlorinated Soda.*

A mixed solution of hypochlorite of soda, $NaO,ClO$, chloride of sodium, and bicarbonate of soda.

*Preparation.*—Take of carbonate of soda, twelve ounces; chloride of sodium, four ounces; black oxide of manganese, in powder, three ounces; sulphuric acid, two fluidounces and a half; distilled water, forty-four fluidounces. Reduce the carbonate of soda to powder, dissolve it in thirty-six ounces of the water, and put the solution into a glass vessel. Mix the chloride of sodium and the oxide of manganese, place them in a retort, and add to them the sulphuric acid, previously mixed with three ounces of the water, and allowed to cool. Heat the mixture gradually, and pass the evolved chlorine through a wash bottle containing five ounces of the water, and afterwards into the solution of carbonate of soda. When the disengagement of chlorine has ceased, transfer the solution to a stoppered bottle, and keep it in a cool and dark place.

When the chlorine comes in contact with the solution of carbonate of soda, there are formed hypochlorite of soda, chloride of sodium, and bicarbonate of soda, thus, $4(NaO,CO_2)+2Cl=2(NaO,2CO_2)+NaO,ClO+NaCl$. The essential and characteristic properties of this solution depend on the hypochlorite of soda. It is the Liqueur de Labarraque, or Labarraque's disinfecting fluid. ["Take of chlorinated lime, twelve troyounces; carbonate of soda, twenty-four troyounces; water, twelve pints. Dissolve the carbonate of soda in three pints of the water, with the aid of heat. Triturate the chlorinated lime, a little at a time, with small portions of the water, gradually added, until a smooth, uniform mixture is obtained. Mix this intimately with the remainder of the water, and set the mixture aside for twenty-four hours. Then decant the clear liquid, and, having transferred the residue to a muslin strainer, allow it to drain until sufficient liquid has passed to make, with the decanted liquid, eight pints. Mix this thoroughly with the solution of carbonate of soda, transfer the mixture to a muslin strainer, and allow it to drain, adding water, if necessary, towards the close, until eleven pints and a half of liquid have passed. Lastly, keep the liquid in well-stopped bottles, protected from the light." U.S. This process is very similar to the British, and has the same reactions. The free chlorine is obtained from the chlorinated lime. The solution obtained by this process is of a greenish-yellow color, a sharp saline taste, chlorine odor, and alkaline reaction. —W.]

*Officinal Characters.*—A colorless (or pale yellow) alkaline liquid, with astringent taste and feeble odor of chlorine (hypochlorous acid). It decolorizes sulphate of indigo. It effervesces with hydrochloric acid, evolving chlorine and carbonic acid, and forming a solution which does not precipitate with bichloride of platinum. ["Its specific gravity is 1.045. It produces a copious, light-brown precipitate with solution of sulphate of iron." U. S. Ph.]

That the base of the solution is soda may be shown in two ways: evaporated to dryness, we obtain a residuum, which renders the outer cone of the flame of a candle, or the flame of a spirit lamp, yellow; saturated with hydrochloric acid, and evaporated to dryness, common salt is procured.

*Composition.*—Prepared according to the Pharmacopœia, its composition will be nearly as follows:—

| Eq. | | Eq. Wt. |
|---|---|---|
| 1 | Hypochlorite of soda | 74.5 |
| 1 | Chloride of sodium | 58.5 |
| 2 | Bicarbonate of soda | 150.4 |
| | dissolved in water. | |

*Tests.*—Specific gravity, 1.103. One fluidrachm, added to a solution of twenty grains of iodide of potassium in four fluidounces of water, and acidulated with two fluidrachms of hydrochloric acid ($2KI+ClH+ClO=2KCl+HO+2I$) requires for the discharge of the brown color (iodine) which the mixture assumes, forty-three measures of the volumetric solution of hyposulphite of soda (=1.52 chlorine), the action of the hyposulphite with free iodine has been explained under hyposulphite of soda. It is not precipitated by oxalate of ammonia.

A solution of chlorinated soda should not yield a precipitate on the addition of a solution of sulphate of magnesia. If a precipitate be obtained, it indicates the presence of the carbonate of soda, and the consequent imperfect saturation of the liquid with chlorine.

*Physiological Effects.*—I am unacquainted with any experiments made to determine the physiological effects of chlorinated soda on man. In *moderate* or *small doses*, it has been denominated stimulant, tonic, astringent, antiseptic, and febrifuge. But these terms give no real explanation of the nature of those organic changes which it gives rise to, and from which its therapeutical value is derived.

*Therapeutics.*—The solution of chlorinated soda is employed as a *disinfectant*, *antiseptic*, and, in cases of poisoning by the hydrosulphurets, and sulphuretted hydrogen and hydrocyanic acids, as an *antidote*. But for most of these purposes chlorinated lime is employed instead of chlorinated soda; since its properties are analogous, and, being manufactured on a very extensive scale for the use of bleachers, it can be obtained more conveniently and cheaply. On this account, therefore, and to avoid repetition, I must refer to the article **Chlorinated Lime**, for information respecting the above uses of chlorinated soda. I would remark, however, that in several cases where I have carefully tried and compared the two compounds, I give the decided preference to chlorinated soda. As an antiseptic, Labarraque also preferred the latter preparation, on the ground that by the process of disinfection it becomes chloride of sodium, which is not a deliquescent salt; whereas the chloride of calcium generated by chlorinated lime attracts water from the atmosphere, and thereby furnishes one of the conditions (viz. moisture) necessary to the putrefactive process. Hence, in his opinion, while chlorinated lime will serve equally well for mere disinfection, chlorinated soda is preferable when we wish at the same time to prevent a renewal of putrefaction.

Chlorinated soda is employed internally in all diseases commonly termed *putrid* or *malignant*—as typhus fever, and scarlatina maligna. It is indicated when there are great prostration of strength, fetid evacuations, and a dry and furred tongue. In such cases I have seen it of essential service, improving the quality of the secretions, producing a moist state of the skin, preventing collapse, and altogether acting most beneficially. It may be administered both by the mouth and the rectum.

As a *local* remedy, it is employed in diseases attended with fetid discharges, not merely as a disinfectant and antiseptic—that is, as a chemical agent destroying fetor, and preventing the putrefaction of dead matters (as gangrenous parts, the discharges from wounds and ulcers), although in these respects it is most valuable—but as a means of stopping or relieving morbid action by changing the action of the living tissues. It frequently puts a stop to the further progress of gangrene; promotes the separation of the dead from the living parts; improves the quality of the secretions; and, at the same time, diminishes their quantity when this is excessive. It is applied to ulcers of various kinds (common, phagedenic, cancerous, syphilitic, and scrofulous) when attended with foul discharges, or a disposition to slough. It is of great service in some affections of the mucous surfaces. Thus it is used as a gargle to check ptyalism and affections of the mouth, whether arising from mercury or other causes. In scarlatina maligna, we apply it to check ulceration and sloughing of the throat. In coryza and ozæna, it has been injected into the nostrils with considerable benefit. In fetid and excessive discharges from the vagina and neck of the uterus or bladder, it is employed as an injection with at least temporary relief. It has also been applied in some skin diseases; as tinea capitis, eczema, scabies, and prurigo pudendi. The above are only a few of the cases in which chlorinated soda has been used with most marked benefit. In conclusion, I may add that there are few, if any, remedies, the uses of which, as local agents, are so valuable and extensive as chlorinated soda and lime.

*Administration.*—It may be administered internally in doses of from twenty to thirty drops or more, diluted with some mild aqueous liquid. For a *gargle* it may be diluted with fifteen, and for a *lotion* with ten or fifteen parts of water.

*Antidotes.*—See **Calx Chlorata.**

CATAPLASMA SODÆ CHLORATÆ, *Chlorine Poultice.*—Take a solution of chlorinated soda, two fluidounces; linseed meal, four ounces; boiling water, eight fluidounces. Add the linseed meal gradually to the water, stirring constantly; then mix in the solution of chlorinated soda.

Applied to foul and sloughing ulcers.

### Nitrate of Soda. (Appendix A.) $NaO,NO_5=85$.

*Natural History.*—It is peculiar to the mineral kingdom. Native nitrate of soda is found in South Peru. It exists in large beds, a few feet below the saline soil, or forming that soil in various places. It is found in distinct strata, a thin layer of brown loam separating the parts.

*Preparation.*—Crude nitrate of soda is obtained by crystallization from a boiling saturated solution of the native salt; it is afterwards purified by resolution and crystallization.

*Properties.*—It usually crystallizes in obtuse rhombohedral crystals, which belong to the rhombohedral system. Its taste is somewhat bitter. In moist air it is slightly deliquescent. It is soluble in about two parts of cold water, and in less than its own weight at 212°. It fuses by heat.

*Composition.*—Crystallized nitrate of soda is anhydrous.

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Soda | 31 | 36.47 |
| 1 Nitric Acid | 54 | 63.53 |
| Crystallized Nitrate of Soda | 85 | 100.00 |

*Tests.*—Entirely soluble in distilled water, the solution giving no precipitate with nitrate of silver or chloride of barium (showing its freedom from chlorides and sulphates).

*Pharmaceutic Uses.*—Employed in the formation of arseniate of soda and nitrite of soda.

### Nitrite of Soda. (Appendix A.) $NaO,NO_3$.

*Preparation.*—Take of nitrate of soda, one pound; charcoal recently burned, and in fine powder, one ounce and a quarter. Mix the nitrate of soda and the charcoal thoroughly in a mortar, and drop the mixture in successive portions into a clay crucible heated to dull redness. When the salt has become quite white, raise the heat so as to liquefy it, pour it out on a clean flagstone, and, when it has solidified, break it into fragments, and keep it in a stoppered bottle.

In this process the charcoal deoxidizes the nitrate of soda, forming carbonic acid, $NaO,NO_5+C=NaO,NO_3+CO_2$. The action, however, seldom stops here, for if the mixture be deflagrated, or subjected to too high a heat, it leads to the formation of a considerable quantity of carbonate of soda.

*Officinal Characters.*—In opaque white fragments, soluble in water and in rectified spirit. The aqueous solution gives a white crystalline precipitate with nitrate of silver ($AgO,NO_3$), which dissolves in hot water. A fragment moistened with a solution of sulphate of copper acquires an emerald-green color. Tartaric acid added to a strong solution develops ruddy fumes ($NO_3$), but gives no precipitate.

*Pharmaceutic Use.*—In the preparation of spirit of nitrous ether.

### **Sodæ Arsenias,** *Arseniate of Soda.* $2NaO,HO,AsO_5+14HO$.

*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 fluidounces. 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, inclose them in stoppered bottles.

The arsenious acid is oxidized at the expense of the nitrate of soda, and combining with the soda, both of this and the carbonate, forms bibasic arseniate of soda, expelling carbonic and nitrous acids; $NaO,CO_2+NaO,NO_5+AsO_3=2NaO,AsO_5+NO_3+CO_2$. By boiling with water the arseniate absorbs one atom and becomes tribasic. If this salt is obtained by spontaneous evaporation it contains 24 equivalents of water; $2NaO,HO,AsO_5+24HO$.

*Officinal Characters.*—In colorless transparent rhombic prisms, soluble in water; the solution alkaline, giving white precipitates (arseniates) with chloride of barium, chloride of calcium, and sulphate of zinc, and a brick-red precipitate with nitrate of silver ($3AgO,AsO_5$), all of which are soluble in nitric acid.

*Tests.*—Heated to 300° it loses 40.38 per cent. of its weight. A watery solution of ten grains of the residue, treated with 5.3 measures of the volumetric solution of soda, continues to give a precipitate with the volumetric solution of nitrate of silver until 161.3 measures of the latter have been added (=6.18 grains $AsO_5$).

*Therapeutics.*—Arseniate of soda is now for the first time introduced into a British Pharmacopœia. It may be used in the same cases as the arsenical solution, over which it has the advantage of possessing a definite form, and probably of being somewhat milder in its action. It is used in the form of solution.

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 fluidounce. Dissolve.

*Dose.*—Min. v to min. xx.

### **Acetate of Soda.** (Appendix A.) $NaO,\bar{A}(C_4H_3O_3)+6HO=136$.

*Preparation.*—Acetate of soda is procured by saturating acetic acid by carbonate of soda, and evaporating the solution so that crystals may form.

*Properties.*—This salt crystallizes in oblique rhombic prisms. Geiger says that a saturated solution of this salt does not readily crystallize when cooled in a tall glass vessel unless some pointed or angular body be introduced. Its taste is cooling, saline, and bitterish. Exposed to the air at ordinary temperatures, the crystals undergo little change; but in dry and warm air they effloresce and become anhydrous. When heated, they first undergo the watery fusion, then give out their water of crystallization, and afterwards enter into igneous fusion. At a red heat they are decomposed, and yield, as a residue, a mixture of charcoal and carbonate of soda. They are soluble in about three parts of cold water, and are slightly soluble in alcohol.

*Composition.*—The following is the composition of this salt:—

| Eq. | Eq Wt. | Per Cent. |
|---|---|---|
| 1 Soda . . . . . . . . . | 31 | 22.8 |
| 1 Acetic Acid . . . . . . . . | 51 | 37.5 |
| 6 Water . . . . . . . . . | 54 | 39.7 |
| Crystallized Acetate of Soda . . . | 136 | 100.0 |

*Tests.*—Its solution in water, when dilute, is not precipitated by chloride of barium or nitrate of silver (showing the absence of sulphates and chlorides).

Potash may be recognized by the before-mentioned tests for this base, as well as by the deliquescence of the suspected acetate.

*Pharmaceutic Uses.*—Employed in the preparation of glacial acetic acid, arseniate of iron, phosphate of iron, and syrup of phosphate of iron.

Solution of Acetate of Soda. (Appendix B. II.)—Take of acetate of soda, half an ounce; distilled water, five fluidounces. Dissolve.

Used in the process for indicating the constituents of phosphate of lime.

## Valerianate of Soda. (Appendix A.) $NaO,\overline{V}(C_{10}H_9O_3)=124$.

## [Sodæ Valerianas, U. S.]

*Preparation.*—Take of solution of soda, a sufficiency; fousel oil, four fluidounces; bichromate of potash, nine ounces; sulphuric acid, six fluidounces and a half; distilled water, half a gallon. Dilute the sulphuric acid with ten fluidounces of the water, and dissolve the bichromate of potash in the remainder with the aid of heat. When both liquids are cold, mix them with the fousel oil in a matrass with occasional brisk agitation, until the temperature of the mixture has fallen to about 90°. Connect the matrass with a condenser, and distil until about half a gallon of liquor has passed over. Saturate the distilled liquid accurately with the solution of soda, remove any oil which floats on the surface, evaporate till watery vapor 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. ["Take of bichromate of potassa, in fine powder, ten troyounces; sulphuric acid, fourteen troyounces; amylic alcohol, four fluidounces; water, four pints; solution of soda, a sufficient quantity. Dissolve the bichromate, with the aid of heat, in three pints of the water, and add to the solution seven troyounces of the sulphuric acid, previously diluted with the remainder of the water. Pour the liquid into a tubulated retort, to which a receiver is attached without luting. Mix the amylic alcohol with the remainder of the sulphuric acid, gradually added, and, by means of a funnel-shaped tube, passing through a cork in the tubulure of the retort and dipping into the liquid, introduce the mixture, when cool, into the retort, in small portions at a time, until it is all added. Return to the retort any liquid which may have spontaneously distilled over, and agitate the whole until the reaction has subsided, and the temperature has fallen to about 100°. Then, by means of a sand-bath, distil the liquid nearly to dryness. Introduce the distilled liquid into a capacious glass matrass, and add to it solution of soda, with frequent agitation, until it is accurately saturated. Separate the oil that floats on the liquid, and evaporate the latter until aqueous vapor ceases to escape, and nothing remains but the salt in a state of fusion. Lastly, pour the fused salt on a porcelain slab, and, after it has concreted, break the mass while yet warm in pieces, and keep these in a well-stopped bottle." U. S. The reaction is the same as in the British process —amylic alcohol is fousel oil.—W.]

By the action of the sulphuric acid on the bichromate of potash, chromic acid ($CrO_3$) is set free, the oxygen of which is evolved, and sulphate of potash and chromium result; this oxygen combines with part of the hydrogen of the fousel oil (hydrated oxide of amyl, $C_{10}H_{12}O_2$) to form water and valerianic acid, which, combining with the undecomposed fousel oil, distils over as valerianate of oxide of amyl, $6(C_{10}H_{12}O_2)+4(KO,2CrO_3)+16SO_3=3(C_{10}H_{11}O),\overline{V}+4(KO,SO_3+Cr_2O_3,3SO_3)+12HO$. The soda decomposes this compound, liberating the fousel oil (which is removed), and forming valerianate of soda, $C_{10}H_{11}O,\overline{V}+NaO,HO=NaO,\overline{V}+C_{10}H_{12}O_2$.

*Officinal Characters.*—In dry white masses, without alkaline reaction, entirely soluble in rectified spirit, and giving out a powerful odor of valerian on the addition of dilute sulphuric acid. ["A deliquescent, very soluble salt, in soft, white, crystalline pieces, having a faint odor of valerianic acid, and a taste at first styptic, but afterwards sweetish. It melts without loss of acid at 285°, and concretes on cooling. If one hundred grains of it, dissolved in six hundred grains of water, heated to 200°, be mixed with a solution of one hundred grains of sulphate of zinc in the same quantity of water, crystals of valerianate of zinc will be formed on the surface of the mixture before it cools." U. S.]

*Pharmaceutic Use.*—Used in the formation of valerianate of zinc.

## **Sodæ et Potassæ Tartras,** *Tartrate of Soda and Potash.*

### [**Potassæ et Sodæ Tartras,** U. S.

*Synonym.*—Rochelle Salt.]

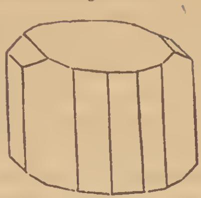
$NaO,KO,\overline{T}(C_8H_4O_{10})+8HO=282$.

*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. ["Take of carbonate of soda, twelve troyounces; bitartrate of potassa, in fine powder, sixteen troyounces; boiling water, five pints. Dissolve the carbonate of soda in the water, and gradually add the bitartrate of potassa. Filter the solution, and evaporate until a pellicle begins to form; then set it aside to crystallize. Pour off the mother-water and dry the crystals on bibulous paper. Lastly, evaporate the mother-water that it may furnish more crystals." U. S.]

In this process the excess of acid in the acid tartrate of potash is saturated by the soda of the carbonate, while the carbonic acid of the latter is disengaged.

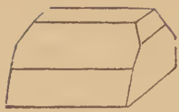
*Officinal Characters.*—In colorless transparent prisms, or halves of prisms of the right-rhombic order, generally eight-sided, tasting like common salt. Heated with sulphuric acid it blackens, evolving inflammable gases and the odor of burnt sugar. It imparts a yellow color to flame. A strong solution gives a crystalline precipitate with a small quantity of dilute sulphuric acid (owing to the formation of acid tartrate of potash).

Fig. 20.



*Prism of Rochelle Salt.*

Fig. 21.



*Natural half of ditto.*

*Properties.*—Exposed to the air, the crystals slightly effloresce. When heated, they undergo watery fusion, evolve their water of crystallization, and are decomposed; the residue consists of charcoal and the carbonates of potash and soda. They are readily soluble in cold, and still more so in hot water.

*Composition.*—The composition of this salt is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Soda | 31 | 11.0 |
| 1 | Potash | 47 | 16.7 |
| 1 | Tartaric Acid | 132 | 46.8 |
| 8 | Water | 72 | 25.5 |
| | Tartrate of Soda and Potash | 282 | 100.0 |

*Tests.*—Entirely soluble in cold water. Forty-seven grains heated to redness till gases cease to be evolved, leave an alkaline residue which requires for neutralization thirty measures (33) of the volumetric solution of oxalic acid. On the addition of nitrate of silver or chloride of barium nothing is thrown down, or, should there be any precipitate, it is redissolved by the addition of water.

*Physiological Effects.*—It is a mild, laxative, cooling salt, very analogous in its effects to the tartrate of potash. When given in the form of dilute solution, and so as not to excite purging, it becomes absorbed, and renders the urine alkaline.

*Therapeutics.*—It is commonly employed as a mild aperient for females and other delicate persons. It may be used with advantage by those who are subject to excessive secretion of uric acid or the urates.

*Administration.*—It is given in doses of from a quarter of an ounce to an ounce. It should be exhibited largely diluted with water. A very convenient mode of exhibition is in combination with bicarbonate of soda and tartaric acid in an effervescing condition.

## Sapo Durus, *Hard Soap.*

### [Sapo, Mat. Med. List, U. S. P.]

Soap made with olive oil and soda.

*Preparation.*—The oil is boiled with a solution of caustic soda until the whole is converted into a thick viscid emulsion which can be drawn out into long, clear threads. Salt is then freely added, which, by abstracting the water, causes the soap to separate and rise to the top, whence it is ladled off into moulds. It is sometimes again dissolved in alkaline lye, and separated to purify and whiten it. Olive oil consists of two fatty acids (oleic and margaric) in combination with glycerine. The soap produced is composed of oleate and margarate of soda, the glycerine being left in the salt lye.

*Characters.*—Grayish white, dry, inodorous; horny and pulverizable when kept in dry warm air; easily moulded when heated.

*Tests.*—Entirely soluble in rectified spirit, not imparting an oily stain to paper (showing its freedom from insoluble soaps, earthy admixture, and unsaponified oil; the insoluble soaps, however, are frequently present).

*Physiological Effects.*—Soap acts very much like the alkalies already noticed. Its local operation, however, is much less energetic than either the caustic or even the carbonated alkalies. Hence it may be administered in considerable doses without causing irritation or inflammation. It promotes the secretion of urine, and communicates alkaline properties to this fluid. In large doses it acts as a purgative.

*Therapeutics.*—As an *antacid*, soap is employed in poisoning by the mineral acids; it should be administered in the form of a strong solution, which effectually neutralizes the acid without acting as an irritant. So also in those forms of dyspepsia which are attended with an excessive formation of acid, soap may be usefully employed to neutralize it. External parts burnt with the strong mineral acids, or with phosphorus, should be washed with a solution of soap. As a *lithonlytic*, soap has been used in those forms of lithiasis in which uric acid prevails. A mixture of soap and lime-water was once considered a most powerful solvent for urinary calculi. As a *purgative*, soap is rarely exhibited alone; in combination with rhubarb, it may be employed with considerable benefit in habitual constipation and disordered conditions of the biliary functions. In the form of enema, a strong solution of it is sometimes used with great relief to dissolve hardened feces, and to relieve obstinate constipation. Laennec found soap a very convenient and useful *expectorant* in dry catarrh. *Externally*, soap is frequently employed on account of its detergent, lubricating, and discutient qualities. Thus, in tinea capitis, scabies, and various other skin diseases, ablution night and morning with soap-water greatly contributes to the cure.

*Administration.*—The usual dose of soap, taken in a pilular form, is from gr. v to gr. xxx. In cases of poisoning by the mineral acids, half a pint of strong solution of soap should be instantly administered.

*Pharmaceutic Uses.*—Soap is used in pharmacy to render other medicines more soluble, or to give a proper consistence to various substances for the making of pills. It is employed in the preparation of resin and soap plaster, compound extract of colocynth, soap liniment, pills of Barbadoes aloes, aloes and assafœtida, Socotrine aloes, compound pill of gamboge, opium pill, and the compound rhubarb and compound squill pills.

LINIMENTUM SAPONIS [U. S.], *Liniment of Soap.*—Take of hard soap, two ounces and a half; camphor, one ounce and a quarter; English oil of rosemary, three fluidrachms; rectified spirit, eighteen fluidounces; distilled water, two fluidounces. Mix the water with the spirit, and add the oil of rosemary, the soap, and the camphor. Digest at a temperature not exceeding 70° with occasional agitation until all (the soluble matters) are dissolved. If the temperature employed be much above this, the liniment is liable to gelatinize. [" Take of soap, in shavings, four troyounces; camphor, two troyounces; oil of rosemary, half a fluidounce; water, four fluidounces; alcohol, two pints. Mix the alcohol and water, digest the soap with the mixture, by means of a water-bath, until it is dissolved; then filter, and, having added the camphor and oil, mix the whole thoroughly together." U. S.

This preparation is the Tinctura Saponis Camphorata of the U. S. Pharmacopœia of 1850. It is a perfectly fluid alcoholic solution of soap, &c. The Linimentum Saponis Camphoratum of the Pharmacopœia of 1850 is the so-called Opodeldoc. Although discarded at the last revision of the Pharmacopœia the former officinal recipe is inserted below, as opodeldoc is much used as a domestic remedy. It differs from soap-liniment in its soap being made with an animal instead of a vegetable oil. It is a gelatinous, white semisolid, which melts at the temperature of the body.

"Take of common soap, sliced, three ounces; camphor, an ounce; oil of rosemary, oil of origanum, each a fluidrachm; alcohol, a pint. Digest the soap with alcohol, by means of a sand bath, till dissolved; then add the camphor and oils, and, when they are dissolved, pour the liquor into broad-mouthed bottles."—W.]

Liniment of soap is used as a stimulant and discutient, as well as, on account of its lubricating qualities in local pains, sprains, bruises, rheumatism, &c. It is a constituent of liniment of opium.

Emplastrum Saponis [U. S.], *Soap Plaster.*—Take of hard soap, in powder, six ounces; litharge plaster, two pounds and a quarter; resin, in powder, one ounce. To the litharge plaster, melted by a gentle heat, add the soap and the resin, first liquefied; then, constantly stirring, evaporate to a proper consistence. ["Take of soap, sliced, four troyounces; plaster of lead, thirty-six troyounces; water, a sufficient quantity. Rub the soap with water until brought to a semi-liquid state; then mix it with the plaster, previously melted, and boil to the proper consistence." U. S.]

This plaster, spread on leather, is used as a discutient and mechanical support. It is a constituent of belladonna plaster and the warm plaster. [This plaster does not enter into the composition of any plaster in the U. S. P.—W.]

[Ceratum Saponis, U. S., *Soap Cerate.*—"Take of soap plaster, two troyounces; white wax, two troyounces and a half; olive oil, four troyounces. Melt together the plaster and wax, add the oil, and, after continuing the heat a short time, stir the mixture until cool."

Used spread on kid as a protective and sedative cooling dressing in chronic inflammation.—W.]

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## LITHIUM. L=7.

*Natural History.*—Lithium is the metallic base of the alkali lithia (so called from λιθος, a stone, because it is exclusively found in the mineral kingdom). It is of a reddish-white color, and is the lightest of all known solid or liquid bodies, having a specific gravity of 0.594.

Lithia (LO=15) is a fixed alkali like soda and potash; it is a constituent of several minerals (*petalite*, *triphane* or *spodumene*, *lepidolite*, *amblygonite*, &c.). It is also found in many mineral waters; in those of Pyrmont and Sliatsch it exists in the form of sulphate; in the Kreuznach waters as the chloride; and in the waters of Aix-la-Chapelle and Burtscheid it is found in combination with phosphoric acid and soda.

### **Lithiæ Carbonas**, *Carbonate of Lithia* [Mat. Med. List, U. S. P.]. $LO,CO_2=37$.

*Natural History.*—Found in many mineral waters, as those of Franzensbad, Klausen, Lubien, Elms, Teplitz, Bilin, Marienbad, Kissengen, Salzbrunn, Buchsäuerling, and Karlsbad.

*Preparation.*—Obtained by adding a strong solution of carbonate of ammonia to a solution of either sulphate of lithia or chloride of lithium; or by decomposing sulphate of lithia by acetate of baryta, and calcining the resulting acetate of lithia, by which it is converted into the carbonate.

*Officinal Characters.*—In white powder, or in minute crystalline grains, alkaline in reaction, soluble in 100 parts of cold water, insoluble in alcohol. It dissolves with effervescence in hydrochloric acid; and the solution evaporated to dryness leaves a residue of chloride of lithium, which, redissolved in water, yields a precipitate (phosphate of lithia $3LO,PO_5$) with phosphate of soda.

*Properties.*—It imparts a crimson-red color to the flame of alcohol. An aqueous solution gives a yellowish-white precipitate with nitrate of silver, and a dense white precipitate with the salts of baryta and lime. In taste it resembles bicarbonate of soda. It dissolves more readily in water holding in solution carbonic acid, by which bicarbonate of lithia is formed. It is in this state, probably, that it exists in many mineral waters. By dissolving carbonate of lithia in hot water, filtering and slowly evaporating the solution, crystals of the carbonate are formed: they are said to be anhydrous. A solution of one part of the carbonate in 1000 parts of water has an alkaline reaction.

Carbonate of lithia has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Lithia | 15 | 40.54 |
| 1 | Carbonic acid | 22 | 59.46 |
| | Carbonate of Lithia | 37 | 100.00 |

*Tests.*—Ten grains of the salt neutralized with sulphuric acid and afterwards heated to redness leave 14.86 grains of dry sulphate of lithia; which, when redissolved in distilled water, yields no precipitate with oxalate of ammonia or solution of lime (showing its freedom from lime, magnesia, alumina, &c.).

*Therapeutics.*—Carbonate of lithia acts as a diuretic, and, according to the experience of Dr. Garrod, has more influence in rendering the urine alkaline than the same quantity of the carbonates of soda and potash. He considers that, on account of the small amount of lithia which forms a salt with uric acid, and the much greater solubility of this salt than of the urates of soda or potash, it may be given with great advantage in certain states of the system in which urate of soda is liable to be deposited in the tissues, as in gout, &c.

*Dose.*—Gr. iii to gr. vi.

### **Lithiæ Citras,** *Citrate of Lithia.* $3LO,\bar{C}(C_{12}H_5O_{11})=210$.

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

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

*Test.*—Twenty grains of the salt, burned at a low red heat with free access of air, leave 10.6 grains of white residue ($LO,CO_2$).

*Therapeutics.*—Citrate of lithia may be used for the same purpose as the carbonate. [In the few cases in which I have employed it, it appears to me to agree with the stomach better than the carbonate.—Ed.]

*Dose.*—Gr. v to gr. x.

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## BARIUM. Ba=68.5.

The metallic basis of the alkaline earth *baryta*, BaO=76.5

**Chloride of Barium [Barii Chloridum,** U. S.]. (Appendix B. I.)
$BaCl+2HO=122$.

*Prepared* by dissolving the native or precipitated carbonate of baryta, or the artificial sulphuret of barium, in hydrochloric acid, to saturation; evaporating to dryness, redissolving and crystallizing.

*Properties.*—Colorless rhombic plates of a bitter and disagreeable taste. Is not precipitated, from a dilute watery solution, by ammonia, sulphuretted hydrogen or ferrocyanide of potassium; but soluble sulphates, phosphates, and carbonates occasion white precipitates of their respective acids. The sulphate of baryta is insoluble in nitric acid; and if an excess of sulphuric acid be used in the precipitation, the filtered solution should be completely volatilized when heated. ["Take of carbonate of baryta, in small pieces, muriatic acid, each, four troyounces; water, a pint. Mix the acid with the water, and gradually add the carbonate of baryta. Towards the close of the effervescence apply a gentle heat, and, when chemical action has ceased, filter the liquid, and evaporate so that crystals may form when it cools." U. S.]

Solution of Chloride of Barium. (Appendix B. II.)—Take of chloride of barium, in crystals, one ounce; distilled water, a sufficiency. Dissolve the chloride of barium in eight fluidounces of the water, and add as much distilled water as will make the bulk of the solution ten fluidounces.

*Used* as a test for sulphuric acid and soluble sulphates, with which it produces a white precipitate of sulphate of baryta, insoluble in nitric acid.

[Liquor Barii Chloridi, U. S.—"Take of chloride of barium, a troyounce; distilled water, three fluidounces. Dissolve the chloride in the distilled water, and filter through paper."

Chloride of barium is said to be a deobstruent and anthelmintic. It has been highly recommended in scrofula and incipient phthisis. The best form of exhibiting it is the solution. The dose is five drops, cautiously increased, in water. In overdoses it acts as an irritant poison, producing symptoms resembling those caused by arsenic.—W.]

[**Barytæ Carbonas,** *Carbonate of Baryta*, Mat. Med. List, U. S. P.

This salt may be made by precipitating the chloride or nitrate with an alkaline carbonate: as thus prepared, it is in the form of a heavy white powder, which is sparingly soluble in water. It occurs in nature in grayish fibrous masses, known as witherite—very rarely it is crystallized.

*Officinal Characters.*—Entirely soluble in dilute muriatic acid with effervescence. The solution formed is not colored nor precipitated by ammonia or hydrosulphuric acid. When sulphuric acid is added in excess, the solution yields no precipitate with carbonate of soda.

*Therapeutics.*—This salt is never used as a medicine, but is officinal in the preparation of the chloride of barium. Its action on the system is that of an acrid narcotic poison, causing inflammation of the gastro-intestinal mucous membrane and serious nervous symptoms, such as dimness of the sight, double vision, paralysis, insensibility, and even convulsions.—W.]

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## CALCIUM. Ca=20.

The metallic base of the alkaline earth, *lime.*

### Calx, *Lime.* [Mat. Med. List, U. S. P.] CaO=28.

*Natural History.*—It occurs in both kingdoms of nature. In the mineral kingdom, lime is found in the form of carbonate, sulphate, phosphate, silicate, arseniate, borate, &c. Its base, calcium, occurs in combination with fluorine (fluor spar). In vegetables, lime is almost invariably present. It is found combined with carbonic, sulphuric, phosphoric, nitric, and various organic acids (as oxalic, malic, citric, tartaric, and kinic); calcium occurs in combination with chlorine. In animals, lime is found principally as carbonate and phosphate.

*Preparation.*—For use in the arts, lime is usually obtained by burning limestone (carbonate of lime), with coals, coke, or other fuel, in a kind of wind furnace called a *kiln*, the carbonic acid being expelled by the heat and vapors, chiefly in the form of carbonic oxide (CO).

*Officinal Characters.*—In light lumps, externally of a dirty white color, white within. When two-thirds of its weight of water are poured upon it, it slakes rapidly, with the development of much heat, and is converted into a snow-white and very bulky powder. This, when agitated with distilled water, gives after filtration a clear solution which has an alkaline reaction, and yields a white precipitate with oxalate of ammonia.

*Properties.*—Lime has an acrid, alkaline taste, and reacts powerfully on vegetable colors as an alkali. It is difficult of fusion; but by the oxyhydrogen flame it may be both fused and volatilized. Exposed to the air, it attracts water and carbonic acid. It is slightly soluble in water. Its solubility in this liquid is very remarkable, cold water dissolving more than hot. According to Mr. Phillips—

| | | | |
|---|---|---|---|
| A pint of water at . . . . . . | 32° | dissolves | 13.25 grs. |
| " " . . . . . . | 60° | " | 11.6 " |
| " " . . . . . . | 212° | " | 6.7 " |

So that water at 32° dissolves nearly twice as much lime as water at 212°. The calcareous salts (especially chloride of calcium) give an orange-red tinge to the flame of alcohol.

*Composition.*—The following is the composition of lime:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Calcium . . . . . . . . . . | 20 | 71.43 |
| 1 Oxygen . . . . . . . . . . | 8 | 28.57 |
| Lime . . . . . . . . . . | 28 | 100.00 |

*Impurities.*—The lime used in the arts is never absolutely pure, but usually contains variable quantities of carbonate of lime, silica, alumina, oxide of iron, and sometimes magnesia.

*Tests.*—If previously slaked it dissolves without effervescence in dilute hydrochloric acid, and if this solution be evaporated to dryness, and the residue redissolved in water, only a very scanty precipitate forms on the addition of saccharated solution of lime (showing its freedom from carbonate, and from any large proportion of alumina, magnesia, phosphate of lime, oxide of iron, &c.).

*Physiological Effects.*—Quicklime, like the fixed alkalies, is a powerful escharotic and irritant. This action is well seen in the ophthalmia produced by the lodgment of small particles of lime in the eye.

When applied to suppurating or mucous surfaces, lime-water checks or stops secretion, and produces dryness of the part: hence it is termed a desiccant. In this property it differs from the fixed alkalies.

When administered *internally*, it neutralizes the free acid of the gastric juice, diminishes the secretion of the gastro-intestinal membrane, and thereby occasions thirst and constipation. It frequently gives rise to uneasiness of stomach, disordered digestion, and not unfrequently to vomiting. After its absorption, it increases the secretion of the urine, and diminishes the excessive formation or deposition of uric acid and the urates. With this exception, it does not, like the alkalies, promote the action of the different secreting organs, but, on the other hand, diminishes it, and has in consequence been termed an astringent. But it does not possess the corrugating action of the astringent vegetables, or of many of the metallic salts—it is rather a drying remedy, or desiccant. In this respect lime differs from the alkalies, but is analogous to the oxide of zinc.

A power of exciting and changing the mode of action of the absorbent vessels and glands has been ascribed to lime-water, and probably with foundation. At any rate, under the use of it, glandular enlargements have become softer and smaller. In other words, it operates as a resolvent. Sundelin says that the excessive use of lime does not, as in the case of the alkalies, bring about a scorbutic diathesis, but a general drying and constriction, analogous to that caused by zinc. Lime, in *large doses*, acts as a poison: the symptoms in one case were thirst, burning in the mouth, burning pain in the belly, obstinate constipation, and death in nine days.

*Therapeutics.*—Quicklime has been employed as a *caustic*, but alone is now rarely resorted to. It is sometimes applied in the form of *potassa cum calce*, Ph. Lond., and is a constituent of the ordinary depilatories. As an *antidote*, lime-water, in conjunction with milk, was recommended by Navier in poisoning by arsenious acid. In the absence of more appropriate antidotes, lime-water may be administered in poisoning by the common mineral and oxalic acids. As a *lithonlytic* it possessed at one time considerable celebrity. As an *antacid* in dyspepsia, accompanied by acidity of stomach, it is sometimes useful. Mixed with an equal measure of milk, which completely covers its offensive taste, it is one of the best remedies in our possession for nausea and vomiting dependent on irritability of stomach. We have found a diet exclusively of lime-water and milk to be more effectual than any other plan of treatment in dyspepsia, accompanied with vomiting of food. It often relieves the superficial but painful ulceration on the mucous membrane of the mouth observed in dyspeptics. In this case, one part of the solution to two or three of milk is usually sufficient. In the dyspepsia of gouty and rheumatic subjects, and which is usually accompanied with a copious secretion of uric acid by the kidneys, I have seen lime-water serviceable. As a *desiccant* or *astringent*, it is useful as a wash for ulcers attended with excessive secretion. In some scrofulous ulcers in which I have employed it, its power of checking secretion has been most marked. In diarrhœa, when the mucous discharge is great, and the inflammatory symptoms have subsided, lime-water is useful as an astringent. As an injection in leucorrhœa and gleet, it sometimes succeeds where other remedies have failed. The internal use of lime-water has also been serviceable in checking secretion from various other parts, as from the bronchial membranes, the bladder, &c.

*Pharmaceutic Uses.*—Employed in the preparation of alcohol from rectified spirit, owing to its strong affinity for water, and in the preparation of pure ether to remove any acid.

Calcis Hydras, *Slaked Lime.* $CaO,HO = 37$.—Take of lime, recently burned, two pounds; distilled water, one pint. Place the lime in a metal pot, pour the water upon it, and when vapor ceases to be disengaged cover the pot with its lid, and set it aside to cool. When its temperature has fallen to that of the atmosphere, remove its contents, pass the powder through an iron-wire sieve, and put it into a wide-mouthed bottle, which should be accurately closed by a well-fitted cork. Slaked lime should be recently prepared.

*Composition.*—It consists of

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Lime | 28 | 75.676 |
| 1 Water | 9 | 24.324 |
| Hydrate of Lime | 37 | 100.000 |

*Pharmaceutic Uses.*—The great affinity of lime for carbonic acid renders it useful in the production of caustic alkalies from their carbonates, as in the processes for solutions of potash and soda, and of chlorate of potash. It is also used for the liberation of ammonia; from the hydrochlorate in the preparation of strong solution of ammonia; and in the processes for sulphate of potash, chloroform, atropia, santonin, &c.

Liquor Calcis [U. S.], *Solution of Lime.* [*Lime Water*].—Take of slaked lime, two ounces; distilled water, one gallon. Introduce the lime into a stoppered bottle containing the water, and shake well for two or three minutes. After twelve hours the excess of lime will have subsided, and the clear solution may be drawn off with a siphon as it is required for use, or transferred to a green glass bottle furnished with a well-ground stopper. When the whole of the solution has been withdrawn from the bottle in which it was made, a fresh solution may be obtained by shaking the sediment at the bottom of the bottle with another gallon of distilled water; and if the lime be pure and the bottle accurately stopped, the process may be repeated four or five time. ["Take of lime, four troyounces; distilled water, eight pints. Upon the lime, first slaked with a little of the distilled water, pour the remainder, and stir them together. Then immediately cover the vessel, and set it aside for three hours. Keep the solution, together with the undissolved lime, in a well-stopped bottle, and pour off the clear liquid when wanted for use. Water free from saline or other obvious impurity, though not distilled, may be employed in this process." U. S.]

*Test.*—Ten fluidounces require for neutralization at least twenty measures of volumetric solution of oxalic acid.

*Dose.*—Half an ounce to two or three ounces.

*Pharmaceutic Uses.*—Employed in the preparation of oxide of silver and liniment of lime.

Liquor Calcis Saccharatus, *Saccharated Solution of Lime.*—Take of slaked lime, one ounce; refined sugar, in powder, two ounces; distilled water, one pint. Mix the lime and 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.

Lime and sugar form a compound considerably more soluble in water than pure lime, the above preparation, containing at least twelve times as much lime as the ordinary solution, the addition of more sugar will increase the proportion still further.

*Tests.*—Specific gravity, 1.052. One fluidounce requires for neutralization 25.4 measures of the standard solution of oxalic acid, which corresponds to 7.11 grains of lime.

*Used* to detect the presence of alumina, magnesia, phosphate of lime, and oxide of iron in prepared chalk and precipitated carbonate of lime, for which purpose it is better adapted than solution of lime on account of the larger proportion of contained lime.

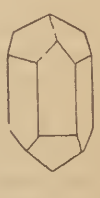
Linimentum Calcis [U. S.], *Liniment of Lime.*—Take of solution of lime, two fluidounces; olive oil, two fluidounces. Mix together with agitation. [" Take of solution of lime, eight fluidounces; flaxseed oil, seven troyounces. Mix them." U.S. The lime decomposes a portion of the oil, which is in great excess, and forms an insoluble lime soap (oleo-margarate of lime). This makes a very thick, semifluid mixture, with the excess of the oil; which when applied to a raw surface excludes the atmosphere and thus allays pain and promotes healing.—W.]

It has long been celebrated as an application to burns and scalds, and is employed for this purpose at the Carron iron works; hence its name Carron oil. [It is also very useful in healing tedious blisters.—Ed.]

## Carbonate of Lime. $CaO,CO_2=50$.

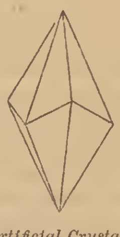
*Natural History.*—Carbonate of lime occurs in both kingdoms of nature. It forms a considerable portion of the known crust of the earth. It is found in the inferior stratified rocks, but more abundantly in the different groups in the fossiliferous rocks, particularly towards the central and higher parts of the series. In the crystallized form it constitutes *calcareous spar* and *arragonite.* The first of these is most extensively distributed, and presents itself under many varieties of shapes. Granular carbonate of lime (the *granular limestone* of mineralogists) more commonly occurs in beds, but sometimes constitutes entire mountains. The whitest and most esteemed primitive limestone is that called *statuary marble.* That from Carrara, on the eastern coast of the Gulf of Genoa, being very pure, should be employed for pharmaceutical purposes. *Chalk* constitutes the newest of the secondary rocks, and occurs abundantly in the southern parts of England. It lies in beds, and contains an abundance of marine as well as terrestrial organic remains. There are various other forms of carbonate of lime constituting the substances called by mineralogists *stalactite carbonate of lime*, *oolite*, *pisolite*, *marl*, and *tufa.* Carbonate of lime is an ordinary ingredient in mineral and common waters, being held in solution by carbonic acid, and therefore deposited

Fig. 22.



*Natural Crystal of Carbonate of Lime.*

Fig. 23.



*Artificial Crystal of Carbonate of Lime.*

when this is expelled by boiling or otherwise. Carbonate of lime is also found in some plants, and is obtained from the ashes of most. It is an abundant constituent of animals, especially of the lower classes. Thus in the Radiate animals we find it in the hard parts of Corals and Madrepores; in the Molluscs (as in the oyster) it is in the shells. In the articulated animals it forms, with phosphate of lime, the crusts which envelop these animals (as the crab and lobster); and in the higher classes it is found in bone, but the quantity of it here is very small.

*Composition.*—Carbonate of lime has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Lime | 28 | 56 |
| 1 | Carbonic Acid | 22 | 44 |
| | Carbonate of Lime | 50 | 100 |

Several forms of carbonate of lime are employed in medicine, viz: *marble*, *chalk*, *prepared chalk*, and *precipitated carbonate of lime.*

### Marble. (Appendix A.)

### [Marmor, Mat. Med. List, U. S. P.]

Hard white crystalline native carbonate of lime, in masses.

*Characters.*—Pure marble should be perfectly soluble, with effervescence, in diluted hydrochloric acid, by which the absence of silica is shown. Ammonia should not cause any precipitate in this solution, by which its freedom from magnesia, alumina, oxide of iron, and phosphate of lime, may be inferred; nor should a solution of sulphate of lime throw down anything, by which the absence of baryta and strontia is proved.

*Used* for the production of carbonic acid in the processes for the bicarbonates of potash and soda.

### Chalk. (Appendix A.)

### [Creta, Mat. Med. List, U. S. P.]

A soft white amorphous native carbonate of lime.

Creta Præparata [U. S.], *Prepared Chalk.*—Carbonate of lime, $CaO,CO_2$, nearly pure. Take of chalk, one pound; water, a sufficiency. Reduce the chalk to powder, and, having rubbed this in a mortar with as much water as will give it the consistence of cream, fill the mortar with more water, and stir well, giving the whole a circular motion. Allow the mixture to stand for fifteen seconds, and then decant the milky liquid into a large vessel. Rub what remains in the mortar, adding as much water as was previously used, and, after allowing it to settle for fifteen seconds, again decant, and let this process be repeated several times, using, if necessary, additional chalk. Transfer the fine sediment which subsides from the decanted liquids to a filter, and dry it at a temperature of 212°. ["Take of chalk, a convenient quantity. Add a little water to the chalk, and rub it into a fine powder. Throw this into a large vessel nearly full of water, stir briskly, and, after a short interval, decant the supernatant liquid, while yet turbid, into another vessel. Treat the coarser particles of chalk, remaining in the first vessel, in a similar manner, and add the turbid liquid to that previously decanted. Lastly, set the liquid by that the powder may subside, and, having poured off the water, dry the powder." U. S.]

By this process of washing the finely divided chalk is separated at once from soluble saline matter and from any coarser particles of chalk, as also from flinty or sandy matter mingled with it. It is then nearly pure carbonate of lime.

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

*Test.*—The salt formed by dissolving the chalk in hydrochloric acid, if rendered neutral by evaporation to dryness and redissolved in water, gives only a very scanty precipitate on the addition of saccharated solution of lime (showing its freedom from any considerable admixture of silica, albumina, oxide of iron, magnesia, or phosphate of lime).

*Physiological Effects.*—The local effects of chalk are those of an absorbent, antacid, and mild *desiccant.* When swallowed, it neutralizes the free acid of the gastric juice, and in this way alone must, by continued use, injure the digestive functions. It causes constipation—an effect commonly observed from the use of a few doses in diarrhœa. By the action of the free acids of the alimentary canal, it is converted into one or more soluble calcareous salts, which become absorbed. Hence the continued use of carbonate of lime is attended with the constitutional effects of the calcareous salts; and, consequently, the statements which have been made as to the influence of chalk over the lymphatic vessels and glands, and its effect in diminishing excessive secretion, may be correct. After chalk has been used for some time, the bowels should be cleared out, as it is apt to form into hard balls, and to lodge in the folds of the intestines.

*Therapeutics.*—As an *absorbent* and *desiccant*, prepared chalk is used as a dusting powder in moist excoriations, ulcers, the intertrigo of children, burns and scalds, erysipelatous inflammation, &c. In the form of ointment it has been recommended in ulcers. As an *antacid*, it is exhibited in those forms of dyspepsia which are accompanied with excessive secretion of acid; and as an antidote in poisoning by the mineral and oxalic acids. It has also been used in some diseases which have been supposed to depend on, or be accompanied by, excess of acid in the system—as in gouty affections, which are usually attended with the excessive production of uric acid; and in rachitis, which some have ascribed to a preponderance of phosphoric acid, or to a deficiency of lime in the system.

*To diminish alvine evacuations*, it is employed in diarrhœa. Its efficacy can hardly be referred solely to its antacid properties, for other antacids are not equally successful, but to its desiccating properties already referred to. Moreover, in many cases of diarrhœa in which chalk is serviceable, no excess of acidity can be shown to exist in the bowels. Aromatics are useful adjuncts to chalk in most cases of diarrhœa. In old obstinate cases, astringents (as logwood, catechu, or kino) may be conjoined with great advantage; and in severe cases, accompanied with griping pains, opium.

*Administration.*—Prepared chalk is given in the form of powder or mixture, in doses of from ten to sixty grains.

*Pharmaceutic Uses.*—Employed in the preparation of citric and tartaric acids, as an ingredient in mercury with chalk, and in the following preparations:—

Mistura Cretæ [U. S.], *Chalk Mixture.*—Take of prepared chalk, a quarter of an ounce; gum arabic, in powder, a quarter of an ounce; syrup, half a fluidounce; cinnamon water, seven fluidounces and a half.

Triturate the chalk and gum arabic with the cinnamon water, then add the syrup and mix.

An ounce and a half contains about twenty grains of chalk.

["Take of prepared chalk, half a troyounce; sugar, gum arabic, in fine powder, each, one hundred and twenty grains; cinnamon water, water, each, four fluidounces. Rub them together until they are thoroughly mixed." U. S. Each fluidounce contains thirty grains.—W.]

PULVIS CRETÆ AROMATICUS, *Aromatic Powder of Chalk.*

*Synonym.*—Confectio Aromatica, *Lond.*

Take of prepared chalk, one pound; aromatic powder, three pounds. Mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

This powder differs from the London Aromatic Confection in containing, in 100 grains, 25 instead of 34 of chalk, and 25 instead of 16 of aromatics.

*Dose.*—Gr. xxx to gr. lx.

PULVIS CRETÆ AROMATICUS CUM OPIO, *Aromatic Powder of Chalk and Opium.*—Take of aromatic powder of chalk, nine ounces and three quarters; opium, in powder, a quarter of an ounce. Mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

Forty grains contain one grain of opium.

*Dose.*—Gr. x to gr. xl.

[TROCHISCI CRETÆ, U. S., *Troches of Chalk.*—"Take of prepared chalk, four troyounces; gum arabic, in fine powder, a troyounce; nutmeg, in fine powder, sixty grains; sugar, in fine powder, six troyounces. Rub them together until they are thoroughly mixed; then with water form a mass, to be divided into troches, each weighing ten grains." U. S.]

### [**Testa**, Mat. Med. List, U. S. P.

The shell of Ostrea edulis, or common American oyster.

TESTA PRÆPARATA, U. S., *Prepared Oyster-shell.*—"Take of oyster-shell, a convenient quantity. Free the oyster-shell from extraneous matter, wash it with boiling water, and, having reduced it to a fine powder, treat this in the manner directed for prepared chalk." U. S. This preparation differs from prepared chalk in containing a small proportion of animal matter, and hence is preferred by some physicians. It is given to meet the same indications as is creta præparata. *Castillon's powders* consist of sago, tragacanth, salep, āā ʒj, prepared oyster-shell ℈j, cochineal q. s. to color mixture. A drachm of this is boiled in milk and the latter then given ad libitum—in chronic bowel affections of children.—W.]

### **Calcis Carbonas Præcipitata** [U. S.], *Precipitated Carbonate of Lime.* $CaO,CO_2=50$.

*Preparation.*—Take of chloride of calcium, five ounces; carbonate of soda, thirteen ounces; boiling distilled water, a sufficiency. Dissolve the chloride of calcium and the carbonate of soda each in two pints of the water; mix the two solutions, and allow the precipitate to subside. Collect this on a calico filter, wash it with boiling distilled water, until the washings cease to give a precipitate with nitrate of silver, and dry the product at the temperature of 212°. ["Take of solution of chloride of calcium, five pints and a half; carbonate of soda, seventy-two troyounces; distilled water, a sufficient quantity. Dissolve the carbonate of soda in six pints of distilled water. Heat this solution and the solution of chloride of calcium, separately, to the boiling point, and mix them.

After the precipitate has subsided, separate it from the supernatant liquid by decantation, and wash it with boiling distilled water until the washings cease to be affected by a solution of nitrate of silver. Lastly, dry the precipitate on bibulous paper." U. S.]

A simple interchange of bases and acids, $CaCl+NaO,CO_2=CaO,CO_2+NaCl$.

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

*Properties.*—Pure carbonate of lime is a tasteless, odorless solid. When heated to redness in a current of air, its carbonic acid is expelled, leaving quicklime. There is considerable difficulty, however, in expelling carbonic acid from perfectly dry chalk. It is almost insoluble in water, one part of carbonate requiring 35,000 parts of water to dissolve it. It is much more soluble in carbonic acid water; the solution reddens litmus, but changes the yellow color of turmeric paper to brown; by boiling, or exposure to the air, the carbonic acid is evolved, and the carbonate of lime deposited.

*Tests.*—With dilute nitric acid it gives a clear solution, which, if perfectly neutral, is not precipitated by saccharated solution of lime added in excess, or by the solution of nitrate of silver (showing its freedom from alumina, magnesia, phosphate of lime, &c., and also from any chloride of sodium left in the precipitate through imperfect washing). Sometimes sulphate of lime is substituted for the precipitated carbonate. The fraud may be readily detected by the addition of either hydrochloric or nitric acid; no effervescence takes place with sulphate of lime. If sulphate be mixed with carbonate of lime, the fraud may be detected as follows: Digest in dilute hydrochloric acid until effervescence ceases; the carbonate will be dissolved, and the sulphate for the most part will be left undissolved. By boiling in water, a small portion of sulphate is dissolved, and, by the addition of chloride of barium to the solution, the presence of sulphuric acid may be recognized.

*Dose.*—Gr. xx to gr. lx.

*Pharmaceutic Uses.*—It is one of the ingredients in bismuth lozenges.

### Phosphate of Lime $3CaO,PO_5=155$.

*Natural History.*—This salt occurs in both kingdoms of nature. Combined with fluoride and chloride of calcium, it occurs in the minerals called *apatite*, *moroxite*, *phosphorite*, and *asparagus stone*. It occurs in most soils, especially in some varieties of chalk, in greater or less abundance, being probably derived from the bones of animals. It abounds in *coprolites*, substances supposed to be the fossil excrements of reptiles. It is a constituent of both animals and vegetables. It forms the principal part of the earthy matter of the bones of the *vertebrata* and of the crustaceous envelopes of the *articulata*.

### [Os, *Bone*, Mat. Med. List, U. S. P.]

### Bone Ash. (Appendix A.)

The residue of ox and sheep bones, which have been burned white in contact with air, reduced to powder; consisting principally of phosphate of lime and a little carbonate of lime. When bones are ignited in close vessels, they yield as a fixed residue *bone black*. If, however, they are calcined in open vessels, the whole of the carbonaceous matter is burnt off, and the white product is called *bone ash* or *bone earth*. A similar product is obtained by calcining the antler of the deer (*Cervus elaphus*). In this case the product, when reduced to a fine powder, is called *burnt hartshorn* (*Cornu Ustum*, *Lond.*). Bone ash consists principally of *phosphate of lime*, but mixed with *carbonate* and a small portion of *sulphate of lime*. The sulphate did not pre-exist in the bones, but is formed during calcination by the oxidation of the sulphur contained in the animal matter of the bone. Thomson mentions *magnesia* (not in the state of phosphate) and *chloride of sodium* as constituents of bone earth.

*Pharmaceutic Uses.*—Used in the formation of precipitated phosphate of lime and phosphate of soda.

### Calcis Phosphas Præcipitata [U. S.], *Precipitated Phosphate of Lime.* $3CaO,PO_5=155$.

*Preparation.*—Take of bone ash, four ounces; hydrochloric acid, six fluidounces; distilled water, two pints; solution of ammonia, twelve fluidounces, or a sufficiency. Digest the bone ash in the hydrochloric acid, diluted with a pint of water until it is dissolved. Filter the solution if necessary; add the remainder of the water, and afterwards the solution of ammonia, until the mixture acquires an alkaline reaction; and, having collected the precipitate on a calico filter, wash it with boiling distilled water as long as the liquid which passes through occasions a precipitate when dropped into the solution of nitrate of silver acidulated with nitric acid. Dry the washed product at a temperature not exceeding 212°. ["Take of bone, calcined to whiteness, and in fine powder, four troyounces; muriatic acid, eight troyounces; water of ammonia, twelve fluidounces, or a sufficient quantity; distilled water, a sufficient quantity. Macerate the bone with the acid, diluted with a pint of distilled water, until it is dissolved, and filter the solution. Add another pint of distilled water, and then, gradually, water of ammonia until the liquid acquires an alkaline reaction. Mix the precipitate obtained, while yet in the stage of magma, with twice its bulk of boiling distilled water, and pour the whole upon a strainer. Wash the precipitate with boiling distilled water until the washings cease to be affected by a solution of nitrate of silver, acidulated with nitric acid. Lastly, dry the precipitate with a gentle heat." U. S.]

By digestion with hydrochloric acid, the phosphate of lime is dissolved and the carbonate of lime is decomposed, with the evolution of carbonic acid, and the formation of water and chloride of calcium. On the addition of ammonia, the phosphate is precipitated. It is washed to deprive it of all traces of chloride of calcium and hydrochlorate of ammonia.

*Officinal Characters.*—A light white amorphous powder, insoluble in water, but soluble without effervescence in dilute nitric acid. The solution continues clear when an excess of acetate of soda is added to it, but lets fall a white precipitate on the addition both of a little oxalate of ammonia, and of perchloride of iron. As oxalate of lime and phosphate of iron are soluble in nitric acid the acetate of soda is added in excess, to effect its transfer to the soda, leaving acetic acid in its place. ["Precipitated phosphate of lime is a white powder, inodorous and tasteless, fusible without decomposition by an intense heat, insoluble in water, but freely soluble in nitric, muriatic, and acetic acids. Its solution in dilute nitric acid yields a white precipitate with oxalate of ammonia; and the same solution, neutralized as far as possible without causing precipitation, gives a lemon-yellow precipitate with solution of ammonio-nitrate of silver." U. S. The lemon-yellow precipitate is the tribasic phosphate of the protoxide of silver.—W.]

*Composition.*—It has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 3 Lime | 84 | 54.2 |
| 1 Phosphoric Acid | 71 | 45.8 |
| Phosphate of Lime | 155 | 100.0 |

*Tests.*—Ten grains dissolve perfectly and without effervescence in dilute hydrochloric acid. The solution yields with ammonia a white precipitate ($3CaO,PO_5$), which is insoluble in boiling solution of potash, and when washed and dried weighs ten grains. The non-effervescence indicates freedom from carbonates, and the weight obtained, after boiling with solution of potash, proves the absence of alumina.

*Physiological Effects.*—As this salt is a general constituent of the animal structures, especially of the osseous tissues, it, or its components, are essential constituents of our food. Man obtains more of this ingredient than the wants of his system require, from the corn, potatoes, milk, and meat on which he feeds; the excess is eliminated by the bowels and the various secretions. When absorbed, it increases, incontestably, the presence of calcareous salts in the bones, the blood, and the urine; but any deficiency of phosphate of lime in the tissues or fluids of the body, is far more likely to arise from defective absorption or assimilation, than from any deficiency of this salt in the food. Large doses disorder the stomach and the digestion by their difficult solubility.

*Therapeutics.*—It has been administered in rickets, with the view of promoting the deposition of bone-earth in the bones. The peroxide of iron may be advantageously conjoined with it.

*Dose.*—Gr. x to gr. xx.

*Pharmaceutic Uses.*—It is an ingredient in antimonial powder.

## Chloride of Calcium. (Appendix A.)

### [Calcii Chloridum, Mat. Med. List, U. S. P.]

Chloride of calcium dried at a dull red heat, $CaCl=55.5$.

Chloride of calcium is a secondary product in the manufacture of the hydrated carbonate of ammonia, as well as of solution of ammonia; and from these sources it is usually procured. It should be kept in a well-closed bottle.

*Properties.*—Anhydrous chloride of calcium is a white, translucent solid, of a crystalline texture. Its taste is bitter and acrid. It is fusible, but not volatile. It deliquesces in the air, has a great affinity for water, and is therefore used to absorb it from gases and from weak spirit, ether, chloroform, &c. It readily dissolves in its own weight of water at 60° F., or in a much smaller quantity of hot water. By evaporation, the solution yields striated crystals, $CaCl+6HO$ (*hydrated chloride of calcium*), having the form of regular six-sided prisms. These crystals undergo the watery fusion when heated, are deliquescent, readily dissolve in water with the production of great cold, and, when mixed with ice or snow, form a powerful frigorific mixture. Both anhydrous and hydrous chloride of calcium are readily soluble in alcohol.

*Composition.*—The composition of this salt is as follows:—

| Eq. | Eq. Wt. | Per. Cent. |
|---|---|---|
| 1 Calcium . . . . . . . . | 20 | 36.03 |
| 1 Chlorine . . . . . . . . | 35.5 | 63.97 |
| Chloride Calcium . . . . . . | 55.5 | 100.00 |

*Tests.*—Entirely soluble in twice its weight of water. The solution is not precipitated by ammonia. The tests show its freedom from alumina and oxide of iron. If the ammoniacal solution be left exposed to the air, carbonic acid is absorbed, and carbonate of lime precipitated. Chloride of calcium, when pure, is colorless, evolves no ammonia when mixed with lime, or chlorine when heated with hydrochloric acid, and undergoes no change of color, nor gives any precipitate, with chloride of barium or sulphuretted hydrogen, showing its freedom from sulphates and ordinary metallic impurities. [" Yields white precipitate (chloride of silver) with nitrate of silver, and with oxalate of ammonia (oxalate of lime)." U. S.]

[*Therapeutics.*—Chloride of calcium is said to be a tonic deobstruent alterative. It has been used in goitre, scrofulous affections, and also in impetigo and other chronic skin diseases. It is at present rarely administered. In large dose, it is an irritant, emeto-cathartic poison.

*Administration.*—The officinal ℥iq. calcii chloridi, U. S., is the best form of exhibition; gtt. xx—f℥j of this may be given three times a day in water.—W.]

*Pharmaceutic Uses.*—Chloride of calcium is used in the preparation of tartaric acid, precipitated carbonate of lime, and hydrochlorate of morphia; also to remove the water from ether, chloroform, and the hydrogen gas in the process for reduced iron.

SOLUTION OF CHLORIDE OF CALCIUM. (Appendix B. II.)—Take of chloride of calcium, one ounce; distilled water, a sufficiency. Dissolve the chloride of calcium in eight fluidounces of the water, and add as much distilled water as will make the bulk of the solution ten fluidounces. *Used* to indicate the presence of citric acid in citrate of potash and arsenic acid in arseniate of soda.

[LIQUOR CALCII CHLORIDI, U. S.—" Take of marble, in small pieces, six troyounces; muriatic acid, twelve troyounces; distilled water, a sufficient quantity. Mix the acid with half a pint of distilled water, and gradually add the marble. Towards the close of the effervescence apply a gentle heat, and, when the action has ceased, pour off the clear liquid and evaporate to dryness. Dissolve the residue in one and a half times its weight of distilled water, and filter through paper."]

SOLUTION (SATURATED) OF CHLORIDE OF CALCIUM. (Appendix B. II.)—Take of chloride of calcium, three hundred and thirty-six grains; distilled water, one fluidounce. Dissolve. *Used* for determining the percentage of nitrous ether in spirit of nitrous ether.

## **Calx Chlorata,** *Chlorinated Lime.*

### [**Calx Chlorinata,** Mat. Med. List, U. S. P.

" A compound resulting from the action of chlorine on hydrate of lime, and containing at least twenty-five per cent. of chlorine." U. S.]

Hypochlorite of lime, $CaO,ClO$, with chloride of calcium, and a variable amount of hydrate of lime.

*Preparation.*—Obtained by passing chlorine gas over slaked lime. The chlorine is usually generated in large, nearly spherical, leaden vessels heated by steam. The ingredients employed are binoxide of manganese, chloride of sodium, and diluted sulphuric acid. The gas is washed by passing it through water, and is then conveyed by a leaden tube into the combination room, where the slaked lime is placed in shelves or trays, piled over one another to the height of five or six feet, cross bars between each, keeping them about an inch asunder, that the gas may have free room to circulate. The combination room is built of siliceous sandstone, and is furnished with windows to allow the operator to judge how the impregnation is going on. Four days are usually required, at the ordinary rate of working, for making good marketable bleaching powder (chlorinated lime). Its formation may be explained as follows: When chlorine comes into contact with slaked lime, a portion of the latter is decomposed; its base (calcium) combines with chlorine to form chloride of calcium, while its oxygen unites with another portion of chlorine and forms hypochlorous acid, which combines with part of the undecomposed lime to form hypochlorite of lime; $2CaO+2Cl=CaCl+CaO,ClO$.

*Officinal Characters.*—A dull-white powder with a feeble odor 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. [" When forty grains of it, triturated with a fluidounce of distilled water, are well shaken with a solution of seventy-eight grains of crystallized sulphate of protoxide of iron and ten drops of sulphuric acid in two fluidounces of distilled water, a liquid is formed which does not yield a blue precipitate with ferridcyanide of potassium (red prussiate of potassa)." U. S.]

*Properties.*—Exposed to the air, it attracts carbonic acid, evolves hypochlorous acid, and is thereby converted into a mixture of carbonate of lime and chloride of calcium, the latter of which deliquesces. When heated, it evolves oxygen gas, sometimes also chlorine gas, and becomes converted into a mixture of chloride of calcium and chlorate of lime, which has no bleaching properties; $9CaCl+9(CaO,ClO)=12O+17CaCl+CaO,ClO_5$.

*Composition.*—The quantity of chlorine absorbed by slaked lime varies with the pressure, the degree of exposure, and the quantity of water present. Hence the substance sold as chlorinated lime is not a uniform product. Good samples of commercial chloride of lime, or bleaching powder, contain, on an average, not more than thirty-six per cent. of chlorine; and, on the small scale, hydrate of lime cannot be made to absorb more than forty per cent.

*Tests.*—Ten grains mixed with thirty grains of iodide of potassium, and dissolved in four fluidounces of water, produce, when acidulated with two fluidrachms of hydrochloric acid, a reddish solution, which requires for the discharge of its color, at least eighty-five measures of the volumetric solution of hyposulphite of soda. (See **Liquor Chlori.**)

*Physiological Effects.*—The *local* action of chlorinated lime is that of an irritant and caustic. A solution of it applied to suppurating and mucous surfaces is a powerful desiccant, probably in part at least from the uncombined lime in solution. When the secretions are excessive and extremely fetid, it not only diminishes their quantity, but much improves their quality; so that, considered in reference to suppurating and mucous surfaces, it is not only a desiccant, but, in a morbid condition of these parts, a promoter of healthy action. Applied in the form of ointment (composed of a drachm of chlorinated lime to an ounce of fatty matter) to scrofulous swellings, Cima found that it provoked suppuration, caused strong redness, promoted the suppurating process, and dispersed the surrounding hardness. Taken *internally*, in *small doses* (as from three to six grains, dissolved in one or two ounces of water,) it sometimes causes pain and heat in the stomach, and occasionally, according to Cima, purging. Under the continued use of it, hard and enlarged absorbent glands have become softer and smaller, from which circumstance it has been supposed to exercise a specific influence over, and to promote the healthy action of, the lymphatic system. During its employment, Cima says he did not find it necessary to give purgatives. Dr. Reid gave it in the epidemic fever which raged in Ireland in 1826, and he tells us that it rendered the tongue cleaner, abated the delirium, and promoted the cutaneous functions. In dysentery, it soon put a stop to the bloody evacuations, the umbilical pain, and the tenesmus.

*Therapeutics.*—Chlorinated lime and soda are extensively employed as disinfectants (or rather deodorizers) and antiseptics. Chlorine gas stands unrivalled for its power of destroying putrid odors and checking putrefaction, and where uninhabited chambers or buildings are to be purified, fumigations with this gas should be adopted. But its powerful action on the organs of respiration precludes its use in inhabited places, and, in such cases, chlorinated lime, on account of its cheapness, may be substituted. When these substances are in contact with organic matter, it is supposed that the hypochlorite gives out oxygen, and is converted into a metallic chloride; the oxygen being the effective deodorizing and antiseptic agent; or it may act by abstracting hydrogen. When, however, the solution of the hypochlorite is exposed to the air, carbonic acid is abstracted by the lime, and hypochlorous acid immediately reacts on any organic matter present. Hence these hypochlorites, when exposed to the air, evolve chlorine so slowly, and in such moderate quantities, as not to produce any noxious effects, although their action on organic matters is very powerful. Their most obvious effect is that of destroying the unpleasant odor of putrid matter. Their action on sulphuretted hydrogen, ammonia, and hydrosulphuret of ammonia (substances evolved by decomposing animal matters) can be readily and easily demonstrated. Other odorous principles given out by putrid matters are, by the experience of most persons, admitted to be destroyed by the alkaline hypochlorites. The alkaline hypochlorites possess another valuable property—that of stopping or checking the putrefactive process; and hence they are called antiseptics. These two properties render the alkaline hypochlorites most valuable agents to the medical practitioner. We apply them to gangrenous parts, to ulcers of all kinds attended with foul secretions, to compound fractures accompanied with offensive discharges, to the uterus in various diseases of this viscus attended with fetid evacuations; in a word, we apply them in all cases accompanied with offensive and fetid odors. As I have already remarked, with respect to chlorinated soda, their efficacy is not confined to an action on dead parts, or on the discharges from wounds and ulcers; they are of the greatest benefit to living parts, in which they induce more healthy action, and the consequent secretion of less offensive matters. Furthermore, in the sick chamber, many other occasions present themselves on which the power of the hypochlorites to destroy offensive odors will be found of the highest value; as, to counteract the unpleasant smell of dressings or bandages, of the urine in various diseases of the bladder, and of the alvine evacuations. In typhus fever, a handkerchief, or piece of calico, dipped in a weak solution of an alkaline hypochlorite, and suspended in the sick chamber, will be often of considerable service both to the patient and the attendants.

The power of the hypochlorites to destroy *infection* or *contagion*, and to prevent the propagation of epidemic diseases, is less obviously and satisfactorily ascertained than their capability of destroying *odor*. Various statements have been made in order to prove the disinfecting power of the hypochlorites with respect to typhus and other infectious fevers. But, without denying the utility of these agents in destroying bad smells in the sick chamber, and in promoting the recovery of the patient by their influence over the general system, I may observe that I have met with no facts which are satisfactory to my mind as to the chemical powers of the hypochlorites to destroy the infectious matter of fever. Nor am I convinced that these medicines are preservative against the plague. Six individuals clothed themselves with impunity in the garments of men who had died of the plague, but which garments had been plunged for six hours in a solution of chlorinated soda. But, as Bouillaud has truly observed, the experiments, to be decisive, should have been made with clothing which had already communicated the plague to the wearers of it. Bonsquet mixed equal parts of a solution of chloride of soda and the vaccine lymph, and found that the latter still possessed the power of producing the usual cow-pock vesicle. These are a few of the facts which are adverse to the opinion that the alkaline hypochlorites possess the power of preventing the propagation of infectious, contagious, or epidemic diseases. In opposition to them there are but few positive facts to be adduced. Coster found that a solution of hypochlorite of soda destroyed the infectious properties of the syphilitic poison, and of the poison of rabid animals. The statements of Labarraque and others, as to the preservative powers of the hypochlorites in typhus, measles, and other zymotic diseases, are too loose and general to enable us to attach much value to them.

Considered in reference to medical police, the power of the alkaline hypochlorites to destroy putrid odors and prevent putrefaction is of vast importance. Thus chlorinated lime may be employed to prevent the putrefaction of corpses previously to interment, to destroy the odor of exhumed bodies during medico-legal investigations, to destroy bad smells, and prevent putrefaction in dissecting-rooms and workshops in which animal substances are employed (as catgut manufactories), to destroy the unpleasant odor from privies, sewers, drains, wells, docks, &c., to disinfect (?) ships, hospitals, prisons, and stables. The various modes of applying it will readily suggest themselves. For disinfecting corpses, a sheet should be soaked in a pailful of water containing a pound of salt, and then wrapped around the body. For destroying the smell of dissecting-rooms, a solution of the salt may be applied by means of a garden watering-pot. When it is considered desirable to cause the rapid evolution of chlorine gas, hydrochloric acid may be added to chlorinated lime.

Solution of chlorinated lime or soda is the best *antidote* in poisoning by sulphuretted hydrogen, hydrosulphuret of ammonia, sulphuret of potassium, and hydrocyanic acid. $CaO,ClO + 2SH = CaCl,2HO + S_2$. It should be administered by the stomach, and a sponge or handkerchief, soaked in the solution, held near the nose, so that the vapor may be inspired. If a person be required to enter a place suspected of containing sulphuretted hydrogen, a handkerchief moistened with a solution of chloride of lime should be applied to the mouth and nostrils, so that the inspired air may be purified before it passes into the lungs. It was by breathing air impregnated with the vapor arising from chlorinated lime, that the late Mr. Roberts (the inventor of the miner's improved safety lamp) was enabled to enter and traverse with safety the sewer of the Bastile, which had not been cleansed for 37 years, and which was impregnated with sulphuretted hydrogen.

A solution of chlorinated lime has been used as a wash in some skin diseases. Derheims used a strong solution with great success in scabies. This mode of curing itch is much cleaner and more agreeable than the ordinary method by sulphur frictions. It has likewise been found successful in tinea capitis.

It has also been employed with great benefit in ophthalmia. The solution used was composed of from a scruple to three or four drachms of chlorinated lime and an ounce of water. It was dropped into the eye, or injected by a syringe, or applied by means of a camel's-hair pencil. I have found a weak solution of the chloride successful in the purulent ophthalmia of infants. Gubian proposed it to prevent the pitting from smallpox. The fully matured pustules are to be opened and washed with a weak solution of this salt: desiccation takes place very promptly, and no marks or pits are said to be left behind.

It has been used internally with great success by Dr. Reid, in the epidemic fever of Ireland. In some of the very worst cases it acted most beneficially, causing warm perspiration, rendering the tongue cleaner and moister, checking diarrhœa, and inducing quiet sleep. In disease of the pulmonary organs, resulting from febrile excitement, Dr. Reid also found it advantageous. In dysentery likewise it was most valuable. He used it by the mouth, and also in the form of clyster. It corrected the intolerable stench of the evacuations, and improved their appearance. Cima used it both internally and externally in scrofula.

*Administration.—Internally*, chlorinated lime may be given in doses of from one grain to five or six grains, dissolved in one or two ounces of water, sweetened with syrup. As the dry salt of the shops deposits hydrate of lime when put into water, the solution should be filtered to get rid of this.

*Antidotes.*—Administer albuminous liquids (as eggs beat up with water) or milk, or flour, or water, or oil, or mucilaginous drinks, and excite vomiting; combat the gastro-enteritis by the usual means. Carefully avoid the use of acids, which would cause the evolution of chlorine gas in the stomach.

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.

When chlorinated lime is digested in water, the hypochlorite of lime and chloride of calcium, as well as a small portion of caustic lime, are dissolved: any carbonate, and the excess of caustic lime, remain undissolved.

*Properties.*—The solution, which has a slight yellow color, first reacts on vegetable colors as an alkali, and afterwards bleaches them, especially if an acid be added. Carbonic acid, or a small quantity of sulphuric acid, sets free hypochlorous acid; $CaCl+CaO,ClO+SO_3=CaCl+CaO,SO_3+ClO$. But if a large quantity of sulphuric acid be employed, free chlorine is evolved; $CaCl+CaO,ClO+2SO_3=2(CaO,SO_3)+2Cl$. Solution of chlorinated lime, when an acid is present, decomposes organic colors and putrid substances. The bleaching power on litmus is very slowly evinced, unless an acid be present: carbonic acid causes the decoloration to be speedily effected. If air be blown through putrid blood, and then through a solution of chlorinated lime, carbonate of lime is precipitated, and the air is disinfected; but if air be first passed through putrid blood, then through caustic potash or milk of lime (to abstract the carbonic acid), and afterwards through a solution of chlorinated lime, it retains its stinking quality. The bleaching and deodorizing properties depend, probably, on the oxidizement of the coloring or offensive matter: if an excess of a strong acid be employed in the process, chlorine is evolved, which produces oxygen at the expense of the elements of water: if, on the contrary, no water is used, Balard supposes that both the hypochlorous acid and lime give out their oxygen, and thereby become chloride of calcium.

*Tests.*—Specific gravity, 1.035. One fluidrachm mixed with twenty grains of iodide of potassium dissolved in four fluidounces of water, when acidulated with two fluidrachms of hydrochloric acid, gives a red solution which requires for the discharge of its color forty-six measures of the volumetric solution of hyposulphite of soda. (See **Liquor Chlori**.)

### Plaster of Paris. (Appendix B. I.)

Native sulphate of lime, $CaO,SO_3$, deprived of water by heat.

SOLUTION OF SULPHATE OF LIME. (Appendix B. II.)—Take of plaster of Paris, a quarter of an ounce; distilled water, one pint. Rub the plaster of Paris in a porcelain mortar for a few minutes with two ounces of the water, introduce the white mixture thus obtained into a pint bottle containing the rest of the water; shake well several times, and allow the undissolved sulphate to subside. When this has occurred, filter, and preserve the clear solution in a stoppered bottle.

*Used* as a test for the presence of oxalic acid in tartaric acid.

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## MAGNESIUM. Mg=12.

The metallic basis of magnesia.

A light white metal, much resembling zinc, and burning like it with a brilliant white flame, producing magnesia.

### Magnesia, *Magnesia*. MgO=20.

*Natural History.*—Magnesia occurs in both kingdoms of nature. It is found native, in the solid state, in combination with water and various acids (carbonic, sulphuric, boracic, silicic, and nitric). Chloride of magnesium exists in sea water, as also in some springs. Magnesia is also found combined with acids in certain vegetables (as *Salsola Kali* and *Fucus vesiculosus*) and in animals (as in the urine and some urinary calculi of man).

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

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

## [Magnesia. U. S.

"Take of carbonate of magnesia, a convenient quantity. Put it into an earthen vessel, and expose it to a red heat for two hours, or until the carbonic acid is entirely expelled."

*Officinal Characters.*—Magnesia is wholly dissolved, without effervescence, by dilute muriatic acid; and the solution yields no precipitate with oxalate of ammonia or chloride of barium.

The U. S. Ph. recognizing only one carbonate of magnesia, of course recognizes only one magnesia.—W.]

## Magnesia Levis, *Light Magnesia.*

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

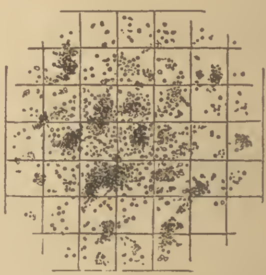
*Officinal Characters.*—A bulky white powder differing from the preceding preparation only in its greater levity, the volumes corresponding to the same weight being to each other in the ratio of three and a half to one.

This increased density of magnesia over magnesia levis is due to the greater aggregation of the granules in the crystalline precipitated carbonate from which it is made.

Fig. 24.

*Microscopic Appearance of Common Calcined Magnesia.*

Fig. 25.



*Microscopic Appearance of Heavy Calcined Magnesia.*

*Properties.*—It is a light, fine, white, colorless, odorless, and tasteless powder. Its density varies according to the mode of preparing it. When moistened it reacts as an alkali on test papers. It is very slightly soluble in water, and, like lime, is more soluble in cold than in hot water. Dr. Fyffe states that it requires 5142 parts of cold, and 36000 parts of hot water to dissolve it. Unlike lime it evolves scarcely any heat when mixed with water. By the combined voltaic and oxyhydrogen flames it has been fused by Mr. Brande. It absorbs carbonic acid slowly from the atmosphere. Its solution in acids does not occasion any precipitate with the ferrocyanides, hydrosulphurets, oxalates, or bicarbonates; but the neutral alkaline carbonates throw down a white precipitate (*carbonate of magnesia*). Magnesia is insoluble in alkaline solutions, and is thereby distinguished from alumina. Its solution in sulphuric acid is remarkable for its great bitterness.

*Composition.*—Magnesia has the following composition :—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Magnesium | 12 | 60 |
| 1 | Oxygen | 8 | 40 |
| | Magnesia | 20 | 100 |

*Tests.*—Dissolved in nitric acid, and neutralized with a mixture of ammonia and hydrochlorate of ammonia, it does not give any precipitate with oxalate of ammonia, or chloride of barium (showing its freedom from lime and sulphates).

When it has been subjected to an insufficient heat during its preparation, or when it has been exposed for some time to the air, it will be found to contain some carbonate of magnesia. Its freedom from carbonate is shown by its dissolving in dilute mineral acids without effervescence. It should dissolve in diluted sulphuric acid by heat, without leaving any residue.

*Physiological Effects.*—When taken into the stomach, magnesia neutralizes the free acids contained in this organ and in the intestines, and forms therewith soluble magnesian salts. In full doses it acts as a laxative; but as it occasions very little serous discharge, Dr. Paris ranks it among purgatives "which urge the bowels to evacuate their contents by an imperceptible action upon the muscular fibres." Part of its laxative effect probably depends on the action of the soluble magnesian salts which it forms by union with the acids of the alimentary canal. Magnesia exercises an influence over the urine analogous to that of the alkalies; that is, it diminishes the quantity of uric acid in the urine, and when continued for too long a period occasions the deposit of the earthy phosphates in the form of white sand. On account of its great insolubility, it requires a longer time to produce these effects than the alkalies. When taken in too large quantities and for a long period it has sometimes accumulated in the bowels to an enormous extent.

*Therapeutics.*—As an *antacid*, it is as efficacious as the alkalies, while it has an advantage over them in being less irritant and not caustic, and therefore is not apt to occasion disorder of the digestive organs. It may be employed to neutralize acids introduced into the stomach from without (as in cases of poisoning from mineral acids), or to prevent the excessive formation of, or to neutralize when formed, acid in the animal economy. Thus it is administered to relieve heartburn arising from, or connected with, the secretion of an abnormal quantity of acid by the stomach; its efficacy is best seen in persons of a gouty or rheumatic diathesis, in which the urine contains excess of uric acid. It will be found of great value in those urinary affections in which alkaline remedies are indicated, but in which potash and soda have created dyspeptic symptoms. It is a most valuable anti-emetic in cases of sympathetic vomiting, especially in that which occurs during pregnancy.

As a *laxative*, magnesia is much employed in the treatment of the diseases of children. It is tasteless, mild in its operation, and antacid—qualities which render it most valuable as an infant's purgative. In flatulency, it is combined with some carminative water; in diarrhœa, with rhubarb. It is employed as a purgative by adults in dyspeptic cases, in affections of the rectum, as piles and stricture, and in diarrhœa.

*Administration.*—As a purgative, the dose for adults is from twenty to sixty grains; for infants, from two to ten grains. As an antacid, the dose is from ten to thirty grains twice a day. It may be conveniently given in milk.

*Pharmaceutic Use.*—It is one of the ingredients in the compound powder of rhubarb.

[TROCHISCI MAGNESIÆ, U. S., *Troches of Magnesia.*—"Take of magnesia four troyounces; nutmeg, in fine powder, sixty grains; sugar, in fine powder, twelve troyounces; mucilage of tragacanth a sufficient quantity. Rub the magnesia and the powders together, until they are thoroughly mixed; then with mucilage of tragacanth form a mass, to be divided into troches, each weighing ten grains."]

## Carbonate of Magnesia. $MgO,CO_2=42$.

*Natural History.*—Native, anhydrous, neutral carbonate of magnesia called *magnesite*, is found in various parts of Europe, Asia, and America. The mineral called *hydromagnesite* is, according to L. Gmelin, a quadrohydrate of the $\frac{3}{4}$ carbonate of magnesia, $4MgO,3CO_2,4HO$; or a compound of hydrate of magnesia and the hydrated carbonate, $MgO,HO+3(MgO,CO_2,HO)$. It accompanies magnesite in India and in America. Carbonate of magnesia, in conjunction with carbonate of lime, occurs in some mineral waters. *Magnesite* constitutes a range of low hills in Hindostan. Some years ago a cargo was brought over by Mr. Babington. Dr. Henry analyzed a sample of it and found its constituents to be *magnesia*, 46; *carbonic acid*, 51; *insoluble matter*, 1.5; *water*, 0.5; and *loss*, 1=100. Native carbonate of magnesia, from India, has been imported in considerable quantities into this country; but has been found, as I am informed, unsalable here. The samples offered for sale in the year 1837 consisted of reniform, opaque, dull masses, adherent to the tongue, having a conchoidal fracture and considerable hardness. Internally, they were whitish; externally, grayish, or yellowish-white. The same substance (I presume) was brought over in 1838 in the calcined state, and was offered for sale as *Indian calcined magnesia.* It was nearly white. It has also been imported, in enormous quantities, from the island of Eubœa, and has been used extensively for the manufacture of sulphate of magnesia.

## Magnesiæ Carbonas, *Carbonate of Magnesia.* [Mat. Med. List, U. S. P.]

$3(MgO,CO_2+HO)+MgO,2HO=191$.

*Synonym.*—Magnesiæ Carbonas ponderosum, *Dub.*

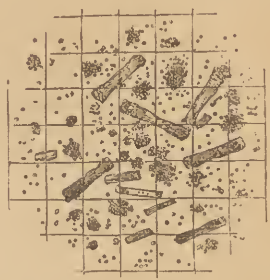
*Preparation.*—Take of sulphate of magnesia, ten ounces; carbonate of soda, twelve ounces; boiling water, a sufficiency. Dissolve the sulphate of magnesia and the carbonate of soda each in a pint of the water; mix the two solutions, and evaporate the whole to perfect dryness by means of a sand-bath. 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°.

From the aggregation of this crystalline precipitate during the evaporation to dryness, this preparation has a greatly increased density when compared with the next.

*Officinal Characters.*—A white granular powder, which dissolves with effervescence in the dilute mineral acids, yielding solutions which, when first treated with hydrochlorate of ammonia, are not disturbed by the addition of an excess of solution of ammonia, but yield a copious crystalline precipitate upon the addition of phosphate of soda (ammonio-phosphate of magnesia).

*Tests.*—With excess of hydrochloric acid it forms a clear solution in which chloride of barium causes no precipitate. Another portion of the solution supersaturated with ammonia gives no precipitate with oxalic acid (showing freedom from sulphates and lime). Fifty grains calcined at a red heat are reduced to twenty-two (indicating the right percentage of magnesia).

Fig. 26.



*Microscopic Appearance of Light Carbonate of Magnesia.*

*Pharmaceutic Use.*—It is an ingredient in the Bismuth lozenge.

[Although the two varieties, the heavy and light, of carbonate of magnesia are met with in our drug stores, yet the U. S. Pharmacopœia does not recognize any difference, and as they are manufactured on a large scale, places them in its Materia Medica List under the head of Carbonate of Magnesia. The density of the carbonate is in direct relation to the density of the liquid from which it is precipitated. Dinneford's magnesia, or the so-called liquid magnesia of the shops, is a solution of the carbonate in carbonic acid water.—W.]

**Magnesiæ Carbonas Levis**, *Light Carbonate of Magnesia.*

*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°.

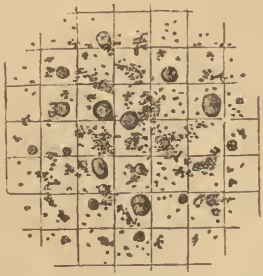
By the mutual reaction of solutions of sulphate of magnesia and carbonate of soda, we ought apparently to obtain, by double decomposition, sulphate of soda and carbonate of magnesia; $MgO,SO_3+NaO,CO_2=NaO,SO_3+MgO,CO_2$. It appears, however, that by ebullition the latter is decomposed, part of its carbonic acid is expelled, and a combination of hydrate of magnesia with carbonate precipitated.

*Officinal 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.

Carbonate of magnesia should be perfectly white and tasteless. The water in which it has been boiled should have no alkaline reaction on turmeric paper, nor throw down anything on the addition of nitrate of silver; by which the absence of alkaline carbonates and chlorides is proved. Carbonate of magnesia is sometimes contaminated with oxide of lead, derived from the vessels in which it is prepared; this may be detected by sulphuretted hydrogen or hydrosulphuret of ammonia producing a brown or a black coloration.

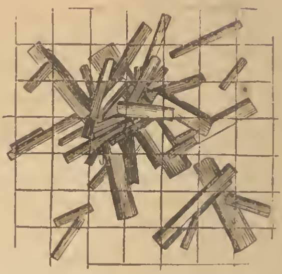
*Physiological Effects.*—The effects of carbonate of magnesia are nearly the same as those of pure magnesia. Its local operation must be somewhat milder than that of the latter, but the difference is hardly perceptible in practice. As the carbonate effervesces with acids, it is more apt to create flatulence when swallowed.

Fig. 27.



*Microscopic Appearance of Heavy Carbonate of Magnesia.*

Fig. 28.



*Crystals of the Hydrated Neutral Carbonate of Magnesia deposited from Dinneford's Solution.*

*Therapeutics.*—The uses of the carbonate are the same as those of calcined magnesia; except where the object is to neutralize acid in the alimentary canal (as in cardialgia, and in poisoning by the mineral acids), when the latter preparation is to be preferred on account of its not effervescing with acids, and thereby not causing flatulency.

*Administration.*—The dose of carbonate of magnesia as a purgative is from ten to sixty grains; as an antacid, from five to twenty grains.

**Magnesiæ Sulphas**, *Sulphate of Magnesia.* [Mat. Med. List, U. S. P.]

$$MgO,SO_3+7HO=123.$$

*Natural History.*—It is a constituent of sea and many mineral waters, as in the bitter purging waters of Epsom, from which its name of Epsom salts was derived, and from which this salt was at first manufactured. It occurs also as an efflorescence on other minerals, forming the *hair salt* of mineralogists; and, with sulphate of soda and a little chloride of magnesium, constitutes *reussite.*

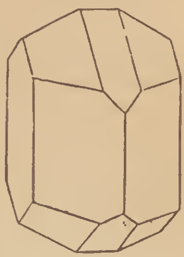
*Preparation.*—The two great sources of the sulphate of magnesia of English commerce are *dolomite* and *magnesite.* Dolomite, or magnesian limestone, is a mixture or combination of the carbonates of magnesia and lime. It crystallizes in rhombohedrons. It occurs in enormous quantities in various counties of England (as those of Somerset, York, and Nottingham), and is largely employed for building: York Minster and Westminster Hall are built of it.

The dolomite is either treated at once with sulphuric acid, and with the mixed sulphates of lime and magnesia separated by crystallization; or it is calcined, the resulting lime and magnesia converted into hydrates by moistening with water, the lime removed by a carefully adjusted quantity of hydrochloric acid, and the residue treated with sulphuric acid or sulphate of iron. Magnesite is merely digested in large tanks with dilute sulphuric acid to saturation, and is then evaporated and crystallized.

*Officinal Characters.*—In minute colorless and transparent rhombic prisms, possessing a bitter taste. It readily dissolves in water, and the solution gives copious white precipitates with chloride of barium (sulphate of baryta), and, with a mixed solution of ammonia, hydrochlorate of ammonia, and phosphate of soda (ammonio-phosphate of magnesia.

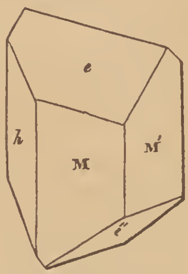
["The solution is not colored nor precipitated by ferrocyanide of potassium, and gives off no muriatic acid upon the addition of sulphuric acid. One hundred grains of the salt, dissolved in water, and mixed with sufficient boiling solution of carbonate of soda to decompose it completely, yield a precipitate of carbonate of magnesia, which, when washed and dried, weighs thirty-four grains." U. S.]

Fig. 29.



*Common Crystal.*

Fig. 30.




*Crystal with diëdral reversed summits.*

*Properties.*—When heated, they undergo watery fusion, then give out their water of crystallization, become anhydrous, and at a high temperature undergo the igneous fusion, and run into a white enamel, but without suffering decomposition. Exposed to the air, they very slowly and slightly effloresce. They dissolve in their own weight of water at 60°, and in three-fourths of their weight of boiling water. They are insoluble in alcohol; and alcohol precipitates this salt from a strong aqueous solution.

*Composition.*—The following is the composition of ordinary crystallized sulphate of magnesia:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Magnesia . . . . . . . . | 20 | 16.26 |
| 1 | Sulphuric acid . . . . . . . | 40 | 32.52 |
| 7 | Water . . . . . . . . | 63 | 51.22 |
| | Sulphate of Magnesia . . . . . | 123 | 100.00 |

*Tests.*—Its aqueous solution at ordinary temperatures is not precipitated by oxalate of ammonia (showing the absence of lime). 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 sulphate of magnesia met with in the shops is usually sufficiently pure for all medicinal purposes. It should be colorless, and its dilute solution should undergo no change when mixed with ferrocyanides or hydrosulphurets.

*Physiological Effects.*—In moderate doses, sulphate of magnesia is a mild and perfectly safe antiphlogistic purgative, which promotes the secretion as well as the peristaltic motion of the alimentary canal. It does not occasion nausea and griping, like some of the vegetable purgatives, nor has it any tendency to create febrile disorder or inflammatory symptoms; but, on the other hand, has a refrigerant influence: hence it is commonly termed a cooling powder. In small doses, largely diluted with aqueous fluids, it becomes absorbed, and slightly promotes the action of other emunctories: thus, if the skin be kept cool, and moderate exercise be conjoined, it acts as a diuretic.

*Therapeutics.*—On account of the mildness and safety of its operation, its ready solubility, and its cheapness, sulphate of magnesia is by far the most commonly employed purgative, both by the public and the profession. The only objection to its use is its bitter and unpleasant taste. To state all the cases in which it is administered would be to enumerate nearly the whole catalogue of known diseases. It must, therefore, be sufficient to mention, that it is excellently well adapted as a purgative for febrile and inflammatory diseases, obstinate constipation, ileus, lead colic, even incarcerated hernia, narcotic poisoning, &c. It may be used as an antidote in poisoning by the salts of lead and baryta.

*Administration.*—As a purgative, it is usually administered in doses of from half an ounce to an ounce and a half; but if taken in the morning fasting, a smaller dose will suffice. In delicate females, sixty grains, or even less, will usually produce the desired effect. Some carminative or aromatic (as peppermint water or tincture of ginger) is frequently conjoined, to obviate flatulency. In febrile and inflammatory diseases, the solution may be acidulated with dilute sulphuric acid with great advantage; or the sulphate may be dissolved in the acid infusion of roses. It is frequently used as an adjunct to the compound infusion of senna, whose purgative effect it promotes, but whose griping tendency it is said to check. In dyspeptic cases, accompanied with constipation, it is conjoined with bitter effusions (as of quassia, gentian, and calumbo). As a purgative enema, an ounce or more of it may be added to the ordinary clyster.

ENEMA MAGNESIÆ SULPHATIS, *Enema of Sulphate of Magnesia. Synonym*, Enema catharticum, *Ed. Dub.*—Take of sulphate of magnesia, one ounce; olive oil, one fluidounce; mucilage of starch, fifteen fluidounces. Dissolve the sulphate of magnesia in the mucilage of starch, add the oil, and mix.

SOLUTION OF AMMONIO-SULPHATE OF MAGNESIA. (Appendix B. II.) Ammonio-sulphate of Magnesia$=MgO,SO_3+NH_4O,SO_3+6HO$.—Take of sulphate of magnesia, one ounce; hydrochlorate of ammonia, half an ounce; solution of ammonia, half a fluidounce; distilled water, a sufficiency. Dissolve the sulphate of magnesia and hydrochlorate of ammonia in eight fluidounces of the water, and to the solution add the ammonia, and as much distilled water as will make up the bulk to ten fluidounces.

*Used* as a test for phosphoric acid in phosphate of ammonia, and also to indicate its presence in phosphate of iron.

[**Liquor Magnesiæ Citratis,** U. S., *Solution of Citrate of Magnesia.*

"Take of magnesia, one hundred and twenty grains; citric acid, four hundred and fifty grains; syrup of citric acid, two fluidounces; bicarbonate of potassa, forty grains; water, a sufficient quantity. Dissolve the citric acid in four fluidounces of water, and, having added the magnesia, stir until it is dissolved. Filter the solution into a strong twelve-ounce bottle, containing the syrup of citric acid. Then add the bicarbonate of potassa, and sufficient water to nearly fill the bottle, which must be closed with a cork, secured with twine. Lastly, shake the mixture occasionally until the bicarbonate is dissolved." U. S. In this process, by the action of the citric acid on the magnesia and bicarbonate, citrate of magnesia and potassa are formed, and a large amount of carbonic acid liberated.

*Therapeutics.*—A rather brisk saline purge, sometimes griping considerably. On account of its pleasant flavor and effervescence, it is much used. The free carbonic acid makes it especially useful when there is any disturbance of the stomach. Dose, f℥vj—f℥xij, or half to a whole bottle.—W.]

## ALUMINUM. Al=13.75.

The metallic bases of the earth alumina ($Al_2O_3$=51.5), a remarkably light, ductile, sonorous metal, with bright silvery lustre, scarcely tarnishing at all by exposure to the air.

### Alumen, *Alum.* [Mat. Med. List, U. S. P.]

Sulphate of alumina and potash, $Al_2O_3,3SO_3+KO,SO_3+24HO=474.5$.

*Natural History.*—It is found native in the neighborhood of volcanoes, and constitutes the mineral called *native alum.*

*Preparation.*—The mineral from which it is procured in this country is called *aluminous slate*, *aluminous shale*, or *aluminous schist.* This substance varies somewhat in its composition in different localities, but always contains sulphuret of iron, alumina, carbon, and sometimes a salt of potash. The most extensive alum manufactory in Great Britain is at Hurlet, near Paisley. Here the aluminous schist lies between the strata of coal and limestone. By the action of the air it undergoes decomposition, and falls down on the floor of the mine. The sulphur attracts oxygen, and is converted into sulphuric acid, which combines partly with the iron (oxidized by the air), and partly with the alumina. By lixiviation, a solution of the sulphates of iron and alumina is obtained: this is evaporated in large brick cisterns, and when sufficiently concentrated is run into coolers, where the sulphate of iron crystallizes, and the sulphate of alumina remains in the mother-liquors. To these, when heated, sulphate of potash or chloride of potassium is added, by which crystals of alum are obtained: these are purified by a second crystallization.

*Officinal Characters.*—In colorless transparent crystalline masses, exhibiting the faces of the regular octohedron, and having an acid sweetish astringent taste. Its aqueous solution gives with caustic potash a white precipitate (alumina), soluble in an excess of the reagent; an immediate precipitate with chloride of barium (sulphate of baryta); and, after some hours, a crystalline precipitate with tartaric acid (acid tartrate of potash).

Fig. 31.

*Alum Crystal.*

*Properties.*—The ferrocyanides, the oxalates, and sulphuretted hydrogen, occasion no precipitate in a solution of pure alum. Hydrosulphuret of ammonia, the caustic alkalies or their carbonates, the phosphate of soda, throw down white precipitates: that produced by the alkalies is soluble in an excess of alkali, but is insoluble in solutions of the carbonated alkalies: these characters show the presence of alumina. Potash is recognized in it by perchloric acid and bichloride of platinum. By exposure to the air it slowly and slightly effloresces. Alum dissolves in 18 times its weight of cold, and in less than its own weight of boiling water.

*Composition.*—The composition of alum is as follows:—

| Eq. | | Eq. Wt. | Per Cent |
|---|---|---|---|
| 1 | Alumina | 51.5 | 10.85 |
| 1 | Potash | 47 | 9.91 |
| 4 | Sulphuric acid | 160 | 33.72 |
| 24 | Water | 216 | 45.52 |
| | Cryst. Alum | 474.5 | 100.00 |

*or,*

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Sulphate of alumina | 171.5 | 36.14 |
| 1 | Sulphate of potash | 87 | 18.34 |
| 24 | Water | 216 | 45.52 |
| | Cryst. Alum | 474.5 | 100.00 |

*Tests.*—Not colored blue by a mixture of the ferrocyanide and the ferricyanide of potassium (showing the absence of the oxides of iron); entirely soluble in hot solution of soda, without the evolution of ammonia.

*Physiological Effects.*—Alum acts chemically on the animal tissues and fluids. If a solution of it in water be added, in certain proportions, to albumen, it causes a white precipitate. It also forms insoluble combinations with milk and with gelatine. These phenomena explain the action of alum on the fibrinous, albuminous, and gelatinous constituents of the living tissues. The compound which alum forms with albumen is soluble in acetic and in hydrochloric acids, and the alumina is precipitable from these solutions neither by ammonia nor by potash.

The immediate *topical* effect of a solution of alum is that of an astringent—namely, corrugation of fibres and contraction of small vessels, by virtue of which it checks or temporarily stops exhalation and secretion, and produces paleness of parts by diminishing the diameters of the small bloodvessels. It is by these local effects that alum, when taken internally, causes dryness of the mouth and throat, somewhat increases thirst, checks the secretions of the alimentary canal, and thereby diminishes the frequency and increases the consistency of the stools. But when alum is applied to a part in larger quantities, and for a longer period, the astriction is soon followed by irritation, and the paleness by preternatural redness. And thus, taken internally in large doses, alum excites nausea, vomiting, griping, purging, and even an inflammatory condition of the intestinal canal—effects which may be perhaps induced by small quantities in persons endowed with unusual or morbid sensibility of the stomach and bowels. Ordinarily, however, tolerably large doses of alum may be given without any unpleasant effects. Thus from 60 to 120 grains, properly diluted, have been given within twenty-four hours; and in colica pictonum as much as 180 grains have been administered in one dose. Employed as an emetic, it produces less prostration than antimony or ipecacuan.

Alum becomes *absorbed.* Orfila detected alumina in the liver, spleen, and urine of animals to whom alum had been administered. After its absorption, alum appears to act as an astringent or astringent-tonic on the system generally, and to produce more or less general astriction of the tissues and fibres, and a diminution of secretion. Such, at least, appear to be its effects in some passive hemorrhages and mucous discharges. Kraus observes that the urine becomes remarkably acid from the use of alum.

*Therapeutics.*—Alum is employed both as an external or topical, and as an internal remedy.

*As a topical remedy.*—Solutions of alum are sometimes employed *to produce contraction or corrugation of the tissues*, and thereby to prevent displacement of parts, especially when accompanied with excessive secretion. Thus it is used as a gargle in relaxation of the uvula with evident advantage. In the early stage of prolapsus of the rectum, a solution of alum, applied as a wash, is sometimes of service, especially when the disease occurs in infants. Washes or injections containing alum are of occasional benefit in prolapsus of the uterus. In hemorrhages, whether proceeding from an exhalation or exudation from the extremities or pores of the minute vessels, or from the rupture of a bloodvessel, a solution, or in some cases the powder, of alum may be used with advantage as a *styptic*, to constringe the capillary vessels, and close their bleeding orifices. Thus in epistaxis, when it is considered advisable to arrest the hemorrhage, assistance may be gained by the injection of alum into the nostrils, or by the introduction of lint moistened with the solution. Where this fails to give relief, finely-powdered alum may be employed in the manner of snuff. In hemorrhage from the mouth or throat, or from the gums in scurvy, or after the extraction of teeth, gargles containing alum are useful. In hæmatemesis, as well as in intestinal hemorrhage, alum whey may be administered; though, of course, no reliance can be placed on it, as the hemorrhage usually depends on circumstances which astringents merely cannot be expected to obviate. In uterine hemorrhage, a sponge soaked in a solution of alum may be introduced into the vagina with good effect. To check the hemorrhoidal flux when immoderate, washes or enemata containing alum may be employed. To stop the bleeding after leech-bites in children, a saturated solution, or the powder of alum, may be applied to the punctures.

In certain inflammations, alum has been used as a *repellent;* that is, it has been applied to the inflamed part in order to produce contraction of the distended vessels, and thereby to diminish the quantity of blood in the seat of the disease in a manner almost mechanical. Thus, in the first stage of ophthalmia it is sometimes considered expedient to cut short the disease by the application of a strong astringent solution (as a saturated solution of alum or of acetate of lead); and whatever difference of opinion exists as to the propriety of these applications in the first stage of ophthalmia, all are agreed as to their value after the violence of vascular action has been subdued. In the treatment of the purulent ophthalmia of infants, no remedy is perhaps equal to an alum wash. [The wash should contain eight grains of alum in an ounce of water, and should be introduced between the lids *every quarter of an hour.* Thus used, the wash seldom fails.—Ed.]

In diphtheria, great importance has been attached to the employment of local applications. In order to promote the expulsion of the false membrane, Bretonneau recommends the insufflation of finely-powdered alum. This is effected by placing a drachm of it in a tube, and blowing it into the throat. Velpeau has extended the use of alum to other inflammatory affections of the throat, as those arising in scarlatina and smallpox. In these cases, powdered alum may be applied to the affected part by means of the finger. Gargles containing this salt will be found useful in most kinds of sore-throat, ulcerations of the mouth and gums, aphthæ, &c. Alum has been employed as an *astringent*, to diminish or stop excessive secretion from the mucous surfaces. Thus a weak solution of this salt is used to check profuse ptyalism, whether from the use of mercury or other causes; and to remove gleet or leucorrhœa. In old-standing diarrhœas, it has been administered, in combination with the vegetable astringents (kino, for example), with occasional advantage. It is also applied to check profuse secretion from ulcers. Alum curd is sometimes applied to ecchymoses and to inflamed eyelids. Sir Everard Home used to apply it to scrofulous tumors.

*As an internal remedy.*—In typhoid fever, two to five grains of alum, given every hour, have been found very successful in checking the exhausting diarrhœa. In the treatment of *lead colic*, alum has been found particularly successful. It allays vomiting, abates flatulence, mitigates pain, and opens the bowels more certainly than any other medicine, and frequently when other powerful remedies have failed. It should be given in full doses (as from twenty to forty grains), dissolved in some demulcent liquid (as gum-water), every three or four hours. Opium and (according to Dr. Copland) camphor may be advantageously conjoined. Alum is administered *internally* in several other diseases; in passive or asthenic hemorrhages from distant organs; as hæmoptysis, menorrhagia, and other uterine hemorrhages, and hæmaturia; in colliquative sweating, pertussis in the chronic form, diabetes, gleet, gonorrhœa, and leucorrhœa. In the three latter diseases it may be combined with cubebs. In chronic dysentery and diarrhœa, alum has been held in great repute. Dr. Meigs, of Philadelphia, has given a teaspoonful of powdered alum as an emetic in cases of croup, and prefers it to any other emetic in this disease.

*Administration.*—The dose of alum is from ten to forty grains. It may be taken in the form of powder, or made into pills with some tonic extract, or in solution. To prevent nausea, an aromatic (as nutmeg) should be conjoined. A pleasant mode of exhibition is in the form of *alum whey*, prepared by boiling a hundred and twenty grains of powdered alum with a pint of milk, then straining; the dose is a wineglassful. For an emetic, thirty to sixty grains may be given in a teaspoonful or two of water. In prescribing alum, it is to be remembered that the vegetable astringents decompose it; by which the astringent property of the mixture is probably diminished. For topical uses, alum is employed in the form of powder solution and poultice. For an injection or gargle, twenty grains in an ounce of water forms a solution of suitable strength. Alum curd is made by agitating a small portion of alum with white of egg till it forms a curd. This is applied between two pieces of thin linen.

*Antidote.*—In a case of poisoning by alum, let the contents of the stomach be immediately evacuated. Promote vomiting by the use of tepid diluents. The inflammatory symptoms are to be combated by the usual antiphlogistic means. Small doses of carbonate of soda may be given at intervals. This will decompose the salt and render it inert.

Alumen Exsiccatum, U. S., *Dried Alum.*—Take of alum, four ounces; heat the alum in a porcelain capsule till it liquefies, raise and continue the heat till aqueous vapor ceases to be disengaged, and then reduce the residue to powder. ["Take of alum, in coarse powder, four troyounces; expose it in a suitable vessel, to a temperature not exceeding 450° until the residue weighs two troyounces and one hundred and twenty grains; then reduce it when cold to fine powder." U. S.] In the preparation of this substance, care must be taken not to apply too great a heat, lest a portion of the acid be driven off as well as the water. On this account, a shallow earthen vessel is preferable to a crucible Dried alum has a more astringent taste, and does not dissolve so readily in water as the crystallized salt. When moistened, it resumes its water of crystallization with evolution of heat. It is employed as a mild escharotic, to destroy exuberant spongy granulations; as those commonly known under the name of proud flesh.

## [**Aluminæ Sulphas,** U. S.

"Take of sulphate of alumina and ammonia, carbonate of soda, each four troyounces; sulphuric acid, a troyounce and one hundred and fifty grains; water, a sufficient quantity; dissolve the salts separately, each in six fluidounces of boiling water, and pour the solution of the sulphate gradually into that of the carbonate; then digest with a gentle heat until the evolution of carbonic acid ceases. Collect upon a filter the precipitate formed, and wash it with water until the washings are no longer affected by chloride of barium. Next, with the aid of heat, dissolve the precipitate in the sulphuric acid, previously diluted with half a pint of water, and, having filtered the solution, evaporate it until a pellicle begins to form. Then remove it to a water-bath and continue the evaporation, with constant stirring, until a dry salt remains. Lastly, preserve this in a well-stopped bottle." U. S.

*Therapeutics.*—Sulphate of alumina is both astringent and antiseptic. A solution of it ʒss–℥ss to the f℥j of water, has been used with asserted advantage as a local application to foul indolent ulcers, cancer of the uterus, &c., and also as a vaginal injection in leucorrhœa, attended with a fetid discharge. Its saturated solution is said to act as a very mild caustic. A strong solution injected into the bloodvessels of a cadaver, will preserve it unchanged for a considerable length of time.—W.]

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## CHROMIUM. Cr=26.25.

The metallic base of the green oxide of chromium ($Cr_2O_3$) and of chromic acid. It has a sp. gr. 5.9, is very infusible, resembles platinum in color, and is so hard as to scratch glass. The green oxide of chromium is a constituent of the chrome alum, and is the coloring ingredient of the emerald.

### Chromic Acid. $CrO_3$=50.25.

Obtained in crimson needles by the action of sulphuric acid upon bichromate of potash. It is a powerful oxidizing and bleaching agent, highly corrosive, and very soluble in water.* (See **Bichromate of Potash**.)

### [Acidum Chromicum, U. S., Mat. Med. List, U. S. P.

*Officinal Characters.*—"In deep-red needleform crystals, deliquescent and very soluble in water, forming an orange-yellow solution. When heated to a temperature between 356° and 374°, it melts into a reddish-brown liquid, which, on cooling, becomes a red, opaque, brittle mass. If a few drops of alcohol are allowed to fall on a small portion of the acid, a vigorous action takes place, attended with an increase in bulk, and the liquid formed becomes yellowish-brown." U. S.

*Therapeutics.*—Chromic acid is a powerful destroyer and solvent of animal tissue. It breaks up the organic constitution by oxidizing the various constituents, being itself converted at the same time into the sesquioxide of chromium. Although its action as a caustic is very slow, yet it penetrates very deeply. It is said to cause but little pain, and is therefore well adapted to the removal of small morbid excrescences, such as condylomata and warts. For this purpose it should be applied in the form of a thick paste, care being taken to limit its action. In weaker solution, applied by a camel's-hair brush, it has been used to destroy the granulations in obstinate granular conjunctivitis, but is a dangerous remedy in such cases.—W.]

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## MANGANESE. Mn=27.5.

The metallic base of the oxides and salts of manganese. It has a gray metallic lustre. Sp. gr. 8.013, and absorbs oxygen with great avidity, from the atmosphere.

### Black Oxide of Manganese, *Binoxide of Manganese.* [Appendix A.] $MnO_2$=43.5.

### [Manganesii Oxidum Nigrum, Mat. Med. List, U. S. P.]

*Natural History.*—The oxide of manganese used in chemistry and pharmacy, is the native anhydrous binoxide, called by mineralogists pyrolusite. It is found in great abundance in Cornwall, Devonshire, Somersetshire, and Aberdeenshire, whence much of what is met with in commerce is obtained. Pyrolusite is also found in Saxony, Hesse, Bohemia, Hungary, Silesia, France, and other countries of Europe.

*Preparation.*—Native binoxide of manganese, after being raised from the mine, is broken into small pieces about the size of peas, and then washed, to separate the earthy impurities. It is afterwards ground in mills to an impalpable powder.

*Properties.*—This mineral occurs massive, columnar, crystallized, and pulverulent; the form of the crystal is the right rhombic prism. The massive variety has sometimes a metallic lustre, but is generally dull and earthy; its color is iron-black, or brownish; it soils the fingers in handling it; its sp. gr. varies from 4.7 to 4.9; it is tasteless, odorless, and insoluble in water; it usually contains oxide of iron, carbonate of lime, sulphate of baryta, and argillaceous matter. Its purity is judged of either by the quantity of oxygen which it is capable of yielding, or by the quantity of chlorine set free when this oxide and hydrochloric acid are allowed to act on each other. The quantity of chlorine set free can be estimated by the quantity of sulphate of iron which it peroxidizes. The brown varieties are inferior to the black ones. [" This oxide should contain at least sixty-six per cent. of deutoxide of manganese." U. S.]

*Composition.*—Pure binoxide of manganese has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Manganese | 27.5 | 63.22 |
| 2 | Oxygen | 16 | 36.78 |
| | Binoxide of Manganese | 43.5 | 100.00 |

*Test.*—Gives off oxygen when heated to redness, and is almost entirely soluble in hydrochloric acid with the evolution of chlorine.

*Pharmaceutic Uses.*—Used in the preparation of permanganate of potash, and as an oxidizing agent in the production of chlorine for the formation of solution of chlorine, solution of chlorinated soda, and chlorate of potash.

### [**Manganesii Sulphas**, *Sulphate of Manganese*, Mat. Med. List, U. S. P. $MnO,SO_3+4HO$.

*Officinal Characters.*—" In colorless, or pale rose-colored, transparent crystals, which, when deposited from a solution at a temperature between 68° and 86°, have the form of right rhombic prisms, and contain four equivalents of water. This salt is very soluble in water. The solution is not disturbed by tincture of nutgall, but affords with caustic alkalies a white precipitate, which soon becomes brown by exposure to the air. Hydrosulphate of ammonia throws down a flesh-colored precipitate, and ferrocyanide of potassium, a white one." U. S. The precipitates thrown down are, with the caustic alkalies the protoxide of manganese ($MnO$), which quickly absorbs oxygen and is converted into the sesquioxide ($Mn_2O_3$); with the hydrosulphate, the sulphuret of manganese; with ferrocyanide of potassium, ferrocyanide of manganese.

*Properties.*—This salt has a bitter, astringent taste, and is insoluble in alcohol. At a red heat it parts with all its water of crystallization, becoming anhydrous; at a heat of 240° it gives up three of its equivalents of water.

*Therapeutics.*—Tonic and cholagogue. In doses of one or two drachms it is said to be purgative. It has been given as adjuvant to iron in cases of anemia, but its powers do not seem to be thoroughly determined. There seems no possibility of its ever replacing iron in the treatment of such cases. According to Gmelin, when given to animals it increases very remarkably the flow of bile. Dose, as a tonic gr. v—xx.—W.]

## ARSENIC. As=75.

### [Arsenicum, Mat. Med. List, U. S. P.]

*Natural History.*—Arsenic is peculiar to the mineral kingdom. It occurs in the metallic state, and in combination with oxygen, with sulphur, and with other metals. There are two native compounds of it with oxygen—namely, *arsenious acid* and *arsenic acid*, the latter being found in combination with bases, forming *arseniates*. Two sulphurets, also, are found native—namely, *orpiment* and *realgar*.

*Properties.*—Metallic arsenic is very hard, very brittle, and crystalline. The form of its crystal is the rhombohedron. The color of the metal varies from tin-white to steel-gray. It possesses considerable brilliancy, but soon tarnishes in the air, and becomes dull and dark gray. Sp. gr. 5.6 to 5.9. At a low red heat it volatilizes without fusing, and yields a vapor having an alliaceous odor: in the open air this vapor becomes oxidized, and yields white fumes of arsenious acid. The physical characters of the metal differ somewhat, according as this exists in the mass, in the form of a ring lining a glass tube, or in that of a spot on a plate of glass, porcelain, or mica. Metallic arsenic, when swallowed, is capable of acting as a powerful poison, probably by becoming oxidized and converted into arsenious acid.

### Arsenious Acid of Commerce. (Appendix A.) White Arsenic.

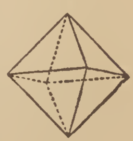
*Preparation.*—Arsenious acid is prepared in Silesia, Bohemia, Saxony, and Cornwall, by roasting the ores of cobalt, tin, and iron, the arsenious acid vapors being condensed in a pulverulent form in the flues or condensing chambers. This rough acid is refined by sublimation, and forms the white arsenic of commerce.

### Acidum Arseniosum, *Arsenious Acid.* [Mat. Med. List, U. S. P.]

*Synonym.*—Arsenicum album, *Ed.* $AsO_3=99$.

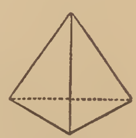
*Preparation.*—Take of arsenious acid of commerce, one hundred grains. Introduce the commercial arsenious acid into a thin porcelain capsule of a circular shape; and, having covered this as accurately as possible with a glass flask filled with cold water, apply the heat of a gas lamp. Sublimed arsenious 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 vapor of arsenious acid which may escape.

Fig. 32.



Regular Octohedron

Fig. 33.

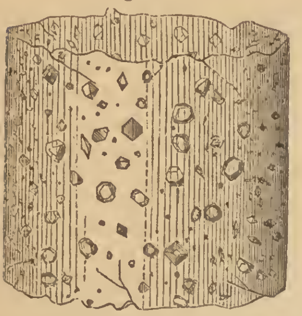


Regular Tetrahedron.

*Officinal Characters.*—A heavy white powder, which, when slowly sublimed in a glass tube, 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 (arsenite of silver), insoluble in water, but readily dissolved by ammonia and nitric acid.

*Properties.*—A clear, watery solution of arsenious acid has a very feeble acid reaction on litmus. Its taste is feeble. By evaporation on a glass plate it yields octahedral crystals. It yields a white precipitate with lime-water of arsenite of lime; a yellow precipitate of sulphuret of arsenic, with sulphuretted hydrogen, soluble in solution of ammonia; a green precipitate of arsenite of copper (Scheele's green) with ammonio-sulphate of copper. When mixed with zinc, and either sulphuric or hydrochloric acid, it evolves arseniuretted hydrogen gas (*Marsh's test*), which has an alliaceous odor, and burns with a bluish-white flame, depositing a black spot of arsenic on a cold plate of porcelain held directly above the jet; and lastly, when boiled with hydrochloric acid and clean copper foil, it gives a gray metallic coating of arsenic to the latter. (*Reinsch's test.*) If arsenious acid be intimately mixed with freshly-ignited but cold charcoal, or, still better, with a mixture of charcoal and carbonate of soda, and heated in a glass tube, the acid is deoxidized, and yields metallic arsenic, which is sublimed into a cooler portion of the tube, where it condenses and forms a metallic crust: $2AsO_3+3C=2As+3CO_2$. [The black spots of arsenic, which are obtained in several of the tests, can be distinguished from all other similar metallic spots (such as those producible by antimony) with which they could be confounded, by being volatilized at a comparative low temperature, and, if in a tube, deposited again higher up as a white ring of arsenious acid, which a pocket lens will show to be crystalline.—W.]

Fig. 34.



*Magnified portion of a Tube lined by the Sublimed Crystals of Arsenious Acid.*

*Composition.*—The following is the composition of arsenious acid:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Arsenic | 75 | 75.76 |
| 3 | Oxygen | 24 | 24.24 |
| | Arsenious Acid | 99 | 100.00 |

*Tests.*—Entirely volatilized by heat. Four grains of it dissolved in boiling water with eight grains of bicarbonate of soda, discharge the color of 80.8 measures of the volumetric solution of iodine ($AsO_3+2I+2HO=AsO_5+2HI$).

*Physiological Effects. Of very small or therapeutical doses.*—In very small quantities (as one-sixteenth or one-twelfth of a grain) no obvious effects are usually produced by the use of arsenic, unless it be continued for a long period. Indeed, some writers go so far as to assert that it is a strengthening remedy, and that it improves the appetite, invigorates digestion, promotes assimilation and secretion, excites the muscular and nervous functions—in a word, acts as a *tonic*. I cannot, however, subscribe to this doctrine. It is, indeed, true that patients sometimes experience a temporary increase of appetite from the use of small doses of arsenic; and it is also certain that this remedy is frequently beneficial in agues and other diseases in which tonics have been found efficacious. But the analogy between the action of arsenious acid and that of the vegetable tonics stops here.

The following is an abstract of the symptoms produced by the *long-continued employment of small doses* of arsenious acid, but which are more or less modified in different cases: Disorder of the digestive functions, characterized by flatulence, sensation of warmth, or actual pain, in the stomach and bowels; loss of appetite; thirst, nausea, and vomiting; purging, or at least a relaxed condition of the bowels, and griping; furred tongue, with dryness and tightness of the mouth and throat, or with salivation. Quick, small, and sometimes irregular pulse; oppressed respiration, with a dry cough. The body wastes—the stomach being frequently so irritable that no food can be retained in it. Headache, giddiness, and want of sleep, are frequently observed. The limbs become painful, feeble, trembling, subject to convulsions; occasionally benumbed, and ultimately paralyzed. The cutaneous system is, in some cases, affected, an eruption makes its appearance, and now and then the hair and nails fall off. Swelling of the feet and of the face is not unfrequently observed; and under these symptoms the patient gradually sinks, in some cases retaining his consciousness to the last, but at other times delirium or stupor supervening.

*Of excessive or poisonous doses* (*acute poisoning*).—The symptoms produced by the ingestion of a large dose of arsenious acid are not invariably alike. They are either such as indicate gastro-enteritis; namely, heat and constriction of the throat, abdominal pain, vomiting, diarrhœa, bloody stools, and tenesmus; or such as indicate great depression of the vascular and nervous systems; namely, faintness, cold clammy sweats, irregular action of the heart, palpitation, and dyspnœa; or tremor, convulsions, delirium, coma, and paralysis.

It is important to determine *what is the smallest fatal dose of arsenious acid*. It is not easy, however, to give a positive answer to this question. Dr. Christison says, "the smallest actually fatal dose I have hitherto found recorded is 4½ grains. The subject was a child four years old, and death occurred in six hours. In this instance, however, the poison was taken in solution." Dr. Letheby has reported a case in which two grains and a half proved fatal in 36 hours: the patient was a robust girl. More recently, a case has been recorded in which there was reason to suspect that the death of a woman was produced by half an ounce of Fowler's mineral solution (=2 grs. of arsenious acid). Dr. Alfred Taylor considers that from two to three grains may be regarded as a fatal dose. However, under certain circumstances, enormous quantities have been swallowed with very trivial effects. Half an ounce has been taken immediately after dinner, and the only effect produced was violent vomiting. Here it is evident that the distension of the stomach with food saved the individual's life.

When arsenious acid is swallowed, or otherwise applied to a living surface, it becomes absorbed. The absorption of it is now no longer a matter of doubt; for arsenic has been detected in the blood, in the animal tissues (liver, spleen, kidneys, stomach, and muscles), and in the urine. The parts principally influenced by arsenious acid are the alimentary canal, and other mucous surfaces, as the conjunctiva, the cerebro-spinal centres, the heart, the lungs, the skin, and the salivary glands.

*Therapeutics.*—[The action of arsenious acid in disease appears to entitle it to be regarded as an *antiperiodic*, an *alterative*, and *antispasmodic*.—Ed.]

In *intermittent fevers and other periodical diseases*, it has been employed with great success. For its introduction into practice in these cases in this country, we are indebted to the late Dr. Fowler, of Stafford. The reports published by Dr. Fowler, of the good effects of arsenic in periodical diseases have been amply confirmed by the subsequent experience of the profession generally. No remedy has been more successful in the treatment of ague. It will not unfrequently put a stop to the disease even when cinchona or the sulphate of quinia has failed. Dr. Brown, who has used it in many hundreds of cases, never saw any permanently ill effect arise from it; he considers it superior to crude bark, but inferior to quinia; over both it has the advantages of cheapness and tastelessness. In agues accompanied with inflammatory conditions, in which cinchona and sulphate of quinia are apt to disagree, arsenic may, according to Dr. Brown, be sometimes administered with the best effects. It is also very successful in relapses after the use of the above remedies. Some trials have been recently made by MM. Maillot, Andral, and Girbal in order to determine the comparative value of arsenic and quinia in the treatment of ague. They agree in their conclusions that, although possessing considerable remedial power over agues, yet it is a less prompt and less certain remedy than sulphate of quinia. On the other hand, M. Boudin, Physician-General to the French troops in Algeria, states that he cured numerous cases of ague with 1-100th of a grain of arsenious acid, one third of the cases having previously resisted quinia. Some neuralgic diseases, as hemicrania and neuralgia of the brow, or brow ague, are often periodic, and generally yield to arsenic.

In various *chronic affections of the skin*, particularly the scaly diseases (lepra, psoriasis, and pityriasis), eczema, and impetigo, arsenic is one of our most valuable agents. I can confidently recommend it in lepra, having seen a large number of cases benefited by it. Frequently the disease is relieved without any obvious constitutional effect. According to Mr. Hunt, arsenic exercises an "almost omnipotent influence" over non-syphilitic cutaneous diseases: and he ascribes the numerous failures in the treatment of these maladies to one or more of the following sources: 1st, the syphilitic character of the disease being overlooked; 2dly, the administration of arsenic during the inflammatory or febrile state of the disease; 3dly, the use of it on an empty stomach; 4thly, the exhibition of the remedy in too large doses, and at intervals too distant. He recommends five minims of Fowler's solution three times a day, to begin with, and as soon as the conjunctivitis appears, to reduce the dose; and he deprecates the employment of gradually increasing doses. These are the regulations under which I have usually given it; and although I can bear testimony to the great value of arsenic in skin disease, my experience does not authorize me to ascribe to it the "almost omnipotent influence" which Mr. Hunt has done, for I have repeatedly witnessed its failure as a therapeutical agent in some of these maladies, especially in superficial lupus, psoriasis guttata, and obstinate eczema. Mr. Hunt considers that the state of the conjunctiva may always be allowed to regulate the dose, and he so regulates it, if possible, that the eyelids shall continue tender during the whole course. [I have not found conjunctivitis occur nearly so frequently as Mr. Hunt's remark implies. I have repeatedly cured both skin disease and chorea by a course of arsenic of some weeks' duration, without being able to discover any increased redness or tenderness of the conjunctiva.—Ed.]

Some *chronic affections of the nervous system* have been benefited by arsenious acid; for example, neuralgia, especially when periodic, and chorea. In hemicrania and neuralgia of the brow, or brow ague, arsenic seldom fails as a medicine. In chorea, I have seen great advantage attend its use—in fact, I know of no remedy for this disease equal to arsenic, which, in a large proportion of cases, acts almost as a specific. It has also relieved angina pectoris.

Arsenic is contraindicated in plethoric habits. "It operates best," according to Mr. Hunt, "in persons of lax fibre and languid circulation and cold and moist skin, and who pass pale and plentiful urine, *i. e.*, in persons to whom iron is suitable."

Arsenious acid has long been employed as an *external application*. It has been applied and recommended by Sir A. Cooper, Dupuytren, and other high authorities; but its use is always attended with some danger. As a remedy for cancer it is never employed by the best surgeons of the present day, because experience has fully shown that it is incapable of curing genuine cancer, while it endangers the lives of the unfortunate patients. But in some forms of severe and unmanageable ulcerations, as lupus, arsenical applications are employed with occasional benefit when all other local remedies fail. Dupuytren employed in lupus an arsenical dusting powder, composed of ninety-nine parts of calomel and one part of arsenious acid. Sir A. Cooper recommends an arsenical ointment (arsenious acid, sublimed sulphur, of each one part; spermaceti ointment, eight parts). Cazenave says he has seen arsenical applications used by Biett, and has himself employed them many times, without having met with one instance of injurious consequences. In *onychia maligna*, Mr. Luke regards an arsenical ointment (composed of arsenious acid, gr. ij, and spermaceti ointment, oz. j) as almost specific.

*Administration.*—Arsenious acid may be administered, in substance, in doses of one-sixteenth to one-eighth of a grain, made into pills with crumb of bread. In making a mass of pills, great care should be taken that the arsenic be equally divided; for this purpose it should be well rubbed in a mortar with some fine powder (as sugar) before adding the bread crumb. A much safer mode of exhibition is to give this potent remedy in the form of solution with potash (as the *liquor arsenicalis*). Whether given in the solid or liquid form, it is best to exhibit it immediately after a meal, when the stomach is filled with food; for when given on an empty stomach (as in the morning, fasting), it is much more apt to occasion gastric disorder. It is sometimes advisable to conjoin opium, either to enable the stomach to retain it, or to check purging. In debilitated constitutions, quinia and other tonics may be usefully combined with it. Its effects are to be carefully watched, and whenever any unpleasant symptoms (as vomiting, griping, purging, swelling or redness of the eyelids, dryness of the throat, ptyalism, headache, or tremors) make their appearance, it will, of course, be advisable to diminish the dose, or suspend for a few days the use of the remedy. Indeed, when none of these symptoms occur, it is not proper to continue its use more than two weeks without intermitting its employment for a day or two, in order to guard against the occasional ill consequences resulting from the accumulation of the poison in the system, for it has on more than one occasion proved fatal when used as a medicinal agent.

*Antidotes.*—In cases of poisoning by arsenic, several indications require to be fulfilled:—

1. The first object to be effected is *to expel the poison from the stomach*. For this purpose the stomach-pump should be immediately applied. If

this be not in readiness, and vomiting have not commenced, tickle the throat with a feather or the finger, and administer an emetic of sulphate of copper or sulphate of zinc. Promote vomiting by diluent and demulcent liquids; as milk, white of egg and water, flour and water, gruel, sugared water, broths, linseed-tea, oil and lime-water, or a mixture of milk, lime-water and albumen. The liquid serves to promote vomiting; the demulcents (mucilage, albumen, oil, casein, or sugar), invest the poisonous particles, and, therefore, act as mechanical antidotes; while the lime-water is useful by diminishing the solubility of the arsenious acid. Olive oil, on which, according to Dr. Paris, the Cornish miners rely with confidence, can only act mechanically in the way just mentioned.

To expel arsenious acid from the intestines, castor oil is the best purgative.

2. The second object is *the employment of chemical antidotes.*

Of these there are none for arsenic on which much reliance can be placed. Those recommended are: animal charcoal, hydrated peroxide of iron, magnesia, and lime-water. But none of these are efficacious as chemical agents unless the poison be in solution. Now, as arsenic is almost invariably taken in a solid form, it follows that the benefit which may be obtained by the use of these agents is generally to be ascribed to their action as mechanical antidotes. With respect to the hydrated peroxide of iron, at least twelve parts of oxide, prepared by ammonia, and moist, are required for each part of arsenic in solution, as it only acts chemically on the *solution.* Dr. T. R. Beck recommends that we should administer to an adult a tablespoonful at least, and to children a dessertspoonful, every five or ten minutes, until relief from the urgent symptoms is obtained. Highly-calcined magnesia has been lately revived as a chemical antidote for arsenic. When in the gelatinous or hydrated state, it abstracts arsenious acid from its solution by forming with it a difficultly-soluble arsenite of magnesia.

3. Another indication is the use of *dynamical antidotes.* Opium is here a very valuable agent. It is undeniable that it is in most cases of great service. If the stomach rejects it we may employ it in the form of clysters. When there is much depression and collapse, brandy and other stimulants are sometimes requisite.

*Pharmaceutic Use.*—Used in the production of arseniate of soda and the following:—

LIQUOR ARSENICALIS, *Arsenical Solution.*—Take of arsenious acid, eighty grains; carbonate of potash, eighty grains; compound tincture of lavender, five fluidrachms; 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. In this preparation the arsenous acid combines with the potash of the carbonate, and disengages the carbonic acid; $KO,CO_2+AsO_3=KO,AsO_3+CO_2$. A slight excess of carbonate is used. The compound tincture of lavender is used as a coloring and a flavoring ingredient, and to distinguish it from other solutions.

[LIQUOR POTASSÆ ARSENITIS, U. S., *Solution of Arsenite of Potash. Synonym*, Fowler's Solution.—"Take of arsenious acid, in small pieces, bicarbonate of potassa, each, sixty-four grains; compound spirit of lavender, half a fluidounce; distilled water, a sufficient quantity; boil the arsenious acid and bicarbonate of potassa, in a glass vessel, with twelve fluidounces of distilled water, until the acid is entirely dissolved. To the solution, when cold, add the compound spirit of lavender, and afterwards sufficient distilled water to make it measure a pint." U.S. Owing to the difference between the imperial and wine pint, the strength of the U. S. solution is very nearly that of the British. Dose, gtt. iij—viij.—W.]

*Tests.*—Specific gravity, 1.009. One fluidounce boiled for five minutes with ten grains of bicarbonate of soda and then diluted with six fluidounces of water to which a little mucilage of starch has been added, does not give with the volumetric solution of iodine a permanent blue color until eighty-one measures have been added. The action is the same as that given under arsenious acid. No blue color can be produced until all the arsenious acid has been converted into arsenic acid.

### [**Arsenici Iodidum**, U. S., *Iodide of Arsenic.*

"Take of arsenic, sixty grains; iodine, three hundred grains; rub the arsenic in a mortar until reduced to a fine powder; then add the iodine, and rub them together until they are thoroughly mixed. Put the mixture into a small flask or a test-tube, loosely stopped, and heat it very gently until liquefaction occurs. Then incline the vessel in different directions, in order that any portion of the iodine, which may have condensed on its surface, may be returned into the melted mass. Lastly, pour the melted iodide on a porcelain slab, and, when it is cold, break it into pieces, and keep it in a well-stopped bottle." U. S. The salt is the result of the direct union of the iodine and arsenic. It is a teriodide with the symbol $AsI_3$ and atomic weight 453.9.

*Officinal Characters.*—Iodide of arsenic is an orange-red, crystalline solid, entirely soluble in water, and wholly volatilized by heat.

*Therapeutics.*—A powerful alterative, which has been used in scaly and tubercular skin diseases with alleged success. It is also used externally as a caustic application to cancers, skin tubercles, &c. Biett was accustomed to use an ointment of the strength of three grains to the ounce. Dose, gr. $\frac{1}{8}$ t. d. in pill or solution.

Liquor Arsenici et Hydrargyri Iodidi, U. S., *Solution of Iodide of Arsenic and Mercury.*—"Take of iodide of arsenic, red iodide of mercury, each thirty-five grains; distilled water, half a pint. Rub the iodides with half a fluidounce of the water, and, when they have dissolved, add the remainder of the water and filter through paper." U.S. A very powerful alterative, combining in itself all the powers for good and evil of iodine, arsenic, and mercury. It may be used in cases of chronic skin diseases, chronic rheumatism, venereal, and other affections which call for an alterative treatment, and in which the milder remedies have failed. The practitioner should always bear in mind, that it is easy to produce salivation with it. It is commonly known as Donovan's solution, and has a yellowish tint and disagreeable, slightly styptic taste. Dose, gtt. iii, t. d. cautiously increased.—W.]

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## ANTIMONY. (*Stibium*). Sb=122.

Antimony is a brittle, highly crystalline metal of a bluish-white color, bright metallic lustre, and sp. gr. 6.7; when submitted to a high temperature with exposure to the air it burns, giving off dense vapors of the oxide.

## **Antimonii Oxidum** [U. S.], *Oxide of Antimony.*

Teroxide of Antimony, $SbO_3 = 146$.

*Preparation.*—Take of solution of terchloride of antimony, sixteen fluidounces; carbonate of soda, five ounces; water, two gallons; distilled water, a sufficiency. Pour the antimonial solution into the water, mix thoroughly, and set aside until the precipitate which forms shall have subsided. Remove the supernatant liquid by a siphon, pour on a gallon of distilled water, agitate well, let the precipitate subside, again withdraw the fluid and repeat the processes of affusion of distilled water, agitation, and subsidence, until the fluid has only a feeble acid reaction on litmus paper. To the precipitate add the carbonate of soda previously dissolved in two pints of distilled water, leave them in contact for half an hour, stirring frequently, collect the deposit on a calico filter, and wash with boiling distilled water, until the washings cease to give a precipitate with a solution of nitrate of silver acidulated by nitric acid. Lastly, dry the product at a heat not exceeding 212°. When the solution of terchloride of antimony is diluted with water, a white precipitate of *oxychloride of antimony* is produced, which becomes crystalline by standing; $6SbCl_3 + 15HO = SbCl_3,5SbO_3 + 15HCl$. By treating this precipitate with carbonate of soda, the remaining portion of chloride of antimony is decomposed, with the formation of chloride of sodium, and carbonic acid. The precipitate then consists of pure teroxide of antimony; $SbCl_3,5SbO_3 + 3(NaO,CO_2) = 6SbO_3 + 3NaCl + 3CO_2$. [“Take of sulphuret of antimony, in very fine powder, four troyounces; muriatic acid, eighteen troyounces; nitric acid, a troyounce and one hundred and twenty grains; water of ammonia, a fluidounce and a half; water, distilled water, each, a sufficient quantity. Introduce the sulphuret into a flask, of the capacity of two pints, and, having added the muriatic acid, digest, by means of a sand-bath, until effervescence ceases. Then, having removed the flask from the sand-bath, add the nitric acid gradually; and, when nitrous acid vapors cease to be given off, and the liquid has grown cold, add to it half a pint of water, and filter. Pour the filtered liquid gradually into twelve pints of water, constantly stirring, and allow the precipitate to subside. Decant the supernatant liquid and wash the precipitate twice by decantation, using, each time, eight pints of water. Then transfer it to a muslin filter to drain, and, after the draining is completed, wash it with water until the washings cease to have an acid reaction. Next introduce it into a suitable vessel, and subject it to the action of water of ammonia for two hours; at the end of which time, transfer it to a moistened muslin filter, and wash it with distilled water as long as the washings produce a precipitate with nitrate of silver. Lastly, dry the precipitate upon bibulous paper with the aid of a gentle heat.” U. S. In the U. S. process, the first step is the formation of the terchloride of the antimony. Thus, $SbS_3 + HCl = SbCl_3 + 3SH$. The nitric acid is added to decompose any sulphuretted hydrogen which may remain in solution. The subsequent steps are similar to the British process.—W.]

*Officinal Characters.*—A white powder, fusible at a low red heat, insoluble in water, but readily dissolved by hydrochloric acid. The solution, dropped into distilled water, gives a white deposit, at once changed to orange by sulphuretted hydrogen.

*Composition.*—Teroxide of antimony has the following composition:

| Eq. | | Eq Wt. | Per Cent. |
|---|---|---|---|
| 1 | Antimony | 122 | 83.56 |
| 3 | Oxygen | 24 | 16.44 |
| | Teroxide of Antimony | 146 | 100.00 |

*Tests.*—Does not yield any sublimate when fused in a test-tube; dissolves entirely when boiled with an excess of the acid tartrate of potash. A crystallized sublimate would indicate the presence of arsenious acid, but it requires the heat to be very carefully applied, as the oxide of antimony is also sublimed by heat in crystals. It would be better that the temperature used should be below that required for fusion.

*Physiological Effects.*—Teroxide of antimony is the active part of all the medicinal preparations of antimony. Its medicinal properties are similar to those of tartarated antimony; but in consequence of its great insolubility, except in acids, its action is slower and milder. It has been little used at present in England, but Dr. Christison states that in its action it is diaphoretic, sedative, expectorant, emetic, and laxative.

*Therapeutics.*—It has been employed chiefly in Scotland and Ireland as a diaphoretic and sedative in catarrh and pneumonia, and in the early stage of febrile diseases; but its effects hitherto have been far from uniform. Three or four grains were found by Dr. Christison to produce not only diaphoresis, but frequently nausea and even vomiting; while at other times the same quantity produced no appreciable effect. Dr. Clark, of Aberdeen, found thirty or forty grains sometimes apparently inert. [I am not disposed to attribute with M. Durrand this variety in its action to the accidental presence or absence of chloride of antimony (for Dr. Clark's preparation, though sometimes inert, was the pure oxide), but rather to the insolubility of the oxide in the stomach when no acid is present.—Ed.]

*Administration.*—Dose, one to three grains. It may be given in confection of roses.

*Pharmaceutic Uses.*—It is employed in the preparation of antimonial powder and tartarated antimony.

Pulvis Antimonialis, *Antimonial Powder.*—Take of oxide of antimony, one ounce; precipitated phosphate of lime, two ounces; mix them thoroughly.

*History.*—Dr. James, who died in 1776, prepared a celebrated patent medicine, long known as *James's powder* (*pulvis Jacobi*). The specification which Dr. James lodged in the Court of Chancery is so ambiguously worded, that his powder cannot be prepared by it. Hence the present preparation has been introduced into the Pharmacopœia as a substitute for it, and for the Pulvis Antimonii Compositus, *Lond.*, and the Pulvis Antimonialis, *Ed.* and *Dub.*, none of which have been found satisfactory.

*Physiological Effects.*—Dr. Pereira attributed the inequality in the operation of the former antimonial powders to the presence or absence of oxide of antimony, and to the uncertain quantity of this ingredient when present. The following examples were given: Mr. Hawkins gave 60 grains morning and evening without any obvious effect; and the late Dr. Duncan, jun., administered doses of 20 and 30 grains several times a day, without inducing vomiting or purging. Dr. Elliotson found even 120 grains nearly inert; nausea alone being in some of the cases produced. In these instances, I presume it contained little or no teroxide. But, on the other hand, a considerable number of practitioners have found it to possess activity. Dr. Paris observes, that "it will be difficult for the chemist to persuade the physician that he can never have derived any benefit from the exhibition of antimonial powder." I am acquainted with one case in which it acted with great activity. A workman employed in the manufacture of this powder in the laboratory of an operative chemist in London, took a dose of it (which, from his account, I estimate at half a teaspoonful), and to use his own words, "it nearly killed him." It occasioned violent vomiting, purging, and sweating. *Dr. James's powder*, which some practitioners consider as more active and certain than our late antimonial powders, appears to be equally inconstant in its operation. Dr. D. Munro, who frequently used this powder, and saw Dr. James himself, as well as other practitioners, administer it, observes: "Like other active preparations of antimony, it sometimes acts with great violence, even when given in small doses; at other times a large dose produces very little visible effects. I have seen three grains operate briskly both upwards and downwards; and I was once called to a patient to whom Dr. James had himself given five grains of it, and it purged and vomited the lady for twenty-four hours, and in that time gave her between twenty and thirty stools; at other times I have seen twenty grains produce little or no visible effect." The present powder avoids one source of uncertainty by containing a definite quantity, 33 per cent. of the oxide; but is, of course, still liable to the uncertainty and variableness which arises from the insolubility of the oxide.

*Therapeutics.*—Antimonial powder is employed as a sudorific in fevers and rheumatic affections. In the former it is given either alone or in combination with mercurials; in the latter, it is frequently conjoined with opium as well as with calomel. In chronic skin diseases it is sometimes exhibited with alteratives.

*Administration.*—The usual dose of it is from three to ten grains, in the form of powder or bolus.

## Sulphuret of Antimony, Prepared. (Appendix A.)

## [Antimonii Sulphuratum, Mat. Med. List, U. S. P.]

Tersulphuret of Antimony, $SbS_3=170$, reduced to fine powder.

*Natural History.*—Tersulphuret of antimony is found native in various parts of the world, especially in Hungary, in the Hartz, in France, in Cornwall, and in Borneo. From the latter place it is imported into this country by way of Singapore, being brought over as ballast in the vessels.

*Properties.*—The fused sulphuret (called *common* or *crude antimony*) occurs in commerce in roundish masses, called loaves or cakes: these, when broken, present a striated crystalline appearance, a dark steel or lead-gray color, and a metallic brilliancy. The commercial tersulphuret is opaque, tasteless, odorless, brittle, easily pulverizable, and has a sp. gr. of about 4.6. Its powder is black, but that of pure tersulphuret is reddish-black. It is little less fusible than metallic antimony. ["Sulphuret of antimony is wholly dissolved by muriatic acid with the aid of heat, hydrosulphuric acid gas being evolved. The solution yields a white precipitate when added to water; and the resulting liquid, after filtration, affords an orange-red precipitate with hydrosulphate of ammonia." U. S.]

*Composition.*—Tersulphuret of antimony has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Antimony | 122 | 71.76 |
| 3 | Sulphur | 48 | 28.24 |
| | Tersulphuret of Antimony | 170 | 100.00 |

*Test.*—Almost entirely soluble in boiling hydrochloric acid.

**Antimonium Sulphuratum** [U. S.], *Sulphurated Antimony.*

*Synonyms.*—Antimonii Oxysulphuretum, *Lond.;* Antimonii Sulphuretum aureum, *Ed.;* Antimonii Sulphuretum præcipitatum, *Dub.* [U. S. P. 1850.]

Tersulphuret of Antimony, $SbS_3$, with a small and variable amount of teroxide of antimony, $SbO_3$.

*Preparation.*—Take of prepared sulphuret of antimony, ten ounces; solution of soda, four pints and a half; dilute sulphuric acid, a sufficiency; distilled water, a sufficiency. Mix the sulphuret of antimony with the solution of soda and boil for two hours with frequent stirring, adding distilled water occasionally to maintain the same volume. Strain the liquor through calico, and, before it cools, add to it by degrees the dilute sulphuric acid till the latter is in slight excess. Collect the precipitate on a calico filter, wash with distilled water till the washings no longer precipitate with chloride of barium, and dry at a temperature not exceeding 212°. ["Take of sulphuret of antimony, in very fine powder, six troyounces; solution of potassa, four pints; distilled water, diluted sulphuric acid, each, a sufficient quantity. Mix the sulphuret of antimony with the solution of potassa and twelve pints of distilled water and boil the mixture over a gentle fire for two hours, constantly stirring, and occasionally adding distilled water, so as to preserve the same measure. Strain the liquid immediately through a double muslin strainer, and drop into it, while yet hot, diluted sulphuric acid so long as it produces a precipitate. Then wash the precipitate with hot water to remove the sulphate of potassa, dry it, and rub it into a fine powder." U. S.]

When the common black tersulphuret of antimony is boiled with a solution of caustic soda, sulphuret of sodium and teroxide of antimony are produced, $3NaO+SbS_3=3NaS+SbO_3$: the former combines with and dissolves some tersulphuret of antimony ($3NaS+xSbS_3$), while the latter unites with soda ($NaO+SbO_3$). When sulphuric acid is added to the strained liquor, it decomposes the sulphuret of sodium, precipitates the tersulphuret of antimony, and combines with the soda which retained the teroxide of antimony in solution; the latter is wholly, or in great part, reconverted into tersulphuret of antimony, $4SO_3+3(NaS,SbS_3)+NaO,SbO_3=4(NaO,SO_3)+4SbS_3$. From Mr. Phillips's analysis, it would appear that some teroxide of antimony escapes decomposition, and is contained in the precipitated product.

*Officinal Characters.*—An orange-red powder, readily dissolved by caustic soda, also by hydrochloric acid, with the evolution of sulphuretted hydrogen and the separation of a little sulphur. The acid solution dropped into water gives a copious white precipitate (oxychloride of antimony). ["The liquid filtered from this powder yields an orange-red precipitate with hydrosulphate of ammonia. Water in which the preparation has been boiled should not yield a white precipitate with chloride of barium, or with oxalate of ammonia." U. S.]

*Properties.*—Sulphurated antimony is odorless and almost tasteless. It is insoluble in cold water, and only slightly soluble in solution of ammonia. Heated in the air, it burns, evolves sulphurous acid, and leaves a grayish residue.

*Composition.*—By boiling in a solution of acid tartrate of potash, it loses, according to Mr. Phillips, 12 per cent.—the amount of teroxide which it is presumed to contain. Its composition, according to the same authority, is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Teroxide of Antimony | 146 | 12.80 |
| 5 | Tersulphuret of Antimony | 850 | 74.56 |
| 16 | Water | 144 | 12.64 |
| | Sulphurated Antimony | 1140 | 100.00 |

*Tests.*—Sixty grains of this preparation, dissolved in hydrochloric acid and dropped into water, give a white precipitate (oxychloride), which, when washed and dried, weighs about fifty-three grains.

*Physiological Effects.*—The medicinal activity of this preparation is greater in proportion to the quantity of oxide of antimony which it may contain. In small doses, it is employed as an alterative, expectorant, and diaphoretic; in somewhat larger doses, it causes nausea and sweating, and sometimes vomiting; in still larger quantities, it excites both vomiting and purging.

*Therapeutics.*—It is principally employed as an *alterative* in chronic diseases, particularly cutaneous affections, glandular enlargements, secondary syphilis, rheumatism, and diseases of the liver. In these complaints it is usually associated with mercurials (especially calomel), and sometimes with either guaiacum or narcotics.

*Administration.*—As an alterative, the dose is from one to three or four grains; as an emetic, from five to twenty grains.

*Pharmaceutic Use.*—Used as a constituent of the compound calomel pill.

[**Antimonii Oxysulphuretum**, U. S., *Oxysulphuret of Antimony.*

*Kermes Mineral.*—"Take of sulphuret of antimony, in very fine powder, a troyounce; carbonate of soda, twenty-three troyounces; water, sixteen pints. Dissolve the carbonate of soda in the water previously heated to the boiling point, and, having added the sulphuret of antimony, boil for an hour. Then filter rapidly into a warm earthen vessel, cover this closely, and allow the liquid to cool slowly. At the end of twenty-four hours, decant the supernatant liquid, drain the precipitate on a filter, wash it with boiled water previously allowed to become cold, and dry it without heat. Lastly, preserve the powder in a well-stopped bottle, protected from the light." U. S.

According to the U. S. Dispensatory "the rationale of the formation of Kermes mineral by this process is as follows: a portion of the carbonate of soda is converted, by a transfer of carbonic acid, into caustic soda and sesquicarbonate. By a double decomposition taking place between a part of the tersulphuret of antimony and the caustic soda, sulphuret of sodium and teroxide of antimony are formed. The undecomposed portion of the tersulphuret then dissolves in the solution of sulphuret of sodium and the teroxide in that of the remaining carbonate of soda. The tersulphuret and the teroxide, being both more soluble in these menstrua hot than cold, precipitate together as the liquid cools and constitute this variety of Kermes." In order to facilitate the student's understanding this, the following formula is appended: 9NaO,

$CO_2 = 3({}_2NaO_3CO_2) + 3NaO$—adding $SbS_3$ to this—$3NaO + SbS_3 = SbO_3 + 3NaS$.

*Officinal Characters.*—Oxysulphuret of antimony is a purplish-brown, tasteless powder, soft and velvety to the touch, wholly and readily soluble in muriatic acid with evolution of hydrosulphuric acid gas, and partly soluble in a hot solution of potassa, leaving a residue soluble in tartaric acid.

The proportion of the various ingredients is said to be two equivalents of the tersulphuret, one of the teroxide, and six of water. If this be correct, this form of Kermes mineral ought to be more active than the antimonium sulphuratum from its containing more of the oxide. Its therapeutic powers and dose are similar to those of the latter drug.—W.]

**Liquor Antimonii Terchloridi,** *Solution of Terchloride of Antimony.*

Terchloride of antimony, $SbCl_3$, dissolved in hydrochloric acid.

*Preparation.*—Take of prepared sulphuret of antimony, one pound; commercial hydrochloric acid, four pints. Place the sulphuret of antimony in a porcelain vessel, pour upon it the hydrochloric acid, and, constantly stirring, apply to the mixture, beneath a flue with a good draught, a gentle heat, which must be gradually augmented as the evolution of gas begins to slacken, until the liquid boils. Maintain it at this temperature for fifteen minutes; then remove the vessel from the fire, and filter the liquid through calico into another vessel, returning what passes through first, that a perfectly clear solution may be obtained. Boil this down to the bulk of two pints, and preserve it in a stoppered bottle.

By the action of liquid hydrochloric acid on tersulphuret of antimony, we obtain terchloride of antimony, while sulphuretted hydrogen escapes; $SbS_3 + 3HCl = SbCl_3 + 3HS$. The terchloride of antimony thus obtained is dissolved in excess of liquid hydrochloric acid.

*Officinal Characters.*—A heavy liquid usually of a yellowish-red color. A little of it dropped into water gives a white precipitate (oxychloride of antimony), and the filtered solution lets fall a copious deposit on the addition of nitrate of silver (chloride of silver). If the white precipitate formed by water be treated with sulphuretted hydrogen it becomes orange ($SbS_3$).

*Tests.*—Specific gravity, 1.47. One fluidrachm mixed with a solution of a quarter of an ounce of tartaric acid in four fluidounces 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 twenty-two grains.

*Therapeutics.*—In medicine it is employed only as a caustic. It usually acts without causing much pain or inflammation, and after the separation of the eschar, produces a clean healthy surface. It is sometimes used as an application to parts bitten by rabid animals or venomous serpents; its liquidity enabling it to penetrate into and corrode all parts of the wound. It is also applied to ulcers to repress excessive granulations. Richter and Beer have employed it in staphyloma: the mode of applying it is as follows: Dip a camel's-hair pencil, or a point of lint, into the liquid, and apply it to the tumor until a whitish crust is perceived, when the whole is to be immediately washed away by means of a larger pencil dipped first into milk and afterwards into milk and water.

*Pharmaceutic Use.*—Used in the preparation of the oxide of antimony.

## **Antimonium Tartaratum,** *Tartarated Antimony.*

### [**Antimonii et Potassæ Tartras,** U. S., *Tartrate of Antimony and Potassa. Tartar Emetic.*]

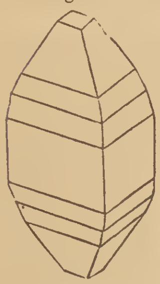
*Synonym.*—Antimonii Potassio-tartras, *Lond.*

Tartrate of antimony and potash, $SbO_3,KO,\bar{T}(C_8H_4O_{10})+2HO$.

*Preparation.*—Take of oxide of antimony, five ounces; acid tartrate of potash, in fine powder, six ounces; distilled water, two pints. Mix the oxide of antimony and tartrate of potash with sufficient distilled water to form a paste, and set aside for twenty-four hours. Then add the remainder of the water and boil for a quarter of an hour, stirring frequently. Filter, and set aside the clear filtrate to crystallize. Pour off the mother liquor, evaporate to one-third, and set aside that more crystals may form. Dry the crystals on filtering paper at the temperature of the air. $HO,KO,\bar{T}+SbO_3+HO=SbO_3,KO,\bar{T}+2HO$. [" Take of oxide of antimony, in very fine powder, two troyounces; bitartrate of potassa, in very fine powder, two troyounces and a half; distilled water, eighteen fluidounces. To the water, heated to the boiling point in a glass vessel, add the powders, previously mixed, and boil for an hour; then filter the liquid while hot, and set it aside that crystals may form. Lastly, dry the crystals, and keep them in a well-stoppered bottle. By further evaporation the mother water may be made to yield more crystals, which should be purified by a second crystallization." U. S.]

*Officinal Characters.*—In colorless transparent crystals, exhibiting triangular facets, soluble in water and less so in proof spirit. It decrepitates and blackens upon the application of heat. Its solution in water gives with hydrochloric acid a white precipitate, which is not formed if tartaric acid be previously added. [" A solution, containing one part in forty of water, is not disturbed by an equal volume of a solution of eight parts of acetate of lead in thirty-two of water and fifteen of acetic acid." U. S.]

Fig. 35.



*Octohedron of Emetic Tartar.*

*Properties.*—Tartarated antimony crystallizes in white, inodorous, rhombic octahedrons, whose lateral planes are striated. By exposure to the air the crystals become opaque, probably by giving out an equivalent of water. Their taste is feebly sweetish, then styptic and metallic. They dissolve in 14 or 15 parts of water at 60° F., and in 2 parts at 212°. The aqueous solution slightly reddens litmus. Tartarated antimony is not soluble in alcohol. If heated on charcoal by the blowpipe, the metal is first reduced, and then a part is reoxidized, and deposited on the charcoal in the form of a white powder or crystalline needles ($SbO_3$).

*Composition.*—The following is the composition of this salt :—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Teroxide of antimony . . . . . . | 146 | 41.47 |
| 1 | Potash . . . . . . . . . . | 47 | 13.35 |
| 1 | Tartaric acid . . . . . . . . | 132 | 37.50 |
| 2 | Water . . . . . . . . . . | 18 | 7.68 |
| | Tartarated antimony . . . . . . | 343 | 100.00 |

*Tests.*—Twenty grains dissolve without residue in a fluidounce of distilled water at 60°, and the solution gives with sulphuretted hydrogen an orange precipitate ($SbS_3$), which when washed and dried at 212°, weighs 9.91 grains.

In the crystalline state, the purity of this salt is easily determined. The crystals should be well formed, perfectly colorless, transparent, or opaque, and, when dropped into a solution of sulphuretted hydrogen, form an orange-colored deposit ($SbS_3$). When pure, the powder of this salt is perfectly white. Some ignorant druggists prefer a yellowish white powder; and I am informed by a manufacturer of this salt, that he is obliged to keep two varieties (one white, the other yellowish white) to meet the demands of his customers! The yellow tint is owing to the presence of iron, which is readily detected in the salt by the blue color immediately produced in its solution by adding first a few drops of dilute sulphuric acid, and then ferrocyanide of potassium. This test should not precipitate or in any way affect solution of the pure salt. A dilute solution of tartarated antimony occasions no precipitate with chloride of barium: it produces a white precipitate (unless the solutions be very dilute) with nitrate of silver, and which is soluble in excess of water (showing freedom from sulphates and chlorides).

*Physiological Effects*, 1. *Local.*—Tartarated antimony is a powerful local irritant. Its irritant properties may be regarded as peculiar or specific. When applied to the epidermis it causes an eruption of painful pustules, resembling those of variola or ecthyma. I am acquainted with no agent which produces an eruption precisely like that caused by tartarated antimony. The facility with which it is produced varies considerably in different individuals, and in the same individual at different times. A pustular eruption has been met with in the mouth, œsophagus, and small intestines, from its internal use, and white aphthous spots have been observed on the velum and tonsils. But these effects are rare. Severe inflammation of the throat has sometimes followed the employment of antimony.

We have further evidence of the local irritation produced by tartarated antimony in its action on the stomach and intestines. When swallowed in full doses, it gives rise to vomiting (whence its name *emetic tartar*) and purging, and pain in the epigastric region. After death, redness of the gastro-intestinal membrane has been found. However, it would appear, from the experiments of Magendie, that part of this effect should be referred to the specific influence which this salt exerts over the stomach, independently of its direct local irritation, since the same symptoms have been induced by its application to wounds, and by its injection into the veins. Occasionally, constitutional effects (nausea, vomiting, and griping pains) have appeared to result from its application to the skin. In one instance death resulted from its employment: the patient was an infant two years of age, and death occurred in forty-eight hours. These effects, if really produced by this salt, occur very rarely.

2. *Constitutional.*—Taken internally, *in small doses*, tartarated antimony increases the secretion and exhalation of the gastro-intestinal membrane, and of the liver and pancreas. Subsequently, it acts powerfully on other emunctories; thus it causes sweating, without any very marked vascular excitement; it renders the mucous membranes (especially the bronchial membrane) moister, and, when the skin is kept cool, promotes the secretion of urine. These effects are produced more certainly and speedily by this salt than by any other antimonial preparation. *In somewhat larger doses*, it excites nausea, frequently with vomiting, depresses the nervous functions, relaxes the tissues (especially the mus-

cular fibres), and occasions a feeling of great feebleness and exhaustion. These symptoms are accompanied or followed by increased secretion and exhalation from the different emunctories, but especially from the skin, as above mentioned. Of all emetic substances, this creates the most nausea and depression. *In excessive doses*, it has, in a few instances, acted as an irritant poison, and even occasioned death. In one case 20, in another 27 grains, nearly proved fatal. In a third, 40 grains caused death. The symptoms in the latter case were vomiting, hypercatharsis, convulsions, epigastric pain and tumefaction, and delirium. Death occurred four days after the ingestion of the poison. Were the above cases not well authenticated, we should be disposed to ascribe the dangerous symptoms and death to some other circumstance rather than to the use of the above-mentioned quantities of emetic tartar; for of late years this salt has been extensively employed in enormous and repeated doses with perfect safety. Rasori has given an ounce or more in twenty-four hours, and many ounces during the course of a disease, without occasioning either vomiting or abundant alvine evacuations. Laennec has confirmed, to a certain extent, the statements of Rasori. He gave 20, 40, and even 90 grains within twenty-four hours (usually in doses of one, two, or three grains) without ever having seen any injurious consequences. The usual effects which I have observed from the continued use of one or two grain doses are nausea, vomiting, and purging, which in most cases are much diminished, or entirely cease, after the use of the medicine for a day or two. Perspiration I have found to be a frequent effect. In all the instances above referred to in which these large doses were administered, the patients were affected with inflammatory diseases. Now it is to this morbid state, or *diathesis*, that, according to Rasori, we ought to ascribe the *tolerance* of these immense quantities of this powerful medicine. Consequently, if the opinion be worth anything, the susceptibility to its influence should increase as the disease subsides —a circumstance which Rasori asserts really takes place. But in this the theoretical views of this distinguished Italian have probably led him to overlook the truth. "It is certainly true," observes Laennec, "that after the acute period of the disease [peripneumonia], the tolerance diminishes, or sometimes entirely ceases; but it is more common to find the patient become habituated to the use of the medicine, insomuch that during convalescence, and when he has begun to use food as in health, he will take daily, without knowing it, six, nine, twelve, or even eighteen grains of emetic tartar." Though I have seen this salt extensively employed in both public and private practice, I have never met any satisfactory cases supporting Rasori's assertion of the diminished tolerance when the patient becomes convalescent. Moreover, large doses have been taken by healthy individuals without any remarkable effects. Alibert, saw, at the Hospital St. Louis, a man who took thirty grains of this salt in order to poison himself, but suffered no remarkable inconvenience from it. Lebreton reports the case of a girl who swallowed three quarters of an ounce at once as a poison: oil was immediately given; vomiting took place, and she soon recovered. Other published cases might be brought forward in proof of the slight effects of large doses, but I must content myself with referring to the memoir of Magendie for a notice of them. I may add, however, that this distinguished physiologist concludes that the comparative slightness of the effects arose from the evacuation of the salt a few moments after its ingestion; though in several, at least, of the cases this was not proved, and in one it certainly did not happen: it was that of a man who swallowed 27 grains of this salt, and did not vomit.

The action of large doses of tartarated antimony on the circulation and respiration is usually that of a sedative. This has been very frequently, though not constantly, observed. In one case of pneumonia, the daily use of from six to eight grains reduced the pulse, in nine days, from 120 to 34 beats per minute, and diminished the number of inspirations from 50 to 18. In another, the pulse descended, in three days, from 72 to 44 beats per minute. The loss of muscular power, the diminution of the frequency of the pulse, the fainting, the cramps and convulsions, the delirium and insensibility, caused by emetic tartar in poisonous doses, are referable to the depressing influence of this substance on the nervous system.

The *absorbent system* is supposed to be stimulated to greater activity by emetic tartar, in consequence of the disappearance of serous and synovial effusions under its use. Laennec ascribed the efficacy of it in pneumonia to the increased activity of the interstitial absorption.

The action of tartarated antimony may therefore be described as diaphoretic, expectorant, diuretic, nauseant, emetic, purgative, sedative, absorbent, and locally irritant.

*Mode of Action.*—Tartarated antimony, when swallowed, becomes absorbed, and may be detected in the blood and viscera, especially the liver. It is eliminated by the urine, in which secretion it can readily be recognized.

*Therapeutics.*—As an *emetic*, this salt is generally given in doses of one or two grains, frequently in combination with ten or fifteen grains of ipecacuan. When we use vomiting, not merely to evacuate the contents of the stomach, as in cases of narcotic poisoning, but as a means of making an impression on the system, and thereby of putting a sudden stop to the progress of a disease, it is by far our best emetic. It is with this view that it is sometimes employed in the early stages of fever, especially when accompanied by gastric or bilious disorder. Tartarated antimony is used as a vomit, with considerable success, in the early stage of inflammatory diseases, especially in croup, tonsillitis, swelled testicle, bubo, and ophthalmia. Here, also, the success of the remedy is in proportion to its early application. In croup it should be given to excite, in the first instance, vomiting, and afterwards prolonged nausea. Under this plan of treatment I have seen two or three slight cases completely recover without the use of any other remedial agent. Dr. Copland also bears testimony to the success of the practice. Dr. Cheyne recommends half a grain of emetic tartar to be dissolved in a tablespoonful of water, and given to a child two or three years of age every half hour till sickness and vomiting are produced; and in two hours after the last act of vomiting, the same process is to be recommenced, and so repeated while the strength will admit. Another disease which is relieved by the occasional use of emetics is *hooping-cough.* They should be administered, at the commencement of the disease, every or every other day. They diminish the violence and length of the fits of spasmodic coughing, and promote expectoration. Tartarated antimony is particularly valuable in this disease, in consequence of being tasteless, and, therefore, peculiarly adapted for exhibition to children. In derangements of the hepatic functions, indicating the employment of emetics, this salt is usually preferred to other vomiting agents, on account of its supposed influence in promoting the secretion of bile. It has been repeatedly *injected into the veins* to excite vomiting. The usual dose is two or three grains dissolved in two ounces of water; but in some cases six grains have been injected. The effects are unequal: when vomiting does occur it is not always immediate; frequently it does not take place at all. In several cases of choking, from the lodgement of pieces of meat in the œsophagus, injection has been used with great success: vomiting was produced, and with it the expulsion of the meat. As a *nauseant*, to reduce the force of the circulation and the muscular power, emetic tartar is frequently of considerable service. Thus, in dislocations of the larger joints (the hip and shoulder, for example), nauseating doses of it are employed to diminish the resistance of the muscles opposing the reduction. Even in strangulated hernia it has been given.

Tartarated antimony, in large doses, is a most powerful and valuable remedy in the treatment of inflammation. On this subject I have already offered some remarks. As an emetic, nauseant, or diaphoretic, it has long been in use in pneumonia. As a remedy for inflammation, independent of its evacuant effects, we are indebted for it to Rasori, who first used it in the years 1799 and 1800, in an epidemic fever which raged at Genoa. Subsequently he exhibited it much more extensively, and in larger doses, in pneumonia. This mode of treatment was tried and adopted in France, first by Laennec, and in this country by Dr. Balfour. Its value as an antiphlogistic is now almost universally admitted. Laennec's mode of using this salt, and which, with some slight modification, I believe to be the best, is the following: Immediately after bleeding, give one grain of emetic tartar, dissolved in two ounces and a half of some mild fluid: this is to be repeated every two hours for six times, and then suspended for seven or eight hours, if the symptoms are not urgent, or if there be any inclination to sleep. But if the disease has already made progress, or if the oppression be great, or the head affected, continue the medicine until amendment takes place; and, in severe cases, increase the dose to two, or two and a half grains. The only modification in this plan, which I would venture to propose, is, to begin with a somewhat smaller dose (say one-third or one-half of a grain), and gradually increase it; for, in consequence of the violent vomiting which one grain has sometimes produced, I have found patients positively refuse to continue the use of the medicine. From my own experience I should say, that tartarated antimony is nearly as serviceable when it causes moderate sickness and slight purging, as when it occasions no evacuation. Laennec observes, that "in general the effect of emetic tartar is never more rapid or more efficient than when it gives rise to no evacuation; sometimes, however, its salutary operation is accompanied by a general perspiration. Although copious vomiting and purging are by no means desirable, on account of the debility and hurtful irritation of the intestinal canal which they may occasion, I have obtained remarkable cures in cases in which such evacuations had been very copious." A few drops of tincture of opium may be sometimes conjoined with the antimony, to check its action on the alimentary canal. In *pleurisy*, tartarated antimony does not succeed so well as in inflammation of the substance of the lungs. "It, indeed, reduces speedily the inflammatory action," says Laennec, "but when the fever and pain have ceased, the effusion does not always disappear more rapidly under the use of tartar emetic than without it." I have sometimes conjoined opium (always after copious blood-letting) with advantage. In *bronchitis* (both acute and chronic) it may be most usefully employed in conjunction with the usual antiphlogistic agents. In *articular rheumatism*, next to pneumonia, emetic tartar has been found by some practitioners (especially by Laennec) more efficacious than in any other inflammatory affection: the usual duration of the complaint, when treated by this remedy, was found by Laennec to be seven or eight days. Synovial effusions (whether rheumatic or otherwise) have, in some cases, given way rapidly to the use of this salt. In *arachnitis*, Laennec has seen all the symptoms disappear, under the use of it, in forty-eight hours. In three instances of acute hydrocephalus, all the symptoms disappeared in the same space of time. In *phlebitis*, in *inflammation of the mammæ* occurring after delivery, in *ophthalmia*, and various other inflammatory affections, emetic tartar has been successfully employed as an antiphlogistic. Tartarated antimony is one of our most valuable sudorifics, being oftentimes available when other agents of this class are inadmissible: for example, when we are desirous of producing diaphoresis, in fevers and other diseases which are accompanied with preternatural vascular action about the head, or congestion of the brain, the use of opiate sudorifics (as the powder of ipecacuan and opium) is objectionable; whereas emetic tartar may be employed with safety, since it has no tendency to increase disorder of the nervous system, but to reduce cerebral excitement. In the advanced stage of typhus fever, accompanied with intense cerebral excitement, manifested by loss of sleep, delirium, &c., Dr. Graves has obtained most beneficial results from the use of emetic tartar and opium. The same combination has been employed with great success in delirium tremens, as well as in delirium of erysipelas, scarlatina and measles, by Dr. Law. *As an expectorant*, in various pulmonary affections, small doses of this salt are frequently employed with advantage.

As a local irritant applied to the skin, it is used in the same cases as vesicatories, over which it has the advantage of not affecting the urino-genital organs. When it is desirable to keep up long-continued irritation, blisters are in some cases preferable. In *chronic diseases of the chest* it is used with the greatest advantage. I have found it much more serviceable than blisters. In employing it, one part of the chest may be rubbed with the ointment until the eruption is produced; and then, after the interval of a day or two, another part: thus keeping up irritation by a succession of applications to different parts of the chest for several months. In this way it is found to be most serviceable in chronic catarrh, pneumonia, and pleurisy. Even in lingering phthisis, I have seen the cough and pain alleviated by the occasional use of antimonial frictions. The objection to its use is the painful character of the eruptions. In *hooping-cough* it is also serviceable. In *laryngitis* it is occasionally of great service; as also in various *affections of the joints*, especially chronic inflammation of the capsular ligament, or of the synovial membrane, hydrops articuli, particularly when connected with inflammation, and tumors of various kinds about the joints. In *tic douloureux* it has also been employed with benefit. In the *paralysis* of children, the region of the spine should be rubbed with the ointment. Its effects are most beneficial, especially when one leg only is affected. It is sometimes necessary to keep an eruption out for many weeks. In *hysteria* the same application to the spine has been found serviceable.

*Administration.*—The dose of tartarated antimony, *in substance*, is, as a diaphoretic and expectorant, one-twelfth to one-sixth of a grain; as a nauseant, from one-fourth to one-half a grain; as an emetic, from one to two grains; as an antiphlogistic, from one-half a grain to three or four grains. This salt is, however, rarely employed in substance. Sometimes a grain of it, mixed with ten or fifteen grains of powdered ipecacuan, is employed as an emetic. A mixture of one grain with sixteen grains of sulphate of potash may be employed, in doses of from two to four grains, as a substitute for antimonial powder, to promote diaphoresis. In *solution*, it is commonly employed as an expectorant, diaphoretic, nauseant, or emetic, in the form of antimonial wine. When used as an antiphlogistic, an aqueous solution of greater strength may be administered: it should be made with boiling distilled water in a glass vessel (as a Florence flask). For external use, tartarated antimony is employed in the form of *liniment*, *ointment*, or *plaster*. A saturated solution is a very useful liniment: it is prepared by pouring an ounce and a half of boiling water over sixty grains of emetic tartar, and allowing the solution to stand till cold. In many cases it will be found preferable to the ointment, being the mildest, least painful, and cleanest. Another mode of employing it externally, is by sprinkling from ten to sixty grains of the salt, in fine powder, over a Burgundy pitch plaster.

*Antidote.*—Promote vomiting by tepid bland liquids. The antidote is said to be tannic acid, and vegetable substances which contain it (as cinchona bark, tea, galls, catechu, &c.). Opium is the most valuable agent for checking excessive evacuations. Venesection and the warm bath have been used to relieve the gastro-enteritis.

VINUM ANTIMONIALE [VINUM ANTIMONII, U. S.], *Antimonial Wine.*—Take of tartarated antimony, forty grains; sherry, one pint. Dissolve.

["Take of tartrate of antimony and potassa, thirty-two grains; boiling distilled water, a fluidounce; sherry wine, a sufficient quantity. Dissolve the salt in the distilled water, and, while the solution is hot, add sufficient sherry wine to make it measure a pint." U. S. The difference between the imperial and wine pints causes the wine of antimony to be the same strength, whether prepared according to the U. S. or British officinal recipe.—W.]

Each fluidounce contains two grains of emetic tartar. It is important that sherry, and not an inferior kind of wine, be employed; for the latter frequently contains matters which precipitate the teroxide of antimony. If the wine be good and the salt pure, no precipitate is formed in the solution, unless it be kept for a long period, when decomposition of the salt ensues.

*Therapeutics.*—Antimonial wine is used, as a diaphoretic or expectorant, in doses of from ten to thirty minims frequently repeated; as a nauseant, from one to two fluidrachms; as an emetic, about half a fluidounce, or two fluidrachms given at intervals of about ten minutes for four or five times, until the desired effect is produced; as an emetic for children, from thirty minims to a fluidrachm.

UNGUENTUM ANTIMONII TARTARATI [UNGUENTUM ANTIMONII, U. S.], *Ointment of Tartarated Antimony.*—Take of tartarated antimony, in fine powder, a quarter of an ounce; simple ointment, one ounce. Mix thoroughly.

["Take of tartrate of antimony and potassa, in very fine powder, one hundred and twenty grains; lard, a troyounce. Rub the powder with a little of the lard, then add the remainder, and thoroughly mix them." U. S.]

This ointment contains nearly twice as much tartarated antimony as Unguentum Antimonii Tartarizati, *Dub.*

In the preparation of this ointment it is important that the tartarated antimony be in the state of a very fine powder, in order to avoid the irritation produced by rubbing gritty particles on the skin.

*Therapeutics* and *Administration.*—This ointment is applied *externally* as follows: A portion, about the size of a small nut, is to be rubbed on the skin night and morning. After the use of it for two or three times, the painful condition of the part thereby induced commonly prevents further employment of friction. It is sometimes applied spread on linen, without rubbing. By either of these methods a crop of painful pustules is produced; but the facility and rapidity with which they are developed varies considerably in different individuals. Occasionally, adventitious eruptions have appeared in other parts of the body, which have been ascribed to absorption of antimony into the system. But I believe, with Rayer, that they arise from the inadvertent application of the ointment to these parts. This ointment is used as a counter-irritant in various chronic maladies: thus it is applied to the chest in pulmonary affections, and to the joints in chronic diseases (whether rheumatic or otherwise). It should only be applied to sound portions of the skin, and, therefore, leech-bites, the scarifications from cupping, and wounds, are to be carefully avoided; for severe inflammation, and even gangrenous ulceration, may be produced by not attending to this caution. I have before mentioned, that in a very few cases severe and even fatal constitutional disorder has appeared to have resulted from the use of antimonial ointment.

[EMPLASTRUM ANTIMONII, U. S., *Plaster of Antimony.*—"Take of tartrate of antimony and potassa, in fine powder, a troyounce; Burgundy pitch, four troyounces. Melt the pitch by means of a water bath, and strain; then add the powder, and stir them well together until the mixture thickens on cooling." U. S. Used for the same purposes as the ointment.—W.]

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## BISMUTH. (Appendix A.) Bi=210.

### [Bismuthum, Mat. Med. List, U. S. P.]

*Natural History.*—Bismuth occurs only in the mineral kingdom. It is found in Cornwall, Saxony, Bohemia, the United States, and other localities. It is met with in the metallic state nearly pure (*native bismuth*), and in combination with sulphur and with oxygen.

*Preparation.*—It is chiefly obtained from native bismuth by melting the metal out of its matrix.

*Properties.*—It is a reddish-white metal, without taste or smell, composed of brilliant broad plates, and readily crystallizable in cubes or regular octahedrons. The sp. gr. of purified bismuth is, according to Karsten, 9.65. It is moderately hard, brittle, pulverizable, fusible at 476° F. When strongly heated in the air, it takes fire, and burns with a faint blue flame, emitting a yellow smoke ($BiO_3$). In close vessels it may be volatilized. Copper may be detected in bismuth by precipitating the nitric solution with ammonia: the supernatant liquor is blue if copper be present.

### Bismuthum Album, *White Bismuth.*

*Synonyms.*—Bismuthi Nitras, *Lond.;* Bismuthi Subnitras, *Dub.*

$BiO_3,NO_5=288.$

*Preparation.*—Take of bismuth, in coarse powder, two ounces; nitric acid, two fluidounces and a half; distilled water, one gallon. Dilute the nitric acid with three ounces of the water, and add the bismuth in successive portions. When the effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any particles of metal which may remain undissolved. Evaporate the solution till it is reduced to two fluidounces, and pour it into half a gallon of the water. When the precipitate which forms has subsided, decant the supernatant liquid, and agitate the sediment with the remainder of the water. After two hours, again decant, and, having placed the product on a filter, dry it at a temperature of 212°.

In the first part of this process we obtain a ternitrate of bismuth by the reaction of bismuth on nitric acid. One equivalent of binoxide of nitrogen is evolved, and an equivalent of ternitrate of bismuth formed, $Bi+4NO_5=BiO_3,3NO_5+NO_2$. Water decomposes the ternitrate of bismuth, and causes the precipitation of white bismuth (also called nitrate, subnitrate, or trisnitrate), leaving a supernitrate in solution, $4(BiO_3,3NO_5)+HO=3(BiO_3,NO_5,HO)+BiO_3,9NO_5$.

### [**Bismuthi Subnitras**, U. S.

"Take of bismuth, in pieces, two troyounces; nitric acid, carbonate of soda, each, ten troyounces; water of ammonia, six fluidounces; distilled water, a sufficient quantity. Mix four troyounces and a half of the nitric acid with four fluidounces of distilled water, in a capacious glass vessel, and, having added the bismuth, set the whole aside for twenty-four hours. Dilute the resulting solution with ten fluidounces of distilled water, stir it thoroughly, and, at the end of twenty-four hours, filter through paper. Dissolve the carbonate of soda in twenty fluidounces of distilled water with the aid of heat, and filter the solution through paper. To this, when cold, slowly add the solution of nitrate of bismuth, with constant stirring. Transfer the whole to a strainer, and, after the precipitate has been drained, wash it with distilled water until cold, slowly add to it distilled water, with constant stirring, until the further addition of this liquid begins to produce a permanent milkiness. Then set the solution aside, and, at the end of twenty-four hours, filter through paper. To the filtered liquid, previously diluted with four pints of distilled water, slowly add the water of ammonia, with constant stirring. Transfer the whole to a strainer, and, after the precipitate has been drained, wash it with two pints of distilled water, drain it again, and press out as much of the liquid as possible. Lastly, dry it upon bibulous paper with a gentle heat, and rub it into powder." U. S.

In the U. S. process for making the subnitrate of bismuth the first step results in the formation of a solution of the ternitrate. The object of precipitating this with the carbonate of soda is to get rid of the arsenic which may be present; most of this remains in the solution as the arseniate of soda—the precipitate being the carbonate of bismuth, with possibly some of the arseniate of bismuth. In order to get rid of any arsenic which may still contaminate the salt, after its reconversion to the ternitrate, water is carefully added to the concentrated solution until there is a slight milky precipitate produced. Although both the arseniate and nitrate of bismuth break up into a soluble persalt and insoluble subsalt, when their solution is diluted, yet the arseniate requires a much less degree of dilution, and for this reason is decomposed before the nitrate, wherefore the U. S. Pharmacopœia directs this careful dilution. The remainder of the process is similar to that of the British Pharmacopœia, excepting that the ammonia is added to take away the acid from the supersalt of bismuth, which is formed, and thus increase the product.—W.]

*Officinal Characters.*—A heavy white powder in minute crystalline scales, blackened by sulphuretted hydrogen ($BiS_3$) insoluble in water, but forming with nitric acid a solution which poured into water gives a white crystalline precipitate, and with sulphuric acid diluted with an equal bulk of water a solution which is blackened (rendered olive brown) by sulphate of iron (showing the presence of nitric acid). [When moistened on litmus paper, has a decidedly acid reaction. Upon being heated to redness, loses twenty per cent. of its weight. When mixed with dilute sulphuric acid in excess and subjected to Marsh's test, yields no arsenic or only a trace. U. S.]

*Composition.*—White bismuth, prepared as above, has the following composition :—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Teroxide of Bismuth . . . . . | 234 | 81.25 |
| 1 | Nitric Acid . . . . . . . . | 54 | 18.75 |
| | White Bismuth . . . . . | 288 | 100.00 |

*Tests.*—Dissolves in nitric acid without effervescence. The solution gives no precipitate with dilute sulphuric acid (showing freedom from carbonates, as carbonates of lead and lime).

*Physiological Effects.*—In *small doses* it acts locally as an astringent, diminishing secretion. On account of the frequent relief given by it in painful affections of the stomach, it is supposed to act on the nerves of this viscus as a sedative. It has also been denominated tonic and antispasmodic. Vogt says, that when used as a cosmetic, it has produced a spasmodic trembling of the face, ending in paralysis. *Large medicinal doses* disorder the digestive organs, occasioning pain, vomiting, purging, &c.; and sometimes affecting the nervous system, and producing giddiness, insensibility, with cramps of the extremities. On the other hand, M. Monneret states, after several years' trial of this medicine, that it may be given in much larger doses than are usually administered, and that it is then of the greatest value in gastro-intestinal affections, especially those attended with fluxes.

*Therapeutics.*—It has been principally employed in those chronic affections of the stomach which are unaccompanied by any organic disease, but which apparently depend on some disordered condition of the nerves of this viscus; and hence the efficacy of the remedy is referred to its supposed action on these parts. It has been particularly used and recommended to relieve gastrodynia and cramp of the stomach, to allay sickness and vomiting, and as a remedy for pyrosis or waterbrash. In the latter disease, I give it in the form of a powder, in doses of 20 grains thrice daily, in conjunction with hydrocyanic acid mixture, and the patient rarely fails to obtain marked benefit from its use. It is also used in ulcer of the stomach. Dr. Theophilus Thompson recommends it in doses of five grains, combined with gum arabic and magnesia, in the diarrhœa accompanying phthisis; and he thinks that, both in efficacy and safety, it surpasses our most approved remedies for that complaint. I have used it with advantage, in the form of ointment, applied to the septum nasi, in ulceration of this part, and as a local remedy in chronic skin diseases.

*Administration.*—The usual dose of this remedy is from five to twenty grains. I seldom commence with less than twenty grains, and have repeatedly exhibited thirty grains without the least inconvenience. It may be administered in the form of powder, lozenge, or pill. The *ointment* which I have above referred to was composed of sixty grains of white bismuth, and half an ounce of spermaceti ointment.

Trochisci Bismuthi, *Bismuth Lozenges.*—Take of white bismuth, fourteen hundred and forty grains; carbonate of magnesia, four ounces; precipitated carbonate of lime, six ounces; refined sugar, thirty ounces; gum arabic, in powder, one ounce; distilled water, six fluidounces; oil of cinnamon, half a fluidrachm. Add the dry ingredients to the water; mix thoroughly, and boil till the mixture is reduced to a proper consistence. Then remove it from the fire, add the oil of cinnamon, and again mix thoroughly. Divide the mass into 720 square lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains two grains of white bismuth.

[**Bismuthi Subcarbonas**, U. S., *Subcarbonate of Bismuth.* $BiO_3CO_2=256.00$.

"Take of bismuth, in pieces, two troyounces; nitric acid, eight troyounces and a half; water of ammonia, five fluidounces; carbonate of soda, ten troyounces; distilled water, a sufficient quantity. Mix four troyounces and a half of the nitric acid, with four fluidounces of distilled water, in a capacious glass vessel, and having added the bismuth, set the whole aside for twenty-four hours. Dilute the resulting solution with ten fluidounces of distilled water, stir it thoroughly, and after twenty-four hours, filter through paper. To the filtered liquid, previously diluted with four pints of distilled water, slowly add the water of ammonia, with constant stirring. Transfer the whole to a strainer, and after the precipitate has been drained, wash it with two pints of distilled water, drain it again, and press out as much of the liquid as possible. Then place the precipitate in a proper vessel, add the remainder of the nitric acid, and heat nearly to the boiling point. When the solution has become cold, slowly add to it distilled water, with constant stirring, until the further addition of this liquid begins to produce a permanent milkiness. Then set the solution aside, and, at the end of twenty-four hours, filter through paper. Dissolve the carbonate of soda in twenty fluidounces of distilled water, with the aid of heat, and filter the solution through paper. To this, when cold, slowly add the solution of nitrate of bismuth, with constant stirring. Transfer the whole to a strainer, and, after the precipitate has been drained, wash it with distilled water until the washings pass tasteless. Lastly, press the precipitate so as to free it as far as possible from water, dry it on bibulous paper with a gentle heat, and rub it into powder." The several earlier steps of this process are to get rid of the contaminating arsenic, as previously explained (Bismuthi subnitras); in the last step a double decomposition takes place, which results in the formation of the subcarbonate of bismuth and the nitrate of soda.

*Officinal Characters.*—Subcarbonate of bismuth is a white or yellowish-white powder, without taste or smell, insoluble in water, but soluble, with effervescence, in dilute nitric acid. Upon being heated to redness, it loses nine and a half per cent. of its weight. When mixed with dilute sulphuric acid in excess, and subjected to Marsh's test, it yields no arsenic, or merely a trace.

*Therapeutics.*—Subcarbonate of bismuth has very similar therapeutic powers to the subnitrate. It is, however, more soluble in the gastric juice, is somewhat antacid, and is said not to constipate. It may be substituted for the subnitrate in gastralgia, especially when there is acidity of the stomach. In diarrhœa, it would seem not to be so useful. The dose is the same as that of the subnitrate, gr. v—ʒss.—W.]

## ZINC OF COMMERCE. (Appendix A.) $Zn=32.5$.

[**Zincum**, Mat. Med. List, U. S. P.]

*Natural History.*—It occurs only in the mineral kingdom. It is found in the form of oxide (*red zinc*), of sulphuret (*blende* or *black jack*), of carbonate (*calamine*), of sulphate (*white vitriol*), of silicate (*electric calamine*), and combined with alumina (*automalite* or *gahnite*).

*Preparation.*—Zinc is usually procured from the native sulphuret or carbonate of that metal. It may also be obtained from the silicate.

The picked ore, being broken into small pieces, is submitted to a dull red heat in a reverberatory furnace. By this process the sulphur of the sulphuret is transformed into sulphurous acid, which escapes, and the zinc is oxidized; while the carbonate loses carbonic acid and water. The resulting oxide is then mixed with some carbonaceous substance (small coal or charcoal), and submitted to heat, by which the metal is reduced and vaporized. Sometimes the reduction is effected in a covered earthen crucible, the bottom of which is perforated by an iron tube, which terminates over a vessel of water situated in an apartment below the furnace. The gaseous products and zinc escape by this tube; and the latter is condensed in the water.

*Properties.*—It is a bluish-white metal, of considerable lustre. It crystallizes in four-sided prisms and needles; its texture is lamellated and crystalline. Its sp. gr. is from 6.8 to 7.2. At common temperature it is tough; from 212° to 300° it is ductile and malleable, and may be readily rolled into thin leaves (*sheet zinc*); at 400° it is so brittle that it may be reduced to powder. It readily fuses, and, at a white heat, may be volatilized. [" It is almost entirely dissolved by dilute sulphuric acid, forming a colorless solution, which yields white precipitates with ferrocyanide of potassium and hydrosulphate of ammonia. Ammonia throws down from this solution a white precipitate, which is wholly dissolved when the alkali is added in excess." U. S. The precipitates are respectively the ferrocyanide of zinc, sulphuret and oxide of zinc.—W.]

The ready solubility of commercial zinc in dilute sulphuric acid depends greatly on its impurity; for absolutely pure zinc is comparatively feebly acted on by this dilute acid.

## **Zinc, Granulated.** (Appendix A.)

Zinc granulated by fusing and pouring it into cold water.

*Tests.*—The hydrogen gas evolved when the metal dissolves in dilute pure sulphuric acid does not black 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 (showing its freedom from sulphur and arsenic).

## **Zinci Oxidum** [U. S.], *Oxide of Zinc.* $ZnO=40.5$.

*Preparation.*—Take of carbonate of zinc, six ounces. Place the carbonate of zinc in a loosely covered Hessian crucible, and expose it to a dull red heat, until a portion, taken from the centre of the contents of the crucible and cooled, no longer effervesces when dropped into dilute sulphuric acid. Let the crucible cool, and transfer the product to stoppered bottles. [" Take of precipitated carbonate of zinc, twelve troyounces; expose it in a shallow vessel, to a low-red heat, until the water and carbonic acid are wholly expelled." U. S.]

Carbonate of zinc, like carbonate of magnesia, loses carbonic acid by exposure to heat, leaving oxide of zinc, $ZnO,CO_2=ZnO+CO_2$.

*Officinal Characters.*—A soft white tasteless and inodorous powder, becoming pale-yellow when heated; and forming with diluted sulphuric acid a solution which gives a white precipitate with hydrosulphuret of ammonia (sulphuret of zinc). [" A yellowish-white powder, insoluble in water, but soluble in dilute sulphuric and muriatic acids without effervescence. The solutions, when neutral, yield white precipitates with ferrocyanide of potassium and hydrosulphate of ammonia." U. S.

The precipitates are respectively the ferrocyanide and sulphuret of zinc.—W.]

*Composition.*—Oxide of zinc has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Zinc | 32.5 | 80.25 |
| 1 | Oxygen | 8 | 19.75 |
| | Oxide of Zinc | 40.5 | 100.00 |

*Tests.*—Dissolves without effervescence in diluted nitric acid, forming a solution which is not affected by chloride of barium or nitrate of silver (showing the absence of sulphates and chlorides), and gives with carbonate of ammonia a white precipitate, which dissolves entirely without color in an excess of the reagent ($ZnO,CO_2$).

*Physiological Effects.*—Applied to ulcerated or other secreting surfaces, it acts as a desiccant and astringent substance. On account of its insolubility, the absorption of it must be very slow. Taken into the stomach in large doses, it acts as a slight irritant, and provokes vomiting, and sometimes purging. In small doses it may be taken for a considerable period without causing any obvious effects. Sometimes, under its employment, certain affections of the nervous system (as epilepsy, chorea, &c.) subside; from which we infer that it exercises some specific influence over this system; and it is, therefore, termed tonic, antispasmodic, and sedative. But the nature of its influence is not very obvious. By long continued use it acts as a slow poison, and produces *tabes sicca*. A gentleman, for the cure of epilepsy, took daily, at an average, twenty grains of oxide till he had consumed 3246 grains, which must have taken him about five months. At the end of this time he was found of a pale, earthy hue, wasted away, and almost idiotical; his tongue was thickly coated, the bowels were constipated, the inferior extremities cold and œdematous, the abdomen tumid, the superior extremities cold and shrivelled, and their skin dry, like parchment; the pulse was about sixty, thready, and scarcely perceptible. Under the use of purgatives, a light nutritive diet, with tonic and diuretic medicines, he rapidly recovered, but he remained subject to epileptic attacks.

*Therapeutics.*—*Internally* it has been commended in some spasmodic diseases, viz., epilepsy, chorea, hysteria, catalepsy, and hooping-cough; and in some painful affections, as neuralgia, and gastrodynia. Though occasionally serviceable in some of these maladies, it has so frequently failed, that practitioners have ceased to place much confidence in it. Oxide of zinc has been found of great service, in five grain doses, combined with extract of henbane or hemlock, in colliquative perspiration.

*Externally* it is employed in the form of powder, lotion, or ointment. As a *dusting powder* it is useful, by its mild, absorbent, and desiccant properties, and is applied to impetiginous, eczematous, and other chronic diseases of the skin, attended with profuse secretion. It is also used to allay or prevent excoriation in children and bedridden persons, and to remove chaps and cracks of the nipples. In painful ulcers, with copious discharge, it is not unfrequently beneficial by its desiccant and sedative properties. *Diffused through water* or a *mucilaginous solution* (in the proportion of a quarter of an ounce of the oxide to six or eight ounces of liquid), it is occasionally useful in eczema.

*Administration.*—Internally, it is administered in the form of pill or powder, in doses of from two or three grains gradually increased to eight, ten, or more.

Unguentum Zinci Oxidi [U. S.], *Ointment of Oxide of Zinc.*—Take of oxide of zinc, in very fine powder, eighty grains; simple ointment, one ounce. Add the oxide of zinc to the ointment, previously melted with a gentle heat, and stir the mixture constantly until it becomes solid. ["Take of oxide of zinc, eighty grains; lard, a troyounce. Mix them." U. S.]

*Used* after burns and blisters, in conjunctivitis, and generally in the same diseases as the powder.

**Zinci Carbonas,** *Carbonate of Zinc.* $ZnO,CO_2+HO+2(ZnO+HO)$.

[**Zinci Carbonas Præcipitata,** U. S., *Precipitated Carbonate of Zinc.*

Zinci Carbonas Præcipitatus, *Pharm.*, 1850.]

*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 into it 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 precipitant three pints of boiling distilled water agitating briskly; let the precipitate again subside, and repeat the processes 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. ["Take of sulphate of zinc, carbonate of soda, each, twelve troyounces; water, eight pints. Dissolve the salts separately, with the aid of heat, each in four pints of the water. Then mix the solutions, and, having stirred the mixture, set it by that the precipitate may subside. Lastly, having poured off the supernatant liquid, wash the precipitate with hot water until the washings are nearly tasteless, and dry it with a gentle heat." U. S.]

The sulphuric acid combines with the soda to form sulphate of soda, the oxide of zinc being precipitated partly in the free state, partly in combination with carbonic acid, the remainder of the carbonic acid escapes as gas, $3ZnO, SO_3+3NaO, CO_2+3HO=3NaO,SO_3+(ZnO,CO_2+HO)+2(ZnO+HO)+2CO_2$.

*Officinal Characters.*—White, tasteless, inodorous, insoluble in water; soluble, with effervescence and without residue, in diluted sulphuric acid, forming a solution which gives a white precipitate with hydrosulphuret of ammonia (sulphuret of zinc).

*Tests.*—Its solution in dilute nitric acid is not precipitated by chloride of barium or nitrate of silver (showing its freedom from sulphates and chlorides), and gives with carbonate of ammonia a white precipitate entirely soluble without color in an excess of the reagent (a blue color indicates the presence of copper).

*Therapeutics.*—It has probably the same action as oxide of zinc, and may be used in the same cases, instead of the *calamine* of the Lond. and Ed. Pharmacopœias, which was at the best impure, native carbonate of zinc, converted into oxide by calcination, and frequently, as met with in the shops, contained no zinc at all. [Calamine was formerly officinal in the U. S. P., but was dismissed at the last revision.—W.]

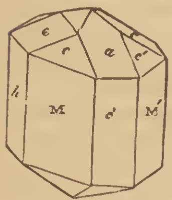
[CERATUM ZINCI CARBONATIS, U. S., *Cerate of Carbonate of Zinc.*—"Take of precipitated carbonate of zinc, two troyounces; ointment of lard, ten troyounces. Mix them." U. S.]

**Zinci Sulphas,** *Sulphate of Zinc.* $ZnO,SO_3+7HO=143.5$. [Mat. Med. List, U. S. P.]

*Preparation.*—Take of zinc, granulated, sixteen ounces; sulphuric acid, twelve fluidounces; 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 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 odor of chlorine. Add now with continued agitation the carbonate of zinc until a brown precipitate appears; let it settle, filter the solution, evaporate till a pellicle forms on the surface, and set aside to crystallize. Dry the crystals by exposure to the air on filtering paper placed on porous bricks. More crystals may be obtained by again evaporating the mother-liquor.

In this process water is decomposed; the hydrogen escapes, while the oxygen unites with zinc to form oxide of zinc, which combines with sulphuric acid, $Zn+HO,SO_3=ZnO,SO_3+H$. The chlorine is added to peroxidize any oxide of iron, manganese, or tin which may have come into the solution from impurities in the zinc employed; this is done by virtue of its affinity for hydrogen, thus, $2FeO+HO+Cl=Fe_2O_3+HCl$. These oxides are then precipitated by the carbonate of zinc, together with any oxide of copper, &c., which may be present, and a pure neutral solution of sulphate of zinc, with a small quantity of chloride, is obtained. The salt is purified from this latter by crystallization.

Fig. 36.



*Crystal of Sulphate of Zinc.*

*Officinal Characters.*—In colorless transparent prismatic crystals, with a strong metallic styptic taste. Its solution in water gives white precipitates with chloride of barium (sulphate of baryta), and hydrosulphuret of ammonia (sulphuret of zinc).

*Properties.*—The crystals are soluble in 2.28 times their weight of cold water, and less than their own weight in boiling water. They are insoluble in alcohol. In dry and warm air they effloresce. When heated they undergo the watery fusion; and if the liquid be rapidly cooled, it congeals into a granular, crystalline, white mass; if the heat be continued the salt becomes anhydrous, and at an intense heat is decomposed, leaving a residue of oxide of zinc.

*Composition.*—The crystallized sulphate has the following composition:—

| Eq. | Eq Wt. | Per Cent. |
|---|---|---|
| 1 Oxide of Zinc | 40.5 | 28.22 |
| 1 Sulphuric Acid | 40. | 27.88 |
| 7 Water | 63. | 43.90 |
| Sulphate of Zinc | 143.5 | 100.00 |

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

The absence of coloration by tincture of galls shows its freedom from iron; the non-precipitation by sulphuretted hydrogen in the presence of free acid, the absence of arsenic, cadmium, copper, or lead; the entire solubility of the ammonia-precipitate in excess of ammonia, the absence of iron, magnesia, or lead; and the non-coloration of this solution, the absence of copper.

["It is soluble in water, and the solution affords white precipitates with ammonia, chloride of barium, ferrocyanide of potassium, and hydrosulphate of ammonia. The precipitate, thrown down by ammonia, is wholly soluble in an excess of the alkali." U. S. The precipitates which are thrown down are, respectively, oxide of zinc, sulphate of baryta, ferrocyanide of zinc, and sulphuret of zinc.—W.]

*Physiological Effects.*—In *small and repeated doses* it acts as an astringent on the alimentary canal, checks secretion, and promotes a constipated condition of the bowels. It exercises a specific influence over the nervous system, manifested by its power of removing certain spasmodic affections: hence it is reputed antispasmodic. To the same influence is to be referred its power of preventing the recurrence of intermittent maladies, from which it has principally derived its denomination of a tonic. Its astringent effect is not confined to the bowels, but is manifested on the pulmonary and urethral mucous membranes, the secretions from which it diminishes: hence the advantage of its use in catarrhal affections of these parts. It does not appear to possess any power of checking cutaneous exhalation. In *full medicinal doses* it is a powerful but safe emetic; it excites speedy vomiting without giving rise to the same degree of distressing nausea occasioned by tartarated antimony. Dr. Cullen observes, that in "order to render its effect certain, the dose must generally be large; and if this is not thrown out again immediately it is apt to continue a disagreeable nausea, or even a vomiting longer than is necessary." In *excessive doses* it acts as an irritant poison, causing vomiting, purging, coldness of the extremities, and fluttering of the pulse. The *local action* of it is that of an astringent and desiccant, and in a concentrated form, it is a powerful irritant and caustic.

*Therapeutics.*—As an *emetic* it is almost exclusively employed in cases of poisoning, especially by narcotics. In these cases it is the best evacuant we can administer, on account of its prompt action. As an *internal astringent* it is administered in chronic dysentery and diarrhœa, in chronic bronchial affections attended with profuse secretion, and in gleet and leucorrhœa. In the latter cases it is usually associated with terebinthinate medicines. As an *antispasmodic* it has been employed with occasional success in epilepsy, chorea, hysteria, spasmodic asthma, and hooping cough. I have little faith in its efficacy in any of these cases.[1] As a *tonic*, it has been serviceable in agues: but it is far inferior to sulphate of quinia or arsenious acid. As a *topical astringent* sulphate of zinc is most extensively employed. We use its aqueous solution as a collyrium in chronic ophthalmia, as a wash for ulcers attended with profuse discharge, or with loose flabby granulations; as a gargle in ulcerations of the mouth, although I have found it for this purpose much inferior to a solution of sulphate of copper; as a lotion for chronic skin diseases; and as an injection in gleet and leucorrhœa.

*Administration.*—As an *emetic* the dose should be from twenty to thirty grains; as a *tonic*, *antispasmodic*, or *expectorant*, from two to ten grains.

For external use, solutions are made of various strengths. They generally consist of from one to twenty grains in an ounce of water.

### Zinci Chloridum [U. S.], *Chloride of Zinc.* ZnCl=68.

*Preparation.*—Take of zinc, granulated, sixteen ounces; hydrochloric acid, forty-four fluidounces; solution of chlorine, a sufficiency; carbonate

[1] I cannot agree with the author as to the inefficiency of sulphate of zinc in chorea, as after using it for many years in the treatment of this disease, I find it (with the exception of iron in anemic cases, and arsenic in the worst forms of chorea) the most effectual remedy we possess.—ED.

of zinc, half an ounce, or a sufficiency; distilled water a pint. Put the zinc into a porcelain basin, add by degrees the hydrochloric acid previonsly 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 odor of chlorine. Add the carbonate of zinc, in small quantities at a time, and with a 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.

The action of hydrochloric acid upon zinc merely consists in a replacement of the hydrogen of the acid by the metal, $Zn + HCl = ZnCl + H$. The effect of the addition of chlorine and of carbonate of zinc has been explained above in the parallel process for sulphate of zinc. [" Take of zinc, in small pieces, two troyounces and a half; nitric acid, prepared chalk, each, sixty grains; muriatic acid, water, each, a sufficient quantity. To the zinc, in a glass or porcelain vessel, add gradually sufficient muriatic acid to dissolve it; then strain the solution, add the nitric acid, and evaporate to dryness. Dissolve the dry mass in five fluidounces of water, add the chalk, and allow the mixture to stand for twenty-four hours; then filter into an evaporating basin, and again evaporate to dryness. Lastly, fuse the dry mass in the basin, pour out the liquid on a flat stone, and, when it has congealed, break the mass in pieces, and keep the fragments in a well-stopped bottle." U. S. The first step in this process results in the formation of chloride of zinc. The nitric acid is added to convert any iron which may be present into the nitrate of the sesquioxide. The chalk decomposes the latter, throwing down the sesquioxide and itself falling as a nitrate of lime.—W.]

*Officinal Characters.*—Colorless opaque rods or tablets, very deliquescent and caustic; soluble almost entirely in water, alcohol, and ether. The watery solution is precipitated white by hydrosulphuret of ammonia (sulphuret of zinc) and nitrate of silver (chloride of silver); but, if first acidulated with hydrochloric acid, it is not affected by sulphuretted hydrogen (which does not precipitate zinc from an acid solution).

*Properties.*—Chloride of zinc unites with both albumen and gelatine to form difficultly soluble compounds, and hence it occasions precipitates with liquids containing these principles in solution. A process has been long used for the preservation of wood, and other vegetable matters, by impregnating them with a solution of chloride of zinc. [The solution yields a white precipitate with ferrocyanide of potassium (ferrocyanide of zinc).—W.]

*Composition.*—Its composition is as follows:—

| Eq | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Zinc | 32.5 | 47.8 |
| 1 Chlorine | 35.5 | 52.2 |
| Chloride of Zinc | 68.0 | 100.0 |

*Tests.*—Its watery solution is not affected by chloride of barium or oxalate of ammonia, and is not tinged blue by the ferrocyanide or ferridcyanide of potassium. Ammonia throws down a white precipitate entirely soluble in an excess of the reagent (showing its freedom from sulphuric acid, lime, oxides of iron, and magnesia).

*Physiological Effects.*—Its *local* action on living tissues is, when in a concentrated solution, that of a caustic or escharotic, depending partly on its affinity for albumen and gelatine; so that when placed in contact with living parts into whose composition these organic compounds enter, the chloride exercising its affinity destroys the life of the part, and unites with the albuminous and gelatinous matters present, and forms thus an eschar. The effects produced by the application of chloride of zinc are the following: Soon after it has been applied a sensation of warmth is felt in the part, followed after a little time by a violent burning pain, which continues for seven or eight hours; that is, until the parts in contact with the chloride are dead. A white eschar is now observed, which usually separates in from eight to twelve days. Unless used in the neighborhood of loose cellular tissue, there is rarely much swelling. As a caustic, chloride of zinc is not inferior in power to terchloride of antimony; nay, Vogt says it appears to him to be more powerful and to penetrate deeper. To this circumstance is owing, in great part, the efficacy of the chloride in various diseases in which it has been applied, and the healthy appearance of the sore after the separation of the eschar. There is no danger of any constitutional disorder arising from the absorption of the poison, as is the case with the arsenical and mercurial caustics.

In *large doses* it acts as an irritant or caustic poison, and, while it causes severe symptoms of alvine irritation, it seriously affects the nervous system. Thus it produces a burning sensation in the stomach, nausea, vomiting, anxiety, short breathing, small quick pulse, cold sweats, fainting, and convulsions. Several fatal cases of poisoning by chloride of zinc, in the impure state in which it is sold as disinfecting fluid, have already occurred. Taken *internally* in *small doses*, no obvious effects are produced.

*Therapeutics.*—*Internally*, chloride of zinc has been given in small but gradually increased doses in scrofula, epilepsy and chorea. Commonly, however, this compound is employed *externally*: thus Papenguth used a dilute solution of it as a lotion in fistulous ulcers of a scrofulous nature. As a *caustic*, it has been applied to produce an issue, to destroy nævi materni; but it is principally employed at the present time to destroy parts affected with intractable forms of disease such as cancroid, old syphilitic, or scrofulous ulcers, and condylomata, the cuticle having been first destroyed by caustic potash. The benefit is supposed not to depend merely on the escharotic effect, but on the chloride inducing a new action in the surrounding parts.

**Zinci Acetas** [U. S.], *Acetate of Zinc.* $ZnO,\overline{A}(C_4H_3O_3)+2HO=109.5$.

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

In this process the carbonic acid of the carbonate of zinc is displaced by the acetic, and passes away as gas, $ZnO,CO_2 + \overline{A} + HO = ZnO,\overline{A} + 2HO + CO_2$. [" Take of acetate of lead, twelve troyounces; zinc, granulated, nine troyounces; distilled water a sufficient quantity. Dissolve the acetate of lead in three pints of distilled water, and filter. Then add the zinc to the solution, and agitate the mixture occasionally, in a stopped bottle, for five or six hours, or until the liquid yields no precipitate with a solution of iodide of potassium. Filter the liquid, evaporate it with a moderate heat to one-fifth, acidulate it slightly with acetic acid, and set it aside to crystallize. Pour off the liquid, and dry the crystals on bibulous paper. Should the crystals be colored, dissolve them in a pint and a half of distilled water, and having heated the solution to ebullition, drop into it, while boiling, recently precipitated carbonate of zinc, in successive portions, until a small quantity of the liquid, on being filtered, passes colorless. Then filter the liquid, acidulate it slightly with acetic acid, and evaporate that crystals may form." U. S. The lead is entirely replaced by the zinc and falls as a precipitate ($PbO\overline{A} + Zn = ZnO,\overline{A} + Pb$), if any remain in the solution the iodide of potassium will cause a yellow precipitate of iodide of lead. If the crystals as first obtained are colored, they are contaminated with iron; the addition of carbonate of zinc to their solution frees them from such impurity, by the zinc replacing the iron, which is precipitated as the carbonate.

*Officinal Characters.*—Thin translucent and colorless crystalline plates, of a pearly lustre, with a sharp unpleasant taste, soluble in water; completely precipitated pure white by sulphuretted hydrogen (sulphuret of zinc); evolving acetic acid when decomposed by sulphuric acid. [The solution yields a white precipitate (ferrocyanide of zinc) with ferrocyanide of potassium.—W.]

*Tests.*—A dilute watery solution is not affected by chloride of barium or nitrate of silver; and, when slightly acidulated with hydrochloric acid, is not precipitated by sulphuretted hydrogen; but after it has boiled for a few minutes with a little nitric acid it yields with ammonia a white precipitate entirely soluble without color in an excess of the reagent. (For explanation see above, **Sulphate** and **Chloride of Zinc**.)

*Physiological Effects.*—Its effects are analogous to those of the sulphate of zinc. Its local action is astringent. Taken internally, in small doses, it acts as a tonic and antispasmodic; large doses occasion vomiting and purging.

*Therapeutics.*—It is rarely administered *internally;* but it is applicable as an emetic, tonic, and antispasmodic, in the same cases in which the oxide or sulphate of zinc is employed. As a *topical* remedy it is used, on account of its astringent qualities, in chronic ophthalmia, gleet, and leucorrhœa. In the latter stages of gonorrhœa, I have found it far more successful than the sulphate. Sir A. Cooper recommends, as the best injection which can be used in the third week of gonorrhœa, a mixture of six grains of sulphate of zinc and four ounces of dilute solution of subacetate of lead. Of course double decomposition takes place, and the active ingredient is the acetate of zinc. It is equally useful as a lotion in chronic eczema, impetigo, and other skin diseases which are attended with much serous or purulent discharge.

*Administration.*—When exhibited internally, as a tonic or antispasmodic, the dose is one or two grains, gradually increased. As an emetic it is rarely administered: the dose is from ten to twenty grains: its operation is very safe. As a lotion or injection it is employed in the form of aqueous solution containing two or more grains of the salt to an ounce of water.

**Zinci Valerianas** [U. S.], *Valerianate of Zinc.*

$ZnO,\bar{V}(C_{10}H_9O_3)=133.5$

*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 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, until 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. ["Take of valerianate of soda, two troyounces and a half; sulphate of zinc, two troyounces and four hundred and twenty grains; distilled water, a sufficient quantity. Dissolve the salts separately, each in twenty fluidounces of distilled water, and having heated the solutions to 212°, mix them, and set the mixture aside to crystallize. Decant the mother water from the crystals, and put them upon a filter in a funnel to drain. Mix the mother water and the drainings, evaporate at a heat not exceeding 200° to four fluidounces, and again set aside to crystallize. Add the crystals, thus obtained, to those in the funnel, wash the whole with a little distilled water, and, having removed them with the filter, spread them on bibulous paper, and dry them with a heat not exceeding 200°." U. S.]

A simple interchange of acids and bases, $ZnO,SO_3+NaO,\bar{V}=ZnO,\bar{V}+NaO,SO_3$. The valerianate of zinc, being the more insoluble salt, crystallizes out first, and may be obtained free from adhering sulphate of soda by recrystallization and washing.

*Officinal Characters.*—In brilliant white pearly tabular crystals, with a feeble odor of valerianic acid, and a metallic taste; scarcely soluble in cold water or in ether, soluble in hot water and alcohol. Heated to redness in an open crucible it leaves a residue which, when dissolved in dilute sulphuric acid, gives a white precipitate with hydrosulphuret of ammonia (ZnS). ["It dissolves in one hundred and sixty parts of water, and in sixty of alcohol, of the specific gravity 0.833. The solutions have an acid reaction and become turbid when heated, and clear again on cooling." U. S.]

*Tests.*—Its solution in hot water is not precipitated by chloride of barium (showing freedom from $SO_3$). It gives when heated with dilute sulphuric acid a distillate which, when mixed with the solution of acetate of copper, does not immediately affect the transparency of the fluid (as would be the case were butyric acid present), but forms after a little time oily drops, which gradually pass into a bluish-white crystalline deposit (valerianate of copper).

Much of the valerianate of zinc of commerce, especially that prepared in Paris, was found by Dr. Neligan to consist of butyrate of zinc, to which oil of valerian had been added.

*Physiological Effects.*—[Valerianate of zinc is a nervine tonic, is antispasmodic, and anthelmintic, and is supposed to combine the antispasmodic properties of zinc and valerian. It has this advantage over the preparations of valerian, that it has less odor, but the active principle of valerian appears to be oil of valerian rather than valerianic acid, and the benefit of the two substances is, I think, most certainly obtained by giving sulphate of zinc with infusion and tincture of valerian.—Ed.]

*Therapeutics.*—It is used in hysteria, in hysterical neuralgia, and in the convulsions of young children, especially when these are caused by worms.

*Administration.*—Dose, one to three grains.

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[**CADMIUM.** Mat. Med. List, U. S. P. Cd=56. Sp. gr. 8.7.

This metal was discovered in 1818, about the same time by Stromeyer and Hermann. Its name is derived from καδμεια, the Greek name for calamine. The action of cadmium salts on the system closely resembles that of the zinc salts.

**Cadmii Sulphas,** U. S., *Sulphate of Cadmium.* $CdO + 4HO = 100$.

"Take of cadmium, in small pieces, a troyounce; nitric acid, two troyounces; carbonate of soda, three troyounces; sulphuric acid, four hundred and twenty grains; distilled water, a sufficient quantity. To the cadmium and two fluidounces of distilled water, introduced into a glass vessel, add by degrees the nitric acid, and, when the action slackens, apply a gentle heat until the metal is dissolved. Filter the solution, and, having dissolved the carbonate of soda in six fluidounces of distilled water, mix the solutions thoroughly. Wash the precipitate obtained until the water passes tasteless, and dissolve it in the sulphuric acid, diluted with four fluidounces of distilled water. Then evaporate the solution to one-third, and set it aside to crystallize. Lastly, dry the crystals on bibulous paper." U. S.

The first step in this process results in the production of the nitrate of the metal; this is decomposed by the carbonate of soda, the carbonate of cadmium being precipitated. This is then converted into the sulphate. Thus $Cd + 2NO_5 = (CdO,NO_5) + NO_4$ and $CdO,NO_5 + NaO,CO_2 = NaO,NO_5 + (CdO,CO_2)$ and $CdO,CO_2 + SO_3 = CO_2 + (CdO,SO_3)$.

*Officinal Characters.*—Sulphate of cadmium is in colorless, prismatic crystals, efflorescent in the air, and very soluble in water. Its solution, even when rendered decidedly acid, yields, on the addition of hydrosulphate of ammonia, a yellow precipitate (sulphuret of cadmium), insoluble in an excess of the precipitant.

*Properties and Tests.*—Sulphate of cadmium has an astringent slightly sour taste. It may be recognized as a salt of cadmium by the officinal test and by its yielding with ferrocyanide of potassium a white precipitate insoluble in hydrochloric acid, and a brownish-yellow one soluble in an excess of the acid with the ferridcyanide. The white precipitate with the chloride of barium shows it to be a sulphate.

*Therapeutics.*—The action of this salt on the system, when taken internally, does not seem to be well determined. It probably is an astringent and emetic, resembling sulphate of zinc, but much more powerful and irritating. It is chiefly used as a topical application, as a stimulating astringent in diseases of the eyes, and has also been employed as an injection in otorrhœa. It is said to be very efficacious in removing specks and opacities of the cornea. As a topical remedy, it has been employed in solution and in the form of ointment. A solution of from gr. ss to gr. iv of the sulphate in an ounce of water has been used as an application to the eye: and of from gr. iv to gr. viij in the like quantity of water in otorrhœa. As an eye ointment, gr. ij of the sulphate to ℈iv of lard have been employed.—W.]

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## TIN (*Stannum*). Sn=59.

*Natural History.*—It is peculiar to the mineral kingdom. It occurs in two states; as an oxide, $SnO_2$ (the *tin stone* and *wood tin* of mineralogists), and as a sulphuret (*tin pyrites*, $2FeS,SnS_2+2Cu_2S,SnS$). It is found in both states in Cornwall, which has long been celebrated for its tin works.

*Properties.*—In its massive form it is a yellowish-white metal, having a peculiar odor when rubbed or handled, and crackling when bent. Its sp. gr. varies from 7.178 to 7.299. It melts at 442° F., and at a white heat is volatilized. It is malleable, but is sparingly ductile.

### Granulated Tin. (Appendix B. I.)

Grain tin, granulated by fusing and pouring it into cold water.

### Solution of Chloride of Tin. (Appendix B. II.)

Chloride of Tin=SnCl.

*Preparation.*—Take of granulated tin, one ounce; hydrochloric acid, three fluidounces; distilled water, a sufficiency. Dilute the acid in a flask with one fluidounce 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 of five fluidounces, and transfer the solution, together with the undissolved tin, to a bottle with an accurately-ground stopper.

The action of tin upon hydrochloric acid is similar to that of zinc, hydrogen being evolved, and a chloride of the metal remaining in solution, $Sn+HCl=SnCl+H$. The excess of metallic tin is necessary to prevent the formation of perchloride ($SnCl_2$).

*Use.*—Solution of chloride of tin is used to indicate the presence of mercury in ammoniated mercury.

### [Cerium. Ce=47.

None of the salts of this metal are officinal, but the oxalate of the protoxide has been proposed by Prof. Simpson as a remedy in the vomiting of pregnancy and uterine irritation. It is also useful in vomiting from other causes, such as pyrosis, phthisis, hysteria, and atonic dyspepsia It is in the form of a white powder, which is inodorous, tasteless, and insoluble in water, alcohol, or ether. From its insolubility it seems probable that it acts simply as a local protective. But Prof. Simpson is said to believe it to be a nervous tonic, relying upon it in the treatment of chorea (U. S. D.); if it has such powers a small portion of it must be dissolved in the acids of the alimentary canal. According to Prof. Simpson, the nitrate of cerium is very similar in its therapeutic powers to the oxalate: he recommends it in various irritable conditions of the alimentary mucous membrane. Dose of the oxalate, gr. i—v, t. d. —W.]

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## LEAD (*Plumbum*). Pb=103.5.

*Natural History.*—It is found both in the metallic state (*native lead?*) and mineralized. It is met with combined with sulphur (*galena*), with selenium, with chlorine (*horn lead*), with oxygen (*native minium*), and with oxygen and an acid, forming an oxy-salt (*carbonate*, *phosphate*, *sulphate*, *tungstate*, *molybdate*, *chromate*, and *arseniate*).

*Preparation.*—It is usually extracted from galena (PbS), which is roasted in reverberatory furnaces, by which it loses the greater part of its sulphur, as sulphurous acid, $SO_2$, and is converted into a mixture of lead, oxide of lead, sulphate of lead, and some undecomposed sulphuret of lead, and afterwards smelted with coal and lime: the first to abstract oxygen, the second to remove sulphur. Oxide of lead readily decomposes sulphuret of lead under the influence of heat, and produces sulphurous acid and metallic lead, $PbS+2PbO=3Pb+SO_2$. Sulphuret of lead, and sulphate of lead also at a red heat, yield metallic lead and sulphurous acid, $PbS+PbO,SO_3=2Pb+2SO_2$.

*Properties.*—It has a bluish-gray color and considerable brilliancy. It may be crystallized, by cooling, in four-sided pyramids. It is malleable, but very imperfectly ductile. Its sp. gr. is 11.35. It has a peculiar odor when handled, and is known from tin by its producing a black discoloration on the fingers when rubbed. It fuses at 612° F., and at a red heat boils and evaporates. By exposure to the air it attracts, first oxygen, and then carbonic acid.

Pure distilled water has no action on lead, provided the gases (as air and carbonic acid) be excluded; but if these be admitted, a thin crust of basic hydrocarbonate of lead is soon formed. It is remarkable that the presence of most neutral salts, especially carbonates and sulphates, impairs the corrosive action of air and water, and, therefore, exerts a protective influence. The chlorides are the least protective. Hence, therefore, we can easily understand why leaden cisterns and pipes do not more frequently give a metallic impregnation to water; and why very pure well-water or rain-water is more apt than common well-water to become impregnated with lead.

### **Lithargyrum,** *Litharge.* $PbO=111.5$

*Synonym.*—Plumbi Oxidum, *Lond.*, *Dub.*

### [**Plumbi Oxidum,** Mat. Med. List, U. S. P.

Plumbi Oxidum Semivitreum, U. S. P. 1850.]

*Preparation.*—Lead, when heated in the air so as to be converted into vapor, burns with a white light, and forms oxide of lead. If melted lead be exposed to a current of air, it is rapidly oxidated and converted into the protoxide of this metal. The oxidated skimmings are denominated *massicot.* These, when fused at a bright red heat, are separated from some intermixed metallic lead; the fused oxide forms, on solidifying, a brick-red mass, which readily separates into crystalline scales: these constitute *litharge.* Litharge is obtained as a secondary product in the cupellation of argentiferous lead. The alloy is melted on a porous vessel, called a *test* or *cupel*, and exposed to the blast of the bellows, by which the lead is oxidized, half-vitrified, and driven off into hard masses of a scaly texture, and in that state is called *litharge* or *silver stone.*

*Officinal Characters.*—In heavy scales of a pale brick-red color, soluble in nitric and acetic acids, either solution, when neutral, giving a copious yellow precipitate with iodide of potassium (iodide of lead). [" In small, yellowish or orange-colored scales, insoluble in water, but almost wholly soluble with slight effervescence in dilute nitric acid. The solution is affected by potassa like that of carbonate of lead in the same acid. Heated with charcoal it is reduced to the metallic state." U. S.]

*Composition.*—Litharge or oxide of lead is thus composed:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Lead | 103.5 | 92.825 |
| 1 | Oxygen | 8 | 7.175 |
| | Litharge | 111.5 | 100.000 |

*Tests.*—It dissolves without effervescence in nitric acid diluted with six volumes of water, and the solution, when supersaturated with ammonia and then cleared by filtration, does not exhibit a blue color (showing its freedom from copper).

*Pharmaceutic Uses.*—It is used in the formation of litharge plaster, acetate of lead, and solution of subacetate of lead.

Emplastrum Lithargyri, *Litharge Plaster.* [Emplastrum Plumbi, U. S., *Plaster of Lead.*] *Synonym:* Emplastrum Plumbi, *Lond.*—Take of litharge, in very fine powder, four pounds; olive oil, one gallon; water, three pints and a half. Boil all the ingredients together gently in a copper pan over a clear fire, and keep simmering for four or five hours, stirring constantly until the oil and litharge acquire a proper consistence for a plaster, adding more water during the process if necessary. ["Take of oxide of lead, in fine powder, thirty troyounces; olive oil, fifty-six troyounces; water, a sufficient quantity. Sift the oxide of lead into the oil, contained in a suitable vessel, of a capacity equal to twice the bulk of the ingredients. Then add half a pint of boiling water, and boil the whole together until a plaster is formed; adding from time to time, during the process, a little boiling water, as that first added is consumed." U. S.]

Olive oil is a compound of oleine (*oleate of glycerine*) and margarine (*margarate of glycerine*). When subjected to heat with litharge and water, the oxide of lead combines with oleic and margaric acid, and sets free glycerine, which remains dissolved in the water. The mixture of oleate and margarate of lead constitutes *emplastrum lithargyri.* The water employed in this process serves two purposes—it moderates the heat and facilitates the union of the acids with the oxide of lead. This is a great improvement on the preparations of previous pharmacopœias: it is a formula of the late Dr. Scott, of Bromley, and contains one-fourth more of olive oil than the Emplastrum Plumbi, *Lond.*

*Properties.*—It is met with in the shops in cylindrical rolls, of a grayish or yellowish-white color, brittle when cold, but softening and ultimately fusing by heat. It is insoluble in water, and partially so in alcohol. It has no taste, but a slight though peculiar odor. When strongly heated, it decomposes, gives out inflammable gas, and leaves a carbonaceous residue, which, when heated in a close vessel, yields globules of lead. Ether dissolves oleate but not margarate of lead.

*Effects and Uses.*—This plaster is employed in surgery on account of its adhesiveness and the mildness of its local action; for it rarely excites irritation. It is used to keep the edges of wounds together in persons with delicate skins. Spread on calico it forms a good *strapping* for giving support and causing pressure in ulcers of the leg—a most successful mode of treating them, and for which we are indebted to Mr. Baynton. In pharmacy it serves as a basis for various other plasters.

Emplastrum Saponis [U. S.], *Soap Plaster.*—Take of hard soap, in powder, six ounces; litharge plaster, two pounds and a quarter; resin, in powder, one ounce. To the litharge plaster, melted by a gentle heat, add the soap and the resin, first liquefied; then, constantly stirring, evaporate to a proper consistence. ["Take of soap, sliced, four troyounces; plaster of lead thirty-six troyounces; water, a sufficient quantity. Rub the soap with water until brought to a semi-liquid state; then mix it with the plaster, previously melted, and boil to the proper consistence." U. S.]

**Plumbi Carbonas,** *Carbonate of Lead* [Mat. Med. List, U. S. P.].
$2(PbO,CO_2)+HO,PbO$.

*Natural History.*—Carbonate of lead is found native, both crystallized and massive, in Scotland, England, &c. It is called *white lead ore.*

*Preparation.*—Carbonate of lead is made by exposing plates, or bars, or other forms of lead to the vapor of acetic acid, and, at the same time, to air loaded with carbonic acid gas. In this country white lead is extensively manufactured by the old or *Dutch* process, which, it is said, yields a product superior as an oil pigment to that obtained by most other methods.

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

*Composition.*—Commercial white lead appears to be somewhat variable in composition. In a general way its composition may be stated as below. But the proportion of hydrated oxide is sometimes less than this.

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 3 | Oxide of Lead | 334.5 | 86.32 |
| 2 | Carbonic Acid | 44 | 11.36 |
| 1 | Water | 9 | 2.32 |
| | White Lead | 387.5 | 100.00 |

*Tests.*—Dissolves in acetic acid without leaving any residue (showing its freedom from sulphate of baryta and other insoluble earthy impurities), and the solution when treated with excess of sulphuretted hydrogen boiled and filtered, gives no precipitate with oxalate of ammonia (showing its freedom from lime).

Unguentum Plumbi Carbonatis [U. S.], *Ointment of Carbonate of Lead.*—Take of carbonate of lead, in fine powder, sixty-four grains; simple ointment, one ounce. Mix thoroughly. ["Take of carbonate of lead, in very fine powder, eighty grains; ointment of lard. a troyounce. Add the carbonate of lead to the ointment, previously softened with a gentle heat, and thoroughly mix them." U. S.]

*Used* as a cooling and desiccating application to excoriated surfaces or burns.

**Plumbi Acetas,** *Acetate of Lead* [Mat. Med. List, U. S. P.].
$PbO,\bar{A}(C_4H_3O_3)+3HO=189.5$.

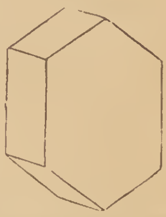
[*Synonym.*—Sugar of Lead.]

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

In this process the protoxide of lead combines with acetic acid, and forms a definite compound.

*Officinal Characters.*—In white masses of interlaced acicular crystals, slightly efflorescent, having an acetous odor, and a sweet astringent taste. Its solution in water slightly reddens litmus, gives a yellow precipitate with iodide of potassium (iodide of lead), and is precipitated white by sulphuric acid (sulphate of lead), acetic acid being set free. ["With its solution, carbonate of soda produces a white, and hydrosulphuric acid a black precipitate. Upon the addition of sulphuric acid, vapor is evolved having the smell of vinegar." U. S. The precipitates are respectively the carbonate and sulphuret of lead.—W.]

Fig. 37.



*Crystal of Acetate of Lead.*

*Properties.*—In a dry and warm atmosphere the crystals are apt to be decomposed by the carbonic acid of the air, and thus to become partially insoluble. When heated, they fuse, give out their water of crystallization, and, at a higher temperature, are decomposed; yielding acetic acid, acetone, carbonic acid, inflammable gas, and water: the residuum is a pyrophoric mixture of lead and charcoal. Acetate of lead is soluble in both water and alcohol. The aqueous solution feebly reddens litmus, though it communicates a green color to the juice of violets. A solution of the neutral acetate is partially decomposed by carbonic acid: a small quantity of carbonate of lead is precipitated, and a portion of acetic acid set free, which protects the remaining solution from further change.

*Composition.*—The neutral acetate has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Oxide of Lead | 111.5 | 58.95 |
| 1 | Acetic Acid | 51 | 26.84 |
| 3 | Water | 27 | 14.21 |
| | Crystallized Acetate of Lead | 189.5 | 100.00 |

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

*Physiological Effects.*—Applied to ulcers, mucous membranes, or other secreting surfaces, it acts as a desiccant and astringent. It reacts chemically on the albumen of the secretions and of the living tissues, and forms therewith compounds which are for the most part insoluble in water and acids. Hence the difficulty with which this salt becomes absorbed. Some of its compounds with organic substances are, however, rendered soluble in water by acids (as the acetic, hydrochloric, and lactic). In large quantities, acetate of lead taken into the stomach acts as an irritant, and causes symptoms of inflammation of the stomach, viz., vomiting, burning in the gullet and stomach, and tenderness at the pit of the stomach. These are usually accompanied with colica pictonum, and are not unfrequently followed by convulsions, coma, or local palsy.

The observations of Dr. A. T. Thomson, Van Swieten, Latham, and Christison have, however, shown that injurious effects from the use of large doses are very rare. I have repeatedly given five grains three times a day for ten days, without inconvenience. This dose was taken for a fortnight. The blue line on the gums was then very distinct, and the patient complained of griping pains in the bowels. A young man suffering from hæmoptysis, and under my care in the London Hospital, took, from July 21 to Aug. 27, 1842, 288 grs. of acetate of lead: at first in doses of 2 grs., then 3 grs., thrice daily. The leaden line on the gums was by no means well marked; at least I have seen it much better marked from a smaller quantity of lead. He experienced slight gripings. The hæmoptysis was most distinctly relieved by it. He took the lead in the form of pills in combination with opium. Dr. Christison has given eighteen grains daily for eight or ten days without any unpleasant symptoms whatever, except once or twice slight colic. During its employment the gums should be frequently examined, in order that the earliest appearance of the blue line before referred to may be detected.

Fig. 38. Fig. 39.

*Wrist-Drop and Emaciated Condition of the Flexors of the Thumb in the Paralysis from Lead.* (M. Hall.)

*Therapeutics.*—Acetate of lead is administered *internally* to diminish the diameter of the capillary vessels, and lessen circulation, secretion, and exhalation. Thus, we employ it in profuse discharges from the mucous membranes; as from the lungs, alimentary canal, and even the urino-genital membrane. In the mild cholera, so common in this country towards the end of summer, I have found acetate of lead in combination with opium most efficacious where the chalk mixture failed. I have used this combination in a few cases of Asiatic cholera, and in one or two with apparent benefit. Some other practitioners have also used it in this disease with decided advantage. In colliquative diarrhœa and chronic dysentery it occasionally proves serviceable. In phthisis it has been found beneficial, but only as a palliative; namely, to lessen the expectoration, check the night-sweats, or stop the harassing diarrhœa. Dr. Latham speaks most favorably of the use of sugar of lead and opium in checking purulent or semi-purulent expectoration. I have repeatedly seen it diminish expectoration, but I have generally found it fail in relieving the night-sweats, though Fouquier supposed it to possess a specific power of checking them; they are more frequently benefited by dilute sulphuric acid. In sanguineous exhalations from the mucous membranes, as epistaxis, hæmoptysis, and hæmatemesis, and in uterine hemorrhage, it is employed with the view of diminishing the calibre of the bleeding vessels, and thereby of stopping the discharge; and experience has fully established its utility. It may be employed in both the active and passive states of hemorrhage. It is usually given in combination with opium. In bronchitis, with profuse secretion, it proves exceedingly valuable. It has been employed also as a remedy for mercurial salivation. It has been applied for this affection in the form of gargle by Sommé. Unless care be taken to wash the mouth carefully after its use, it is apt to blacken the teeth. On the same principles that we administer it to check excessive mucous discharges, it has been employed to lessen the secretion of pus in extensive abscesses attended with hectic fever. Drs. Neuhold and Hasserborne have used the acetate of lead in enemata, in cases of strangulated hernia, as first recommended by Neuber and Peitl, and have found great advantage from it. The quantity used has been from ten to forty grains in from six to twenty-four ounces of warm water.

As a *topical* remedy, we use acetate of lead as a sedative, astringent, and desiccant. An aqueous solution of it is applied to inflamed parts, or to secreting surfaces, to diminish profuse discharges. Thus we use it in phlegmonous inflammation, in ophthalmia, in ulcers with profuse discharges, in gonorrhœa and gleet. In the sloughing and ulceration of the cornea which attend purulent and pustular ophthalmia, its use should be prohibited, as it forms a white compound which is deposited on the ulcer, to which it adheres tenaciously, and in the healing becomes permanently and indelibly imbedded in the structure of the cornea. The appearance produced by this cause cannot be mistaken; its chalky impervious opacity distinguishes it from the pearly semi-transparent structure of even the densest opacity produced by common ulceration. Acetate of lead, applied in the solid form or in strong solution, is stated to have been found of great service in the treatment of granular conjunctivitis by Mr. Cunin, of Brussels [but it has no advantage over sulphate of copper, and it leaves for several days a white glaze on the surface of the conjunctiva.—Ed.].

*Administration.*—Acetate of lead may be administered internally in doses of from one to ten grains. Dr. A. T. Thomson advises its exhibition in dilute distilled vinegar, to prevent its change into carbonate, which renders it more apt to occasion colic. It is usually exhibited in the form of pill, frequently in combination with opium. [Dilute acetic acid or oxymel is certainly a useful addition to the acetate when given in solution, but the utility of the acetic acid probably consists in its favoring the absorption of the acetate by retaining it in solution.—Ed.] Sulphuric acid (as in infusion of roses), sulphates (as of magnesia, and soda, and alum), phosphates and carbonates, render it inert; the carbonates, however, facilitate the production of colica pictonum. Common (especially spring) water, which contains sulphates, carbonates, and chlorides, is incompatible with this salt. Two grains dissolved in an ounce of water form an ordinary lotion.

*Pharmaceutic Use.*—It is a constituent of the pill of lead and opium, and is used in the preparation of solution of subacetate of lead, and of strychnia.

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.

Acetate of lead and opium react chemically on each other and produce acetate of morphia and meconate with a little sulphate of lead. Experience, however, has fully established the therapeutic value of the combination. In hæmoptysis profuse secretion of bronchial mucus, obstinate diarrhœa, Asiatic cholera, and dysentery, its effects are most valuable.

*Dose.*—From four to eight grains.

**Liquor Plumbi Subacetatis** [U. S.], *Solution of Subacetate of Lead.*

Subacetate of lead, $2PbO,\overline{A}$, dissolved in water.

*Synonym.*—Liquor plumbi diacetatis, *Lond.*

*Preparation.*—Take of acetate of lead, five ounces; litharge, in powder, three ounces and a half; distilled water, one pint, or a sufficiency. Boil the acetate of lead and the litharge in the water for half an hour, constantly stirring; then filter, and when the liquid is cold add to it more distilled water until the product measures twenty fluidounces. Keep the clear solution in stoppered bottles. [" Take of acetate of lead, sixteen troyounces; oxide of lead, in fine powder, nine troyounces and a half; distilled water, a sufficient quantity. Boil the acetate and oxide with four pints of distilled water, in a glass or porcelain vessel, for half an hour, occasionally adding distilled water to preserve the measure, and filter through paper. Lastly, keep the liquid in a well-stopped bottle." U. S.]

The acetate of lead combines with an additional equivalent of oxide of lead to form the subacetate. This process yields a uniform product. It is commonly known as Goulard's extract.

*Officinal Characters.*—A dense clear colorless 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 ($PbO,SO_3$), acetic acid being set free. [" A colorless liquid, of the specific gravity 1.267. It is decomposed by exposure to the air, carbonate of lead being formed. When added to a solution of gum, it occasions a dense white precipitate. In other respects it possesses the properties of an aqueous solution of acetate of lead." U. S.]

*Tests.*—Specific gravity, 1.26. Two fluidrachms require for perfect precipitation twenty-seven measures of the volumetric solution of oxalic acid.

*Physiological Effects.*—Its effects are analogous to those of the acetate. Its chemical action on the living tissues depends on its affinity for albumen and fibrine. Dr. A. T. Thomson asserts, from his experiments on animals, that the subacetate has more tendency to cause colic than the neutral acetate, because it is more readily converted into carbonate of lead. It is employed in medicine as a local astringent and sedative. Paralysis is said to have resulted from its external use.

*Therapeutics.*—It is employed, when diluted, to promote the resolution of external inflammation, to check profuse discharges from suppurating, ulcerated, and mucous surfaces, and to alleviate local pains. Thus it is applied to parts affected with either phlegmonous or erysipelatous inflammation, to whitlows, to inflamed tendons, aponeuroses, or absorbent glands; in ophthalmia; to contusions, sprains, burns, wounds (whether incised or lacerated); to blistered surfaces, ulcers, and abscesses. It is rarely given internally, but it is said to have proved successful in hydrophobia.

*Administration.*—It is employed diluted with water, added to poultices or mixed with fatty matters, and applied as an ointment.

LIQUOR PLUMBI SUBACETATIS DILUTUS [U. S.], *Dilute Solution of Subacetate of Lead, Lead Water.*—Take of solution of subacetate of lead, two fluidrachms; rectified spirit, two fluidrachms; distilled water, nineteen fluidounces and a half. Mix, and filter through paper. Keep the clear solution in a stoppered bottle. [" Take of solution of subacetate of lead, three fluidrachms; distilled water, a pint. Mix them." U. S.]

This preparation is commonly termed, in the shops, *Goulard water.* It should be transparent and colorless; but when prepared with common water it is more or less milky, owing to the formation of carbonate, sulphate, and chloride of lead. It is also more or less turbid if it be made with distilled water which has been exposed to the air, and in consequence has absorbed carbonic acid. The small quantity of spirit employed can be of no service. The quantity of the solution of subacetate of lead employed in making Goulard water is much too small; it should be, at least, three times, and in some cases I have used six times as much. I have never seen any ill effects from its use though it is said to have become absorbed in some cases. The same objection applies to the use of this compound as to that of the neutral acetate, in ulceration of the cornea.

Goulard water is used as a cooling, sedative, and astringent wash in the cases already enumerated for the Goulard's extract. A poultice, composed of crumb of bread and Goulard water, is sometimes a very useful application to phlegmons, painful wounds, irritable ulcers, &c. &c.

UNGUENTUM PLUMBI SUBACETATIS, *Ointment of Subacetate of Lead.* [CERATUM PLUMBI SUBACETATIS, U. S., *Cerate of the Subacetate of Lead.*] *Synonym:* Ceratum Plumbi Compositum, *Lond.*—Take of solution of subacetate of lead, six fluidounces; camphor, sixty grains; white wax, eight ounces; olive oil, one pint. Melt the wax with sixteen ounces of the oil, on a steam or water bath, remove the vessel, and, as soon as the mixture begins to thicken, gradually add the solution of subacetate of lead, and stir the mixture constantly until it cools; then add the camphor dissolved in the rest of the oil, and mix thoroughly. ["Take of solution of subacetate of lead, two fluidounces and a half; white wax, four troyounces; olive oil, eight troyounces; camphor, thirty grains. Mix the wax, previously melted, with seven troyounces of the oil. Then remove the mixture from the fire, and when it begins to thicken, gradually pour in a solution of subacetate of lead, stirring constantly with a wooden spatula until it becomes cool. Lastly, add the camphor dissolved in the remainder of the oil, and mix." U. S.]

This was called Goulard's cerate. It is employed as a dressing to wounds and ulcers, for the purpose of allaying irritation and appeasing pain. With the same views it is also applied to excoriated surfaces, burns, scalds, blistered surfaces, and irritable cutaneous affections. Opium is sometimes advantageously combined with it.

### [**Plumbi Iodidum,** U. S., *Iodide of Lead.* PbI=230.5.

"Take of nitrate of lead, iodide of potassium, each, four troyounces; distilled water, a sufficient quantity. With the aid of heat, dissolve the nitrate of lead in a pint and a half, and the iodide of potassium in half a pint of distilled water, and mix the solutions. Allow the precipitate formed to subside, and, having poured off the supernatant liquid, wash it with distilled water and dry it with a gentle heat." In this process the iodide of lead is one of the products of the double decomposition of the two salts. Thus, $PbO,NO_5+KI=KO,NO_5+PbI$.

*Officinal Characters.*—A bright yellow heavy inodorous powder, fusible and volatilizable by heat, and soluble in twelve hundred and thirty-five parts of cold and one hundred and ninety-four parts of boiling water. A hot saturated solution on cooling deposits the salt in brilliant golden scales.

*Therapeutics.*—Iodide of lead is thought to combine the action of iodine and lead. It has been used to dispel scrofulous glandular enlargements, and other indolent tumors. It is given internally, and used externally in the form of an ointment. Dose, Internally, gr. j—v in pill; as an ointment, ʒss—ʒiss—℥j of lard.—W.]

## IRON (*Ferrum*). Fe=28.

## [FERRUM. Mat. Med. List, U. S. P.]

*Natural History.*—Iron is met with in both kingdoms of nature. It is found in the metallic state (*native iron*, meteoric and terrestrial), in combination with oxygen (*hæmatite*, *micaceous iron*, *brown iron stone*, and *magnetic iron ore*), with sulphur (*iron pyrites* and *magnetic pyrites*), with chlorine (in the mineral called *pyrosmalite*), and with oxygen and an acid (*carbonate*, *phosphate*, *sulphate*, *arseniate*), &c. It occurs in the ashes of most plants, and in the blood and some other parts of animals.

*Extraction.*—In England, iron is extracted principally from *clay iron ore*, an impure carbonate of iron; this is *roasted* on large heaps of coal, by which it loses carbonic acid, water, and sulphur. It is then *smelted* with a flux (in South Wales limestone; in the forest of Dean, clay) and coke. The flux and the earthy particles of the ore run down into a *slag*, the carbonate of iron is deprived of its oxygen by the carbon of the coke, and the iron, in combination with carbon, is melted and run into moulds. In order to deprive iron of the substances with which it is combined in cast-iron, the latter is successively submitted to the process of *refining puddling*, and *welding*, by which it is converted into *wrought-iron.* The essential objects of these processes are to burn off the carbon of the cast-iron and to oxidize the silicon, by which silicic acid is formed; this unites with oxide of iron.

*Properties.*—Pure iron has a whitish-gray color. When polished, it has a high degree of brilliancy; its taste is peculiar and styptic; when rubbed it becomes odorous. Its ductility and tenacity are great, its malleability comparatively small, its sp. gr. 7.788, but diminishes by rolling and drawing. It is strongly magnetic.

*Physiological Effects.*—Iron is probably inert, or only acts mechanically, so long as it retains its metallic form; but it readily oxidizes in the alimentary canal, and thereby acquires medicinal power. As acids promote this chemical change, acid wines and fruits assist in rendering the metal active, while alkalies and their carbonates have an opposite effect. The oxidizement of the iron is attended with the evolution of hydrogen gas, which gives rise to unpleasant eructations. Like the ferruginous preparations generally, the internal employment of iron causes blackening of the stools, owing to the formation of the hydrated sulphuret of iron. Iron is one of the few metals which by oxidizement is not rendered more or less poisonous. The salts of iron produce a black stain when applied to the tongue. The *local* effects of the sulphate, pernitrate, and perchloride of iron are those of caustics and irritants, and these preparations, accordingly, rank amongst poisons. Most of the ferruginous preparations are astringent; that is, they constringe the parts with which they are in contact, and thereby diminish secretions and check sanguineous discharges. Thus, when swallowed, they repress the secretions and exhalation of the gastro-intestinal membrane, and thereby render the alvine evacuations more solid, and even occasion costiveness. The sulphate, pernitrate, and perchloride of iron, are the most powerful of the ferruginous astringents. Administered in large quantities, or when the alimentary canal is in an irritable condition, all the compounds of iron are liable to excite heat, weight, and uneasiness at the præcordia, nausea, and even vomiting and sometimes purging. The oxides and the carbonate of iron are very mild topical agents.

Before the chalybeates can produce constitutional effects they must be absorbed; and Tiedemann, Gmelin, and Simon have shown that iron has been found in the urine and milk after the administration of ferruginous salts, as well as in increased quantity in the blood. The absorption of iron is generally assisted by its combination with vegetable bitters. The constitutional effects of iron are best observed in anæmia. If in this condition chalybeates are administered the blood acquires a more scarlet color, the skin assumes its natural tint, the lips and cheeks become more florid, the pulse becomes fuller and stronger, the temperature of the body is increased, and the muscular strength augmented. Preparations of iron are less liable to derange the stomach if taken with or after a meal.

*Therapeutics.*—The general indications for their use are debility, feebleness, and inertia of the different organs of the body, atony (marked by a soft, lax, or flabby condition of the solids), defect of the red corpuscles of the blood (*anæmia*), or a watery condition of this fluid (*hydræmia, leucophlegmatic temperament*).

The contra-indications are the reverse of these: great strength and activity of organs, excessive tonicity (characterized by a firm and tense condition of the solids), and redundancy of the red corpuscles of the blood—as in general excess of the blood (*plethora*), in fever, in acute inflammation, and in the sanguine temperament. To these may be added congestion, or a tendency thereto, of important organs, especially of the brain and lungs, and intestinal irritation.

The following are some of the more important diseases in which chalybeates prove serviceable:—

1. In maladies attended with defect of the red corpuscles of the blood; as in anæmia, with or without irregularity of the uterine functions (chlorosis, amenorrhœa, dysmenorrhœa, and menorrhagia), and whether occurring spontaneously and without any obvious cause, or resulting from profuse discharges (hemorrhages, fluxes, as leucorrhœa, &c.), from food defective in either quantity or quality, and from deficiency of light and pure air. In these cases, the use of iron, combined with sufficient nourishing food, pure air, abundance of light, and, when necessary, the employment of purgatives, proves curative. But, when the anæmia or hydræmia is dependent on organic diseases—as cancer, granular degeneration of the kidney, or morbus cordis—the use of iron can at best be palliative only.

2. In some chronic affections of the nervous system great benefit is obtained by the use of iron. Chorea in a large number of cases may be relieved, and oftentimes cured, by chalybeates; though, in general, I consider them inferior to arsenic, which usually cures chorea much more speedily and certainly than they do. Cases, however, sometimes occur in which the chalybeates are preferable; as where anæmia coexists. Epilepsy and hysteria are other nervous affections which are sometimes benefited by a course of iron, especially when they are attended with anæmia or uterine obstructions.

3. In diseases of the spleen the ferruginous compounds are occasionally found useful. "I regard iron as a specific," says Cruveilhier, "in hypertrophy of the spleen, or chronic splenitis; whether primitive or consecutive in intermittent fevers." After noticing the symptoms attending this condition (such as paleness of the lips, &c., great lassitude, abdominal and cephalic pulsations, brought on by the slightest exertion, pain at the left side, disordered state of the digestive organs, accelerated pulse, and heart easily excited), he goes on to remark, "By the aid of iron I have obtained the complete resolution of enlargements of the spleen, which have occupied half, or even two-thirds, of the abdomen." Is not iron

useful in these cases by removing the coexistent anæmia? In disease of the spleen, accompanied with enlargement of this organ, but unattended by anæmia, I have found it fail to give relief. In hypertrophy of the liver iron has not been found as beneficial as in hypertrophy of the spleen.

4. In scrofula and rickets, the long-continued use of ferruginous compounds, in some cases combined with alkalies or iodine, has appeared to me on many occasions to be highly beneficial. In these cases iron proves most serviceable where there is a manifest tendency to anæmia, with a pale flabby condition of the solids.

**Iron Wire,** *Annealed Iron Wire, Binding Wire.* (Appendix A.)

*Synonym.*—Ferrum in fila tractum, *Lond.*

*Iron wire* is used for various pharmaceutical purposes; as for the preparation of *sulphate of iron*, *perchloride of iron*, *pernitrate of iron*, *iodide of iron*, and other preparations.

### Ferrum Redactum [U. S.], *Reduced Iron.*

*Synonym.*—Ferri Pulvis, *Dub.* [U. S. P. 1850.]

Metallic iron with a variable amount of magnetic oxide of iron.

*Preparation.*—Take of peroxide of iron, one ounce; zinc, granulated, a sufficiency; sulphuric acid of commerce, a sufficiency; chloride of calcium, a sufficiency. Introduce the peroxide of iron into a gunbarrel, confining it to the middle part of the tube by plugs of asbestos. Pass the gun-barrel through a furnace, and when it has been raised to a strong red heat, cause it to be traversed by a stream of hydrogen gas developed by the action on the zinc of some of the sulphuric acid diluted with eight times its volume of water. The gas before entering the gun-barrel must be rendered quite dry by being made to pass first through the remainder of the sulphuric acid, and then through a tube eighteen inches long, packed with minute fragments of the chloride of calcium. The farther end of the gun-barrel is to be connected by a cork with a bent tube dipping under water; and when the hydrogen is observed to pass through the water at the same rate that it bubbles through the sulphuric acid, the furnace is to be allowed to cool down to the temperature of the atmosphere, the current of hydrogen being still continued. The reduced iron is then to be withdrawn, and inclosed in a dry stoppered bottle. ["Take of subcarbonate of iron, thirty troyounces. Wash the subcarbonate thoroughly with water until no traces of sulphate of soda are indicated by the appropriate tests, and calcine it in a shallow vessel until free from moisture. Then spread it upon a tray, made by bending an oblong piece of sheet-iron in the form of an incomplete cylinder, and introduce this into a wrought iron reduction-tube, of about four inches in diameter. Place the reduction-tube in a charcoal furnace; and, by means of a self-regulating generator of hydrogen, pass through it a stream of that gas, previously purified by bubbling successively through solution of subacetate of lead, diluted with three times its volume of water, and through milk of lime, severally contained in four-pint bottles, about one-third filled. Connect with the further extremity of the reduction-tube, a lead tube bent so as to dip into water. Make all the junctions air-tight by appropriate lutes; and, when the hydrogen has passed long enough to fill the whole of the apparatus to the exclusion of atmospheric air, light the fire, and bring that part of the reduction-tube, occupied by the subcarbonate, to a dull-red heat, which must be kept up so long as the bubbles of hydrogen, breaking from the water covering the orifice of the lead tube, are accompanied by visible aqueous vapor.

When the reduction is completed, remove the fire, and allow the whole to cool to the ordinary temperature, keeping up, during the refrigeration, a moderate current of hydrogen through the apparatus. Withdraw the product from the reduction-tube, and, should any portion of it be black instead of iron-gray, separate such portion for use in a subsequent operation. Lastly, having powdered the reduced iron, keep it in a well-stopped bottle. When thirty troyounces of subcarbonate of iron are operated on, the process occupies from five to eight hours." U. S. As the subcarbonate of iron of the U. S. Ph. is really the hydrated sesquioxide, this process is essentially the same as the British.—W.]

The water of the dilute sulphuric acid is decomposed by the zinc, hydrogen being evolved, and sulphate of zinc formed, $Zn+HO+SO_3=ZnO,SO_3+H$. The hydrogen passing over the heated peroxide of iron abstracts its oxygen, reducing it partly to the metallic state, partly to that of magnetic oxide, $4F_2O_3+8H=5Fe+FeO,Fe_2O_3+8HO$. The process is continued until it is evident that the hydrogen has ceased to absorb oxygen. It is necessary to keep up the stream of hydrogen until cold, as the reduced iron rapidly reabsorbs oxygen from the air while hot. There is some trouble in obtaining iron in this finely reduced state. If the heat be insufficient, the reduction is incomplete: if carried too high, the particles of iron may become aggregated in masses. This preparation has been for some time known on the Continent as *Quevenne's iron*. It was first introduced by MM. Quevenne and Miquelard under the name of *fer réduit*. It has been adopted in the Dublin Pharmacopœia, as well as in that of the United States (Ph. 1850), under the name of *pulvis ferri*.

*Officinal Characters.*—A fine grayish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar. It dissolves in hydrochloric acid with the evolution of hydrogen, and the solution gives a light-blue precipitate with the ferridcyanide of potassium. [" It is wholly dissolved by a mixture of one part of sulphuric acid and sixty of water, without yielding the odor of hydrosulphuric acid. A small portion of it, struck on an anvil with a smooth hammer, forms a scale having a brilliant metallic lustre." U. S.]

*Tests.*—Ten grains added to an aqueous solution of fifty grains of iodine and fifty grains of iodide of potassium, and digested with them in a small flask at a gentle heat, leave not more than five grains undissolved, which should be entirely soluble in hydrochloric acid.

The iodine (dissolved by the aid of the iodide of potassium) combines with the metallic iron, and dissolves it, leaving the magnetic oxide, mingled with it, untouched. At least one-half of the preparation, therefore, should be metallic iron.

*Physiological Effects and Uses.*—As a medicine it possesses the properties of other ferruginous preparations, acting like the carbonate of the metal. In consequence of its fine state of division it is far more soluble in the fluids of the alimentary canal than iron filings. It has no inky flavor, and is not liable to blacken the teeth. As a chalybeate it is said to be objectionable, because it cannot be preserved from oxidation, and on account of the unpleasant eructations of hydrogen gas to which it gives rise. In reference to the first objection we may remark, that we have preserved iron perfectly bright, and without the least sign of oxidation, for many months, in a bottle filled with lime-water and well stoppered. This might be made the preservative medium until it was required for use. It has been found a very efficacious form of iron in anæmia, probably in consequence of its very ready solubility in the alimentary canal.

*Dose.*—From one to ten grains, in the form of pill or bolus.

### **Ferri Oxidum Magneticum,** *Magnetic Oxide of Iron.*

*Synonym.*—Ferri Oxidum Nigrum, *Ed.*

Peroxide of iron, $Fe_2O_3$, with about nine per cent. of protoxide of iron, FeO, and twenty-two of water.

*Natural History.*—It occurs in the mineral kingdom under the name *magnetic iron ore*, the massive form of which is called *native loadstone.* It is found in Cornwall, Devonshire, Sweden, and other countries.

*Preparation.*—Take of sulphate of iron, six ounces; sulphuric acid, three fluidrachms; nitric acid, two fluidrachms; solution of soda, fifty-eight fluidounces, or a sufficiency; distilled water, a sufficiency. Add the sulphuric acid to five fluidounces of the water, and with the aid of heat dissolve in the mixture four ounces of the sulphate of iron. Mix the nitric acid with two fluidounces of the water, and, having added the dilute acid to the solution of sulphate of iron, concentrate by boiling until, on the sudden disengagement of ruddy vapors, the liquid passes from a dark to a red color. To the solution thus obtained add the two remaining ounces of sulphate of iron, first dissolved in half a pint of distilled water. Mix well, add to the liquid the solution of soda, and having boiled for five minutes in an iron vessel, collect the precipitate on a calico filter, and wash it with boiling distilled water, until the liquid which passes through ceases to give a precipitate when allowed to drop into a solution of chloride of barium. Lastly, dry the precipitate without heat in a confined portion of air over a capsule containing sulphuric acid, and inclose it in a stoppered bottle.

The first portion of the sulphate of iron is converted into persulphate by the action of the nitric and sulphuric acid, binoxide of nitrogen being formed; $6(FeO,SO_3)+3SO_3+NO_5=3(Fe_2O_3,3SO_3)+NO_2$. This binoxide of nitrogen is held in solution by the unoxidized sulphate of iron, communicating to the solution a deep olive green-color. As the oxidation proceeds, and the quantity of protosulphate diminishes, the binoxide is given out, and coming into contact with the atmosphere is converted into ruddy fumes of peroxide of nitrogen ($NO_4$.) At length, through the evolution of these fumes, the dark color of the solution changes to red, a proof that the whole of the sulphate of iron is peroxidized. On the addition of soda to the mixed solution of protosulphate and persulphate of iron, a compound of the hydrated protoxide and peroxide of iron is precipitated. This is to be washed with water until all traces of sulphuric acid are got rid of, and carefully dried without heat to avoid further oxidation.

*Officinal Characters.*—Brownish black, destitute of taste, strongly magnetic. It dissolves without effervescence in hydrochloric acid diluted with half its bulk of water, and the solution thus obtained gives blue precipitates with the ferrocyanide and with the ferridcyanide of potassium (indicating $Fe_2O_3$, and FeO).

*Tests.*—Twenty grains moistened with nitric acid, and calcined at a low red heat, leave 15.8 grains of the peroxide of iron. Twenty grains dissolved in hydrochloric acid continue to give a blue precipitate with the ferridcyanide of potassium until 8.3 measures of the volumetric solution of bichromate of potash have been added (showing the quantity of protoxide converted into peroxide of iron).

*Therapeutics.*—Its effects are similar to those of the chalybeates in general, and which have been already described. It does not produce local irritation. It is a more valuable preparation than the peroxide, in consequence of being more readily soluble in the fluids of the stomach.

*Administration.*—Dose, from gr. v to gr. xx or more, twice or thrice daily.

## **Ferri Peroxidum**, *Peroxide of Iron.*

*Synonyms.*—Ferri Sesquioxidum, *Lond.;* Ferri Oxidum Rubrum, *Edin.*

$Fe_2O_3,HO=89$.

*Natural History.*—It is found native in the crystallized state (*specular iron*, *micaceous iron*, or *iron glance*), and in globular and stalactitic masses (*red hæmatite*); the finest specimens of the first occur in the Isle of Elba; the second is found near Ulverstone, in Lancashire, and in Saxony. *Red ochre* is peroxide of iron in a soft and earthy form. *Reddle*, or *red chalk*, is an argillaceous substance, which owes its color to peroxide of iron. Hydrated peroxide of iron is also found native.

*Preparation.*—Take of hydrated peroxide of iron, four ounces; place the peroxide of iron in a stove or oven until it becomes dry to the touch; and then expose it to a heat of 212° until it ceases to lose weight. Lastly, reduce it to a fine powder, and preserve it in a bottle.

If this preparation be heated to a higher degree, it becomes more aggregated and of a darker color, but more insoluble in hydrochloric acid.

*Officinal Characters.*—A powder of a dark-brown color, and destitute of taste; dissolves completely, though slowly, with the aid of heat in hydrochloric acid diluted with half its volume of water, forming a solution which gives a copious blue precipitate with the ferrocyanide of potassium.

*Composition.*—Peroxide of iron has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Iron | 56 | 62 92 |
| 3 Oxygen | 24 | 26.96 |
| 1 Water | 9 | 10 12 |
| Peroxide of Iron | 89 | 100.00 |

*Tests.*—It dissolves completely in hydrochloric acid, and the solution gives no precipitate with chloride of barium, or with the ferridcyanide of potassium (showing its freedom from sulphates, and that the whole of the iron is in the state of peroxide).

*Physiological Effects.*—It is termed alterative, tonic, and emmenagogue. Its obvious effects on the body are very slight. It produces blackness of the stools, and in large doses occasions nausea, a sensation of weight at the pit of the stomach, and sometimes dyspeptic symptoms. It possesses very little astringency. The constitutional effects arising from the continued use of it are those produced by the ferruginous compounds generally, and which have been before described.

*Therapeutics.*—It may be employed in any of the before mentioned cases in which the ferruginous tonics are indicated. It has been strongly recommended as a remedy for neuralgia, and in some cases it gives complete, in others partial, relief. But in many instances no benefit whatever is obtained from its use, and in one case in which I prescribed it the patient fancied it increased her sufferings.

*Administration.*—The usual dose, as a tonic and emmenagogue, is from ten to thirty grains. In tic-douloureux it has been given in much larger quantities, as from a quarter to half an ounce. These enormous doses have sometimes been followed by very inconvenient accumulations of the oxide in the rectum. It may be administered in the form of a confection. To enable it to sit easily on the stomach, it may be combined with aromatics.

Emplastrum Ferri [U. S.], *Chalybeate Plaster.*—Take of peroxide of iron, in fine powder, one ounce; Burgundy pitch, two ounces; litharge plaster, eight ounces. Add the peroxide of iron to the Burgundy pitch and litharge plaster, previously melted together, and stir the mixture constantly till it stiffens on cooling. [" Take of subcarbonate of iron, three troyounces; plaster of lead, twenty-four troyounces; Burgundy pitch, six troyounces. Add the subcarbonate of iron to the plaster and Burgundy pitch, previously melted together, and stir them constantly until the mixture thickens on cooling." U. S. This plaster is widely known as " strengthening plaster."—W.]

*Use.*—Spread on leather, it is employed as a mechanical support and slight stimulant in muscular relaxation, lumbago, and weakness of the joints.

### [**Ferri Subcarbonas,** U. S., *Subcarbonate of Iron; Precipitated Carbonate of Iron.*

" Take of sulphate of iron, eight troyounces; carbonate of soda, nine troyounces; water, eight pints. Dissolve the salts separately, each in four pints of the water; then mix the solutions, and, having stirred the mixture, set it by that the precipitate may subside. Having poured off the supernatant liquid, wash the precipitate with water until the washings pass nearly tasteless, and dry it on bibulous paper without heat." U. S. By the double decomposition of the two ingredients, a whitish precipitate of the carbonate of the protoxide of iron is formed in the first step of this process. Thus, $NaO,CO_2+FeO,SO_3=NaO,SO_3+FeO,CO_2$, the sulphate of soda remaining in solution. On exposure to the air, most of the protoxide of iron absorbs oxygen, is converted into the sesquioxide and liberates its carbonic acid. Thus, $2(FeO,CO_2)+O=Fe_2O_3+2CO_2$. The subcarbonate of iron of the U. S. Ph. is then the anhydrous sesquioxide of iron, mixed probably with a very small amount of the carbonate of the protoxide.

*Officinal Characters.*—A reddish-brown powder, wholly dissolved by dilute muriatic acid with slight effervescence, forming a solution from which the sesquioxide of iron is completely precipitated by ammonia added in excess. The liquid which remains is not colored by hydrosulphuric acid or ferrocyanide of potassium.

*Therapeutics.*—The uses, dose and mode of administration are precisely those of the ferri peroxidum of the Br. Ph.

Trochisci Ferri Subcarbonatis, U. S., *Troches of Subcarbonate of Iron.*—" Take of subcarbonate of iron, five troyounces; vanilla, sixty grains; sugar, in fine powder, fifteen troyounces; mucilage of tragacanth, a sufficient quantity. Rub the vanilla first with a part of the sugar into a uniform powder, and afterwards with the subcarbonate of iron and the remainder of the sugar until they are thoroughly mixed; then, with mucilage of tragacanth, form a mass, to be divided into troches, each weighing twenty grains." U. S. Dose, i—vi lozenges=v—xxx grs. of the subcarbonate.—W.]

### **Ferri Peroxidum Hydratum,** *Hydrated Peroxide of Iron.*

### [**Ferri Oxidum Hydratum,** U. S., *Hydrated Oxide of Iron.*]

Hydrated peroxide of iron, $2Fe_2O_3,3HO$, with a variable amount of uncombined water.

*Preparation.*—Take of solution of persulphate of iron, four fluidounces; solution of soda, thirty-three fluidounces, or a sufficiency; distilled water, one pint. Add the persulphate of iron to the distilled water and gradually pour the dilute solution into the solution of soda, stirring well for a few minutes; collect the precipitate on a calico filter and wash it with distilled water until the filtrate ceases to give a precipitate with chloride of barium. Lastly, inclose the precipitate, without drying it, in a porcelain pot whose lid is made tight by a luting of lard. This preparation should be recently made.

The soda combines with the sulphuric acid of the persulphate, and peroxide of iron is precipitated; $Fe_2O_3,3SO_3 + 3NaO = 3(NaO,SO_3) + Fe_2O_3$. ["Take of solution of tersulphate of iron, a pint; water of ammonia, water, each, a sufficient quantity; to the solution of tersulphate of iron, previously mixed with three pints of water, add water of ammonia, with constant stirring, until in slight excess; then pour the whole on a wet muslin strainer, and wash the precipitate with water until the washings pass nearly tasteless. Lastly, mix the precipitate with sufficient water to make the mixture measure a pint and a half, and transfer it to a wide-mouthed bottle, which must be well stopped.

"When hydrated oxide of iron is to be made in haste for use as an antidote, the washing may be performed more quickly, though less perfectly, by pressing the strainer forcibly with the hands until no more liquid passes, and then mixing the precipitate with sufficient water to bring the mixture to the measure of a pint and a half." U. S. The reaction in this case is similar to that of the British process. Thus, $Fe_2O_3,3SO_3 + 3NH_4O = Fe_2O_3 + 3(NH_4O\ SO_3)$.—W.]

*Officinal Characters.*—A soft moist pasty mass, of a reddish-brown color. Dissolves readily in dilute hydrochloric acid without the aid of heat, forming a solution which gives a copious blue precipitate with the ferrocyanide of potassium. A little of it dried at 212° gives off moisture when further heated in a test tube. ["If dried at a heat not exceeding 180°, it afterwards loses on exposure to a red heat, eighteen per cent. of water." U. S.]

*Tests.*—Free from grittiness; leaves on calcination about twelve per cent. of peroxide of iron.

*Therapeutics.*—Hydrated peroxide of iron has been chiefly employed as an antidote in poisoning by arsenious acid. Drs. Bunsen and Berthold were the first to assert the antidotal powers of this preparation. Their statements were confirmed by other experimentalists. On the other hand, others have denied its antidotal powers. It is generally admitted that if a sufficiently large quantity of the hydrated peroxide be added to a *solution* of arsenious acid, it combines with the acid and forms an insoluble precipitate; $2Fe_2O_3 + AsO_3 = 3FeO,AsO_5 + FeO$. In such cases the hydrated peroxide would act as a chemical antidote. But it appears from the experiments of Dr. A. Taylor that, when the hydrated peroxide is mixed with arsenious acid in the form of powder, little or no chemical effect is produced. Now as in most cases of arsenical poisoning, the arsenious acid is taken in the form of powder, it follows that in such the hydrated peroxide would not act as a chemical antidote, though it would doubtless be serviceable as a mechanical antidote. In thirty-one cases in which it was given, recovery took place in twenty-nine. In one of these nearly a quarter of an ounce of arsenic had been taken. In the two unsuccessful cases the antidote could not be retained on the stomach.

*Administration.*—When exhibited as an antidote in arsenical poisoning it must be administered in very large doses, in a freshly hydrated state. Dr. Taylor and Dr. Maclagan say that twelve, Devergie thirty-two, parts of the hydrated oxide are required for every part of arsenious acid swallowed. Dr. Beck recommends that it should be given in the quantity of a tablespoonful every five or ten minutes, or as often as the patient can swallow it. If hydrated peroxide be not at hand, let the common red-brown oxide of iron be given with water as a substitute; for though not equally efficacious with the hydrated oxide, it appears to possess some antidotal power.

### **Ferri Carbonas Saccharata,** *Saccharated Carbonate of Iron.*

### [**Pilulæ Ferri Carbonatis,** *Pills of Carbonate of Iron*, U. S.]

Carbonate of iron, $FeO,CO_2$, mixed with peroxide of iron, and sugar, and forming at least fifty-seven per cent. of the mixture.

*Preparation.*—Take of sulphate of iron, two ounces; carbonate of soda, two ounces and a half; boiling distilled water, two gallons; refined sugar, one ounce. Dissolve the sulphate of iron and the carbonate of soda 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°.

The sulphate of iron and carbonate of soda mutually decompose each other, forming sulphate of soda and carbonate of iron, $FeO,SO_3+NaO,CO_2=FeO,CO_2+NaO,SO_3$. By exposure to the air the carbonate of iron absorbs oxygen, and becomes converted into peroxide, $2(FeO,CO_2)+O=Fe_2O_3+2CO_2$, it is necessary therefore, in washing and collecting it, to keep it from contact with the air as much as possible. The presence of sugar has a powerful effect in preventing the oxidation. ["Take of sulphate of iron, eight troyounces; carbonate of soda, nine troyounces; clarified honey, three troyounces; sugar, in coarse powder, two troyounces; boiling water, two pints; syrup, a sufficient quantity. Dissolve the salts separately, each in a pint of the water, a fluidounce of syrup having been previously added to each pint; mix the two solutions when cold, in a bottle just large enough to hold them, close it accurately with a stopper, and set it by that the carbonate of iron may subside. Pour off the supernatant liquid, and having mixed water, recently boiled, with syrup in the proportion of a pint to the fluidounce, wash the precipitate with the mixture until the washings no longer have a saline taste. Place the precipitate on a flannel cloth to drain, and, having expressed as much of the water as possible, mix it immediately with the clarified honey and sugar. Lastly, by means of a water-bath, evaporate the mixture, constantly stirring, until it is brought to the weight of eight troyounces." U. S. This process is better than that of the British Ph., the carbonate being more fully protected during the manufacture from the oxygen of the air, by sugar. The reactions are the same as those just detailed. This is a soft, pilular mass of a dark greenish-gray color, blackening on exposure. About half of its weight is the carbonate of the protoxide of iron. Dose, gr. ii—v, in pill.—W.]

*Officinal Characters.*—Small coherent lumps of a gray-brown color, with a sweet very feeble chalybeate taste. Dissolves with effervescence in warm hydrochloric acid diluted with half its volume of water, and the solution is but slightly affected by the ferrocyanide, but gives a copious blue precipitate with the ferridcyanide of potassium.

*Tests.*—Its solution in hydrochloric acid gives but a very slight precipitate with chloride of barium (showing its freedom from adhering sulphate of soda). Twenty grains dissolved in excess of hydrochloric acid and diluted with water, continue to give a blue precipitate with the ferridcyanide of potassium until at least thirty-three measures of the volumetric solution of bichromate of potash have been added.

*Therapeutics.*—It is one of the most valuable of the ferruginous compounds, on account of the facility with which it dissolves in the fluids of the stomach, and becomes absorbed. Its local effects are very mild. Its uses are those of chalybeates in general, and which have been before mentioned.

*Administration.*—Dose, gr. v to gr. x. It may be given in syrup or with confection of roses as in the following pill.

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.

This is a substitute for the Pilula Ferri Composita, *Lond.* It contains more than four times the quantity of carbonate of iron and no myrrh.

*Dose.*—Gr. v to gr. x.

[Pilulæ Ferri Compositæ, U. S., *Compound Pills of Iron.*—"Take of myrrh, in fine powder, one hundred and twenty grains; carbonate of soda, sulphate of iron, each, sixty grains; syrup, a sufficient quantity. Rub the myrrh, first with the carbonate of soda, and afterwards with the sulphate of iron, until they are thoroughly mixed; then beat them with syrup so as to form a pilular mass, to be divided into eighty pills." U. S. The reaction in this process is precisely that described above, the pills being a mixture of myrrh, sulphate of soda, and carbonate of the protoxide of iron.

*Therapeutics.*—They are exhibited to meet the same indications as the Mistura Ferri Composita.

Two to six pills may be given three times a day.—W.]

Mistura Ferri Composita [U. S.], *Compound Mixture of Iron.*—Take of sulphate of iron, thirty grains; carbonate of potash, twenty-five grains; myrrh, in powder, sixty grains; sugar, sixty grains; spirit of nutmeg, one fluidrachm; rose water, eight fluidounces. Triturate the myrrh and carbonate of potash with the sugar, the spirit of nutmeg, and seven ounces of the rose water, the latter being gradually added until a uniform mixture is obtained. To this add the sulphate of iron, previously dissolved in the remaining ounce of rose water, and inclose the mixture at once in a bottle which should be tightly corked. ["Take of myrrh, sugar, each, sixty grains; carbonate of potassa, twenty-five grains; sulphate of iron, in coarse powder, twenty grains; spirit of lavender, half a fluidounce; rose water, seven fluidounces and a half. Rub the myrrh, sugar, and carbonate of potassa with the rose water, gradually added, then with the spirit of lavender, and, lastly, with the sulphate of iron; and pour the mixture immediately into a bottle, which must be well stopped." U. S.]

This is a professed imitation of Dr. Griffiths' celebrated antihectic or tonic mixture. In the preparation of it double decomposition takes place: by the mutual reaction of carbonate of potash and sulphate of iron we obtain sulphate of potash, which remains in solution, and carbonate of protoxide of iron, which is precipitated; $FeO,SO_3+KO,CO_2=FeO,CO_2+KO,SO_3$. To prevent the latter attracting more oxygen, it is to be preserved in a well-stoppered bottle. The quantity of carbonate of potash directed to be used is almost twice as much as is required to decompose the quantity of sulphate of iron ordered to be employed. The excess combines with the myrrh, and forms a kind of saponaceous compound, which assists in suspending the carbonate of iron in the liquid. When first made, this mixture has a greenish color, owing to the hydrated ferruginous carbonate; but by exposure to the air it becomes reddish, in consequence of the absorption of oxygen, by which peroxide of iron is formed, and carbonic acid evolved: hence it should only be prepared when required for use. The sugar has the effect of greatly retarding this oxidation.

*Physiological Effects and Uses.*—This is one of the most useful and efficacious ferruginous preparations, owing to its ready solubility, in consequence of which it is readily absorbed. Its constitutional effects are analogous to those of the ferruginous compounds in general already described. Its tonic and stimulant properties are promoted by the myrrh. The excess of alkaline carbonate must not be forgotten in estimating the sources of its activity. It is admissible in most of the cases in which ferruginous remedies are indicated; but it is especially serviceable in anæmia, chlorosis, atonic amenorrhœa, and hysterical affections. It is also employed with benefit in the hectic fever of phthisis and chronic mucous catarrh.

Dr. Graves gives it to check excessive bronchial secretions in doses of one or two fluidrachms in almond mixture. The usual *dose* is from one to two fluidounces.

### **Ferri Phosphas** [U. S.], *Phosphate of Iron.*

Phosphate of iron, $3FeO,PO_5$, 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 solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with hot distilled water till the filtrate ceases to give a precipitate with chloride of barium. Finally dry on porous bricks in a stove whose temperature does not exceed 100°. Preserve the dried salt in a stoppered bottle.

The phosphoric acid of the phosphate of soda combines with the oxide of iron of the sulphate, the sulphuric acid uniting with the soda both of the phosphate and acetate, liberating acetic acid, in which phosphate of iron is insoluble; $3(FeO,SO_3)+2NaO,HO,PO_5+NaO,\bar{A}=3FeO,PO_5+3(NaO,SO_3)+\bar{A}$. It is necessary to avoid violent stirring, which granulates the precipitate, and causes it to pass through the filter. ["Take of sulphate of iron, five troyounces; phosphate of soda, six troyounces; water, eight pints. Dissolve the salts separately, each in four pints of the water; then mix the solutions, and set the mixture by that the precipitate may subside. Lastly, having poured off the supernatant liquid, wash the precipitate with hot water, and dry it with a gentle heat." U. S. In this process the precipitate is the result of the double decomposition of the two salts. Thus $2(FeO,SO_3)+(2NaO,HO,PO_5)=(2FeO,HO,PO_5)+2(NaO,SO_3)$. The American salt therefore differs in its composition from the English. At first it is whitish, but on exposure rapidly absorbs oxygen and receives a bluish tint. It almost always contains some of the phosphate of the sesquioxide ($Fe_2O_3PO_5$).—W.]

*Officinal Characters.*—A slate-blue amorphous powder, insoluble in water, soluble in hydrochloric acid. The solution yields a precipitate with both the ferrocyanide and the ferridcyanide of potassium, that afforded by the latter being the more abundant; and when treated with tartaric acid and an excess of ammonia, and subsequently with the solution of ammonio-sulphate of magnesia, lets fall a crystalline precipitate (ammonio-phosphate of magnesia).

Tartaric acid forms double salts with iron and ammonia, which are not decomposed by excess of that alkali; the presence of tartaric acid thus prevents the precipitation of oxide of iron by ammonia, and allows the application of the ordinary test for phosphoric acid. [" It is dissolved by dilute muriatic acid, forming a solution which yields with ammonia a precipitate, insoluble in an excess of the alkali." U. S. According to the U. S. Dispensatory this test is intended to show the presence of the phosphate of the sesquioxide of iron and the absence of the phosphate of soda. The precipitate formed with the phosphate of the protoxide is soluble in an excess of the ammonia, whilst that with the phosphate of the sesquioxide requires for its solution the presence of the phosphate of soda also.—W.]

*Test.*—If it is digested in hydrochloric acid with a lamina of pure copper, a dark deposit does not form on the metal (showing its freedom from arsenic).

*Therapeutics.*—Dr. Venables proposed this preparation in the treatment of diabetes. Dr. Prout has also borne favorable testimony to its effect. He says it is an excellent remedy. It may also be used for the same purposes as other hematinics.

*Dose.*—Gr. ij to gr. x.

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 fluidounces and a half; refined sugar, eight ounces; distilled water, eight fluidounces. 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 fluidounces.

This is a solution of freshly precipitated phosphate of iron in dilute phosphoric acid, converted into a syrup by the addition of sugar, which prevents the peroxidation of the iron. It contains about eight grains of phosphate of iron in one fluidounce. It is an agreeable preparation of phosphate of iron, and may be taken in *doses* of one or more fluidrachms.

### [**Ferri Pyrophosphas,** U. S., *Pyrophosphate of Iron.*

"Take of phosphate of soda, seven troyounces and a half; solution of tersulphate of iron, seven fluidounces, or a sufficient quantity; citric acid, two troyounces; water of ammonia, five fluidounces and a half, or a sufficient quantity; water, a sufficient quantity. Heat the phosphate of soda, in a porcelain capsule, until it undergoes the watery fusion, and continue the heat until it becomes dry. Transfer the dry salt to a shallow iron capsule, and heat it to incipient redness, without fusion. Then dissolve it in three pints of water, with the aid of heat, and, having filtered the solution and cooled it to the temperature of 50°, add solution of tersulphate of iron until this ceases to produce a precipitate. Stir the mixture thoroughly, and pour it upon a muslin strainer, and, when the precipitate has drained, wash it with water until the washings pass nearly tasteless, and transfer it to a weighed porcelain capsule. To the citric acid, contained in a suitable vessel, add water of ammonia until the acid is saturated and dissolved. Then add the solution to the precipitate in the weighed capsule, stir them together, and evaporate until the liquid is reduced to sixteen troyounces. Spread this on plates of glass or porcelain, so that, on drying, the salt may be obtained in scales. Lastly, preserve it in a well-stopped bottle, protected from the light." U. S.

The first step in this process results in the conversion of common tribasic phosphate of soda ($2NaO+HO,PO_5$) into the pyro or bibasic phosphate ($2NaO,PO_5$). When this is added to the tersulphate of iron, the sesquiphosphate of the sesquioxide of iron is precipitated. Thus $3(2NaO,PO_5)+2(Fe_2,O_3,3SO_3)+9HO=6(NaO,SO_3)+(2Fe_2,O_3,3PO_5+9HO)$. The citrate of ammonia is then prepared and mixed with the latter.

*Officinal Characters.*—"Pyrophosphate of iron, thus prepared, is in apple-green scales, having an acidulous, slightly saline taste. It is wholly and freely soluble in water. Ferrocyanide of potassium, when added to the dilute solution, gives rise to a pale-blue color, which produces no precipitate. This preparation contains forty-eight per cent. of anhydrous pyrophosphate of iron." U. S. The reason that there is no precipitate produced, but only a blue tint, by the addition of the ferrocyanide of potassium, is that the ferrocyanide of iron is soluble in the citrate of ammonia.

*Therapeutics.*—A mild and efficient chalybeate. Dose, two to five grains administered either in pill or dissolved in simple syrup.—W.]

## **Sulphuret of Iron.** (Appendix B. I.) $FeS=44$.

### [**Ferri Sulphuretum,** Mat. Med. List, U. S. P.]

*Natural History.*—In the mineral kingdom sulphur and iron are frequently met with in combination. *Common* or *yellow iron pyrites*, usually called *mundic*, is a bisulphuret of iron, $FeS_2$. It occurs in Cornwall and Derbyshire.

*Preparation.*—Sulphuret of iron is made by heating an iron rod to a full white heat in a forge, and rubbing it with a roll of sulphur over a deep vessel filled with water, to receive the fused globules of sulphuret which form. An inferior sort, good enough, however, for pharmaceutic purposes, is obtained by heating one part of sublimed sulphur and three of iron filings in a crucible in a common fire till the mixture begins to glow, and then removing the crucible and covering it, until the action, which at first increases considerably, shall come to an end. The sulphur and iron enter into combination, and form sulphuret of iron.

*Properties.*—If properly prepared it gives out abundance of sulphuretted hydrogen gas, when mixed with either diluted sulphuric or hydrochloric acid, while a ferruginous solution is obtained.

*Composition.*—Its composition is liable to some variation. The best has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Iron | 28 | 63.6 |
| 1 | Sulphur | 16 | 36.4 |
| | Sulphuret of Iron | 44 | 100.0 |

*Uses.*—Employed in the production of sulphuretted hydrogen.

**Ferri Sulphas** [U. S.], *Sulphate of Iron.* $FeO,SO_3+7HO=139$.

*Preparation.*—Take of iron wire, four ounces; sulphuric acid, four fluidounces; distilled water, one pint and a half. Pour the water on the iron placed in a porcelain capsule, add the sulphuric acid, and when the disengagement from 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. [" Take of iron, in the form of wire and cut in pieces, twelve troyounces; sulphuric acid, eighteen troyounces; water, eight pints. Mix the sulphuric acid and water, and add the iron; then heat the mixture until effervescence ceases. Pour off the solution, and, having added thirty grains of sulphuric acid, filter through paper, allowing the lower end of the funnel to touch the bottom of the receiving vessel. Evaporate the filtered liquid in a matrass until sufficiently concentrated; then set it aside in a covered vessel to crystallize. Drain the crystals in a funnel, dry them on bibulous paper, and keep them in a well-stopped bottle." U. S.]

In this process one equivalent of iron decomposes one equivalent of water, combines with an equivalent of oxygen, and sets free an equivalent of hydrogen. The equivalent of protoxide of iron combines with an equivalent of sulphuric acid to form an equivalent of sulphate of iron; $Fe+HO,SO_3=FeO,SO_3+H$. The *common green vitriol*, or *copperas*, or *crude sulphate of iron* of the shops is prepared by exposing heaps of moistened iron pyrites (bisulphuret of iron) to the air for several months. In some places the ore is previously roasted. The moistening is effected by rain or by manual labor. Both constituents (iron and sulphur) are oxidized; the products are protoxide of iron and sulphuric acid. But as the quantity of sulphuric acid formed is greater than is sufficient to saturate the protoxide of iron, the excess is saturated either by the alumina contained in the clay mixed with the pyrites, or by the addition of old iron.

Fig. 40.

*Crystal of Sulphate of Iron.*

*Officinal Characters.*—In oblique-rhombic prisms, of a green color and styptic taste; insoluble in rectified spirit, soluble in water. [" In transparent bluish-green crystals, which, on exposure to the air, effloresce and change their color." U. S.] The solution gives a white precipitate with chloride of barium ($BaO,SO_3$), and a blue one with the ferridcyanide of potassium (indicating FeO), and on exposure to the air gradually becomes turbid, depositing a reddish-brown sediment (basic persulphate of iron).

*Composition.*—The composition of this salt is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Protoxide of Iron | 36 | 25.9 |
| 1 | Sulphuric Acid | 40 | 22.8 |
| 7 | Water | 63 | 45.3 |
| | Sulphate of Iron | 139 | 100.0 |

*Tests.*—Crystals free from opaque rust-colored spots, and dissolving in water without leaving any ochrey residue. The aqueous solution gives no precipitate with sulphuretted hydrogen, and one nearly white with ferrocyanide of potassium (showing freedom from peroxide of iron and other metals).

The *common green vitriol*, or *copperas*, of the shops is a mixture of the sulphates of the protoxide and peroxide of iron. It is liable to be contaminated with the salts of copper, zinc, manganese, alumina, magnesia, and lime. Copper may be recognized and removed from it by immersing a clean iron spatula in a solution of it: the iron becomes incrusted with copper. Copper may also be detected by adding excess of caustic ammonia to the ferruginous solution and filtering the liquid. If copper be present, the liquor will have an azure blue tint. The ammoniacal liquid should yield, by evaporation, no fixed residuum. It is difficult to deprive the salt of the other impurities above mentioned.

*Physiological Effects.*—This salt acts locally as a powerful astringent, and, when employed in a concentrated form, as an irritant. The latter effect depends on its chemical action on the organic constituents (albumen) of the tissues. The remote effects of sulphate of iron are analogous to those of other ferruginous compounds, which have been already described.

Swallowed *in small doses*, it has an astringent operation on the gastro-intestinal mucous membrane, and thereby diminishes the quantity of fluid secreted or exhaled; hence its continued use causes constipation. It becomes absorbed, and operates on the system as a tonic, stimulant, emmenagogue, and astringent. *In large medicinal doses* it readily excites pain, heat, or other uneasiness at the pit of the stomach, and not unfrequently causes nausea and vomiting; this is especially the case in irritable conditions of the viscus. *In excessive doses* it operates as an irritant poison.

*Therapeutics.*—Sulphate of iron is to be preferred to other ferruginous compounds in cases in which there is great relaxation of the solid parts, with immoderate discharges. When the long-continued use of ferruginous compounds is required, it is less adapted for administration than some other preparations of iron, on account of its local action on the alimentary canal. It is employed in lump, powder, or solution, as a styptic, to check hemorrhage from numerous small vessels. A solution of it is applied to ulcerated surfaces and to mucous membranes to diminish profuse discharges, as in chronic ophthalmia, leucorrhœa, and gleet. A solution of three drachms of the sulphate in five ounces of water has been used by Velpeau to repress erysipelas. *Internally*, it is administered in passive hemorrhages, on account of its supposed astringent influence over the system generally; also in immoderate secretion and exhalation—as in humid asthma, chronic mucous catarrh, old dysenteric affections, colliquative sweating, diabetes, leucorrhœa, and gleet. It has also been found serviceable against tapeworm. [Five grains combined with three of sulphate of quinia, and taken three or four times a day, rapidly diminishes enlarged spleen.—Ed.]

*Administration.*—The dose of it is from one to five grains in the form of pill. [Owing to the strong tendency of this salt to effloresce, the pill is very apt to become crumbly; the dried sulphate should therefore be preferred.—W.] If given in solution, the water should be recently boiled, to expel the atmospheric air dissolved in it, the oxygen of which converts this salt into a persulphate. A very agreeable method of exhibiting sulphate of iron is in solution in carbonic acid water.

For local purposes, solutions of it are employed of various strengths, according to circumstances. In chronic ophthalmia, we may use one or two grains to an ounce of water; as an injection in gleet, from four to ten grains.

*Used* for the production of oxide of iron in many of the preparations of iron.

FERRI SULPHAS EXSICCATA [U. S.], *Dried Sulphate of Iron.*—Take of sulphate of iron, four ounces. Expose the sulphate of iron in a porcelain capsule to a moderate heat, which may be finally raised to 400°, until aqueous vapor ceases to be given off. Reduce the residue to a fine powder, and preserve it in a stoppered bottle. [" Take of sulphate of iron, in coarse powder, twelve troyounces. Expose it, in an unglazed earthen vessel, to a moderate heat, with occasional stirring, until it has effloresced; then increase the heat to 300°, and maintain it about that temperature until the salt ceases to lose weight. Lastly, reduce the residue to fine powder, and keep it in a well-stopped bottle." U. S.]

By exposure to a moderate heat, the crystals lose $\frac{6}{7}$ths of their water of crystallization; so that 85 grains of dried sulphate are equivalent to 139 grains of the crystallized sulphate, or 3 grains are equal to $4\frac{9}{10}$ grains of the crystals.

*Use.*—This is better adapted than the sulphate of iron for administration in the form of pills.

*Dose.*—Half a grain to three grains.

## [**Liquor Ferri Subsulphatis**, U. S., *Solution of Subsulphate of Iron.* $2Fe_2O_3,5SO_3$.

*Syn.*—Solution of Persulphate of Iron; Monsel's Solution.

"Take of sulphate of iron, in coarse powder, twelve troyounces; sulphuric acid, a troyounce and thirty grains; nitric acid, a troyounce and three hundred grains; distilled water, a sufficient quantity. Mix the acids with half a pint of distilled water in a capacious porcelain capsule, and, having heated the mixture to the boiling point, add the sulphate of iron, one-fourth at a time, stirring after each addition until effervescence ceases. Then keep the solution in brisk ebullition until nitrous vapors are no longer perceptible, and the color assumes a deep ruby-red tint. Lastly, when the liquid is nearly cold, add sufficient distilled water to make it measure twelve fluidounces." U. S. In this process the nitric acid oxidizes the protoxide of iron of the sulphate and converts it into the sesquioxide. In order to fully neutralize the latter and convert it into tersulphate, three proportions of sulphuric acid would be necessary; instead of this, there is just sufficient of the acid to convert it into a subsulphate. Thus, $12(FeO,SO_3)+2NO_5=6(Fe_2O_3)+12\,SO_3+2NO_2$, add $3SO_3=6(Fe_2O_3)+15SO_3=3(2Fe_2O_3,5SO_3)$.

*Officinal Characters.*—An inodorous, syrupy liquid, of a ruby-red color, and of an extremely astringent taste, without causticity. Its specific gravity is 1.552. It mixes with water and with alcohol in all proportions without decomposition, and yields with ammonia (sesquioxide of iron) a bulky reddish-brown precipitate. By evaporating a portion of it on a glass surface with a moderate heat, the salt may be obtained in transparent scales, which are deliquescent, and readily soluble in water.

*Therapeutics.*—Monsel's salt is possessed of very great astringency, with very little or no irritant properties. It is therefore one of the best and most powerful styptics. Internally, it has been used with great advantage, in hemorrhage from the stomach and bowels. Also as an injection in hemorrhage from the rectum. It is sometimes useful as an astringent and stimulating application to flabby indolent ulcers. Externally it should be applied in solution by means of a camel's-hair brush or a dossil of lint. In hemorrhage of the stomach it may be given in 5—15 grain doses in solution; in hemorrhage from the bowels the same dose in pill. As an astringent chalybeate it may be exhibited in 1—3 gr. doses after meals.—W.]

### **Ferri Sulphas Granulata,** *Granulated Sulphate of Iron.*

$FeO,SO_3+7HO$.

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

Sulphate of iron is very liable to become ochreous in consequence of portions of the solution from which it has been deposited adhering between the plates of the crystals. This is prevented in the above process from the salt at once forming in hard grains from its want of solubility in the spirit, which latter also impedes their oxidation during drying.

*Officinal Characters.*—In small granular crystals of a pale-green color, and mildly styptic taste, soluble in water, insoluble in rectified spirit.

*Tests.*—Free from opaque rust-colored spots, and dissolving in water without leaving any ochrey residue. The aqueous solution gives no precipitate with sulphuretted hydrogen, and one nearly white with ferrocyanide of potassium.

SOLUTION OF SULPHATE OF IRON. (Appendix B. II.)—Take of granulated sulphate of iron, ten grains; boiling distilled water, one fluidounce. Dissolve. This solution should be recently prepared.

*Uses.*—Solution of protosulphate of iron is used as a test for nitric acid, which turns it to a deep olive green, owing to the formation and solution of binoxide of nitrogen ($NO_2$).

### **Solution of Persulphate of Iron.** (Appendix A.)

### [**Liquor Ferri Tersulphatis,** U. S., *Solution of Tersulphate of Iron.*]

Persulphate of iron, $Fe_2O_3,3SO_3$, in solution in water.

*Preparation.*—Take of sulphate of iron, eight ounces; sulphuric acid, six fluidrachms; nitric acid, four fluidrachms; distilled water, twelve fluidounces, or a sufficiency. Add the sulphuric acid to ten ounces of the water, and dissolve the sulphate of iron in the mixture, with the aid of heat. Mix the nitric acid with the remaining two ounces of water, and add the dilute acid to the solution of sulphate of iron. Concentrate the whole by boiling until, upon the sudden disengagement of ruddy vapors, the liquid ceases to be black and acquires a red color. A drop of the solution is now to be tested with ferridcyanide of potassium, and if a blue precipitate forms, a few additional drops of nitric acid should be added, and the boiling renewed, in order that the whole of the protosulphate may be converted into persulphate of iron. When the solution is cold, make the quantity eleven fluidounces by the addition, if necessary, of distilled water. [" Take of sulphate of iron, in coarse powder, twelve troyounces; sulphuric acid, two troyounces and sixty grains; nitric acid, a troyounce and three hundred and sixty grains; water, a sufficient quantity. Mix the acids with half a pint of water in a capacious porcelain capsule, and, having heated the mixture to the boiling point, add the sulphate of iron, one-fourth at a time, stirring after each addition until effervescence ceases. Then continue the heat until the solution acquires a reddish-brown color, and is free from nitrous odor. Lastly, when the liquid is nearly cold, add sufficient water to make it measure a pint and a half." U. S.]

The oxidation process here is exactly the same as in the preparation of magnetic oxide of iron: $6(FeO,SO_3)+3SO_3+NO_5=3(Fe_2O_3,3SO_3)+NO_2$.

*Officinal Characters.*—A viscid solution of a dark-red color, inodorous, and very astringent, miscible in all proportions with alcohol and water. Diluted with ten volumes of water it gives a white precipitate with the chloride of barium ($BaO,SO_3$), and a blue precipitate with the ferrocyanide, but not with the ferridcyanide of potassium (showing the conversion into peroxide is complete). [" Its specific gravity is 1.320. A fluidounce of it yields, on the addition of ammonia in excess, a bulky reddish-brown precipitate (sesquioxide of iron) which is free from black discoloration, and which, when washed, dried, and ignited, weighs sixty-nine grains." U. S. The U. S. Ph. solution is not much more than two-thirds the strength of the British. It is perfectly clear, not at all viscid, and has a very strongly acid styptic taste. It is not used as a medicine on account of its very marked irritant properties.—W.]

*Tests.*—Specific gravity, 1.441. One fluidrachm diluted with two fluidounces 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.

*Pharmaceutic Use.*—Employed in the preparation of hydrated peroxide of iron, tartarated iron, citrate of iron and ammonia, and citrate of iron and quinia. [In the U. S. Pharmacopœia it is employed in the formation of ferri et ammoniæ sulphas, ferri et ammoniæ tartras, ferri et potassæ tartras, ferri ferrocyanidum, ferri oxidum hydratum, ferri pyrophosphas, liquor ferri citratis.—W.]

## **Liquor Ferri Perchloridi,** *Solution of Perchloride of Iron.*

Perchloride of iron, $Fe_2Cl_3=162.5$, in solution in water.

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

By the action of hydrochloric acid upon metallic iron, hydrogen is evolved, and protochloride of iron produced, $Fe+HCl=FeCl+H$. This protochloride (containing excess of hydrochloric acid) is then oxidized at the expense of the nitric acid, and converted into perchloride, $6FeCl+3HCl+NO_5=3Fe_2Cl_3+3HO+NO_2$. During the evaporation it should be well boiled to expel any nitric acid. The quantity of hydrochloric acid ordered is not quite sufficient to prevent a formation of basic chloride when diluted with water or spirit.

*Officinal Characters.*—An orange-brown solution, without smell, but possessing a strong styptic taste; miscible with water and alcohol in all proportions. Diluted with water it is precipitated white by nitrate of silver (AgCl), and blue by the ferrocyanide, but not by the ferridcyanide of potassium (showing that the conversion into perchloride is complete).

*Composition.*—The anhydrous perchloride has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 2 | Iron | 56 | 34.46 |
| 3 | Chlorine | 106.5 | 65.54 |
| | Perchloride of Iron | 162.5 | 100.00 |

*Uses.*—Employed in the preparation of the tincture of perchloride of iron. It may be used, diluted with water, as an astringent wash in leucorrhœa.

*Tests.*—Specific gravity, 1.338. A fluidrachm diluted with two fluidounces 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.

[**Ferri Chloridum,** U. S., *Chloride of Iron.* ($Fe_2Cl_3$).

"Take of iron, in the form of wire and cut in pieces, two troyounces; muriatic acid twelve troyounces; nitric acid, a troyounce, or a sufficient quantity. To eight troyounces of the muriatic acid, introduced into a two-pint flask, add the iron, and apply a gentle heat until the acid is saturated and effervescence has ceased. Filter the solution, add to it the remainder of the muriatic acid, heat the mixture nearly to the boiling point in a four pint porcelain capsule, and add nitric acid in successive portions until red fumes are no longer evolved, and a drop of the liquid ceases to yield a blue precipitate with ferridcyanide of potassium. Transfer the liquid to a smaller capsule, evaporate it by a gentle heat, on a sand-bath, until reduced to eight troyounces and three hundred and sixty grains, and set it aside, covered with glass, for several days, in order that it may form a solid, crystalline mass. Lastly, break this into pieces, and keep the fragments in a well-stopped bottle protected from the light." U. S.

The chemical reactions in this process are explained under the head of Liq. Ferri Perchloridi Br. The U. S. Pharmacopœia prefers the solid salt because it keeps better, the solution having a strong tendency to deposit the sesquioxide, leaving an excess of the acid in the solution.

*Officinal Character.*—In orange-yellow, crystalline pieces, very deliquescent, and wholly soluble in water, alcohol, and ether. Its solution in water affords with ammonia a brown precipitate of hydrated sesquioxide of iron, and does not yield a blue one with ferridcyanide of potassium (red prussiate of potassa).

*Therapeutics.*—It is used as an external styptic application and as an astringent wash. When applied with just enough water to form a pasty mass it is a powerful hæmostatic. When used as a wash the strength should be gr. v—ʒj—f℥j; as a styptic, ʒij—ʒvj—f℥j.—W.]

Tinctura Ferri Perchloridi, *Tincture of Perchloride of Iron.* [Tinctura Ferri Chloridi, U. S. P., *Tincture of Chloride of Iron.*]—Take of solution of perchloride of iron, five fluidounces; rectified spirit, fifteen fluidounces. Mix, and preserve in a stoppered bottle.

*Test.*—Specific gravity 0.992.

This tincture has one-fourth of the strength of Tinctura Ferri Sesquichloridi, *Dub.* It contains about as much perchloride of iron as the

London tincture, but much less free acid, so that it can be used, if desirable, in larger doses.

["Take of iron, in the form of wire and cut in pieces, three troyounces; muriatic acid, seventeen troyounces and a half; alcohol, three pints; nitric acid, distilled water, each, a sufficient quantity. Introduce the iron into a flask of the capacity of two pints, pour upon it eleven troyounces of the muriatic acid, and allow the mixture to stand until effervescence has ceased. Then heat it to the boiling point, decant the liquid from the undissolved iron, filter it through paper, and, having rinsed the flask with a little boiling distilled water, add this to it through the filter. Pour the filtered liquid into a capsule of the capacity of four pints, add the remainder of the muriatic acid, and, having heated the mixture nearly to the boiling point, add a troyounce and a half of nitric acid. When effervescence has ceased, drop in nitric acid, constantly stirring, until it no longer produces effervescence. Lastly, when the liquid is cold, add sufficient distilled water to make it measure a pint, and mix it with the alcohol." U. S. The first steps in this process result in the conversion of the iron into the perchloride as explained under the head of Liq. Ferri Perchloridi, Br. There is more than sufficient acid used. The free acid reacts with the alcohol, forming an ether, which gives to the preparation its peculiar odor and probably some of its peculiar therapeutic powers. As prepared by the U. S. process tincture of the chloride of iron is probably a more certain preparation than when made in accordance with the Br. Ph. The strengths are about the same. "A yellowish-brown liquid, having a harsh, acid, styptic taste, and an agreeable ethereal odor. Its specific gravity is 0.990. A fluidounce of it, diluted with water, and treated with ammonia in excess, affords a precipitate of sesquioxide of iron, which, when washed, dried, and ignited, weighs twenty-nine grains." U. S.—W.]

*Physiological Effects.*—Tincture of perchloride of iron is, in its local action, one of the most powerful of the preparations of iron. It acts as an energetic astringent and styptic, and in large doses as an irritant. When swallowed in large medicinal doses it readily disorders the stomach. The general or constitutional effects of this preparation agree with those of other ferruginous compounds. It appears to possess, in addition, powerfully diuretic properties. Indeed, it would seem to exercise some specific influence over the whole of the urinary apparatus; for, on no other supposition can we explain the remarkable effects which it sometimes produces in affections of the kidneys, bladder, urethra, and even the prostate gland. It usually constipates the bowels.

*Therapeutics.*—It is sometimes, though not frequently, used as a topical agent. Thus it is applied as a *caustic* to venereal warts, and to spongy granulations. As an *astringent* it is sometimes employed as a local application to ulcers attended with a copious discharge; or as a *styptic* to stop hemorrhage from numerous small vessels, or from leech bites, or after the extraction of teeth. In the form of a weak solution, the perchloride has been employed in surgery for the purpose of effecting the cure of aneurism without operation. A case in which a cure was thus effected by M. Lobert has been brought before the French Academy. A small trocar was introduced into the sac; the blade was then withdrawn, and six drops of a solution of perchloride of iron were injected through the canula into the interior of the sac. The injection was repeated, and some severe local and constitutional symptoms followed; nevertheless the sac was ultimately converted to a solid hard tumor. The severe symptoms following the injection were chiefly due to arteritis excited by the irritating action of the perchloride on the walls of the injured vessel. Perchloride of iron in M. Jobert's opinion should be restricted in its employment chiefly to the treatment of traumatic aneurisms, in sacs lately formed and free from inflammation. He regards it as a dangerous method of treatment when the aneurismal sac is inflamed, or when changes of any duration have rendered its walls degenerate and diseased. M. Pravaz had previously employed the tincture of perchloride of iron for the same purpose. As applied to the treatment of aneurismal tumors it has generally been found by French surgeons to be very successful. It frequently causes immediate coagulation of the contents of an aneurismal sac. This is followed by inflammation and suppuration: a small puncture gives exit to a purulent serosity, and within a short period an eschar is cast off, while the tumor itself contracts to the size of a small nut. This plan of treatment is more especially adapted to aneurisms of those vessels the trunks of which are not accessible for ligature. The following are the principal phenomena observed on the injection of the perchloride into an artery. 1. The formation of primary and secondary clots. 2. The infiltration of plastic lymph into the sheath of the artery, and adhesion of the clots. 3. The elimination of the disorganized parts. 4. Hypertrophy of the middle coats. 5. The encysting of the clots. 6. The disappearance of the secondary clots and plastic formations. 7. Occlusion of the artery. As this liquid is a powerful irritant, there is necessarily some risk attending its use in the treatment of aneurisms.

M. Malgaigne has lately brought before the Academy of Medicine of Paris a series of cases which tend to show that the above injections are not only very often ineffectual, but they are fraught with much danger. In one instance death took place from phlebitis after the use of this injection, and many cases of failure have been brought forward. M. Velpeau and M. Roux do not, however, join M. Malgaigne in his condemnation of the use of the perchloride, and think that further trials should be made, especially as regards erectile tumors. The injection of a coagulating fluid, although merely a few drops at a time, into an aneurismal sac, is a proceeding which should not be lightly undertaken, especially as compression and the ligature offer such favorable chances of controlling the disease. Still, it would be a valuable discovery if either the perchloride of iron, or any other powerfully coagulating substance, could be made to cause the obliteration of an aneurism of those vessels which a ligature cannot reach. Cautious trials might perhaps be continued, and it may be that a most beneficial innovation is at hand.

Internally it may be employed as a *tonic* in any of the cases in which the other ferruginous compounds are administered, and which I have already mentioned. It is one of our best remedies in anæmia and chlorosis. It has been especially commended in scrofula. Mr. Hamilton Bell has employed this tincture with great success in the treatment of erysipelas. The bowels are first to be freely opened. The tincture is then given, in mild cases, in doses of from fifteen to twenty-five minims every two hours. [I have employed this remedy in nearly one hundred cases of idiopathic erysipelas of the face and head, and, with two exceptions, successfully. It not only cured the disease, but much shortened its duration, and prevented to a great degree its exhausting effects, as Mr. Bell has stated. One of the fatal cases was just recovering from severe rheumatic endo-pericarditis, when erysipelas occurred. The other was free from any complication, but was much exhausted when I first saw her, and probably took the tincture in too small doses, viz., fifteen minims. I consider the repetition of the dose (20 to 30 minims) every two hours very important, and have seen patients, who had taken the tincture for a week every four hours without benefit, immediately improve after taking it every two hours. I give it both in asthenic and sthenic cases, and find delirium no objection to its use.—Ed.] The only local application is hair powder or cotton wadding. To infants it may be given in doses of two drops and upwards. In various affections of the urino-genital organs it is frequently used with great success. Thus, in retention of urine, arising from spasmodic stricture, its effects are sometimes beneficial. It should be given in doses of ten minims every ten minutes. However, Mr. Lawrence, alluding to Mr. Cline's recommendation of it, says: "I believe general experience has not led others to place any very great confidence in the use of this remedy." In incontinence of urine in children, it is particularly serviceable in doses of from three to four minims. In gleet and leucorrhœa it is sometimes serviceable. I have found it occasionally successful, when given in conjunction with the tincture of cantharides, in the latter stage of gonorrhœa, after a variety of other remedies had failed. In passive hemorrhage from the kidneys, uterus, and bladder, it is employed with great benefit. It also greatly diminishes the disposition to worms in children.

[In chronic desquamative nephritis, and probably other varieties of the so-called Bright's disease, tr. ferri chloridi is a very useful remedy, acting as a chalybeate, astringent, and diuretic, diminishing the amount of albumen, and increasing the flow of urine.—W.]

*Administration.*—The dose of it is from ten to thirty minims, gradually increased to one or two drachms, and taken in some mild diluent.

### **Ferri Iodidum,** *Iodide of Iron.* $FeI+4HO=191$.

*Preparation.*—Take of fine iron wire, one ounce and a half; iodine, three ounces; distilled water, fifteen fluidounces. Introduce the iodine, iron, and twelve ounces of the water into a flask, and having heated the mixture gently for about ten minutes, raise the heat, and boil until the solution loses its red color. Pass the solution through a small paper filter into a dish of polished iron, washing the filter with the remainder of the water, and boil down until a drop of the solution taken out on the end of an iron wire solidifies on cooling. The liquid should now be poured out on a porcelain dish, and, as soon as it has solidified, should be broken into fragments, and inclosed in a stoppered bottle.

A great excess of iron is here ordered, and in all the preparations of this salt, as it facilitates the action and insures the rapid formation of the iodide.

*Officinal Characters.*—Crystalline, green with a tinge of brown, inodorous, deliquescent, soluble in water, forming a slightly green solution which gradually deposits a rust-colored sediment, and acquires a red color (from absorption of oxygen from the air). It gives a copious blue precipitate with the ferridcyanide of potassium, and one of a similar color with mucilage of starch, on the addition of a minute quantity of chlorine (indicating iodine).

*Properties.*—Iodide of iron has a styptic taste. It is soluble in its own weight of water. By exposure to the air it is decomposed, and deposits peroxide of iron with liberation of iodine. When in solution the deteriorating effect of this action on the strength of the solution is prevented by the introduction of a coil of iron wire. When heated in the air, it absorbs oxygen, and is converted into peroxide of iron and iodine, which escapes in violet vapor.

*Test.*—It dissolves almost entirely in water, leaving but a very small quantity of red sediment (showing a trace only of basic salt).

*Physiological Effects.*—In *small and repeated doses* its effects are not very obvious, save that of blackening the stools. It sometimes sharpens the appetite and promotes digestion. It passes out of the system in the urine, and both of its constituents may be detected in this fluid. When it does not purge, it frequently acts as a diuretic. In *full doses*, as ten grains, it on one occasion caused uneasy sensation at the epigastrium, nausea, slight headache, copious black stool, and, in two hours, a larger quantity of urine, containing both iron and iodine. Its medicinal influence on the body seems to be stimulant, hematinic, tonic, and alterative or deobstruent. It possesses the combined properties of iron and iodine.

*Therapeutics.*—Iodide of iron is indicated as a tonic, hematinic, and resolvent in cases of debility accompanied with a soft and relaxed condition of the solids, and paleness of the skin. It is especially applicable in scrofulous and strumous affections of the glandular system, in which the use both of iodine and iron is indicated. In tabes mesenterica, and in swellings of the cervical lymphatic glands, it often proves highly advantageous. In chlorosis, and in atonic amenorrhœa, Dr. Thomson found it serviceable; and his testimony of its good effects has been supported by that of others. Its operation must be promoted by exercise and an invigorating diet. In secondary syphilis, occurring in debilitated and scrofulous subjects, it is in some cases, according to the testimony of both Drs. Thomson and Ricord, a valuable remedy. The last-mentioned writer employed it in the form of injection (composed of from thirty to sixty grains of iodide dissolved in eight ounces of water) in blenorrhœas, and in that of lotion in venereal and carious ulcers. Dr. Pierquin employed it internally and externally in leucorrhœa and amenorrhœa. It has also been used in incipient cancer and in atonic dyspepsia. Dr. Walsh considers it as specially appropriate in cases of cancer attended with anæmia.

*Administration.*—The dose of it is three grains gradually increased to eight, ten, or more. Ricord has given forty grains per day. It may be exhibited in the form of syrup, tincture, or of aqueous solution, flavored with a little tincture of orange-peel. It must be remembered that acids, alkalies, and their carbonates, most metallic salts, all vegetable astringents, and many organic solutions, decompose it. Pierquin gave it in chocolate, Bourdeaux wine, distilled water, diluted spirit, or made into lozenges with saffron and sugar. In leucorrhœa and amenorrhœa, he employed an ointment (composed of sixty grains of iodine to an ounce of lard), by way of friction to the upper part of the thighs.

Syrupus Ferri Iodidi [U. S.], *Syrup of Iodide of Iron.* [*Synonym*, Liquor Ferri Iodidi, *U. S. Pharm.* 1850.]—Take of fine iron wire, one ounce; iodine, two ounces; refined sugar, twenty-eight ounces; distilled water, thirteen fluidounces. 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.

By filtering the solution of iodide of iron into a strong syrup, the oxidizing action of the air is greatly impeded by the sugar. This process yields 31 ounces by measure of syrup, which contains $5\frac{1}{4}$ grains of iodide of iron to the fluidrachm. The syrup should be kept in well-filled and well-stoppered bottles.

*Dose*.—Half a drachm to a drachm.

["Take of iodine, two troyounces; iron, in the form of wire and cut in pieces, three hundred grains; distilled water, three fluidounces; syrup, a sufficient quantity. Mix the iodine, iron, and distilled water in a flask of thin glass; shake the mixture occasionally until the reaction ceases, and the solution has acquired a green color and lost the smell of iodine. Then, having introduced a pint of syrup into a graduated bottle, heat it by means of a water-bath to 212°, and, through a small funnel inserted in the mouth of the bottle, filter into it the solution already prepared. When this has passed, close the bottle, shake it thoroughly, and, when the liquid has cooled, add sufficient syrup to make the whole measure twenty fluidounces. Lastly, again shake the bottle, and transfer its contents to two-ounce vials, which must be well stopped." U. S. A transparent liquid, of a pale-green color. It deposits no sediment by keeping, and does not tinge solution of starch blue. Mixed with sulphuric acid it becomes brown, and the mixture emits violet vapors when heated. This syrup is considerably stronger than the corresponding British preparation, as it contains 7.33 grains of the dry iodide to a fluidrachm, and may be given in from twenty to forty drop doses after meals.—W.]

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.

Three grains contain one of the iodide.

[Pilulæ Ferri Iodidi, U. S.—"Take of iodine, half a troyounce; sugar, in fine powder, a troyounce; marshmallow, in fine powder, half a troyounce; gum Arabic, in fine powder, reduced iron, each, sixty grains; water, ten fluidrachms. Mix the iodine with a fluidounce of the water in a thin-glass bottle, add the iron, and shake them together until a clear, green solution is obtained. Mix the powders in a small porcelain capsule, and filter upon them, through a small filter, first the solution previously heated, and afterwards the remainder of the water in order to wash the filter. Then, by means of a water-bath, with constant stirring, evaporate the whole to a pilular consistence, and divide the mass into three hundred pills. Dissolve sixty grains of balsam of Tolu in a fluidrachm of ether, shake the pills with the solution until they are uniformly coated, and put them on a plate to dry, occasionally stirring them until the drying is completed. Lastly, keep the pills in a well-stopped bottle." U. S.

These pills are devoid of the smell of iodine; and distilled water, rubbed with them and filtered, does not color solution of starch, or gives it only a slight blue tint. The process of the U. S. Ph. is much superior to that of Br. Ph., because it protects the pills against the oxygen of the air so much more completely, both during and after their manufacture. The U. S. pill contains nearly one grain of iodine, and one-fifth of a grain of iron. One pill may be given *after meals* to commence with, gradually increased to three.—W.]

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

## [**Liquor Ferri Nitratis,** U. S., *Solution of Nitrate of Iron.*]

Pernitrate of Iron, $Fe_2O_3,3NO_5$, in solution in water.

*Preparation.*—Take of fine iron wire, free from rust, one ounce; nitric acid, three fluidounces; 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. ["Take of iron, in the form of wire and cut in pieces, two troyounces and a half; nitric acid, five troyounces; distilled water, a sufficient quantity. Mix the iron with twelve fluidounces of distilled water in a wide-mouthed bottle, and add to the mixture, in small portions at a time, with frequent agitation, three troyounces of the nitric acid, previously mixed with six fluidounces of distilled water, moderating the reaction by setting the vessel in cold water, in order to prevent the occurrence of red fumes. When the effervescence has nearly ceased, agitate the solution with the undissolved iron until a portion of the liquid, on being filtered, exhibits a pale-green color. Then filter the liquid, and, having poured it into a capacious porcelain capsule, heat it to the temperature of 130°, and add the remainder of the nitric acid. When the effervescence has ceased, continue the heat until no more gas escapes, and then add sufficient distilled water to bring the liquid to the measure of thirty-six fluidounces." U. S. As prepared by the U. S. Ph. process, the solution of the nitrate of iron is only about one-half the strength of the corresponding British preparation.—W.]

The iron is oxidized at the expense of one portion of the nitric acid, binoxide of nitrogen being given out; the peroxide of iron thus formed is then dissolved in the undecomposed acid; $2Fe+4NO_5=Fe_2O_3,3NO_5+NO_2$.

*Officinal Characters.*—A clear solution of a reddish-brown color, slightly acid and astringent to the taste; gives a blue precipitate with the ferrocyanide of potassium ($Fe_2O_3$). 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 color (indicating $NO_5$ by the formation of $NO_2$, which is held in temporary solution by the sulphate of iron).

*Tests.*—Specific gravity, 1.107. One fluidrachm treated with an excess of solution of ammonia gives a precipitate which, when washed, dried, and incinerated, weighs 2.6 grains. It gives no precipitate with the ferridcyanide of potassium (showing its freedom from protoxide). ["A transparent liquid, having a pale-amber color, and a specific gravity between 1.060 and 1.070. It does not afford a blue precipitate with ferridcyanide of iron. A fluidounce of it, on the addition of ammonia in excess, yields a reddish-brown precipitate, which, when washed, dried, and ignited, weighs between eight and ten grains." U. S.]

*Physiological Effects.*—They are those of a very powerful astringent and mild caustic. Mr. Kerr thinks that, in addition to the astringent quality, it possesses the property of diminishing the tenderness of the mucous membranes with which it comes in contact. Its remote effects are hematinic and tonic, like other chalybeates. Altogether, this preparation resembles in its medicinal properties the perchloride of iron.

*Therapeutics.*—Mr. Kerr introduced it as a valuable remedy for chronic diarrhœa both in children and adults, and whether accompanied with vomiting or not. With the exception of dysentery, he found it useful in almost every case of diarrhœa. He employed it both by the mouth and by the rectum. Dr. Graves has borne testimony to its beneficial effects; as has also Kopp, who states that he gave it with success in many cases which had resisted every approved remedy. Dr. Reynolds, of Brookville, U. S., confirms Mr. Kerr's observations on its efficacy, especially in arresting choleraic diarrhœa. Dr. T. C. Adams, of the United States, employed it not only in diarrhœa, but also in other mucous discharges, as leucorrhœa, in which disease he conjoined the local use of it with its internal administration. He also used it in aphthous sores and toothache (Dunglison). Dr. J. W. Williams used it with success in the diarrhœa and alvine hemorrhage of typhoid fever.

It seems well adapted for hæmatemesis, hemorrhage from the bowels, and uterine hemorrhage, in pale, feeble, and languid constitutions. In such it may be employed to serve the double purpose of a topical astringent, and a tonic and hæmatinic. It has been used as a substitute for quinine in intermittent fever. The pernitrate has been used of late, like the perchloride, for injecting aneurismal sacs and nævi. In one case in which it was used for nævus, sloughing took place and the child died. In a concentrated state it has a powerful local action.

The *dose* of it is from ten minims to a fluidrachm. Mr. Kerr gave in some cases a teaspoonful three or four times a day; and he was acquainted with one case in which half an ounce was swallowed with no other effect than a considerable degree of costiveness. It may be given in plain water. Kopp gave it in gruel; but it is probable that it would prove less effective as a topical agent when administered in gruel than in simple water. To children it may be given in doses of a few drops according to their age. Mr. Kerr employed from nine to twelve drops, in warm water, in the form of enema, for young children. Diluted with water, it has been employed, as an injection, in leucorrhœa and uterine hemorrhage.

### **Ferri Arsenias,** *Arseniate of Iron.*

Arseniate of iron, $3FeO,AsO_5$, partially oxidated.

*Preparation.*—Take of sulphate of iron, nine ounces; arseniate of soda, dried at 300°, four ounces; acetate of soda, three ounces; boiling distilled water, a sufficiency. Dissolve the arseniate and acetate of soda in two pints, and the sulphate of iron in three pints of the water, mix the two solutions, collect the white precipitate which forms, on a calico filter, and wash until the washings cease to be affected by a dilute solution of chloride of barium. Squeeze the washed precipitate between folds of strong linen in a screw press, and dry it on porous bricks in a warm air chamber whose temperature shall not exceed 100°.

The arsenic acid of the arseniate of soda combines with the oxide of iron of the sulphate to form arseniate of iron, the sulphuric acid uniting with the soda, both of the arseniate and acetate, and liberating acetic acid, in which the arseniate of iron is insoluble, $3FeO,SO_3+2NaO,HO,AsO_5+NaO,\bar{A}=3FeO,AsO_5+3NaO,SO_3+\bar{A}+HO$.

*Officinal Characters.*—A tasteless amorphous powder of a green color, insoluble in water, but readily dissolved by hydrochloric acid. This solution gives a copious light-blue precipitate with the ferridcyanide of potassium (FeO), and a still more abundant one of a deeper color with the ferrocyanide of potassium ($Fe_2O_3$). A small quantity boiled with an excess of caustic soda and filtered gives, when exactly neutralized by nitric acid, a brick-red precipitate on the addition of solution of nitrate of silver (arseniate of silver).

*Tests.*—The solution in hydrochloric acid when diluted gives no precipitate with chloride of barium (showing its freedom from sulphates). Twenty grains dissolved in an excess of hydrochloric acid diluted with water continue to give a blue precipitate with the ferridcyanide of potassium until at least seventeen measures of the volumetric solution of bichromate of potash have been added (the protoxide of iron is peroxodized by the chromic acid of the bichromate, and the volume required is equal to 2.8 grains of protoxide in the preparation).

*Physiological Effects.*—Its effects are similar to those of arsenious acid; topically it acts as a caustic. In about half an hour it excites uneasiness, which continues for several hours, and is followed by swelling, especially when it is used for ulcers of the face: in a few days a slough is formed. The employment of it, like that of other arsenical preparations, requires caution, as the arsenic becomes absorbed.

*Therapeutics.*—The therapeutical properties of the arseniate of iron in the treatment of herpetic and squamous diseases of the skin has been lately minutely investigated by M. Duchesne Duparc; and, in a memoir read before the French Academy, he advances the following propositions as the result of his researches: 1. Arseniate of iron possesses, in common with all other arsenical preparations, unquestionable remedial properties, applicable to the treatment and cure of herpetic and squamous affections of the skin. 2. The great advantage of this substance is, that it may be administered in sufficient doses without giving rise to any of the consequences with which various other arsenical preparations have been justly reproached. 3. The arseniate of iron, whether given singly or in combination with other substances, ought always to be administered in graduated doses, commencing from one-twentieth, one-tenth, or even one-fifth of a grain, according to the age, the constitution, and, above all, the state of the digestive organs of the patient. 4. Numerous facts, accurately observed, authorize M. Duparc in concluding, that a daily dose of one-fifth of a grain of arseniate of iron, uninterruptedly repeated during the necessary time, is competent in the adult to effect the cure of an herpetic or squamous affection however extensive or long established. Mr. Carmichael used it externally in ulcerated cancer. He applied from thirty to sixty grains as a dressing in cases of extensive ulceration. It has been used by Biett in lupus, elephantiasis, psoriasis, chronic eczema, and lichen.

*Administration.*—The dose of it is from one-sixteenth to one-twelfth of a grain in the form of pill. It may be applied externally in the form of ointment composed of from twenty to thirty grains of the arseniate to one ounce of fat.

### [**Liquor Ferri Citratis**, U. S., *Solution of Citrate of Iron.*

"Take of citric acid, in coarse powder, five troyounces and three hundred and sixty grains; solution of tersulphate of iron, a pint; water of ammonia, distilled water, each, a sufficient quantity. Dilute the solution of tersulphate of iron with two pints of distilled water, add a slight excess of water of ammonia, with constant stirring, transfer the precipitate formed to a muslin strainer, and wash it with water until the washings are nearly tasteless. When the precipitate is drained, put half of it in a porcelain capsule on a water bath, heated to 150°, add the citric acid, and stir the mixture until the precipitate is nearly dissolved. Then add so much of the reserved precipitate as may be necessary fully to saturate the acid. Lastly, filter the liquid, and evaporate it, at a temperature not exceeding 150°, until it is reduced to the measure of a pint." U. S.

In this process the ammonia precipitates the sesquioxide of iron from the solution of the tersulphate. The subsequent steps result in the union of this with citric acid. Thus $(Fe_2O_3,3SO_3)+3NH_4O=3(NH_4O,SO_3)+Fe_2O_3$ and $Fe_2O_3+\underline{C}=(Fe_2O_3\underline{C})$. This preparation is of a deep reddish-brown color, and keeps unchanged for a long time. Its taste is ferruginous. It may be given as a mild chalybeate in doses of ten minims (five grains of the salt), after meals, administered in water. It is much used in the formation of other salts of iron, being officinally so in Ferri Citras, U. S., Ferri et Ammoniæ Citras, U. S., Ferri et Quiniæ Citras, U. S.—W.]

[Ferri Citras, U. S., *Citrate of Iron.*—" Take of solution of citrate of iron, a convenient quantity. Evaporate it to the consistence of syrup and spread it on plates of glass so that, on drying, the salt may be obtained in scales." U. S. This salt is of a deep ruby-red color, entirely uncrystallizable and very soluble. It is a mild and pleasant chalybeate, and may be given in five grain doses either in pill or solution.—W.]

**Ferri et Ammoniæ Citras** [U. S.], *Citrate of Iron and Ammonia.*
$(Fe_2O_3,NH_4O,HO,\overline{C}(C_{12}H_5O_{11})+2HO)$?

*Preparation.*—Take of solution of persulphate of iron, eight fluidounces; solution of ammonia, fourteen fluidounces, or a sufficiency; citric acid, in crystals, five ounces; distilled water, half a gallon. Add the persulphate of iron to two pints of the distilled water, and gradually pour the dilute solution into the solution of ammonia, stirring well for a few minutes; collect on a calico filter the hydrated peroxide of iron which precipitates, and wash it with distilled water until the filtrate ceases to become turbid on the addition of chloride of barium. Dissolve the citric acid in the remainder of the water, and digest the solution at a boiling heat on the oxide of iron. Make the liquid neutral by the addition of solution of ammonia, evaporate it to the consistence of syrup, and dry it in thin layers, on flat porcelain or glass plates, at a temperature not exceeding 140°. Remove the dry salt in flakes, and keep it in stoppered bottles. [" Take of solution of citrate of iron, a pint; water of ammonia, six fluidounces. Mix the solution of citrate of iron with the water of ammonia, evaporate the mixture at a temperature not exceeding 150° to the consistence of syrup, and spread it on plates of glass, so that, on drying, the salt may be obtained in scales." U. S. Ferri et ammonia citras has probably nearly the same constitution whether prepared by the U. S. or British process.—W.]

*Officinal Characters.*—In thin transparent scales of a hyacinth-red color, with a tinge of olive-green, slightly sweetish and astringent in taste; feebly reddens litmus paper; is soluble in water, almost insoluble in rectified spirit. Heated with solution of soda, it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with hydrochloric acid, give any crystalline deposit (showing the absence of potash and tartaric acid). [" The solution causes no change in the color of litmus or turmeric, and does not yield a precipitate with ferrocyanide of potassium." U. S.]

*Tests.*—Its solution in water, when acidulated with hydrochloric acid, gives a copious blue precipitate with the ferrocyanide of potassium ($Fe_2O_3$), but none with the ferridcyanide (showing freedom from FeO). When incinerated with exposure to the air it leaves 26.5 per cent. of peroxide of iron.

*Physiological Effects.*—The great advantages of this preparation, as a chalybeate, are: that it is devoid of any disagreeable flavor, so that it is readily taken by children and delicate persons; that it has no irritating properties, so that it is not apt to disturb the stomach; that it is readily soluble in water, forming a very agreeable solution; and that it may be given in conjunction with the alkaline carbonates, and many other salts often required when chalybeates are administered. On the other hand, it has its disadvantages: 1st, being devoid of astringent properties, it is unfitted for those cases in which the chalybeates are resorted to on account of their topical effects; 2dly, it appears to me to operate on the general system more slowly and less powerfully as a hematinic than the perchloride or sulphate.

*Therapeutics.*—In ordinary cases of debility requiring a ferruginous tonic, especially where the stomach is irritable, or where the alkaline carbonates are required to be conjoined, and also in the various strumous affections of children, this salt is a valuable and useful preparation; but in extreme anæmia from violent hemorrhage, where an immediate and powerful hematinic is required, it is inferior to the perchloride and sulphate.

*Administration.*—It may be given in doses of from five to ten grains dissolved in water, flavored with syrup of orange peel, or in infusion of gentian or calumba. If directed to be taken in an effervescing mixture of citrate of potash, it should be dissolved in the citric acid solution.

### **Ferri et Quiniæ Citras** [U. S.], *Citrate of Iron and Quinia.*

Citric acid combined with peroxide of iron, protoxide of iron, and quinia.

*Preparation.*—Take of solution of persulphate of iron, three fluidounces; sulphate of iron, one ounce; distilled water, a sufficiency; solution of soda, thirty-six fluidounces; citric acid, in crystals, two ounces and a quarter; sulphate of quinia, three hundred and eighty grains; dilute hydrochloric acid, a sufficiency; solution of chloride of barium, a sufficiency; solution of ammonia, a sufficiency. Add the solution of persulphate of iron to the sulphate of iron dissolved in ten fluidounces of the water; mix well, and pour the mixture into the solution of soda with constant stirring. Collect the precipitate (peroxide and protoxide of iron) on a calico filter, and wash with distilled water, until the liquid which passes through ceases to give a precipitate with chloride of barium. Dissolve the citric acid in twenty fluidounces of the distilled water, and having then added the washed precipitate, digest the mixture on a water bath, with repeated stirring, until a solution is obtained. In eight fluidounces of the water acidulated with a little of the dilute hydrochloric acid dissolve the sulphate of quinia, add sufficient of the solution of chloride of barium to precipitate the sulphuric acid, and filter, and having treated the solution with a slight excess of ammonia, collect the precipitate (quinia) on a paper filter, and wash it with distilled water until nitrate of silver dropped into the filtrate gives but a very slight precipitate. Transfer the washed quinia to the capsule containing the citrate of iron, and digest on a water bath, until the alkaloid is dissolved. Lastly, let this solution be evaporated to the consistence of syrup, and dried in thin layers on flat porcelain or glass plates at a temperature below 140°, and let the residue be removed in flakes, and preserved in stoppered bottles. The sulphate of quinia is here converted into hydrochlorate by the chloride of barium, the sulphate of baryta formed being removed by filtration.

["Take of solution of citrate of iron, ten fluidounces; sulphate of quinia, a troyounce; diluted sulphuric acid, water of ammonia, distilled water, each a sufficient quantity. Triturate the sulphate of quinia with six fluidounces of distilled water, and, having added sufficient diluted sulphuric acid to dissolve it, cautiously pour into the solution water of ammonia, with constant stirring, until in slight excess. Wash the precipitated quinia on a filter, and, having added it to the solution of citrate of iron, maintained at the temperature of 120° by means of a water-bath, stir constantly until it is dissolved. Lastly, evaporate the solution to the consistence of syrup, and spread it on plates of glass so that, on drying, the salt may be obtained in scales." U. S. This process is essentially different from that of the Br. Ph., and is so simple that it explains itself. The product differs from the corresponding Br. salt, consisting of the sesquioxide of iron, quinia and citric acid, exactly how combined is not known. The officinal characters of the U. S. Ph. are as follows: "In thin transparent scales, varying in color from reddish-brown to yellowish-brown with a tint of green, according to the thickness of the scales. Its taste is ferruginous and moderately bitter. It is soluble in cold water, more readily so in hot water, but insoluble in ether and officinal alcohol. Ammonia, added to the aqueous solution, deepens its color to reddish-brown, and causes a whitish curdy precipitate of quinia, but no sesquioxide of iron is thrown down." The U. S. salt is not deliquescent.—W.]

*Officinal Characters.*—Thin scales of a greenish golden yellow color, somewhat deliquescent, and entirely soluble in cold water; the solution is very slightly acid, and is precipitated reddish-brown by solution of soda (oxide of iron and quinia), white by solution of ammonia (quinia), blue by the ferrocyanide ($Fe_2O_3$) and by the ferridcyanide of potassium ($FeO$), and grayish-black by tannic acid.

This is a different preparation from that usually made, which corresponds to the characters here given, but contains citrate of ammonia.

*Tests.*—Taste bitter as well as chalybeate. When burned with exposure to air, it leaves a residue which yields nothing to water. Fifty grains dissolved in a fluidounce of water and treated with a slight excess of ammonia give a white precipitate (quinia), which, when collected on a filter, and dried, weighs eight grains. The precipitate is entirely soluble in pure ether, when burned leaves no residue, and when dissolved by the aid of an acid forms a solution which, decolorized by a little purified animal charcoal, turns the plane of polarization strongly to the left (showing freedom from cinchonia and quinidia).

*Therapeutics.*—This salt combines the effects of iron and quinia.

*Administration.*—It may be given in the form of a pill, or in solution, in doses of from three to ten grains, or more.

## **Ferrum Tartaratum,** *Tartarated Iron.*

### [**Ferri et Potassæ Tartras,** U. S., *Tartrate of Iron and Potassa.*]

Tartrate of iron and potash, $Fe_2O_3,KO,\overline{T}(C_8H_4O_{10})+HO$.

*Synonym.*—Ferri potassio-tartras, *Lond.*

*Preparation.*—Take of solution of persulphate of iron, four fluidounces; solution of soda, two pints, or a sufficiency; acid tartrate of potash, in powder, two ounces; distilled water, a sufficiency. Add the persulphate of iron to a pint of distilled water, and gradually pour the dilute solution into the solution of soda, stirring well for a few minutes; then collect the precipitate (peroxide of iron) on a calico filter, and wash it with distilled water until the filtrate ceases to become turbid on the addition of chloride of barium. To the acid tartrate of potash and thirty ounces of distilled water placed in a capsule add the precipitate, and digest the mixture with repeated stirring for six hours, at a heat which must be carefully prevented from rising above 140°. After the solution has cooled down to the temperature of the atmosphere, decant it off any undissolved precipitate, evaporate it to the consistence of syrup, and, having poured it in a thin layer on flat porcelain or glass plates, evaporate it to dryness at a temperature not exceeding 140°. Lastly, remove the dried salt in flakes, and preserve it in stoppered bottles. ["Take of solution of tersulphate of iron, a pint; bitartrate of potassa, seven troyounces; distilled water, four pints. With the solution of tersulphate of iron, prepare the hydrated oxide of iron according to the formula for that substance. Mix the bitartrate of potassa with the distilled water, heat the mixture to 140°, and, keeping it at that temperature, gradually add the hydrated oxide, frequently stirring, until it ceases to be dissolved; then filter the solution, evaporate it by means of a water-bath to the consistence of syrup, and spread it upon plates of glass or porcelain, so that on drying, the salt may be obtained in scales." U. S.]

*Officinal Characters.*—Thin transparent scales of a deep garnet-color, slightly deliquescent, somewhat sweet, and rather astringent, soluble in (four parts of) water and sparingly soluble in spirit. The aqueous solution, when acidulated with hydrochloric acid, gives a copious blue precipitate with the ferrocyanide of potassium, but no precipitate with ferridcyanide. When the salt is boiled with solution of soda, peroxide of iron separates, but no ammonia is evolved, and the filtered solution when slightly acidulated by hydrochloric acid gives, as it cools, a crystalline deposit (acid tartrate of potash). ["In transparent scales, of a dark ruby-red color, and wholly soluble in water. The solution does not change the color of litmus, and at common temperatures, does not yield a precipitate with potassa, soda, or ammonia. Ferrocyanide of potassium does not render it blue, unless an acid be added." U. S.]

*Tests.*—By incinerating fifty grains of this preparation at a red heat, and acting on the residue with hydrochloric acid, a solution is obtained which, when digested with a little nitric acid, and afterwards diluted with four fluidounces of water, and supersaturated with ammonia, yields a precipitate of peroxide of iron weighing 14.92 grains.

*Therapeutics.*—In its effects and uses it resembles the ammonio-citrate.

*Administration.*—It may be given in doses of from ten to thirty grains, dissolved in water, or in sherry, as in the vinum ferri.

Vinum Ferri, *Wine of Iron.*—Take of tartarated iron, one hundred and sixty grains; sherry, one pint. Dissolve.

One fluidrachm should contain one grain of the salt; but in consequence of the tartaric acid in the sherry, much of the tartarated iron is deposited as acid tartrate, $FeO,HO,\overline{T}$; the wine is, therefore, better made with the citrate of iron and ammonia.

*Dose.*—The dose for adults is from $\frac{1}{2}$ fl. oz. to 1 fl. oz. or more; and for children 1 fl. drm. and upwards.

[**Ferri et Ammoniæ Sulphas,** U. S., *Sulphate of Iron and Ammonia.* ($Fe_2O_3,3SO_3+NH_4O,SO_3+24HO$.)

*Synonym.*—Ammonio-ferric Alum.

"Take of solution of tersulphate of iron, two pints; sulphate of ammonia, four troyounces and a half; heat the solution of tersulphate of iron to the boiling point, add the sulphate of ammonia, stirring until it is dissolved, and set the liquid aside to crystallize. Wash the crystals quickly with very cold water, wrap them in bibulous paper, and dry them in the open air." U. S. In this process the salts unite to form a compound salt or alum, in which the sesquioxide of iron replaces the sesquioxide of alumina of ordinary alum, and the ammonia the potassa.

*Properties.*—"In octohedral crystals, of a pale-violet color, soluble in one and a half parts of water at 60°, and in less than their weight of boiling water. Potassa produces with the solution a reddish-brown precipitate (sesquioxide of iron). When rubbed with potassa and moistened, the salt emits the odor of ammonia." U. S. The crystals slowly effloresce on exposure to the air, and have a sour astringent taste.

*Therapeutics.*—Ammonio-ferric alum unites very great astringency to its chalybeate powers. It was first recommended by Dr. Tyler Smith in leucorrhœa, and where the discharge is dependent upon debility, it exercises a very great controlling and curative influence, checking the discharge and building up the system. It is said to be nearly as efficacious in chronic diarrhœas and dysentery. The dose is five grains three times a day, increased if necessary. It may be administered in solution, in syrup or bitter infusion, or if patient object to the taste, in pill, which can be made with gum.—W.]

[**Ferri Lactas,** U. S., *Lactate of Iron.* ($FeO,C_6H_5O_5+3HO$.)

"Take of lactic acid, a fluidounce; iron, in the form of filings, half a troyounce; distilled water, a sufficient quantity. Mix the acid with a pint of distilled water in an iron vessel, add the iron, and digest the mixture on a water-bath, supplying distilled water, from time to time, to preserve the measure. When the action has ceased, filter the solution while hot, into a porcelain capsule, and set it aside to crystallize. At the end of forty-eight hours, decant the liquid, wash the crystals with a little alcohol, and dry them on bibulous paper. By evaporating the mother-water in an iron vessel to one-half, filtering while hot, and setting the liquid aside, more crystals may be obtained." U. S. In this process the iron is converted into the protoxide by the water (hydrogen being liberated) and then unites with the lactic acid. Thus, $Fe+4HO+C_6H_5O_5=[FeO.C_6H_5O_5+3HO]+H$.

*Officinal Characters.*—"In greenish-white crystalline crusts or grains of a mild, sweetish, ferruginous taste, soluble in forty-eight parts of cold, and twelve of boiling water, but insoluble in alcohol. Exposed to heat it froths up, gives out thick, white, acid fumes, and becomes black; sesquioxide of iron being left. If it be boiled for fifteen minutes with nitric acid of the specific gravity 1.20, a white, granular deposit of mucic acid will occur on the cooling of the liquid." U. S. The solution of lactate of iron has an acid reaction, and quickly becomes yellow, owing to the absorption of oxygen.

*Therapeutics.*—This salt is a mild, efficient chalybeate, and is said to have also the property of greatly increasing the appetite. The dose is

1 to 3 grains after meals; increased to 4 or 5. It may be given in solution or pill. The solution should be freshly prepared and be saturated with sugar. The pill should be made with honey and some inert powder.—W.]

[**Ferri Ferrocyanidum**, U. S., *Ferrocyanide of Iron.*
($Fe_4(FeCy_3)_3+6HO$.)

*Ferri Ferrocyanuretum*, *Pharm.* 1850. *Pure Prussian Blue.*

"Take of ferrocyanide of potassium, nine troyounces; solution of tersulphate of iron, a pint; water, three pints. Dissolve the ferrocyanide of potassium in two pints of the water, and add the solution gradually to the solution of tersulphate of iron, previously diluted with the remainder of the water, stirring the mixture during the addition; then filter the liquid, and wash the precipitate on the filter with boiling water until the washings pass nearly tasteless. Lastly, dry it, and rub it into powder." U. S. In this process there is a double decomposition of the reagents resulting in the formation of the officinal salt and of sulphate of potassa. Thus, $3(K_2(FeCy_3)+2(Fe_2O_3 3SO_3)=(Fe_4(FeCy_3)_3)+6(KO,SO_3)$. As the Prussian blue always contains six equivalents of water, which cannot be separated from it without decomposition, its full formula is that given above. Some chemists regard it a hydro-ferrocyanate of the sesquioxide of iron; arranging its formula in accordance with this view, it would be $2Fe_2O_3,3H_2FeCy_3$.

*Officinal Characters.*—"A tasteless powder, insoluble in water and the dilute mineral acids, and having a rich, deep-blue color. Dilute muriatic acid, after having been boiled on it, yields no precipitate on the addition of ammonia." U. S. Most of the Prussian blue of commerce contains free sesquioxide of iron; if this be present, the ammonia in the last test will throw down a brown precipitate ($Fe_2O_3$).

*Therapeutics.*—Owing to the cyanogen which it contains, this salt is said to unite sedative to its chalybeate powers. It is also affirmed to be an alterative and even an antiperiodic. It has been recommended in malarial fevers "as more certain, prompt and efficacious, than bark," in epilepsy and in neuralgia. It should be given in pill in 3 gr. doses, t. d. increased to 5 grs.—W.]

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## COPPER (*Cuprum*). Cu=31.75.

*Natural History.*—Copper is found in the metallic or reguline state; combined with oxygen, both as red oxide $Cu_2O$, and *black* oxide, $CuO$; combined with sulphur, as *glance copper*, $Cu_2S$, and as *blue* or *indigo copper*, $CuS$; and also forming double sulphurets (*variegated copper*, $FeCuS$, *copper pyrites*, $FeCuS_2$, &c.) combined with selenium; with chlorine (*atacamite*); and with oxygen and an oxyacid (*carbonate*, *phosphate*, *sulphate*, *silicate*, *vanadiate*, and *arseniate*).

*Preparation.*—The copper of commerce is usually prepared from *copper pyrites* (the double sulphuret of copper and iron). The greater part of the ore raised in Cornwall is of this kind. It is roasted and then smelted, by which *coarse metal* is produced. This is calcined and again smelted, by which we obtain *fine metal*, or, when cast in sand, *blue metal*. By re-roasting and smelting, *coarse copper* is produced. These processes of roasting and smelting effect the expulsion of the sulphur and the oxidizement of the iron. The copper thus produced is smelted and exposed to the air, to drive off any volatile matters by which *blistered* *copper* is obtained. It is *refined* or *toughened* by melting it and stirring it with a birch pole.

*Properties.*—It is a brilliant red metal, crystallizable in regular octahedra and cubes, having a specific gravity of 8.86 to 8.894; malleable and ductile; it has a nauseous, styptic taste, and a peculiar and disagreeable smell. It fuses at 1996° F. (Daniell); at a higher temperature it may be volatilized. It is combustible, and is readily oxidated. Acid, alkaline, saline, and fatty bodies, when placed in contact with it in the air, promote its union with oxygen; and, by dissolving a portion of the newly-formed oxide, acquire poisonous properties. It is easily recognized by its communicating a green tinge to flame. It dissolves in dilute nitric acid; the solution possesses the following properties: It is blue, or greenish blue; with potash or soda it yields a blue precipitate (*hydrated oxide of copper*); a small quantity of ammonia produces with it a similar bluish-white precipitate, but an excess redissolves it, forming a deep blue liquid; ferrocyanide of potassium occasions in it a reddish-brown precipitate (*ferrocyanide of copper*); sulphuretted hydrogen and the hydrosulphurets throw down a precipitate (*sulphuret of copper*); and lastly, a polished iron plate plunged into the liquid, becomes coated with metallic copper $CuO,NO_5+Fe=Cu+FeO,NO_5$.

### Copper Foil. (Appendix B. I.)

Pure metallic copper, thin and bright.
*Used* as a test for arsenic in hydrochloric acid.

### Sulphate of Copper of Commerce. (Appendix A.)

*Natural History.*—It occurs in copper mines, as those of Cornwall, and is formed by the joint action of air and water on sulphuret of copper. The cupreous solutions of copper mines are termed *waters of cementation.*

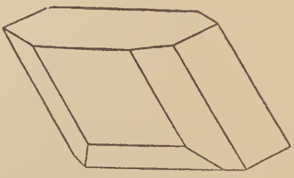
*Preparation.*—For commercial purposes sulphate of copper is sometimes procured by the direct action of sulphuric acid upon copper scales, obtained from sheet copper which has undergone the process of annealing in a furnace or forge. These materials are placed in wooden troughs lined with lead; the operation being aided by steam blown in through a leaden pipe dipping to the bottom of the liquid.

### Cupri Sulphas, *Sulphate of Copper.* [Mat. Med. List, U. S. P.]

$$CuO,SO_3+5HO=124.75.$$

*Preparation.*—Take of sulphate of copper of commerce, eight ounces; boiling distilled water, one pint. Dissolve the sulphate of copper in the water; filter the solution, and set it by that it may crystallize. Remove the crystals to filtering paper placed upon a porous brick, and, having dried them without heat, inclose them in a bottle.

Fig. 41.



*Doubly oblique Prism of Sulphate of Copper.*

*Officinal Characters.*—In oblique prismatic crystals, of a clear blue color, soluble in water, and reddening litmus. Its solution gives with chloride of barium a white precipitate insoluble in hydrochloric acid (sulphate of baryta), and a maroon-red precipitate with ferrocyanide of potassium (ferrocyanide of copper). [" Ammonia throws down from the solution a precipitate, which is wholly dissolved when the alkali is added in excess." U. S. The precipitate is the hydrated oxide of copper.—W.]

*Properties.*—It dissolves in about four parts of water at 60°, and two parts of boiling water. It is insoluble in alcohol. It is known to be a salt of the oxide of copper by sulphuretted hydrogen causing a black precipitate ($CuS$); ammonia in excess forming a dark purple blue colored liquid, and by the action of a polished iron plate upon which copper is precipitated by immersion.

*Composition.*—Its composition is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Oxide of Copper | 39.75 | 31.86 |
| 1 | Sulphuric Acid | 40.00 | 32.06 |
| 5 | Water | 45.00 | 36.08 |
| | Sulphate of Copper | 124.75 | 100.00 |

*Tests.*—An aqueous solution of the salt to which twice its volume of solution of chlorine has been added, when treated with an excess of solution of ammonia, gives a sapphire-blue solution, leaving nothing undissolved (showing the absence of iron and manganese. The chlorine is added to peroxidize these metals, so as to insure their precipitation by the ammonia).

*Physiological Effects.*—In *very small doses* it has no sensible operation on the body. In *larger doses* it is a safe and useful emetic, acting very speedily, and without exciting any great disorder of the general system. In *excessive doses* it becomes a poison, producing inflammation of the alimentary canal, and disordering the functions of the nervous system. In a case mentioned by Dr. Percival, 120 grains proved fatal; the patient was violently convulsed. In a more recent case there were vomiting and insensibility, but no convulsions or purging: the child died in four hours.

Its topical action is stimulant, astringent, styptic, and caustic. Its causticity depends on its union, either as a neutral or basic salt, with one or more of the constituents of the tissues.

*Therapeutics.*—Where speedy vomiting without much nausea is required, as in cases of narcotic poisoning, sulphate of copper is a tolerably sure and valuable *emetic.* It has also been employed, with success, to provoke vomiting in croup, and thereby promote the expulsion of the false membrane.

As an *astringent* it has been used with great benefit in chronic diarrhœa and dysentery. It often succeeds when the ordinary vegetable astringents fail. It is also used as an astringent to check excessive secretion from the bronchial and urino-genital mucous membranes. Dr. Wright found it serviceable in dropsy.

As a *tonic* or *antispasmodic* it has been given in intermittent diseases, as the ague; and in some maladies of the nervous system (epilepsy and chorea).

As a topical agent, it has often been employed in substance as an application to ulcers, either for the purpose of repressing excessive soft and spongy granulations, commonly denominated "proud flesh," or of hastening the process of cicatrization: and for either of these purposes it is one of the best agents we can employ. Solutions of it are frequently applied to mucous membranes to diminish excessive secretion: thus to the conjunctiva, in chronic ophthalmia, and the mucous lining of the vagina or urethra, in discharges from these parts. In superficial ulcerations of the mucous membranes (especially of the mouth), one or two applications of the sulphate of copper, in substance, are generally sufficient to heal them.

As a *styptic*, a solution of this salt is sometimes used to repress hemorrhages from a number of small vessels.

It may be used as a deodorizer to destroy the smell of sulphuretted hydrogen, or hydrosulphuret of ammonia, evolved by putrefying substances. It acts by forming sulphuret of copper.

*Administration.*—The dose of it, as an *emetic*, is from three or four grains to fifteen; as an *astringent*, or *tonic*, from a quarter of a grain to one, two, or more grains, given so as not to occasion vomiting. In chronic diarrhœa it should be given twice or thrice a day, combined with opium. Solutions used for external purposes vary considerably in their strength in different cases, but usually from one or two grains to eight or twelve, dissolved in an ounce of water, are employed.

*Antidotes.*—The chemical antidote for this salt is *albumen*; hence, the whites of eggs, and in the absence of these, milk, or even wheaten flour should be employed. *Iron filings* have been proposed by some. The iron decomposes the cupreous salt, and precipitates the copper in the metallic (and, therefore, in an inert) state. The *ferrocyanide of potassium* is also said to be a good antidote; sugar has likewise been employed for the same purpose.

Solution of Ammonio-Sulphate of Copper. (Appendix B. II.) Ammonio-sulphate of copper $=CuO,SO_3+2NH_3,HO$.—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 fluidounces of the water, and to the solution add the ammonia until the precipitate thus formed is nearly dissolved. Clear the solution by filtration, and then add distilled water, so that the bulk may be ten fluidounces.

*Used* as a test for the presence of sulphur in strong solution of ammonia, and for arsenious acid, with which it forms Scheele's green.

## Sulphate of Copper, Anhydrous.

(Appendix B. I.) $CuO,SO_3=79.75$.

Sulphate of copper deprived of its waters by a heat of 400°.

*Officinal Characters.*—A yellowish white powder, which becomes blue when moistened with water (being converted into the ordinary crystalline salt).

*Uses.*—Employed as a test for the presence of water in absolute alcohol.

## [Cuprum Ammoniatum, U. S., *Ammoniated Copper.*

"Take of sulphate of copper, half a troyounce; carbonate of ammonia, three hundred and sixty grains. Rub them together in a glass mortar until effervescence ceases. Then wrap the ammoniated copper in bibulous paper, dry it with a gentle heat, and keep it in a well-stopped bottle." U. S. The exact nature of the reaction which takes place in this process is not known.

*Properties.*—Ammoniated copper has a deep azure-blue color, an ammoniacal odor, styptic taste, and alkaline reaction. It is freely soluble in water. By exposure to the air is said to be converted into sulphate of ammonia and carbonate of copper.

*Therapeutics.*—It has been given as a nervine and antispasmodic in epilepsy and hysteria, and is asserted to have produced cures. It is at present but little used. The dose, $\frac{1}{4}$—$\frac{1}{2}$ gr. three times a day, gradually increased to 3 or 4 grains. It may be administered either in pill or solution.—W.]

[**Cupri Subacetas,** Mat. Med. List, U. S. P.]

**Subacetate of Copper of Commerce,** *Verdigris.* (Appendix B. I.)

$2CuO,\bar{A}(C_4H_3O_3)+6HO.$

*Preparation.*—At Montpelier it is thus made: The refuse of grapes is allowed to ferment with sour wine, and is then laid in alternate strata with plates of copper; acetous fermentation takes place, and the metal becomes oxidized by the combined influence of the air and acid. In about fifteen days the plates are covered with the acetate of copper: they are then wetted, and exposed for a month to the air: the acetate absorbs the water, and uniting with more oxide of copper, forms a subacetate, which is scraped off, and packed in leathern sacks for exportation. At Grenoble, verdigris is obtained by sprinkling plates of copper with ready made vinegar. In this country it is prepared by exposing thin plates of copper to the action of acetic acid. The method now practised consists in alternating plates of copper with pieces of woollen cloth steeped in acetic acid: they gradually become corroded, and superficially covered with verdigris, which is from time to time removed, and the operation repeated as long as the plate lasts. French verdigris is imported in sacks weighing from twenty-five to thirty pounds.

*Properties.*—It occurs in masses or in powder. The taste is astringent and metallic; the odor is somewhat similar to, though more disagreeable than, acetic acid. Verdigris is insoluble in alcohol. Water resolves it into a soluble acetate and an insoluble basic acetate. When digested with strong sulphuric acid, it evolves acetic acid, which is readily distinguished by its odor. Heated in a glass tube it gives out acetic acid: the residue contains metallic copper. Chalk and sulphate of copper are employed to adulterate verdigris. The first effervesces with the mineral acids. The characteristics of the second have been already pointed out. ["In masses of a pale-green color, almost wholly soluble, with the aid of heat, in dilute sulphuric acid. Ammonia, added to the solution, produces a precipitate, which is entirely dissolved by an excess of the alkali." U. S. The precipitate is the hydrated oxide of copper.—W.]

Solution of Acetate of Copper. (Appendix B. II.) Acetate of Copper $=CuO,\bar{A}(C_4H_3O_3)+HO=99.75$.—Take of subacetate of copper of commerce, in fine powder, half an ounce; acetic acid, one fluidounce; distilled water, a sufficiency. Dilute the acid with half a fluidounce 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 fluidounces.

*Used* as a test for the presence of butyric acid in valerianate of zinc.

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## MERCURY (*Hydrargyrum*). $Hg=100$.

*Natural History.*—Mercury is comparatively a rare substance. It is found in the metallic state, either pure (*native* or *virgin mercury*) in the form of globules, in the cavities of the other ores of this metal, or combined with silver (*native amalgam*). Sulphuret of mercury (*native cinnabar*) is the most important of the quicksilver ores, since the metal of commerce is chiefly obtained from it. The principal mines of it are those of Idria in Carniola, Almaden in Spain, and New Almaden in California.

**Mercury of Commerce,** *Quicksilver.* (Appendix A.)

*Preparation.*—The extraction of quicksilver is very simple. In some places the native cinnabar is mixed with caustic lime, and distilled in iron retorts. The products are sulphuret of calcium, sulphate of lime, and mercury, which distils over. $4HgS+4CaO=3CaS+CaO,SO_3+4Hg$. At Almaden the ore is roasted, by which the sulphur is converted into sulphurous acid, and the mercury volatilized: $HgS+2O+Hg=SO_2$. At Idria a modification of this process is followed.

The purity of this metal is ascertained by its brilliancy and great mobility. Mechanical impurities—such as adhering dirt or dust—are instantly detected, and may be separated by straining through flannel, or by filtering through a small hole in the apex of an inverted cone of paper. The presence of lead, tin, zinc, or bismuth may be suspected by the rapidity with which the metal tarnishes in the air, and by its small parts *tailing*, instead of preserving a spherical form.

**Hydrargyrum,** *Mercury.* [Mat. Med. List, U. S. P.]

*Preparation.*—Take of mercury of commerce, three pounds; hydrochloric acid, three fluidrachms; 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 fluidrachms 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.

By distillation the fixed metals, as iron, tin, lead, &c., are left behind; the mercury is freed from arsenic or zinc by digestion in the hydrochloric acid.

*Officinal Characters.*—Brilliantly lustrous and easily divisible into spherical globules. [" It is wholly volatilized by heat, and is dissolved without residue by nitric acid. A globule made to roll over white paper occasions no trace. Pure sulphuric acid, agitated with it and afterwards evaporated, leaves no residue." U. S.]

*Properties.*—At ordinary temperatures mercury is an odorless, tasteless, liquid metal, having a whitish color like silver or tin. Its sp. gr. is 13.5 or 13.6. When intimately mixed with pulverulent or fatty bodies, it loses its liquid character, and it is then said to be *killed* or *extinguished*.

*Tests.*—Volatilizes with heat without any residue.

[Many chemists assign to mercury the atomic weight of 100, and arrange its compounds as suboxides and subsalts, and protoxides and protosalts; whilst others consider its equivalent as 200, and its compounds as protoxides and binoxides and salts. The British Pharmacopœia follows the former chemists, the U. S. Pharmacopœia the latter. Thus the atomic weight of the red oxide is given as 108 by the former [$1Hg(=100)+1O(=8)$]; but the latter considers it as 216 [$1Hg(=200)+2O(=16)$]. In the same way the British Pharmacopœia gives ($HgCl$) as the symbol of corrosive sublimate with the atomic weight of 135.5, but the U. S. Pharmacopœia considers it as $HgCl_2$, with the atomic weight of 271.00. It is easily seen how these are merely different views of the same thing. Thus we take in the British Pharmacopœia view $2(HgO+SO_3)$ [$=2(108+40)$], and add $2(NaCl)$[$=2(23+35.5)$], and have resulting $2(HgCl)+2(NaO,SO_3)=2(135.5)+2$ proportions of sulphate of soda. In the U. S. Pharmacopœia view we take $HgO_2+2SO_3$[$=216+80$], add

$2(NaCl)[=2(23+35.5)]$ and obtain $HgCl_2+2(NaO,SO_3)=(271.)+2$ proportions of sulphate of soda. When reading the symbols taken from the original work, the student must remember the above facts. I have tried to prevent confusion by giving the U. S. symbols alongside in brackets, or explaining the U. S. processes separately.—W.]

*Physiological Effects.* 1. *Of Metallic Mercury.*—So long as mercury retains its *liquid form*, it is inert. It is notorious that it has been repeatedly taken in doses of a pound or more in cases of obstruction of the bowels, without proving noxious. In the few instances in which it has acted injuriously, chiefly when it has been retained in the bowels for a considerable time, it has no doubt become oxidized in the bowels. Dr. Christison considers the question set at rest by the Berlin college of physicians, and that the metal is innocuous. But the injurious effects of *mercurial vapors* when inhaled or otherwise applied to the body have been long known. They are observed in water gilders, looking-glass silverers, barometer-makers, workmen employed in quicksilver mines, and in others exposed to mercurial emanations. In most instances an affection of the nervous system is brought on, which is indicated by shaking palsy, vertigo, loss of memory, and other cerebral disorders, which often terminate fatally. If the individual continue his business, other more dangerous symptoms come on, such as delirium, epilepsy, or apoplexy; and ultimately death takes place. A well-known instance of the effect of mercurial vapor is afforded by the "Triumph" man-of-war and "Phipps" schooner, which received on board several tons of quicksilver saved from a wreck. In consequence of the rotting of the bags the mercury escaped, and the whole of the crew suffered more or less. In the space of three weeks two hundred men were salivated, two died, and all the animals were destroyed.

2. *Of Mercurial Compounds.*—Probably all the mercurial compounds are more or less noxious. The only doubtful exception to the statement is in the case of the sulphurets of this metal, which, according to Orfila, are inert. *Local Effects.*—For the most part the local effect of mercurial compounds is alterative and more or less irritant. Many of the preparations, as corrosive sublimate and the nitrate, are energetic caustics. *Remote Effects.*—In small and repeated doses the first obvious effects of mercurials is an increased activity in the secreting and exhaling apparatus. This is particularly observed in the digesting organs; the quantity of intestinal mucus, of bile, of saliva, of mucus of the mouth, and probably of pancreatic liquid being augmented. The alvine discharges become more liquid, and contain a larger proportion of bile. The operation of the medicine does not stop here; the pulmonary, urino-genital and conjunctival membranes, become moister, the urine is increased in quantity, the catamenial discharge is sometimes brought on, the skin becomes damper, and at the same time warmer, so that mercury seems to promote the excretions generally. The absorbent or lymphatic system seems also to be stimulated to increased activity, for we frequently observe that accumulations of fluid in the shut sacs (as the pleura, peritoneum, arachnoid, and synovial membranes) diminish in quantity, and in some cases rapidly disappear, under the use of mercury. At the same time also glandular swellings, enlargements, and indurations of various kinds are dispersed. When our object is to obtain the *sialagogue* operation of mercurials, we give them in somewhat larger or more frequent doses. To a certain extent the effects are the same as those already mentioned, but more intense. Of all the secretions none are so uniformly and remarkably augmented as those of the mucous follicles of the mouth

and salivary glands; and the increased secretion is accompanied with more or less tenderness and inflammation of these parts, the whole constituting what is termed *salivation* or *ptyalism*. The first symptoms of this affection are slight tenderness and tumefaction of the gums, which acquire a pale rose color except at the edges surrounding the teeth, where they are deep red. Gradually the mouth becomes very sore, and the tongue much swollen, a coppery taste is perceived, and the breath becomes remarkably fetid. The salivary glands soon become tender and swollen: the saliva and the mucus of the mouth flow abundantly, sometimes to the extent of several pints in the twenty-four hours. During this state (unless abundance of suitable food be supplied), the fat is rapidly absorbed and the patient becomes emaciated. The quantity of saliva and bursal mucus discharged by patients under the influence of mercury varies according to the quantity of medicine employed and the susceptibility of the patient. When *large* or *poisonous doses* of some of the soluble salts of mercury have been swallowed, gastro-enteritis is produced. The patient complains of an acrid styptic taste in the mouth, a feeling of burning and tightness in the throat; the face is usually flushed and sometimes swollen; violent vomiting and purging, frequently of bloody matters, soon come on, the vomiting being increased by everything taken into the stomach; oftentimes there is irritation of the urinary passages and sometimes suppression of urine; the pulse is small, frequent, and contracted; the respiration difficult, the extremities cold; salivation sometimes occurs. These symptoms terminate in death; and post-mortem examination discovers inflammation, and its consequences, of the gastro-intestinal membrane.

*Absorption of Mercury.*—By the external or internal use of mercury the metal becomes absorbed, and is subsequently either deposited in some of the solids of the body, or thrown out of the system by some of the excretories. Mercury has been detected in the blood, in the perspiration, the saliva, the gastro-intestinal secretion, the bile, and the urine. It has also been found, in the metallic state, in the bones, brain, liver, lungs, cellular tissue, &c.

*Therapeutics.* 1. *Of Metallic Mercury.*—Liquid mercury has been used as a *mechanical* agent to remove obstructions of the bowels: for example, intussusception, or intestinal invagination. But neither theory nor experience seems favorable to its use.

2. *Of the Preparations of Mercury.*—As *alteratives*, they are given in small doses in various chronic diseases; such, for example, as dyspepsia, gout, chronic skin diseases, and scrofula. Calomel is said to be less beneficial as an alterative than blue pill, on account of its more irritating action on the bowels. Mercury and chalk is an excellent alterative, especially for children.

Certain preparations of mercury (as blue pill, calomel, and mercury and chalk) are employed as *purgatives*. They promote secretion from the mucous follicles of the intestines, from the liver, and the pancreas. They are rarely, however, used alone; being, in general, either combined with, or followed by, other cathartics (as jalap, senna, colocynth, or the saline purgatives). Thus it is a common practice to exhibit a blue pill or calomel at night, and an aperient draught the following morning: the object being to allow the pill to remain as long as possible in the bowels, in order that it may the more effectually act on the liver. Mercurial purgatives are administered for various purposes; sometimes as anthelmintics, sometimes to assist in evacuating the contents of the alimentary canal, but more commonly with the view of promoting the secretions, particularly of the liver, or of producing counter-irritation, and thereby of relieving affections of other organs, as the skin or head. Dr. Prout, however, compares the stimulating effects of mercury to the stimulating effects of dram drinking, and says that a liver, which has often been stimulated to perform its function by mercury, is seldom influenced by any milder remedy, so that the habit creates the necessity for its continuance. He therefore cautions persons against the abuse or wanton use of mercury, when milder means will suffice.

The great value of mercurials is experienced when they are given as *sialagogues*. Formerly it was supposed that the beneficial effects of mercury were proportionate to the degree of ptyalism; and thus, to eradicate particular affections, it was thought necessary to cause the evacuation of a given quantity of saliva. Modern experience has proved the incorrectness of this notion, and has shown that the good effect of mercurials may generally be gained by a very slight affection of the mouth [sometimes indeed without affecting the mouth at all.—Ed.]. We now rarely find it necessary to excite a high degree of salivation; indeed, frequently it would be prejudicial, but we sometimes find it requisite to keep up a moderate effect for several weeks, particularly in diseases of a chronic character.

*Production of sore mouth and salivation.*—One of the most efficacious methods of putting the system under the influence of mercury is *friction* with the ointment of mercury; but the troublesome and unpleasant nature of the process is a strong objection to it in practice, more especially in venereal diseases, in which patients usually desire secrecy. *Fumigation*, as a means of affecting the general system, is an old method of treating venereal diseases. Turner employed for this purpose cinnabar; Lalouette, calomel; and the late Mr. Abernethy, the suboxide. Sir Benjamin Brodie, however, considered fumigation the least efficacious method, and Mr. Colles has frequently seen it fail in exciting salivation. He says, an easy method of fumigating any part is by using *mercurial candles*, composed of cinnabar or oxide of mercury, mixed with melted wax, with a wick, and burnt under a glass funnel. Upon the whole, the most convenient mode of producing salivation is by the *internal use of mercurials*, particularly of those preparations which are mild in their local action, as blue pill, calomel, and mercury and chalk.

Occasionally great difficulty is experienced in affecting the mouth—a circumstance which may arise from the irritable condition of the bowels: and when this is the case, inunction should be resorted to, or opium, or vegetable astringents conjoined. Sometimes, however, the system appears insusceptible to the influence of mercury, and this may arise from idiosyncrasy, or from the presence of some disease, particularly fever. Emetics and blood-letting are useful in these cases, as they promote absorption; and as the influence of the former depends on the state of nausea produced, tartarated antimony will be the best vomit, since it is the most powerful nauseant. Varying the mode of administering the mercury will also sometimes facilitate its operation upon the system: thus, if it have been employed internally, inunction should be tried, and *vice versâ*. Children are salivated with difficulty, and old persons less easily than those of middle age. Salivation rarely occurs under two years of age. Dr. Graves attributes this to the salivary glands being most developed in middle age. Salivation is the ordinary indication in adults that the system is beginning to be influenced by mercury, because the salivary glands are usually first affected; but in young children the liver is first affected, and green stools afford the first indication. Some persons, again, are salivated by a single dose, say one or two grains of calomel, while others cannot be salivated at all. Even the external use of mercury (180 grains of mercurial ointment) has produced exfoliation of the jaw and death.

*Treatment during salivation.*—During the time that the patient's mouth is sore, he should, if possible, confine himself to the house, use warm clothing, avoid exposure to cold, take light but nourishing food, and regulate the state of his stomach and bowels. Mr. Hunter thought that during a mercurial course the manner of living need not be altered; but Mr. Colles has properly, I think, objected to this. If the discharge become excessive, or ulceration of the gums take place, the further use of mercury is of course to be stopped; and in order to moderate the effect already produced, the patient should be very freely exposed to a cold but dry air, use purgatives and opium, and wash his mouth with some astringent and stimulating liquid. I have generally employed, as a gargle, a solution of the chlorinated soda or lime; but in the absence of these, a solution of alum, or of sulphate of copper, may be used. Dr. Watson observes that "when the flow of saliva, and the soreness of the gums, form the chief part of the grievance, I have found nothing so generally useful as a gargle made of brandy and water, in the proportion of one part of brandy to four or five of water." With regard to internal remedies, I have no confidence in any as having a specific power of stopping salivation, though iodine, sulphur, nitrate of potash, and other substances have been strongly recommended. Sometimes sulphate of quinia is administered with advantage. [I have rarely failed to stop, or at least to check, salivation by a grain of opium given every four or six hours.—Ed.]

*Fever.*—It has been said that salivation diminishes the susceptibility to the contagion of fever, whether common or specific; but that it is not an absolute preventive is shown by the fact, that patients under the full influence of mercury have caught fever and died of it. I have several times used mercurials as sialagogues in fever; I believe, for the most part, with advantage. I have only used them when there was some marked local determination or inflammatory condition. I have seen several fatal cases of fever in which mercurials were used profusely without having any effect on the mouth; but in other instances, in which the mouth became affected, recovery took place. My experience, therefore, agrees with that of Dr. Copland, namely, that death, after salivation has been established, is very rare. Whether the recovery was the consequence of the mercurial action, or the salivation the result of the mitigation of the disorder, cannot be positively proved, though I think the first more probable. The great indisposition of the system in fever to take on the mercurial action, is frequently a most annoying circumstance. It may sometimes be overcome by the employment of mercurials both internally and externally. But it is a common and approved practice in the West Indies to give twenty grains of calomel, with or without a similar dose of sulphate of quinia, three times a day at the commencement of yellow fever, with the effect, never of salivating, but of causing the evacuation of thick black pitchy stools. In Germany also it is a common practice to give twenty grains of calomel on alternate nights during the first few days of fever; nor has this practice been without advocates in this country. (See *Lancet*, March, 1843.)

The beneficial influence of mercurials has been more particularly experienced in the fevers of warm climates, especially those of the East

Indies. It has been said by several writers, that in the yellow fever of the West Indies its beneficial effects are not equally evident.

*Inflammation.*—Of late years various forms of inflammation have been most successfully combated by the use of mercury. Hence this mineral is termed an *antiphlogistic.* It is principally valuable in adhesive inflammation, to stop, control, or prevent the effusion of coagulable lymph. On the other hand, it may prove injurious in erythematous, scrofulous, malignant, and gangrenous inflammation, as well as in inflammation accompanied with debility or great irritability of the nervous system. It is not equally serviceable in all inflammations. The *nature of the tissue*, the *structure of the organ affected*, and the *quality* or *kind* of inflammation, are points of considerable importance as affecting its use.

Thus it appears that inflammations of *membranous tissues* are those principally benefited by a mercurial plan of treatment; and more especially those in which there is a tendency to the exudation of coagulable lymph or of serous fluid—as meningitis, pleuritis, pericarditis, and peritonitis (particularly of puerperal women). In inflammation of the lining membrane of the air-tube, but more especially in croup, or, as it is sometimes termed, plastic inflammation of the larynx, mercury is one of our most valuable remedies; and as this disease is one which terminates rapidly, no time should be lost in getting a sufficient quantity of mercury into the system. Calomel is usually employed; but when the bowels are very irritable, mercury and chalk, or even mercurial inunction, may be resorted to. In inflammation of the tunics of the eye, particularly iritis, mercury (next to blood-letting) is the only remedy on which much confidence can be placed; and we use it not merely with a view of putting a stop to the inflammatory action, but also in order to cause the absorption of the effused lymph. In inflammation of the synovial membranes, mercury has been employed, and in some cases with manifest advantage. In dysentery, mercury has been extensively used, especially in warm climates. By some, calomel has been employed merely as a purgative; by others, to produce its sialagogue effects. Mr. Annesley ("Diseases of India"), at the commencement of dysentery, gave twenty grains of calomel and a grain of opium. In this disease a large dose of calomel has often a sedative effect, allaying tenesmus, and diminishing the action of the bowels.

The *structure of the organ* influences the effect of mercury: at least it is well known that this mineral is more beneficial in inflammation of certain organs (especially those of a glandular structure, as the liver) than of others; and we refer it to some peculiarity in the structure of the part affected. In hepatitis of either temperate or tropical climates (particularly of the latter), mercury is advantageously employed. Blood-letting, however, should be premised, particularly in the disease as usually met with in this country. In peripneumonia, more especially when hepatization has taken place, the best effects have sometimes resulted from its use: of course after the employment of blood-letting. When hepatization has taken place, Dr. Davies recommends the use of blue pill and opium. In acute cases I prefer calomel and opium. In inflammation of the substance of the brain, also, mercury may be advantageously resorted to after the usual depletives.

The *nature* or *quality of the inflammation* also influences the effects, and thereby the uses of mercury. Thus in syphilitic inflammation, mercurials are of the greatest utility; less so in rheumatic inflammation; still less in scrofulous, and most decidedly objectionable in cancerous or scorbutic diseases. The treatment of rheumatism by calomel and opium was proposed by Dr. Hamilton, and has found many supporters; and, undoubtedly, when the febrile action does not run too high, or when the pericardium becomes affected, calomel and opium, preceded by blood-letting, will be found serviceable. It appears to me best adapted to the fibrous or diffuse form of the disease, and to fail in the synovial. The scrofulous habit is, for the most part, unfavorable to the use of mercury given as a sialagogue, but there are cases in which it is not only admissible but serviceable—as scrofulous ophthalmia, when of an acute kind. In all maladies of a malignant character (as cancers and fungoid diseases) mercurials are highly objectionable.

*Venereal diseases.*—It was formerly the opinion of surgeons that the symptoms of the venereal disease were progressive, and never disappeared until mercury was administered; but it has of late years been clearly proved that this notion is erroneous; and we are indebted to some of our army surgeons for showing that the venereal disease, in all its forms, *may* be cured without an atom of mercury. Moreover it is fully established by the experience of almost every surgeon, that, while in some instances mercury exercises a beneficial influence hardly to be observed with respect to any other disease or any other remedy, yet that in some cases it acts most injuriously, and it is generally supposed that many of the bad venereal cases formerly met with arose, in great part, from the improper use of mercury. It is a point, therefore, of considerable importance to determine what cases are best adapted for a mercurial, and what for a non-mercurial, method of treatment; for, in admitting the *possibility* of a cure without this agent, it is not to be inferred that the method is either *eligible* or *expedient;* nay, the very persons who have proved the possibility, admit that in some cases this mineral, given so as to excite moderate salivation, is advisable. One fact is, I think, tolerably well established, namely, that the cure of venereal diseases, without the aid of mercury, is much slower and less secure against relapses than by a mercurial treatment. It is not easy to lay down rules to guide us in the selection of the one or the other of these methods of treatment. Mr. Carmichael relies principally on the eruption, and, next to this, on the appearance of the primary ulcer; and of the four forms of the venereal disease which he has described, namely, the *papular*, the *pustular*, the *phagedenic*, and the *scaly*, full courses of mercury are required, he says, in one only, namely the scaly; in which the primary sore is the Hunterian chancre or callous ulcer, and the eruption partakes of the characters of lepra or psoriasis. But it has been satisfactorily proved by experiments made in the military hospitals, that even this scaly form of the disease may get well without mercury; and, on the other hand, in the pustular and papular forms, mercury is often a most valuable agent. Hennen, Rose, Guthrie, and Thomson, advise the employment of moderate quantities of mercury whenever the disease does not readily subside under the use of ordinary methods of treatment. But unless some special circumstances contraindicate the use of mercury, it is, I think, advisable to affect the mouth slightly in most forms of the disease.

The following circumstances also deserve attention, as affecting the use of mercury: Some of the worst and most intractable forms of venereal disease occur in scrofulous subjects; and in such, mercury is in general prejudicial. I have seen numerous instances of its injurious effects. Another point deserving attention in deciding on the use of mercury, is the condition of the primary sore: if it be much inflamed, or of an irritable nature—if it be of the kind called phagedenic, or at all disposed to slough—mercury must be carefully avoided, as it increases the disposition to sloughing. In one case that fell under my notice, a gentleman lost his penis by the improper use of mercury under the circumstances just mentioned.

*Cholera.*—Writers on the spasmodic cholera, both of this country and of India, speak for the most part favorably of the effects of mercury, especially in the form of calomel. I have met with no writers who attribute ill effects to it. Unfortunately those who advocate its use are not agreed as to the dose, or frequency of repetition: some advising it in small, others in large doses; some as a purgative, others as a sedative, in combination with opium; others, again, using it as a sialagogue. It is deserving of especial notice, that, when salivation takes place, the patient in general recovers.

*Dropsy.*—In this disease, mercurials may do either good or harm. Thus, when the dropsical effusion depends on inflammation, they may be employed with the best effects, as when hydrocephalus arises from meningitis, or hydrothorax from pleuritis. When ascites is occasioned by an enlarged liver, which compresses the vena portæ, and thereby gives rise to effusion, mercurials are sometimes beneficial. On the contrary, when dropsy occurs in old subjects, and when it depends on, or is accompanied by, general debility, salivation is almost always hurtful. In granular degeneration of the kidney, characterized by an albuminous condition of the urine, its use is highly objectionable. It is of no service to the primary disorder, while its effect on the mouth is often very violent and uncontrollable. When the effusion arises from mechanical causes not removable by mercury, as obliteration of any of the venous trunks, or pressure of malignant tumors, salivation is injurious. Occasionally dropsical effusion takes place without any appreciable cause, and then, of course, if mercury be employed, it must be in part on speculation. In such cases calomel is not unfrequently employed in combination with squills or digitalis.

*In chronic diseases of the viscera*, especially those arising from or connected with inflammation, mercury is frequently serviceable. Thus, in enlargement or induration of the liver, in hepatization of the lungs, &c. In those diseases commonly termed malignant, as cancers and fungus hæmatodes, and also in diseases of a non-malignant character, but occurring in debilitated subjects, mercurials, given so as to excite salivation, are objectionable. In diseased spleen they are usually injurious.

*In chronic diseases of the nervous system*, mercury has been recommended in paralysis, and on some occasions has proved exceedingly efficacious. I have repeatedly seen hemiplegia with impaired vision and hearing, headache, and cramps of the extremities, recover under the use of mercury, after blood-letting and purgatives had failed. In one case the patient (a young man) was kept under the influence of the medicine for two months. Mr. Colles has likewise found it more efficacious in paralysis. In tetanus, mania, epilepsy, hysteria, tic douloureux, and other affections of the nervous system, mercury has been used with occasional benefit.

The foregoing are some of the most important diseases against which mercurials have been successfully administered as sialagogues.

*Pharmaceutic Uses.*—Employed in the formation of green iodide of mercury, red oxide of mercury, sulphate of mercury, calomel, acid solution of nitrate of mercury, ointment of nitrate of mercury, and the following preparations.

Emplastrum Ammoniaci cum Hydrargyro [U. S.], *Ammoniac and Mercury Plaster.*—Take of ammoniac, twelve ounces; mercury, three ounces; olive oil, one fluidrachm; sulphur, eight grains. Heat the oil, and add the sulphur to it gradually, stirring till they unite. With this mixture triturate the mercury, until globules are no longer visible; and lastly, add the ammoniac, previously liquefied, mixing the whole carefully. ["Take of ammoniac, twelve troyounces; mercury, three troyounces; olive oil, sixty grains; sublimed sulphur, eight grains. Heat the oil, and gradually add the sulphur, stirring constantly until they unite; then add the mercury, and triturate until globules of the metal cease to be visible. Boil the ammoniac with sufficient water to cover it, until they are thoroughly mixed; then strain through a hair sieve, and evaporate, by means of a water-bath, until a small portion taken from the vessel hardens on cooling. Lastly, add the ammoniac, while yet hot, gradually to the mixture of oil, sulphur, and mercury, and thoroughly incorporate all the ingredients." U. S.]

The presence of a small quantity of sulphur greatly facilitates the division of the mercury, probably by the formation of a little sulphuret of mercury.

*Therapeutics.*—This plaster, like the following, is employed especially to disperse venereal buboes. It frequently excites an eczematous eruption.

Emplastrum Hydrargyri [U. S.], *Mercurial Plaster.*—Take of mercury, three ounces; olive oil, one fluidounce; resin, one ounce; litharge plaster, six ounces. Dissolve the resin in the oil with the aid of heat; let them cool; add the mercury, and triturate till its globules disappear. Then add to the mixture the litharge plaster, previously liquefied, and mix the whole thoroughly. The Edinburgh formula has been adopted, which, like the Dublin, contained one-third more mercury than the London.

["Take of mercury, six troyounces; olive oil, resin, each, two troyounces; plaster of lead, twelve troyounces. Melt the oil and resin together, and, when they have become cool, rub the mercury with them until globules of the metal cease to be visible. Then gradually add the plaster, previously melted, and mix the whole together." U. S.]

*Therapeutics.*—It is used as a discutient in glandular enlargements and other swellings whether venereal or otherwise, and also to the region of the liver in hepatic complaints.

Hydrargyrum cum Creta [U. S.], *Mercury and Chalk.*—Take of mercury, by weight, one ounce; prepared chalk, two ounces. Rub the mercury in a porcelain mortar until metallic globules cease to be visible to the naked eye, and the mixture acquires a uniform gray color.

This preparation, like the Dublin powder, contains one-third of its weight of mercury. The London and Edinburgh powders contained three parts in eight. If the powder be digested in acetic acid, the lime of the chalk is dissolved, and the carbonic acid escapes; but the greater part, if not the whole, of the mercury is insoluble in the acid, and hence it is not in the state of suboxide. If examined by a lens, the residue is found to consist of minute separate globules, which readily whiten silver and gold, showing they are in the metallic state. Hence it is evident that the quicksilver is mechanically divided only.

["Take of mercury, three troyounces; prepared chalk, five troyounces. Rub them together until the globules cease to be visible, and the mixture acquires a uniform gray color." U.S. This powder is of the strength of the old London and Edinburgh powder, three parts in eight. The U.S.

Pharmacopœia directs that it should have the following properties: "A gray powder, partly dissipated by heat. When a small portion is treated with dilute acetic acid in excess, it is partly dissolved, nothing remaining but mercury in the form of minute globules, visible by the aid of a magnifying glass. The solution, on the addition of muriatic acid. is rendered opalescent; and, when filtered after this addition, and treated with hydro-sulphuric acid, does not yield a black precipitate." U. S.]

*Therapeutics.*—It is a valuable remedy in infantile syphilis. It is frequently employed to promote and improve the secretions of the liver, pancreas, and bowels, in various disordered conditions of the digestive organs accompanied by clay-colored stools or purging. In strumous affections of children (especially large mesenteric glands), and other chronic maladies, it is administered with great advantage as an alterative.

*Administration.*—To adults, it is given in doses of from five to twenty grains. It should be given in the form of powder. For children, the dose is two or three grains. Rhubarb, carbonate of soda, or, in some cases, powder of ipecacuan and opium may be conjoined with it.

LINIMENTUM HYDRARGYRI, *Liniment of Mercury. Synonym*, Linimentum Hydrargyri Compositum, *Dub.*—Take of ointment of mercury, one ounce; solution of ammonia, one fluidounce; liniment of camphor, one fluidounce. 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.

*Therapeutics.*—It is employed externally by means of friction in chronic tumors and in chronic affections of the joints where the object is to excite absorption. It is said to produce salivation more readily than the ointment of mercury, owing to the camphor and ammonia.

PILULA HYDRARGYRI, *Mercurial Pill.* [PILULÆ HYDRARGYRI, U. S., *Pills of Mercury.*]—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. ["Take of mercury, a troyounce; confection of rose, a troyounce and a half; liquorice root, in fine powder, half a troyounce. Rub the mercury with the confection until the globules cease to be visible; then add the liquorice root, and beat the whole into a pilular mass, to be divided into four hundred and eighty pills." U. S.]

The friction is usually effected by steam power. By trituration, the metal is reduced to a finely divided state, and becomes intimately mixed with the confection and liquorice powder. It is a soft mass, of convenient consistence for making into pills, and has a dark blue color, from which it has acquired its popular name of *blue pill.* When rubbed on paper or glass it ought to present no globules. Three grains of this pill contain one grain of mercury. [Each pill of the U. S. Pharmacopœia weighs three grains and contains one grain of mercury.—W.]

*Therapeutics.*—The practice of giving a blue pill at night, and a senna draught the following morning, has become somewhat popular, in consequence of its being recommended by the late Mr. Abernethy, in various disorders of the chylopoietic viscera. In doses of five to fifteen grains it frequently acts as a purgative. As an alterative, in doses of two or three grains, blue pill is frequently resorted to. Lastly, it is one of the best internal agents for exciting salivation in the various diseases for which mercury is adapted.

*Administration.*—The usual form of exhibiting it is in the form of pill, in the dose already mentioned; but it may also be administered when suspended in a thick mucilaginous liquid. If the object be to excite salivation, we may give five grains in the morning, and from five to ten in the evening; and, to prevent purging, opium may be conjoined.

UNGUENTUM HYDRARGYRI [U. S.], *Ointment of Mercury.*—Take of mercury, one pound; prepared lard, one pound; prepared suet, one ounce. Rub them together until metallic globules cease to be visible. ["Take of mercury, twenty-four troyounces; lard, suet, each, twelve troyounces. Rub the mercury with a troyounce of the suet and a small portion of the lard until the globules cease to be visible; then add the remainder of the lard, and of the suet softened with a gentle heat, and thoroughly mix them." U. S.]

The mercury in this ointment is in a finely-divided metallic state. Guibourt states that, by digesting ether on mercurial ointment, the fatty matter may be dissolved, and liquid mercury obtained in equal weight to that used in making the ointment. It is an unctuous fatty body, of a bluish-gray color, and if properly prepared gives no traces of globules when rubbed on paper and examined with a magnifier of four powers. A powerful microscope, however, detects innumerable globules. It contains half its weight of mercury.

*Therapeutics.*—Applied *externally*, it is employed either as a local or constitutional remedy. Thus, as a *local* agent, it is used as a dressing to syphilitic sores, and is rubbed into tumors of various kinds (not those of a malignant nature, as cancer and fungus hæmatodes), with the view of causing their resolution. As a *means of affecting the constitution*, we use mercurial inunctions in syphilis, in inflammatory diseases, and, in fact, in all the cases (already noticed) in which our object is to set up the mercurial action in the system, more especially when the irritable condition of the digestive organs offers an objection to the internal employment of mercurials. It may be laid down as a general rule, that mercury may be used with more safety by the skin than by the stomach; but reasons of convenience, which I have already alluded to, frequently lead us to prefer its internal use.

*Administration.*—When the object is to excite very speedy salivation, thirty grains may be rubbed into the skin every hour, washing the part each time, and varying the seat of application. If, however, it be not desirable or necessary to produce such speedy effect, thirty grains, or more, rubbed in night and morning, will be sufficient. During the whole course of inunction, the patient should wear the same drawers night and day.

When the friction is performed by a second person, the hand should be enveloped with a soft oiled pig's bladder, turned inside out. Mercurial frictions ought not to be violent, but long continued, and had better be carried on near a fire, in order to promote the liquefaction and absorption of the ointment. In syphilis, and other diseases in which our sole object is the constitutional affection, it matters little to what part of the body the ointment is applied, provided the cuticle be thin (for this layer offers an impediment to absorption in proportion to its thickness). The internal parts of the thighs are therefore usually selected; but in liver complaints, the inunctions are made in the region of that organ. The occasional use of the warm bath promotes absorption when the ointment is applied to the skin.

**Hydrargyri Oxidum Rubrum** [U. S.], *Red Oxide of Mercury.*
$HgO=108$. [$HgO_2=216$. U. S.]

*Synonym.*—Hydrargyri Nitrico-oxidum, *Lond.;* Red Precipitate.

*Preparation.*—Take of mercury, by weight, eight ounces; nitric acid, three fluidounces; water, two fluidounces. 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 vapors cease to be evolved; and when cold, inclose the product in a bottle. ["Take of mercury, thirty-six troyounces; nitric acid, twenty-four troyounces; water, two pints. Dissolve the mercury, with the aid of a gentle heat, in the acid and water previously mixed, and evaporate to dryness. Rub the dry mass into powder, and heat it in a very shallow vessel until red vapors cease to arise." U. S.]

When mercury and diluted nitric acid are digested together, the metal is oxidized at the expense of part of the acid, while binoxide of nitrogen escapes, and, combining with the oxygen of the air, becomes peroxide of nitrogen. The oxidized metal unites with undecomposed nitric acid to form a nitrate $6Hg+4NO_5=NO_2+3(Hg_2O,NO_5)$. [Or, taking Hg at 200, $3Hg+4NO_5=NO_2+3(HgO,NO_5)$.—W.] When this is mixed with fresh mercury and heated, the nitric acid is decomposed, binoxide of nitrogen given off, and red oxide of mercury remains. $Hg_2O,NO_5+2Hg =4HgO+NO_2$. [$HgO,NO_5+Hg=2HgO_2+NO_2$.]

*Officinal Characters.*—An orange-red powder readily dissolved by hydrochloric acid, and yielding a solution which, with caustic potash added in excess, gives a yellow precipitate (oxide of mercury), and with solution of ammonia a white precipitate (ammoniated mercury).

*Tests.*—Entirely volatilized by a heat under redness, being at the same time decomposed into mercury and oxygen. If this be done in a test-tube, no orange vapors are perceived (showing its freedom from undecomposed nitrate). Dissolves without residue in hydrochloric acid (proving the absence of a lower oxide and of calomel).

*Therapeutics.*—As an external agent it is used in the form of levigated powder or ointment; the latter is officinal. As a caustic it is sprinkled over spongy excrescences, venereal warts, chancres, and indolent fungous ulcers.

UNGUENTUM HYDRARGYRI OXIDI RUBRI [U. S.], *Ointment of Red Oxide of Mercury. Synonyms*, Unguentum Hydrargyri Nitrico-Oxidi, *Lond.* Unguentum Oxidi Hydrargyri, *Dub.*—Take of red oxide of mercury, in very fine powder, sixty-four grains; simple ointment, one ounce; mix thoroughly. ["Take of red oxide of mercury, in very fine powder, sixty grains; ointment of lard, a troyounce. Add the oxide of mercury to the ointment previously softened with a gentle heat, and thoroughly mix them." U. S.]

This ointment undergoes decomposition by keeping, its color changing from red to gray, in consequence of the partial deoxidation of the oxide of mercury.

*Therapeutics.*—It is a valuable stimulant, and as such is frequently applied to indolent sores and ulcers when we require to increase the quantity and improve the quality of the discharge; also to inflamed eyelids and chronic conjunctivitis.

## **Sulphate of Mercury.** (Appendix A.) $HgO,SO_3=148$. [$HgO_2 2SO_3=296$.]

*Preparation.*—Take of mercury, by weight, twenty ounces; sulphuric acid, twelve fluidounces. Heat the mercury with the sulphuric acid in a porcelain vessel with constant stirring until the metal disappears, then continue the heat until a dry white salt remains.

The mercury is first oxidized at the expense of the sulphuric acid, sulphurous acid being given off, and then the oxide of mercury thus formed combines with a further portion of undecomposed acid to form sulphate. $Hg+2SO_3=HgO,SO_3+SO_2$.

*Officinal Characters.*—A white crystalline heavy powder, rendered yellow by affusion of water (basic sulphate or turpeth mineral).

*Tests.*—Entirely volatilized by heat.

*Used* in the production of calomel and corrosive sublimate.

[**Hydrargyri Sulphas Flava**, U. S., *Yellow Sulphate of Mercury.* Hydrargyri Sulphas Flavus, *Pharm.* 1850. *Turpeth Mineral.*

"Take of mercury, four troyounces; sulphuric acid, six troyounces. Mix them in a glass vessel, and boil, by means of a sand-bath, until a dry white mass remains. Rub this into powder, and throw it into boiling water. Pour off the supernatant liquid, wash the yellow precipitate repeatedly in hot water, and dry it." U. S. In this process the bisulphate (sulphate, Br.) of mercury is first formed. When this is thrown into water, it is decomposed, a sesquisulphate of the deutoxide falls, and a supersulphate is left in solution. Thus, $4(HgO_2 2SO_3)=HgO_2 6SO_3+3HgO_2 2SO_3$ (turpeth mineral).

*Physical Properties.*—Turpeth mineral is a lemon yellow powder, of a rather acrid taste, nearly insoluble in cold, very slightly soluble in boiling water. It is decomposed at a red heat; at a moderate heat it becomes reddish, but resumes its original yellow on cooling.

*Therapeutics.*—In small quantities it occasions nausea, vomiting, and ptyalism. Taken into the nostrils it excites sneezing, and sometimes salivation. Stenzel mentions a fatal case from its internal use. It is sometimes used as an emetic in cases of swelled testicle, to promote absorption by its nauseating and emetic action. It was formerly given at the commencement of a mercurial course. As an errhine it has been administered in chronic ophthalmia and affections of the brain—as incipient hydrocephalus. As an alterative it has been given in the scaly diseases—lepra and psoriasis. It has also been recommended as an alterative and emetic in croup.

*Administration.*—As an alterative, the dose should not exceed half a grain, or at most a grain; as an emetic it is given to the extent of five grains, in which dose it causes violent vomiting; as an errhine, a grain should be mixed with four or five of some mild powder, as starch or liquorice powder.—W.]

**Calomelas**, *Calomel.* Subchloride of Mercury, $Hg_2Cl=235.5$. [Protochloride of Mercury. $HgCl=235.5$.]

[**Hydrargyri Chloridum Mite**, U. S., *Mild Chloride of Mercury. Calomel.*]

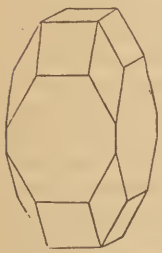
*Synonym.*—Hydrargyri Chloridum, *Lond.*

*Preparation.*—Take of sulphate of mercury ten ounces; mercury, by weight, seven ounces; chloride of sodium, dried, five ounces; boiling distilled water, a sufficiency. Moisten the sulphate of mercury with water, and rub it and the mercury together until globules are no longer visible; add the chloride of sodium, and thoroughly mix the whole by continued trituration. Sublime by a suitable apparatus into a chamber of such size that the calomel, instead of adhering to its sides as a crystalline crust, shall fall as a fine powder on its floor. Wash this powder with boiling distilled water, until the washings cease to be darkened by a drop of hydrosulphuret of ammonia. Finally, dry at a heat not exceeding 212°, and preserve in a jar or bottle impervious to light.

By the mutual action of sulphate of mercury, mercury, and chloride of sodium upon each other when heated, sulphate of soda is formed, and calomel rises in vapor, $HgO,SO_3 + Hg + NaCl = Hg_2Cl + NaO,SO_3$. A small quantity of corrosive sublimate ($HgCl$) is also generally formed, which is removed by washing. ["Take of mercury, forty-eight troyounces; sulphuric acid, thirty-six troyounces; chloride of sodium, eighteen troyounces; distilled water, a sufficient quantity. Boil, by means of a sand-bath, twenty-four troyounces of the mercury with the sulphuric acid until a dry white mass is left. Rub this, when cold, with the remainder of the mercury, in an earthenware mortar, until they are thoroughly mixed; then add the chloride of sodium, and, having rubbed it with the other ingredients until globules of mercury cease to be visible, sublime the mixture. Reduce the sublimed matter to a very fine powder, wash it with boiling distilled water until the washings afford no precipitate with water of ammonia, and dry it." U. S. The first step in both this process and that for corrosive sublimate (U. S.) results in the formation of the bisulphate of the deutoxide, as before explained. This is reduced to the sulphate of the protoxide by the mercury, and when this is sublimed with the salt, a protochloride is obtained. Thus, $HgO_2 2SO_3 + Hg = 2(HgO,SO_3) - 2(HgO,SO_3) + 2NaCl = 2(HgCl) + 2(NaO,SO_3)$. Owing to some of the bisulphate not being reduced, more or less corrosive sublimate is formed, which the washing removes.—W.]

*Officinal Characters.*—A dull white, heavy, and nearly tasteless powder, rendered yellowish by trituration in a mortar; insoluble in water, spirit, or ether. Digested with solution of potash, it becomes black; and the clear solution, acidulated with nitric acid, gives a copious white precipitate with nitrate of silver.

Fig. 42.



*Crystal of Calomel.*

Potash converts the calomel into suboxide (protoxide), with the formation of chloride of potassium ($Hg_2Cl + KO = Hg_2O + KCl$) with which nitrate of silver occasions a white precipitate of chloride of silver, insoluble in nitric acid.

*Properties.*—Heated in a glass tube by a spirit lamp, it is volatilized, and yields a white sublimate. Mixed with carbonate of soda and heated, it yields a sublimate of liquid globules of metallic mercury. Solution of chloride of tin decomposes it: the products are bichloride of tin and metallic mercury ($Hg_2Cl + SnCl = 2Hg + SnCl_2$) [$HgCl + SnCl = Hg + SnCl_2$].

*Composition.*—The following is the composition of calomel:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 2 | Mercury | 200.0 | 84.92 |
| 1 | Chlorine | 35.5 | 15.08 |
| | Calomel | 235.5 | 100.00 |

| [Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Mercury | 200 | 84.92 |
| 1 | Chlorine | 35 | 15.08 |
| | | 235 | 100.00] |

*Tests.*—Entirely volatilized by a sufficient heat. Warm ether which has been shaken with it in a bottle leaves, on evaporation, no residue, showing its freedom from earthy impurities, and from corrosive sublimate, which is soluble in ether.

*Therapeutics.*—Calomel is very frequently used as an *alterative* in glandular affections, chronic skin diseases, and disordered conditions of the digestive organs, more particularly in those cases which are connected with hepatic derangement. For this purpose it is usually taken in combination with other alteratives, as in the well-known Plummer's Pill, which will be presently noticed. It is very frequently employed as a *purgative*, though on account of the uncertainty of its cathartic effects it is seldom given alone; generally in combination with other drastic purgatives—such as jalap, scammony, or compound extract of colocynth, the activity of which it very much promotes. We employ it for this purpose when we are desirous of relieving affections of other organs, on the principle of counter-irritation. Thus, in threatened apoplexy, in mental disorders, in dropsical affections, and in chronic diseases of the skin. In torpid conditions of the bowels, where it is necessary to use powerful catharties to produce alvine evacuations, as in paralytic affections, it is advantageously combined with other purgatives. Sometimes we use it to promote the biliary secretion—as in jaundice and other affections of the liver, in chronic skin diseases, and in various disordered conditions of the alimentary canal not accompanied by inflammation. Moreover, in the various diseases of children requiring the use of purgatives, it is generally considered to be very useful; and its being devoid of taste is of course an advantage. As a *sedative* it has been administered in yellow fever, spasmodic or malignant cholera, dysentery, and liver affections. As a *sialagogue*, it may be used in the cases in which I have already stated that mercurials generally are employed; with the view of preventing irritation of the alimentary canal, it is usually given in combination with opium, unless the existence of some affection of the nervous system contraindicates the use of narcotics; this combination is employed in peripneumonia, pleuritis, croup, laryngytis, hepatitis, enteritis, and other inflammatory diseases; in fever, syphilis, and chronic visceral diseases. Calomel is frequently combined with other medicines to increase their effects; as with squill, to produce *diuresis*, in dropsy; or with antimonials, to promote *diaphoresis*. As an *anthelmintic*, it is in frequent use, and forms one of the active ingredients of many of the nostrums sold for worms.

Calomel is also used *locally*. It is sometimes suspended in thick mucilage, and used as a gargle in venereal sore-throat, or injected into the urethra in blennorrhœa. Now and then it is used as a substitute for cinnabar in fumigation. As a local application, in the form of ointment, calomel is one of the most useful remedies we possess for the cure of several forms of the chronic skin diseases. [It is often very useful as a desiccant alterative dressing to soft chancres, over which it may be dusted two or three times a day.—W.]

*Administration.*—When used as an *alterative*, it is given in doses of from half a grain to a grain, frequently combined with sulphurated antimony (as in *Plummer's Pill*) or antimonial powder, and repeated every or every other night; a mild saline laxative being given the following morning. As a *purgative*, from two to five grains are given usually in combination with, or followed by, the use of other purgatives, especially jalap, senna, scammony, or colocynth. As a *sialagogue*, it is exhibited in doses of one to three or four grains, generally combined with opium or Dover's powder, twice or thrice a day. As a *sedative*, the dose is from twenty to thirty grains or more. The use of acids with calomel frequently occasions griping. Calomel is most extensively employed in the diseases of children, and may be given to them in as large or proportionally larger doses than to adults.

Pilula Calomelanos Composita, *Compound Pill of Calomel.* (*Pilula Hydrargyri Chloridi Composita, Lond.*)—Take of calomel, one ounce; sulphurated antimony, one ounce; guaiac resin, in powder, two ounces; castor oil, one fluidounce. Triturate the calomel with the antimony, then add the guaiac resin and castor oil, and beat the whole into a uniform mass.

A little stronger than the London and Edinburgh pills, which contained one grain of calomel in six. This, like the Dublin, contains one grain in five.

[Pilulæ Antimonii Compositæ, U. S., *Compound Pills of Antimony, Plummer's Pills.*—"Take of sulphurated antimony, mild chloride of mercury, each, one hundred and twenty grains; guaiac, in fine powder, molasses, each, half a troyounce. Rub the sulphurated antimony first with the mild chloride of mercury, and afterwards with the guaiac and molasses, so as to form a pilular mass, to be divided into two hundred and forty pills." U. S. Each pill contains half a grain of calomel and weighs three grains. From one to four may be given at a time.—W.]

*Therapeutics.*—This preparation is commonly known as *Plummer's Pill.* It is frequently employed as an alterative in chronic skin diseases, in the papular and pustular forms of the venereal disease, in chronic liver affections, and in various disordered conditions of the digestive organs.

*Dose.*—The dose is from five to ten grains.

Unguentum Calomelanos, *Ointment of Calomel.*—Take of calomel, eighty grains; prepared lard, one ounce. Mix thoroughly.

*Therapeutics.*—This is a most valuable application in porrigo favosa, impetigo, herpes, and the scaly diseases (psoriasis and lepra). It might be also used as an inunction.

## **Hydrargyrum Corrosivum Sublimatum,** *Corrosive Sublimate.*

## [**Hydrargyri Chloridum Corrosivum,** U. S., *Corrosive Chloride of Mercury.*]

Chloride of mercury, $HgCl=135.5$ [Bichloride of mercury, $HgCl_2=271.$]

*Synonym.*—Sublimatus corrosivus, *Edin.* Sublimatum corrosivum, *Dub.* Hydrargyri Bichloridum, *Lond.*

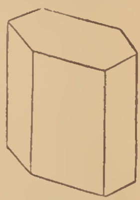
*Preparation.*—Take of sulphate of mercury, twenty ounces; chloride of sodium, dried, ten ounces; black oxide of manganese, in fine powder, one ounce. Reduce the sulphate of mercury and the chloride of sodium each to fine powder, and having mixed them and the oxide of manganese thoroughly by trituration in a mortar, place the mixture in a tall matrass of green glass, and by a regulated heat applied through the intervention of sand, let the corrosive sublimate be sublimed. The matrass must now be broken in order to remove the sublimate, which should be kept in jars or bottles impervious to light.

When sulphate of mercury and chloride of sodium are heated together double decomposition takes place, sulphate of soda being formed and corrosive sublimate rising in vapor $HgO,SO_3+NaCl=HgCl+NaO,SO_3$. The oxide of manganese is added to prevent the formation of calomel by the liberation of a little chlorine.

["Take of mercury, twenty-four troyounces; sulphuric acid, thirty-six troyounces; chloride of sodium, eighteen troyounces. Boil, by means of a sand bath, the mercury with the sulphuric acid until a dry white mass is left. Rub this, when cold, with the chloride of sodium in an earthenware mortar; then sublime with a gradually increasing heat." U. S. $HgO_2,2SO_3$=the dry white mass—$HgO_2,2SO_3+2NaCl=2(NaO SO_3)+HgCl_2$.—W.]

*Officinal Characters.*—In heavy colorless 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 (oxide of mercury), a white precipitate with ammonia (ammoniated mercury), and a curdy white precipitate with nitrate of silver (chloride of silver).

Fig. 43.



*Crystal of Perchloride of Mercury.*

*Properties.*—Albumen forms a white precipitate with an aqueous solution of corrosive sublimate. This precipitate is soluble in water. Fibrin forms a similar white compound. When albuminous and fibrinous textures are immersed in a solution of this salt, combination takes place, the tissue contracts, increases in density, becomes whiter, and does not putrefy. Hence it is employed by the anatomist for hardening and preserving certain parts of the body, as the brain. Corrosive sublimate is soluble in fifteen parts of water and in seven of rectified spirit. The aqueous solution possesses some of the characters of an acid. Thus it reddens litmus, and it unites with the chlor-bases (as chloride of sodium), forming the double salts called *hydrargyro-chlorides*. Litmus, which has been reddened by a solution of corrosive sublimate, has its blue color restored by chloride of sodium. Corrosive sublimate is recognized by the following characters. *Heated* in a tube by a spirit lamp, with caustic, or the carbonated fixed alkalies, an alkaline chloride is formed, oxygen, and if a carbonate be used, carbonic acid gas is evolved, and metallic mercury is sublimed and condensed in the form of globules on the sides of the tube. The fused residue in the tube, if dry carbonate of soda be used, is chloride of sodium. This may be dissolved in water acidulated with nitric acid, and then tested by nitrate of silver. In this way the presence of chlorine as the combining ingredient of the mercury is established. *Iodide of potassium* occasions a scarlet precipitate (HgI) [$HgI_2$] soluble in excess either of iodide of potassium or of corrosive sublimate; the precipitate frequently appears at first of a yellow color, though it quickly becomes scarlet. *Chloride of tin* added in excess causes first a white precipitate (*calomel*), and afterwards a grayish powder of mercury, which falls down in a finely-divided state ($HgCl+SnCl=Hg+SnCl_2$) [$HgCl_2+2SnCl=Hg+2SnCl_2$]. *Sulphuretted hydrogen* in excess passed through a solution of corrosive sublimate occasions a black precipitate (HgS) [$HgS_2$]. If the latter be in excess, a white precipitate (*chloro-sulphuret of mercury*, 2HgS,HgCl) [$2HgS_2HgCl_2$] is obtained. *Galvanism.*—Place the solution on a piece of gold or polished copper foil, slightly acidulating it with dilute hydrochloric acid, and then touching the metal, through the solution, with a slip of zinc. Mercury is instantly deposited.

*Composition.*—The composition of this salt is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Mercury | 100 | 73.8 |
| 1 | Chlorine | 35.5 | 26.2 |
| | Corrosive Sublimate | 135.5 | 100.0 |

| [Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Mercury | 200 | 73.8 |
| 1 Chlorine | 71 | 26.2 |
| | 271 | 100.0] |

*Tests.*—Entirely soluble in ether. When heated it sublimes without decomposing or leaving any residue (showing its freedom from earthy impurities and from calomel).

*Physiological Effects.*—In *small* or *therapeutic doses* it frequently exerts a beneficial effect on syphilitic and other diseases without producing any obvious alteration in the action of the different organs. Occasionally, especially when the stomach and bowels are in an irritable condition, it gives rise to a sensation of warmth in the epigastrium, and causes nausea, griping, and purging. In such cases it is best to diminish the dose and conjoin conium or opium. Continued use of it often causes diaphoresis if the skin is kept warm, while at other times the quantity of urine is increased. It may cause salivation, but corrosive sublimate has less tendency to produce this effect than the other preparations of mercury. *In somewhat larger doses, or by the long-continued use of small doses*, gastro-enteritis and all the usual constitutional effects of mercury are brought on, as heat and griping pain in the alimentary canal, particularly in the stomach and rectum, loss of appetite, nausea, vomiting, purging, and disordered digestion. The pulmonary organs also not unfrequently become affected, and the patient complains of dry cough, pain in the chest, disordered respiration and bloody expectoration. These symptoms agree with the following results obtained by Dr. Christison in his experiments on animals. "Corrosive sublimate causes, when swallowed, corrosion of the stomach; and, in whatever way it obtains entrance into the body, irritation of that organ and of the rectum, inflammation of the lungs, depressed action, and perhaps, also, inflammation of the heart, oppression of the functions of the brain, and inflammation of the salivary glands." *In very large doses* it acts as a caustic poison in virtue of its affinity for albumen, fibrin, and the other constituents of the tissues, and produces violent irritation of the alimentary canal, flushed countenance, and a whitened condition of the epithelium of the mouth, often followed sooner or later by profuse salivation and ulceration of the mouth with great fetor of the breath.

*Therapeutics.*—*Internally*, it has been employed as a sialagogue, alterative, and diaphoretic. It has been employed with varying degrees of success as a remedy for *venereal diseases;* but the balance of evidence is decidedly favorable to the employment of corrosive sublimate, in such cases. By its partisans, it has been asserted to be a safe and efficacious mercurial for the removal of venereal symptoms in a very short space of time, and without causing salivation, merely by exciting diaphoresis. Its opponents state, on the other hand, that other mercurials are quite as effectual and speedy; that the cure by corrosive sublimate is not permanent; and lastly, that its corrosive and irritant properties render its employment objectionable. During the time the patient is under its influence, he should adopt a sudorific regimen, and take decoction of sarsaparilla. In various *chronic diseases*, it has been given as an *alterative* and *diaphoretic* with occasional success. Thus, in rheumatism, diseases of the bones, periodical pains, skin diseases, scrofulous affections, and disorders of the nervous system. In such it should be associated with diaphoretics (as antimony or sarsaparilla), and warm clothing. Not unfrequently opiates should be combined with it. Corrosive sublimate is a valuable *sorbefacient* in old dropsical complaints, as those arising from diseased heart, liver or lungs. Under its use I have repeatedly seen dropsical symptoms disappear.

As an *external* remedy, it has been employed as a *caustic* in substance. In onychia maligna, it is used with great advantage, mixed with an equal weight of sulphate of zinc, and sprinkled thickly upon the surface of the ulcer, which is then to be covered with a pledget of lint saturated with tincture of myrrh. A *solution* has been employed for various purposes; thus by Baumé for pediluvia, to produce salivation; as a lotion in chronic skin disease, as lepra, psoriasis, and scabies; as a wash to ulcers, particularly those of a venereal nature; as an injection in discharges from the urinary organs; as a collyrium in chronic diseases of the eye, especially those of a venereal nature; and as a gargle in ulcers of the tonsils. In obstinate gleet, where the constitution is not very irritable, an injection of a solution of corrosive sublimate is frequently very serviceable. I am informed that a most effective remedy for the contagious porrigo which spreads amongst children in schools, is an ointment composed of from half to two grains of corrosive sublimate to an ounce of lard.

*Administration.*—It may be used internally in substance or solution. The dose of it in substance is from one-sixteenth to one-eighth of a grain. Some advise it to be given to the extent of one-fourth of a grain, but in this dose it is very apt to gripe and purge. In solution, it may be exhibited dissolved in water, alcohol, or ether.

For *external use*, a watery solution may be employed, containing from half a grain to two or three grains, dissolved in one ounce of distilled water. As an injection in gonorrhœa, from gr. $\frac{1}{8}$ to $\frac{1}{4}$ may be dissolved in an ounce of water.

*Antidotes.*—Several substances which decompose corrosive sublimate have been employed as antidotes; but the only efficacious antidotal treatment consists in the free administration of albuminous substances. When corrosive sublimate is mixed with *albumen*, a compound is formed whose chemical action on the tissues is slight as compared with that of the corrosive sublimate itself. Hence the whites and yelks of eggs, milk, and a mixture of wheat-flour, oatmeal (or barley meal), and water, are used as antidotes. Baron Thénard, the celebrated chemist, inadvertently swallowed a concentrated solution of corrosive sublimate, but by the immediate use of white of eggs suffered no material harm. Peschier states that one egg is required for every four grains of the poison. Albumen retards, but does not prevent, the absorption of the poison, and consequently does not preclude the production of the constitutional effects of corrosive sublimate. [A brisk purgative should therefore be administered, to carry it out of the bowels.—W.]

Solution of Corrosive Sublimate. (Appendix B. II.)—Take of corrosive sublimate, one hundred grains; distilled water, five fluidounces. Dissolve, and keep the solution in a bottle impervious to light.

May be *used* to detect the presence of albumen, and also of iodide of potassium.

**Hydrargyrum Ammoniatum** [U. S.], *Ammoniated Mercury.*
$NH_2Hg_2,[Hg.]Cl=251.5.$

*Synonyms.*—Hydrargyri ammonio-chloridum, *Lond.*, *Dub.* Hydrargyri præcipitatum album, *Ed.* [White Precipitate.]

*Preparation.*—Take of corrosive sublimate, three ounces; solution of ammonia, four ounces; distilled water, three pints. Dissolve the corrosive sublimate in the water with the aid of a moderate heat; mix the solution with the ammonia, constantly stirring; collect the precipitate on a filter, and wash it well with cold distilled water until the liquid which passes through ceases to give a precipitate when dropped into a solution of nitrate of silver acidulated by nitric acid. Lastly, dry the product at a temperature not exceeding 212°. [" Take of corrosive chloride of mercury, six troyounces; water of ammonia, eight fluidounces; distilled water, eight pints. Dissolve the corrosive chloride of mercury in the distilled water, with the aid of heat, and to the solution, when cold, add the water of ammonia, frequently stirring. Wash the precipitate with water until the washings become nearly tasteless, and dry it." U. S.]

By the addition of ammonia to a solution of corrosive sublimate, a white precipitate of the ammoniated mercury is formed, while there remains in solution half the chlorine of the corrosive sublimate combined with hydrogen and ammonia, as hydrochlorate of ammonia, which is removed by washing, $2HgCl+2NH_3=NH_2Hg_2Cl+NH_4Cl$ [$HgCl_2+2NH_3=NH_2HgCl+NH_4Cl$].

*Officinal Characters.*—An opaque white powder on which cold water, alcohol, and ether have no action. Digested with caustic potash, it evolves ammonia, acquiring a pale yellow color, 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 gray, and affords globules of metallic mercury.

By the action of caustic potash, ammoniated mercury is resolved into ammonia, oxide of mercury and chloride of potassium, $NH_2Hg_2Cl+KO,HO=NH_3+KCl+2HgO$. By the action of chloride of tin into amide of mercury, metallic mercury and bichloride of tin, $NH_2Hg_2Cl+SnCl=NH_2Hg+Hg+SnCl_2$.

*Composition.*—Ammoniated mercury has the following composition:—

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Mercury [1 Mercury, U. S.] | 200 | 79.522 |
| 1 Nitrogen | 14 | 5.566 |
| 2 Hydrogen | 2 | 0.795 |
| 1 Chlorine | 35.5 | 14.115 |
| Ammoniated Mercury | 251.5 | 99.998 |

*Test.*—Entirely volatilized at a heat under redness (evidencing its freedom from earthy fixed salts, &c.).

*Therapeutics.*—It is employed as an external agent only; commonly in the form of an ointment. It is an efficacious application in various skin diseases—as porrigo, impetigo, herpes, and even scabies; also in ophthalmia tarsi. Among the lower classes it is commonly used to destroy pediculi.

*Antidote.*—Albumen. The speedy expulsion of the poison from the stomach.

UNGUENTUM HYDRARGYRI AMMONIATI [U. S.], *Ointment of Ammoniated Mercury.* (*Unguentum Hydrargyri Ammonio-chloridi, Lond. Unguentum Præcipitati albi, Ed.*)—Take of ammoniated mercury, sixty-four grains; simple ointment, one ounce. Mix thoroughly. [" Take of ammoniated mercury, in very fine powder, forty grains; ointment of lard, a troyounce. Mix them." U. S.]

*Therapeutics.*—Stimulant, alterative, and detergent. It is used as mentioned above in various skin diseases.

**Hydrargyri Iodidum Viride** [U. S.], *Green Iodide of Mercury.*

*Synonym.*—Hydrargyri iodidum, *Lond.* [U. S. P. 1850.] $Hg_2I=327$ [$HgI=327$].

*Preparation.*—Take of mercury, by weight, one ounce; iodine, two hundred and seventy-eight grains; rectified spirit, a sufficiency. Rub the iodine and mercury in a porcelain mortar, occasionally moistening the mixture with a few drops of the spirit, and continue the trituration until metallic globules are no longer visible, and the whole assumes a green color. 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. ["Take of mercury, a troyounce; iodine, three hundred grains; stronger alcohol, a sufficient quantity. Mix the mercury and iodine in a mortar, and, having added half a fluidounce of stronger alcohol, triturate the mixture until the ingredients are thoroughly incorporated. Stir the mixture occasionally, and, at the end of two hours, triturate again, with considerable pressure, until it is nearly dry. Then rub it up with stronger alcohol, gradually added, until it is reduced to a uniform thin paste; and, having transferred this to a filter, wash it with stronger alcohol until the washings cease to produce a permanent cloudiness when dropped into a large quantity of water. Lastly, dry the iodide in the dark with a gentle heat, and keep it in a well-stopped bottle, protected from the light." U. S.]

In this process the mercury and iodine enter into combination. The alcohol facilitates the union by dissolving a portion of iodine, and forming with the remainder a pasty mass. Some red iodide is usually first produced, and is afterwards transformed into the green iodide by uniting with mercury.

*Officinal Characters.*—A dull green powder insoluble in water, which darkens in color upon exposure to light. When gradually heated in a test-tube, it yields a yellow sublimate, which upon friction becomes red (red iodide of mercury), while a globule of metallic mercury is left in the bottom of the tube ($Hg_2I=HgI+Hg$) [$HgI=HgI_2+Hg$].

*Properties.*—Its sp. gr. is 7.75. It is insoluble in alcohol, or solution of chloride of sodium; but it is slightly soluble in solution of iodide of potassium.

*Composition.*—It consists of

| Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 2 Mercury | 200 | 61.16 |
| 1 Iodine | 127 | 38.84 |
| Green Iodide of Mercury | 327 | 100.00 |

| [Eq. | Eq. Wt. | Per Cent. |
|---|---|---|
| 1 Mercury | 200 | 61.16 |
| 1 Iodine | 127 | 38.84] |

*Tests.*—Entirely volatilized by a heat under redness. When it is shaken in a tube with ether nothing is dissolved (showing its freedom from red iodide). ["A greenish-yellow powder, which becomes red when heated. It is insoluble in water and alcohol. Officinal stronger alcohol, when shaken with it and separated by filtration, gives but a transient cloudiness on being dropped into water, and, when evaporated from a porcelain surface, leaves only a faint-red stain, showing freedom from the red iodide." U. S.]

*Therapeutics.*—It has been used in syphilis and scrofula, especially when they occur in the same individual. Lugol employed an ointment of it in those forms of external scrofulous disease which resemble syphilis. Ricord gave it internally with good effect in syphilis infantum. Biett has successfully employed it in syphilitic ulceration and venereal eruptions. He considered it to be one of the most valuable preparations of mercury in the treatment of syphilis.

*Administration.*—The dose of it for adults is from one grain gradually increased to three or four. Ricord gave from one-sixth to one-half of a grain to children of six months old. Biett employed it internally, and also externally, in the form of ointment, to the extent of twelve or fourteen grains daily, by way of friction.

**Hydrargyri Iodidum Rubrum** [U. S.], *Red Iodide of Mercury.*

*Synonym.*—Hydrargyri Biniodidum, *Ed.* $HgI=227$ [$HgI_2=454$].

*Preparation.*—Take of corrosive sublimate, four ounces; iodide of potassium, five ounces; boiling distilled water, four pints. Dissolve the corrosive sublimate in three pints, and the iodide of potassium in the remainder of the water, and mix the two solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and, having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding 212°. [" Take of corrosive chloride of mercury, a troyounce; iodide of potassium, a troyounce and one hundred and twenty grains; distilled water, a sufficient quantity. Dissolve the corrosive chloride of mercury in a pint and a half, and the iodide of potassium in half a pint of distilled water, and mix the solutions. Collect the precipitate upon a filter, and, having washed it with distilled water, dry it with a gentle heat, and keep it in a well-stopped bottle." U. S.]

A simple interchange of metals, $HgCl+KI=HgI+KCl$. [$HgCl_2+2KI=HgI_2+2KCl$]. Red iodide of mercury being slightly soluble in hot water; it is necessary to allow the mixed solutions to cool before separating the precipitate.

*Officinal Characters.*—A crystalline powder of a vermilion color, 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. [" Is dissolved by boiling alcohol and solution of chloride of sodium." U. S.] When digested with solution of soda it assumes a reddish-brown color, and the fluid cleared by filtration and mixed with solution of starch gives a blue precipitate on being acidulated with nitric acid.

By the action of soda on red iodide of mercury red oxide of mercury is formed, and iodide of sodium remains in solution, $HgI+NaO=HgO+NaI$ [$HgI_2+2NaO=1HgO_2+2NaI$], from which nitric acid eliminates free iodine, $3NaI+4NO_5=3(NaO.NO_5)+3I+NO_2$.

*Composition.*—Its composition is as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Mercury | 100 | 44.05 |
| 1 | Iodine | 127 | 55.95 |
| | Red Iodide of Mercury | 227 | 100.00 |

| [Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Mercury | 200 | 44.05 |
| 2 | Iodine | 254 | 55.95 |
| | | 454 | 100.00] |

*Tests.*—Entirely volatilized by a heat under redness, and entirely soluble in ether (showing its freedom from red lead and earthy impurities, and from the green iodide).

*Physiological Effects.*—It is a powerful irritant and caustic, nearly as powerful as, or in the opinion of Rayer more powerful than, corrosive sublimate. Applied to ulcers in the form of ointment I have known it to cause excruciating pain. Left in contact with the skin for a while it induces, says Rayer, a most intense erysipelatous inflammation. It requires to be administered internally with great caution. Like other mercurial compounds its repeated use causes salivation.

*Therapeutics.*—It has been employed in the same cases (*i. e.* syphilis and scrofula) as the green iodide of mercury, than which it is much more energetic. It has been employed by M. Cazenave in cases of lupus. Breschet applied it, in the form of ointment, with great success, in a case of obstinate ulceration (thought to have been carcinomatous) of the angle of the eye. In the form of the officinal ointment it has been used in opacity of the cornea. In obstinate ophthalmia tarsi, with thickening of the meibomian glands, it has also been successfully employed. It is most effective in bronchocele.

*Administration.*—It should be given in doses of one-sixteenth of a grain, gradually increased to one-fourth of a grain. It may be exhibited in the form of pills, or dissolved in alcohol or ether.

UNGUENTUM HYDRARGYRI IODIDI RUBRI, *Ointment of Red Iodide of Mercury.*—Take of red iodide of mercury, in very fine powder, sixteen grains; simple ointment, one ounce. Mix thoroughly.

This ointment contains one-fourth as much red iodide of mercury as unguentum hydrargyri iodidi rubri, *Dub.*

## **Liquor Hydrargyri Nitratis Acidus**, *Acid Solution of Nitrate of Mercury.*

## [**Liquor Hydrargyri Nitratis**, U. S., *Solution of Nitrate of Mercury.*]

Nitrate of mercury, $HgO,NO_5$ [$HgO_2 2NO_5$], in solution in nitric acid.

*Preparation.*—Take of mercury, four ounces; nitric acid, three fluidounces and a quarter; distilled water, three fluidounces. 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. ["Take of mercury, three troyounces; nitric acid, five troyounces; distilled water, six fluidrachms. Dissolve the mercury, with the aid of a gentle heat, in the acid, previously mixed with the distilled water. When reddish vapors cease to arise, evaporate the liquid to seven troyounces and a half, and keep it in a well-stopped bottle." U. S.]

The mercury is oxidized at the expense of part of the nitric acid, and the oxide of mercury thus formed dissolved in the remainder, $3Hg + 4NO_5 = 3(HgO,NO_5) + NO_2$. The acid solution is boiled in order to insure complete oxidation, and also to get rid of the binoxide of nitrogen. [According to the U. S. Pharmacopœia view this is a solution in nitric acid of the binitrate of deutoxide of mercury. Thus—$3Hg + 8NO_5 = 3(HgO_2 2NO_5) + 2NO_2$.—W.]

*Officinal Characters.*—A colorless and strongly acid solution, which gives a yellow precipitate with solution of potash added in excess (oxide of mercury). If a crystal of sulphate of iron be dropped into it, in a little time the salt of iron, and the liquid in its vicinity, acquire a dark color (owing to the formation and solution of binoxide of nitrogen, $NO_2$) ["A specific gravity 2.165. It is not precipitated by the addition of distilled water; with iodide of potassium, a bright-red precipitate, soluble in an excess of the precipitant. When dropped on a bright surface of copper, the diluted solution instantly deposits a coating of mercury." U. S.]

*Test.*—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 (showing its freedom from subnitrate).

*Therapeutics.*—It is often employed in the Parisian hospitals as a caustic. Biett frequently employed it with success in lupus. It should be applied to the extent of a crown-piece, by means of a brush, to the ulcers, tubercles, and scars which remain soft or purple, and seem on the point of breaking: lint moistened with the solution is then to be applied to the cauterized surface. The parts immediately become white, a kind of erysipelatous inflammation is set up in the surrounding parts, and in a few days a yellow scab gradually falls off. This solution is also used for the cauterization of the ulcerated cervix uteri. When the inflammation is intense, the ulceration large, and the granulations redundant or unhealthy, it exercises a very prompt and beneficial influence, generally cleansing and modifying the sore in one application. In very slight ulcerations, however, I think it is too powerful a remedy. It has been used by Recamier as a caustic in cancerous diseases. He thinks it acts specifically, and modifies the vital actions of the surrounding parts. The acute pain which its application causes is alleviated by a strong solution of opium. Godard employed it in herpes exedens. It has likewise been used with success in a great variety of other cases—as syphilitic and scrofulous ulcers, condyloma, obstinate lepra and psoriasis, and porrigo favosa. By its *local use* the constitutional effects of mercury have been produced. Breschet has seen salivation induced by one application of it to the ulcerated neck of the uterus. To prevent absorption, Mialhe recommends that the cauterized part should be washed immediately after the application of the caustic.

UNGUENTUM HYDRARGYRI NITRATIS [U. S.], *Ointment of Nitrate of Mercury.* (*Unguentum Citrinum, Ed.*)—Take of mercury, by weight, four ounces; nitric acid, eight fluidounces; prepared lard, fifteen ounces; olive oil, thirty-two fluidounces. 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 (about 180°), add the solution of mercury, also hot, mixing them thoroughly. If the mixture do not froth up, increase the heat till this occurs. ["Take of mercury, a troyounce and a half; nitric acid, three troyounces and a half; neat's-foot oil, twelve troyounces; lard four troyounces and a half. Dissolve the mercury in the acid; then heat together the oil and lard in an earthen vessel, and, when the temperature reaches 200°, remove the mixture from the fire. To this add the mercurial solution, and, with a wooden spatula, stir constantly so long as effervescence continues, and afterwards occasionally until the ointment stiffens." U. S. Neat's-foot oil is directed in this process, because the ointment made with it retains its butter-like consistence and color much longer than when olive oil is employed.—W.]

By the action of concentrated nitric acid on mercury, nitrate of the oxide of mercury is produced ($3Hg+4NO_5=3(HgO.NO_5)+NO_2$), which is dissolved in the excess of nitric acid used. When the solution is mixed with the lard and olive oil, a portion of elaïdine is produced by the action of nitrous or hyponitrous acid on the fat and oil, as well as a red viscid oil. Soubeiran says that carbonic acid and binoxide of nitrogen gases are evolved. This ointment has a fine lemon yellow color, a butyraceous consistence, and a peculiar nitrous odor. From the increased specific gravity of the nitric acid this ointment contains about one-third more acid than the London ointment, and the proportions of lard and oil are reversed. It also retains its buttery consistence better. It is very apt to become gray when mixed with other ointments, in consequence of their deoxidizing powers; and to prevent this, a considerable excess of nitric acid is ordered. It should be spread with wooden or ivory spatulas. When fresh prepared, this compound contains the following substances, besides the ordinary constituents of lard and olive oil: elaïdine, red oil, elaidate of mercury (mercurial soap), nitric acid, and nitrate of mercury.

*Therapeutics.*—It is employed as a stimulant and alterative in *chronic diseases of the skin*, more particularly those affecting the hairy scalp, as the different forms of porrigo, in which it is exceedingly efficacious. It is also used as a dressing to *ulcers*, to stimulate and cleanse them—as in foul syphilitic sores, and phagedenic ulcers. Lastly, it is employed in *ophthalmic diseases*, more particularly ophthalmia tarsi, in which it is applied (mixed with its own weight of almond oil) by means of a camel's hair pencil to the lids, frequently with such advantage that some have regarded it as a specific in this complaint. More frequently, however, it is used recently mixed with seven parts of lard.

[**Hydrargyri Sulphuretum Rubrum**, U. S., *Red Sulphuret of Mercury. Cinnabar.* $HgS_2$ 264.

"Take of mercury, forty troyounces; sublimed sulphur, eight troyounces. To the sulphur, previously melted, gradually add the mercury, with constant stirring, and continue the heat until the mass begins to swell. Then remove the vessel from the fire, and cover it closely to prevent the contents from inflaming. When the mass is cold, rub it into powder, and sublime." U. S.

*Officinal Characters.*—In brilliant, crystalline masses, of a deep-red color and fibrous texture. It is entirely volatilized by heat. When heated with potassa it yields globules of mercury. It is not soluble in either nitric or muriatic acid, but is dissolved by a mixture of these acids. Acetic acid which has been digested with it, does not yield a precipitate with iodide of potassium.

*Therapeutics.*—In the form of powder (vermilion) this drug is much used in the arts. It is only used in medicine for mercurial fumigations in cases of obstinate syphilitic, skin, and other affections. The patient should be seated on a chair, covered with blankets, under which the fumes should be made to rise, from some cinnabar thrown on a red-hot iron or otherwise heated. Sometimes the fumes are inhaled, when it is desirable to salivate in as short a time as possible; they are, however, very irritating to the lungs.—W.]

[**Hydrargyri Cyanidum**, U. S., *Cyanide of Mercury.*
Hydrargyri Cyanuretum, *Pharm.* 1850. $HgCy_2 = 252.00$.

"Take of ferrocyanide of potassium, five troyounces; sulphuric acid, four troyounces and one hundred and twenty grains; red oxide of mercury, in fine powder, water, each, a sufficient quantity. Dissolve the ferrocyanide of potassium in twenty fluidounces of water, and add the solution to the sulphuric acid, previously diluted with ten fluidounces of water, and contained in a glass retort. Distil the mixture nearly to dryness into a receiver, containing ten fluidounces of water and three troyounces of red oxide of mercury. Set aside two fluidounces of the distilled liquid, and to the remainder add, with agitation, sufficient red oxide to destroy the odor of hydrocyanic acid. Then filter the solution, and, having added the reserved liquid, evaporate the whole in a dark place, in order that crystals may form. Lastly, dry the crystals, and keep them in a well-stopped bottle, protected from the light." U. S.

In this process hydrocyanic acid is generated by the action of the sulphuric acid and water on the ferrocyanide of potassium, sulphate of potash and iron being left in the retort. Thus $K_2Cy^3Fe + 3SO_3 + 3HO = 2(KO,SO_3) + FeO,SO_3 + 3HCy$. Then the hydrocyanic acid acts on the binoxide of mercury forming the bicyanide of mercury and water. Thus, $2HCy + HgO_2 = HgCy_2 + 2HO$.

*Officinal Characters.*—In white prismatic crystals, wholly soluble in water. When muriatic acid is added to the solution, hydrocyanic acid is evolved, made evident by its odor, and bichloride of mercury is left, which is entirely volatilized by heat. When cyanide of mercury is heated cyanogen is given off, and a blackish matter is left containing globules of mercury.

*Therapeutics.*—The action of the cyanide of mercury on the system closely resembles that of corrosive sublimate, to which some prefer it, owing to its being less apt to cause epigastric pain. If it should meet with free hydrochloric acid in the stomach, hydrocyanic acid would be formed; the dose is, however, too small for any danger to be apprehended from this source. It is capable of producing salivation. It may be used in those diseases in which corrosive sublimate is commonly exhibited. Dose, one-sixteenth to one-tenth of a grain in solution.—W.]

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## SILVER (*Argentum*). Ag=108.

*Natural History.*—It is found in the mineral kingdom in various states; sometimes nearly pure, or alloyed with other metals (especially gold, antimony, arsenic, and copper); or combined with sulphur, iodine, bromine, or chlorine. Of these, *native silver* and the sulphuret are by far the most abundant.

### Silver Refined, *Pure Metallic Silver*. (Appendix A.)

*Properties.*—When pure, this metal is white, with a slight shade of yellow, inodorous and tasteless. It is moderately hard and elastic, very ductile and malleable: a single grain may be drawn out into 400 feet of wire, and leaf silver may be procured, whose thickness is only $\frac{1}{100000}$th of an inch. Its specific gravity is 10.474. It melts at a bright red heat (1873° F., according to Daniell). When exposed to the air it does not oxidate, but readily tarnishes by sulphur vapors.

*Tests.*—If ammonia is added in excess to the solution of the metal in nitric acid, the resulting fluid exhibits neither color nor turbidity (showing its freedom from copper, lead, iron, &c.).

The silver of the shops usually contains traces of gold and copper. The gold is left as a dark-colored powder when the silver is dissolved in nitric acid.

**Argenti Oxidum** [U. S.], *Oxide of Silver.* $AgO = 116$.

*Preparation.*—Take of nitrate of silver in crystals, half an ounce; solution of lime, three pints and a half; distilled water, ten fluidounces. 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.

The lime combines with the nitric acid of the nitrate of silver, to form nitrate of lime, while oxide of silver is precipitated, $AgO,NO_5 + CaO = CaO,NO_5 + AgO$. ["Take of nitrate of silver, four troyounces; distilled water, half a pint; solution of potassa, a pint and a half, or a sufficient quantity. Dissolve the nitrate of silver in the water, and to the solution add solution of potassa so long as it produces a precipitate. Wash this repeatedly with water until the washings are nearly tasteless. Lastly, dry the precipitate, and keep it in a well-stopped bottle, protected from the light." U. S. The reaction is similar to that of the British process, the potassa taking the place of the lime $AgO,NO_5 + KO = KO,NO_5 + AgO$.—W.]

*Officinal Characters.*—An olive-brown powder, which at a low red heat gives off oxygen, and is reduced to the metallic state. It dissolves completely in nitric acid without the evolution of any gas, forming a solution which has the characters of nitrate of silver. ["When it is dissolved in nitric acid, and the solution is precipitated by chloride of sodium in excess, the supernatant liquid is not discolored by hydrosulphate of ammonia." U. S.]

*Properties.*—It is insoluble in the fixed alkalies, readily soluble in caustic ammonia, and very slightly soluble in water; the aqueous solution has an alkaline reaction and a metallic taste, and is rendered turbid by a small quantity of carbonic acid, but is dissolved by an excess of it.

*Composition.*—Oxide of silver has the following composition:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Silver | 108 | 93.103 |
| 1 | Oxygen | 8 | 6.897 |
| | Oxide of Silver | 116 | 100.000 |

*Test.*—Twenty-nine grains heated to redness leave twenty-seven grains of metallic silver.

*Therapeutics.*—Its uses are analogous to those of the nitrate. It is well adapted for painful (neuralgic) and irritable conditions of the stomach and intestines, especially those which are attended with augmented secretions. Thus in gastrodynia and enterodynia, in pyrosis and chronic diarrhœa, it has proved serviceable. In uterine diseases, especially where there are augmented discharges and great irritability, it has been beneficial, as in hysteralgia, menorrhagia, leucorrhœa, and dysmenorrhœa. It has also been used in epilepsy, syphilis, and cholera. Externally, it has been employed in the form both of powder and ointment; in irritable ulcers, both syphilitic and non-syphilitic, in ophthalmia, in sore nipples, and in gonorrhœa. In the latter complaint, it was used in the form of ointment applied to the urethral membrane by means of a bougie.

*Administration.*—The dose of it is from one-half to two grains twice or thrice daily, in the form of powder or pill. It may be continued for five or six weeks with safety, but its prolonged employment is liable to be attended with permanent discoloration of the skin. For external use it may be applied in the form of ointment composed of thirty grains of oxide to one ounce of lard.

**Argenti Nitras** [U. S.], *Nitrate of Silver.* $AgO,NO_5=170$.

*Preparation.*—Take of refined silver, three ounces; nitric acid, one fluidounce and three quarters; distilled water, five fluidounces. Add the nitric acid and the water to the silver in a flask, and apply a gentle heat until the metal is dissolved. Decant the clear liquor from any black powder which may be present, into a porcelain dish, evaporate, and set aside to crystallize; pour off the liquor, and again evaporate and crystallize. Let the crystals drain in a glass funnel, and dry them by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate in rods, fuse the crystals in a dark room in a capsule of platinum or thin porcelain, and pour the melted salt into proper moulds. Nitrate of silver must be preserved in bottles furnished with accurately ground stoppers. [" Take of silver, in small pieces, two troyounces; nitric acid, two troyounces and a half; distilled water, a sufficient quantity. Mix the acid with a fluidounce of distilled water in a porcelain capsule, add the silver to the mixture, cover it with an inverted glass funnel, resting within the edge of the capsule, and apply a gentle heat until the metal is dissolved, and red vapors cease to be produced; then remove the funnel, and, increasing the heat, evaporate the solution to dryness. Melt the dry mass, and continue the heat, stirring constantly with a glass rod, until free nitric acid is entirely dissipated. Dissolve the melted salt, when cold, in six fluidounces of distilled water, allow the insoluble matter to subside, and decant the clear solution. Mix the residue with a fluidounce of distilled water, filter through paper, and, having added the filtrate to the decanted solution, evaporate the liquid until a pellicle begins to form, and set it aside in a warm place to crystallize. Lastly, drain the crystals in a glass funnel until dry, and preserve them in a well-stopped bottle. By evaporating the mother water, more crystals may be obtained." U. S.]

The silver abstracts oxygen from part of the nitric acid, disengaging binoxide of nitrogen, and forming oxide of silver, which unites with the rest of the nitric acid to form nitrate of silver, $3Ag+4NO_5=3(AgO,NO_5)+NO_2$. In fusing, care must be taken not to overheat, and thereby to decompose the salt. The moulds should be warmed.

*Officinal Characters.*—In colorless tabular right-rhombic prisms, or in white cylindrical rods, soluble in distilled water, and in rectified spirit; gives with hydrochloric acid a curdy white precipitate (chloride of silver), which darkens by exposure to light, and is soluble in solution of ammonia. [And the liquid, filtered from the precipitate, is not colored by hydrosulphuric acid, and, when evaporated, leaves no residue. U. S.] A small fragment heated on charcoal with the blowpipe, first melts, and then deflagrates, leaving behind a dull white metallic coating (Ag).

*Properties.*—It does not deliquesce; when exposed to the atmosphere and solar light it blackens, probably from the action of organic matter or sulphuretted hydrogen contained in the atmosphere. Mr. Scanlan finds that nitrate of silver in a clean dry glass tube, hermetically sealed, undergoes no change of color by exposure to solar light: the contact of organic matter, however, readily occasions it to become black. A solution of nitrate in pure distilled water is unchanged by exposure to solar light; but the presence of organic matter causes the liquid to become black or reddish. It forms with the solutions of the alkaline carbonates, oxalates, and ferrocyanides, white precipitates (*carbonate*, *oxalate*, and *ferrocyanide of silver*). With a solution of phosphate of soda it yields a yellow precipitate, $3AgO,PO_5$; with the alkaline arsenites, a yellow precipitate, $2AgO,AsO_3$; with arseniates, a brick-red precipitate, $3AgO,AsO_5$. Phosphorus and metallic copper immersed in it precipitate metallic silver, sulphuretted hydrogen occasions a black precipitate of sulphuret of silver.

*Composition.*—Nitrate of silver is composed as follows:—

| Eq. | | Eq. Wt. | Per Cent. |
|---|---|---|---|
| 1 | Oxide of Silver | 116 | 68.24 |
| 1 | Nitric Acid | 54 | 31.76 |
| | Nitrate of Silver | 170 | 100.00 |

*Tests.*—Ten grains dissolved in two fluidrachms of distilled water give with hydrochloric acid a precipitate which, when washed and thoroughly dried, weighs 8.44 grains (AgCl). The filtrate when evaporated by a water bath leaves no residue (proving the absence of impurities).

*Physiological Effects.*—The local action of nitrate of silver is that of a caustic or corrosive. Applied to the skin it produces first a white mark, owing to its union with the coagulated albumen of the cuticle. Gradually this becomes bluish-gray, purple, and ultimately black, owing to the partial reduction of the silver. If the integument be moistened, and the nitrate applied three or four times, it causes at the end of some hours vesication, which is usually attended with less pain than that produced by cantharides. In some cases, however, it excites acute pain. When applied to an ulcer it produces a white film. This film in a few hours assumes a dark color and ultimately forms a black eschar. This hardens and in a few days becomes corrugated, separates at the edges, and at length peels off altogether, leaving the surface of the sore beneath in a healed state. The intensity of the pain varies much in different cases, but it is on the whole very much less than might be imagined by those who have not tried this remedy. When applied to mucous surfaces a similar white compound of the nitrate with the animal matter of the secreted mucus is formed, and this defends the living tissue from the action of the caustic, so that the effects are not so violent as might be expected. In some cases it produces smarting pain, which lasts for several hours, but no serious effects have resulted from its use, and oftentimes it excites neither pain nor inflammation. Its application to the conjunctiva is attended with acute pain (especially when inflammation is going on), though in general this soon subsides. On all these surfaces it acts as an astringent. If continually administered *internally*, at first in small and afterwards in gradually increased doses, it may be employed for a considerable period without producing any obvious changes in the corporeal functions, although it may be exercising a beneficial influence over the constitution, evinced by its amelioration of certain diseases. If the dose be too large it occasions gastrodynia, sometimes nausea and vomiting, and occasionally purging. Taken in an excessive dose it acts as a corrosive poison. All the above-mentioned effects are referable to its local action; and from them we have no evidence of its absorption or of the nature of its influence over the general system; but the discoloration of the skin, which occasionally results from its use, fully proves that absorption does take place when the medicine is continued in small but long-continued doses. The blueness or slate color of the skin just alluded to has been produced in several patients who have continued the use of the nitrate during some months or years. In one instance the mucous membrane of the stomach and intestines was similarly tinted; and Wedemeyer relates a case in which all the internal viscera were more or less blue. The discoloration of the skin is usually regarded as permanent. In one person, whom I had an opportunity of observing, no perceptible diminution of the color had occurred after several years; but in some cases it gradually fades in intensity.

*Therapeutics.*—Nitrate of silver has been employed *internally* in a very few cases only; and of these the principal and most important are epilepsy, chorea, and angina pectoris. Its liability to discolor the skin is a great drawback to its use: a medical man is not justified in risking the production of this effect without previously informing his patient of the possible result. In *epilepsy*, it has occasionally, perhaps more frequently than any other remedy, proved successful. Its *methodus medendi* is imperfectly understood. The cases which have been relieved by it are probably those termed by Dr. M. Hall eccentric. In the few instances in which I have seen this remedy tried, it has proved unsuccessful; but it was not continued long, on account of the apprehended discoloration of the skin. In *chorea* it has been successfully employed. In *angina pectoris* it has been administered in the interval of the paroxysms with occasional success. *In chronic affections of the stomach* (especially morbid sensibility of the gastric and intestinal nerves) it has been favorably spoken of. It has been employed to allay chronic vomiting connected with disordered innervation, as well as with disease of the stomach (scirrhus and cancer), and to relieve gastrodynia. The foregoing are the most important of the diseases against which nitrate of silver has been administered internally. During the epidemic cholera of 1849, Mr. G. Ross gave the nitrate of silver, in grain doses, in seventy of the worst form of cases; *i. e.* in 70 cases out of 853, in which, other means having failed, the nitrate was employed as a last resource: of this number only 5 died. Nitrate of silver has also been used in the form of injection in cases of cholera, upon the indication of the necessity therein existing for the arrest of the destructive flow of saline matters from the bowels.

As an *external agent*, its uses are far more valuable, while they are free from the inconvenience of permanently staining the skin. It is employed sometimes as a *caustic*, and as such it has some advantages over caustic potash and the liquid corrosives. Thus, it does not liquefy by its application, and hence its action is confined to the parts with which it is placed in contact. It is used to remove and repress spongy granulations in wounds and ulcers, and to destroy warts, whether venereal or otherwise. It is applied to chancres on their first appearance, with the view of decomposing the syphilitic poison, and thereby of stopping its absorption, and preventing bubo or secondary symptoms. This practice has the sanction of Mr. Hunter. I have several times seen it fail, perhaps because it was not adopted sufficiently early. The nitrate should be scraped to a point, and applied to every part of the ulcer. M. Robin, of St. Etienne, states that an ointment of nitrate of silver, in the proportion of about one part to fifteen, is very efficacious in promoting the resolution of buboes, or in expediting the removal of thickening where the abscess has suppurated and been opened. The application of nitrate of silver to *punctured wounds* is often attended with most beneficial effects. it prevents or subdues inflammatory action in a very surprising manner.

It is equally adapted for poisoned as for simple wounds. To promote the healing of *ulcers* it is a most valuable remedy. In large indolent ulcers, particularly those of a fistulous or callous kind, it acts as a most efficient stimulant. To small ulcers it may be applied so as to cause an eschar; and when at length this peels off, the sore is found to be healed. Mr. Higginbottom asserts, that "in every instance in which the eschar remains adherent from the first application, the wound or ulcer over which it is formed invariably heals." Dry lint will, in general, be found the best dressing for sores touched with the nitrate.

Nitrate of silver was proposed by Mr. Higginbottom as a topical remedy for external inflammation. It may be applied with great advantage to subdue the inflammatory action of erythema, of paronychia or whitlow, and of inflamed absorbents. In some cases it is merely necessary to blacken the cuticle; in others, it may be used so as to induce vesication. M. Delvaux has found vesication of the surface very serviceable in pleurodynia and other neuralgic affections. Bretonneau and Serres recommend the *cauterization of variolous pustules* by nitrate of silver, in order to cut short their progress. It is principally useful as a means of preventing pitting, and should be employed on the first or second day of the eruption. The solid caustic is to be applied to each pustule after the apices have been removed. This method has also been employed in the treatment of *shingles* (herpes zoster): in one case the disease was cured in a few hours.

*In some diseases of the eye*, nitrate of silver is a most valuable remedial agent. It is used in the solid state, in solution, and in ointment: the solution may be used as a wash and injection, or applied by a camel's hair pencil. In deep ulcers of the cornea, a cone of the solid nitrate should be applied; in superficial ones, a solution (of from four to ten grains of the salt to an ounce of distilled water) may be employed. There is one drawback to the use of this substance in ulcers of the cornea, as well as other affections of the eye: viz. the danger of producing dark specks on the cornea, or of staining the conjunctiva; but this occurrence is rare. In both acute and chronic ophthalmia, Mr. Guthrie employs this salt in the form of ointment (Arg. Nitr. gr. ij ad gr. x; Liq. Plumbi Subacet. min. xv; Ung. Cetacei, gr. lx). Of this, he directs a portion (varying in size from a large pin's head to that of a garden pea) to be introduced between the lids by the finger or a camel's hair pencil. It causes more or less pain, which sometimes lasts only half an hour, at others till next day. Warm anodyne fomentations are to be used, and the application of the ointment repeated every third day. In acute cases, two or three applications will arrest the disease. While many surgeons hesitate to use nitrate of silver in the first stage of acute purulent ophthalmia, all are agreed as to its value in the second stage of the disease, as well as in chronic ophthalmia. Besides the disease of the eye already mentioned, there are many others in which the oculist finds this salt of the greatest service as a caustic, astringent, or stimulant.

In *inflammatory affections and ulcerations of the mucous membrane of the mouth and fauces* nitrate of silver is sometimes a most valuable application. When the fibrinous exudation of croup commences on the surface of the tonsils and arches of the palate (diphtheria?), its further progress may be stopped, according to Mr. Mackenzie, by the application of a solution composed of twenty grains of nitrate of silver and an ounce of distilled water. The solid nitrate has been introduced through an aperture in the trachea, and applied to ulcers on the inner surface of the larynx in a case of phthisis laryngea, with apparent benefit. Nitrate of silver in solution, of the strength recommended by Dr. Green, of New York (viz. 60 grains to 1 fl. oz.), has been used with the most satisfactory results in inflammatory affections of the mucous membranes of the mouth, fauces, and pharynx. A case is related by Mr. Kesteven, in which severe inflammation of the epiglottis, with all its distressing symptoms, was immediately relieved by the application of a strong solution of this salt, and within twelve hours deglutition was completely restored. Dr. Lockwood has found a similar solution applied to the Schneiderian membrane a successful means of arresting catarrh in its early stages. Mr. J. D. Brown, of Haverfordwest, reports the good effects of a strong solution of nitrate of silver in quinsy. In some forms of *leucorrhœa*, the application of nitrate of silver, either in the solid state or in solution, is attended with beneficial effects. It is, I believe, most successful in cases dependent on local irritation or subacute inflammation, and not arising from constitutional debility. The solution may be applied by a piece of lint or sponge, or may be injected by means of a syringe with a curved pipe. Its strength must vary according to circumstances. Dr. Jewel generally employed three grains of the nitrate to an ounce of water; but in the Lock Hospital, solutions are sometimes used containing thirty, or even forty grains to the ounce. In some cases the solid nitrate has been applied to the cervix uteri and vagina by means of a silver tube. In *gonorrhœa of the female*, a solution of the nitrate of silver, or even this caustic in the solid state, has been used with the best effects. In many cases the discharge ceased, never to return, in twenty-four hours. In *gonorrhœa of the male*, the introduction of a bougie smeared with an ointment of nitrate of silver, is occasionally a most effectual cure; but the practice is dangerous, as it is liable to cause urethritis. An aqueous solution of the salt has been successfully used in chronic gonorrhœa. It may also be employed at the commencement, before micturition becomes painful. Mr. William Reeves, of Carlisle, has, with satisfactory results, employed injections of nitrate of silver, twenty grains to the ounce of distilled water, in irritable bladder. In *fissured or excoriated nipples*, the application of the solid nitrate of silver is of great service. It should be insinuated in all the chaps or cracks, and the nipple afterwards washed with tepid milk and water. The application of solid nitrate of silver is a most effectual remedy for the different forms of *porrigo* which affect the heads of children. The caustic should be well rubbed into the parts. I have never known the practice to fail, or to cause the loss of hair. Where the greater portion of the scalp is involved, the different spots should be cauterized successively at intervals of some days, for I have seen fever and delirium produced in a child from the too excessive use of this remedy. In *psoriasis*, the same medicine was found by Dr. Graves most effectual. An aqueous solution of the nitrate is also valuable as an astringent wash in other skin diseases, as *impetigo*. The solid nitrate is sometimes employed to stop the progress of irritative or erysipelatous inflammation, by applying it in a circular form around, and at a little distance from, the inflamed portion; but I have frequently observed the inflammation extend beyond the cauterized part. Mr. Higginbottom reports favorably of the effects of applying the nitrate to *burns* and *scalds*; and his observations have been confirmed by those of Mr. Cox. *In strictures of the urethra and œsophagus*, bougies armed with nitrate of silver or lunar caustic on their points are occasionally employed with great advantage, at least in urethral strictures. Lunar caustic, fused round a platinum wire, has been employed by M. Chassaignac for operating with greater safety in cavities, where the fracture of the caustic might be dangerous. Notwithstanding that the application of nitrate of silver to stricture of the urethra has been repeatedly advocated, it is now but little employed; yet of its efficacy and safety in many obstinate cases, where the simple bougie fails, I am assured by repeated observation.

*Administration.*—Nitrate of silver may be exhibited in doses of one-sixth of a grain, gradually increased to three or four grains, three times a day. The usual mode of administering it is in the form of pills made of bread-crumb; but the chloride of sodium which it contains renders it objectionable: some mild vegetable powder with mucilage is preferable. Common salt or salted foods should not be taken either immediately before or after swallowing these pills. It is deserving of especial notice that larger doses may be administered without inconveniencing the stomach, in the form of pill than in that of solution, in consequence, I presume, of the latter acting on a larger surface. Dr. Powell in some cases was able to give fifteen grains at a dose in the form of pills, while he rarely found stomachs that could bear more than five grains in solution. It is advisable not to continue the use of it beyond a month or six weeks at a time. The inhalation of nitrate of silver has been proposed by Dr. T. K. Chambers, in order to obtain its direct application to the air-passages. A light innocuous powder, such as the pollen of the lycopodium, or club-moss, is allowed to take up as much as it will of a saturated solution of the salt, and is then carefully dried and powdered. Two grains and a half of the powder thus prepared by Mr. Squire were found to contain one grain of nitrate. A glass funnel, or other apparatus for the especial purpose, serves for the introduction of the powder. Dr. Chambers observes, that its employment is attended with far less cough and spasm than the application of a sponge to the glottis. For external use, an aqueous solution is employed, of strengths varying from a quarter of a grain to forty grains, in an ounce of distilled water. The formula for Mr. Guthrie's ointment has already been given.

*Antidote.*—The antidote for nitrate of silver is common salt. When this comes in contact with lunar caustic, nitrate of soda and chloride of silver are produced: the latter compound is, according to the experiments of Orfila, innocuous. The contents of the stomach should be removed, and the inflammatory symptoms combated by demulcents, blood-letting, and the usual antiphlogistic means. When the local use of nitrate of silver causes excessive pain, relief may be gained by washing the parts with a solution of common salt. Pieces of caustic have been occasionally left in the vagina and urethra. Injections of a solution of common salt are the best means of preventing bad effects.

To diminish the slate-colored tint of the skin arising from nitrate of silver, acids or the super-salts offer the most probable means of success. The external and internal use of dilute nitric acid, or the internal employment of the acid tartrate of potash, may be tried: the discoloration is said to have yielded to a steady course of the last-mentioned substance. Recent stains of the cuticle from the application of nitrate of silver may be removed by washing with a solution of common salt, followed by solution of ammonia, and stains of long standing by wetting them with the iodide and subsequently with the cyanide of potassium.

*Pharmaceutic Use.*—Used in the preparation of oxide of silver, and the following:—

Volumetric Solution of Nitrate of Silver. (Appendix B. III.)—Take of nitrate of silver, 148.75 grains; distilled water, one pint; dissolve, and keep in an opaque stoppered bottle. The quantity of this solution which fills the volumetric tube to 0, includes seventeen grains of nitrate of silver, or $\frac{1}{10}$ of an equivalent of the salt in grains. Upon dropping it into dilute hydrocyanic acid rendered alkaline by soda, the precipitate first formed is upon agitation redissolved, and continues to be so until the whole of the cyanogen of the acid has united with the sodium and the silver, forming the double cyanide of sodium and silver. In such experiments 100 volumetric measures of the solution correspond to 5.4 grains of absolute hydrocyanic acid (see **Acidum Hydrocyanicum Dilutum**, p. 98).

This solution is also used to determine the purity of rectified spirit, and as a test for the presence or absence of hydrochloric acid, chlorides, iodides, &c.

Solution of Ammonio-Nitrate of Silver. (Appendix B. II.) Ammonio-Nitrate of Silver$=AgO,NO_5+2NH_3$.—Take of nitrate of silver, in crystals, a quarter of an ounce; solution of ammonia, half a fluidounce, or a sufficiency; distilled water, a sufficiency. Dissolve the nitrate of silver in eight fluidounces 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 fluidounces.

*Used* as a test for arsenious and phosphoric acids, whose compounds with oxide of silver are soluble in nitric acid, and cannot therefore be precipitated by the ordinary nitrate of silver.

[Argenti Nitras Fusa, U. S., *Fused Nitrate of Silver*. Argenti Nitras Fusus, *Pharm.* 1850.—"Take of Nitrate of silver a convenient quantity. Melt it in a porcelain capsule, and continue the heat cautiously until frothing ceases; then pour the melted salt into suitable silver moulds." U. S. Fused nitrate of silver occurs in the shops, in the form of small, whitish, subtranslucent cylinders. The U. S. Pharmacopœia directs the following tests of its purity: "A small portion of fused nitrate of silver, rubbed into fine powder with twice its weight of sugar, forms a mixture, which when burned upon a surface of glass or porcelain, leaves a tasteless residue. When treated with muriatic acid, as directed in the note to nitrate of silver, the liquid, filtered from the precipitate formed, is totally evaporated by heat." It is the only suitable form to be used as a caustic.—W.]

[**Argenti Cyanidum**, U. S., *Cyanide of Silver*. Argenti Cyanuretum, *Pharm.* 1850.

"Take of nitrate of silver, ferrocyanide of potassium, each, two troyounces; sulphuric acid, a troyounce and a half; distilled water, a sufficient quantity. Dissolve the nitrate of silver in a pint of distilled water, and pour the solution into a tubulated glass receiver. Dissolve the ferrocyanide of potassium in ten fluidounces of distilled water, and pour the solution into a tubulated retort, previously adapted to the receiver. Having mixed the sulphuric acid with four fluidounces of distilled water, add the mixture to the solution in the retort, and distil, by means of a sand-bath, with a moderate heat, until six fluidounces have passed over, or until the distillate no longer produces a precipitate in the receiver. Lastly, wash the precipitate with distilled water, and dry it." U. S. In this process the ferrocyanide of potassium is decomposed by the sulphuric acid, sulphate of iron and potassa being formed and hydrocyanic acid being set free. This acid then acts on the nitrate of silver, forming a precipitate of the cyanide of silver. Thus. $K_2FeCy_3+3SO_3+3HO=2(KO,SO_3)+FeO,SO_3+3HCy$ and $NO_5KO+HCy=(NO_5+HO)+KCy$.

*Officinal Characters.*—Cyanide of silver is a white powder, insoluble in water and in cold nitric acid, but soluble in that acid at the boiling temperature. When it is exposed to heat, cyanogen is given off, and metallic silver left.

*Therapeutics.*—Cyanide of silver is never itself administered, but is used in the manufacture of dilute hydrocyanic acid.—W.]

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## GOLD (*Aurum*). Au=196.5.

*Natural History.*—It is found only in the metallic state, commonly alloyed with other metals, especially with silver, copper, and iron. It occurs in veins in primitive rocks, and is also found in alluvial deposits in small lumps or particles, called *gold dust.* It is found in several parts of Europe, Asia, and Africa, but principally in America, especially the southern part. It has been largely found of late years in California and Australia.

### Fine Gold. (Appendix B. I.)

Gold free from metallic impurities.

*Properties.*—Pure gold has a rich yellow color, a sp. gr. of 19.2 to 19.4; is soft, very ductile, and malleable; fuses at a bright-red heat (2016° F., according to Daniell); and in the liquid state has a brilliant greenish color. It is unacted on by nitric acid, but is readily soluble in nitro-hydrochloric acid. The solution is yellow, stains organic matters (as the skin) purple, throws down by the addition of sulphate of iron, metallic gold in a finely divided state; by chloride of tin, a dark or purple-black precipitate; and by subnitrate of mercury ($Hg_2O,NO_5$), a black precipitate. Heated with borax by the blowpipe, it forms a pink or rose-colored glass, but is subsequently reduced.

### Terchloride of Gold. $AuCl_3$=303.

*Properties.*—Terchloride of gold is in the form of small crystalline needles, of a deep orange-red color, inodorous, and having a strong, styptic, disagreeable taste. It is deliquescent, on which account it should be preserved in a well-stoppered bottle; it is soluble in water, alcohol, and ether. Ether will remove it from its solution in water. When heated, it evolves chlorine, and is converted, first into protochloride, and then into metallic gold, which is left in the spongy state. It reddens litmus, is reduced by many metals (as iron, copper, tin and zinc), by several of the non-metallic elementary substances (as phosphorus), and, under exposure to light, by many organic bodies (as charcoal, sugar, gum, gallic acid, and extractive).

Solution of Terchloride of Gold. (Appendix B. II.)—Take of fine gold, reduced by a rolling machine to a thin lamina, sixty grains; nitric acid, one fluidounce; hydrochloric acid, seven fluidounces; distilled water, nine fluidounces. Place the gold in a flask with one fluidounce of the nitric and six fluidounces of the hydrochloric acid, first mixed with four fluidounces of the water, and digest until it is dissolved. Add to the solution an additional fluidounce of hydrochloric acid, evaporate at a heat not exceeding 212° until acid vapors cease to be given off, and dissolve the terchloride of gold thus obtained in five fluidounces of distilled water. The solution should be kept in a stoppered bottle.

By the mutual action of nitric and hydrochloric acid upon each other, free chlorine and binoxide of nitrogen are produced, $3HCl+NO_5=3Cl+NO_2+3HO$. The chlorine combines with the gold to form terchloride.

*Used* as a test for atropia, with which it forms a yellow crystalline compound.

## PLATINUM. Pt=98.5.

*Natural History.*—Platinum is found in the metallic state, in small grains, in Brazil and Peru; also in Antioquia (North America), and in considerable quantities in the Uralian mountains of Siberia.

### Platinum Foil. (Appendix B. I.)

### Bichloride of Platinum. $PtCl_2$=169.5.

*Properties.*—Bichloride of platinum occurs in prismatic crystals, having the composition, $PtCl_2,10HO$. On heating these a dark reddish-brown, deliquescent, saline mass of anhydrous bichloride of platinum is obtained. It is soluble in water, alcohol, and ether. It forms a soluble double salt with chloride of sodium, which yields prismatic crystals of a deep orange-color on evaporation. With ammonia, in the presence of hydrochloric acid, it yields a very insoluble compound, $NH_4Cl, PtCl_2$, which, on being heated to redness, leaves the platinum in a spongy state.

SOLUTION OF BICHLORIDE OF PLATINUM. (Appendix B. II.)—Take of thin platinum foil, a quarter of an ounce; nitric acid, a sufficiency; hydrochloric acid, a sufficiency; distilled water, seven fluidounces; mix half a fluidounce of the nitric acid with three fluidounces of the hydrochloric acid and two fluidounces of the water; pour the mixture into a small flask containing the platinum, and digest at a gentle heat, adding more of the acids mixed in the same proportion, should this be necessary, until the metal is dissolved. Transfer the solution to a porcelain capsule, add to it a fluidrachm of hydrochloric acid, and evaporate on a water-bath until acid vapors cease to be given off. Let the residue be dissolved in the remaining five ounces of distilled water, and preserved in a stoppered bottle.

The action here is precisely similar to that described under terchloride of gold, the action of the nitric upon the hydrochloric acid producing chlorine, which unites with the metallic platinum.

*Used* as a test for the presence or absence of potash and potash salts, with which, in the presence of chlorine, &c. it forms a sparingly soluble double salt, $KCl,PtCl_2$; also as an indication of nicotia, the active principle of tobacco.

# ORGANIC BODIES.

Under this division are included those vegetables and animals, with their educts and products, which are admitted into the British Pharmacopœia.

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## VEGETABLES.

### CRYPTOGAMIA—FLOWERLESS PLANTS.

### [ALGÆ. Sea Weeds.

### CHONDRUS CRISPUS, *Grev.*

*Generic Characters.—Frond* cartilaginous, nerveless, compressed or flat, flabelliform, dichotomously cleft: formed internally of three strata; the *inner*, of densely packed longitudinal fibres: the *medial*, of small roundish cells; the *outer*, of vertical, colored, moniliform filaments. *Fructification:* 1, prominent *tubercles* (*nemathecia*) composed of radiating filaments whose lower articulations are at length dissolved into *spores* (?); 2, *tetraspores* collected into sori, immersed in the substance of the frond (*Harvey*).

*Specific Characters.—Frond* stipitate, thickish, cartilaginous, flat or curled, segments wedge-shaped, very variable in breadth; apices truncate, submarginate, or cloven; axils obtuse; sori elliptical or oblong, concave on one side (*Harvey*). *Fronds* from two or three to ten or twelve inches long; their substance cartilaginous, in some varieties approaching to horny, flexible and tough; their *color* deep, purple-brown, often tinged with purplish-red, paler at the summit, becoming greenish, and at length white in decay.

*Habitat.*—On rocks and stones on the coasts of Great Britain. It is chiefly gathered on the west coast of Ireland.—W.]

### [Chondrus, *Irish Moss.* Mat. Med. List, U. S. P.

Carrageen or Irish moss consists of the fronds, which are usually from two to four inches long, dry, crisp, mostly yellowish or dirty white (from bleaching in the sun), but intermixed with purplish red portions, inodorous or nearly so, with a mucilaginous taste.

In warm water the dried commercial frond swells up, and, when boiled, almost entirely dissolves. If the swollen and partially dissolved frond be examined by the microscope, it is seen to consist of very minute, somewhat fusiform cohering cells. A calcareous meshy crust (consisting of various species of *Flustra*) is frequently found on the frond.

*Chondrus mamillosus* is found in commercial carrageen. The frond of this plant is more or less channelled; but the species is best distinguished by the fructification; in *Ch. crispus* the subhemispherical capsules are imbedded in the disk of the frond, producing a depression on the opposite side; in *Ch. mamillosus* the spherical capsules are scattered over the disk of the frond, and are supported on little short stalks, Fig. 44.

Fig. 44.

*Chondrus mamillosus.*
Portion of the channelled frond bearing the pedicellate capsules.

Carrageen contains a trace of iodine and bromine, some starch, and a large amount of a peculiar gum-like substance. The mucilaginous constituent of carrageen moss is termed by some writers *vegetable jelly* or *vegetable mucilage*, by others *pectin*. It appears to me to be a peculiar modification of mucilage, and I shall therefore call it *carrageenin*. (*Pereira.*) It is soluble in boiling water, and its solution forms a precipitate with diacetate of lead and silicate of potash, and, if sufficiently concentrated, gelatinizes on cooling. Carrageenin is distinguished from ordinary gum by its aqueous solution not producing a precipitate on the addition of alcohol; from starch by its not assuming a blue color with tincture of iodine; from animal jelly by tincture of nutgalls causing no precipitate; from pectin by acetate of lead not throwing down anything, as well as by no mucic acid being formed by the action of nitric acid.

The composition of carrageenin dried at 212° F., according to Schmidt, is represented by the formula $C_{12}H_{10}O_{10}$; so that it appears to be identical with starch and sugar. Mulder, however, represents it by the formula $C_{24}H_{19}O_{19}$.

*Physiological Effects.*—Carrageen moss is nutritive; its mucilaginous matter acts as an element of respiration, while its inorganic constituents (phosphate of lime, potash, salts, &c.) may also serve some useful purpose in the animal economy. It is generally regarded as being readily digestible.

Medicinally, it is emollient and demulcent.

*Uses.*—It is a popular remedy for pulmonary complaints, especially those of a phthisical character, chronic diarrhœa and dysentery, scrofula, rickets, enlarged mesenteric glands, irritation of bladder and kidneys, &c. As a culinary article it has been employed as a substitute for animal jelly in the preparation of *blanc-mange*, jellies, white soup, &c.

*Administration.*—It is usually exhibited in the form of decoction or jelly. It has also been employed in combination with chocolate or cocoa.

*Decoction of Carrageen or Irish Moss.*—Macerate half an ounce of carrageen in cold or warm water, during ten minutes; then boil in three pints of water for a quarter of an hour. Strain through linen. When properly flavored it may be used as a *tisan* or common drink. By doubling the quantity of carrageen, a *mucilage* (*mucilago chondri*) is procured. Milk may be substituted for water when the decoction is required to be very nutritious; and various flavoring substances, sugar, lemon-juice, or aromatics may be ingredients.

*Carrageen Jelly.*—This may be prepared by adding sugar to the strained decoction, and boiling down until the liquid is sufficiently concentrated to gelatinize on cooling; or by employing a larger quantity of carrageen. If milk be substituted for water, *carrageen blanc-mange* is obtained.—W.]

## LICHENES, *Juss.* Lichens.

## CETRARIA ISLANDICA, *Ach.*

Cryptogamia, Algæ, *Linn.*

*Botanic Character.*—*Thallus* erect, three or four inches high, tufted and irregularly divided, foliaceous and somewhat leathery, olive-brown on the upper or fertile surface, paler beneath; division channelled, lobed, and fringed. Fructification near the margin of the larger lobes, consisting of flat brown plates (*apothecia*) with an elevated border. Woodv. pl. 205, page 566 (*lichen islandicus*); Steph. and Church, pl. 69.

Fig. 45.

*Cetraria islandica.*
The *apothecia* on the larger lobes of the thallus.

*Habitat.*—Dry mountainous districts of the new and old continents. Although met with in considerable abundance in Scotland, it is never gathered there as an article of commerce.

### Cetraria, *Iceland Moss.* [Mat. Med. List, U. S. P.]

The entire lichen.

*Officinal Characters.*—Foliaceous, lobed, crisp, cartilaginous, brownish-white, paler beneath, bitter and mucilaginous. A strong decoction gelatinizes on cooling.

*Description.*—Iceland moss is in general brownish or grayish-white; the upper surface darker, towards the base sometimes marked with blood-red spots; the under surface whitish, with white spots lodged in little depressions of the thallus which have a chalky or mealy appearance, and when submitted to microscopic examination appear warty, pearl-white masses. Fructification is rather rare on the commercial lichen. When dry, the lichen is almost odorless. Its powder is whitish-gray. It swells up in cold water, to which it communicates some portion of bitterness, and a very little mucilage. If some tincture of iodine be dropped on the moistened thallus, the tissues become intensely blackish-blue.

By prolonged boiling in water, the lichen yields a mucilaginous decoction, which, when cold, gives with a solution of iodine a blue color (*indicating starch*), with solution of subacetate of lead a copious whitish precipitate (*amylate of lead*), with a mixture of sulphate of copper and potash a green precipitate (*cetrarate of copper*), and with the persalts of iron a red color (*cetrarate of iron*).

*Commerce.*—It is imported from Hamburgh and Gottenburgh, and is said to be the produce of Norway and Iceland.

*Composition.*—Iceland moss contains about eighty per cent. of amylaceous matter, three of cetraric acid, a little gum, uncrystallizable sugar, and extractive. There are at least two kinds of amylaceous matter; namely, one which is colored blue by iodine (*lichen starch*), and one which does not become blue with this agent (*inuline*). The *Cetraric Acid*, *Cetrarin*, or *Bitter Principle* resides in the cortical portion of the thallus. It exists there for the most part in the state of free cetraric acid, and not as a cetrarate. In the pure state the acid occurs in the form of shining minute acicular crystals. It is intensely bitter, not volatile, and is infusible without decomposition. It is almost insoluble in water, which, however, acquires a bitter taste when boiled with the acid. It is soluble in boiling alcohol, but crystallizes in great part on cooling. It is slightly soluble in ether, and is quite insoluble in the fixed and volatile oils. It is dissolved both by the caustic and carbonated alkalies, and is precipitated from its solution by acids.

*Physiological Effects.*—It is a mucilaginous or demulcent tonic, without any trace of astringency. If the bitter matter and extractive be removed, it is nutritive, emollient, and demulcent, like ordinary starch, over which it has no advantage.

*Therapeutics.*—Iceland moss is well adapted to those cases requiring a nutritious and easily digested aliment, and a mild tonic not liable to disorder the stomach. It has been principally recommended in chronic affections of the pulmonary and digestive organs, particularly phthisis, chronic catarrh, dyspepsia, chronic diarrhœa, and dysentery; but its efficacy has been much exaggerated.

*Administration.*—It is best exhibited in the form of decoction. When employed as an alimentary substance merely, the bitter matter should be extracted before ebullition. The lichen should be heated once or twice in water up to about 180° F., by which it will be deprived of most of its bitterness. It is then to be boiled in water or milk. When the decoction is sufficiently concentrated, it gelatinizes on cooling. It may be flavored with sugar, lemon-peel, white wine, or aromatics, and then forms a very agreeable kind of diet.

DECOCTUM CETRARIÆ [U. S.], *Decoction of Iceland Moss.*—Take of Iceland moss, one ounce; distilled water, one pint and a half. Wash the moss in cold water to remove impurities; boil it with the distilled water for ten minutes in a covered vessel, and strain while hot. The product should measure about a pint. [" Take of Iceland moss, half a troyounce; water, a sufficient quantity. Boil the Iceland moss in a pint of water for fifteen minutes, strain with compression, and add sufficient water through the strainer to make the decoction measure a pint." U. S.]

*Dose.*—Fluidounce j to fluidounce iv.

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## ROCCELLA, *Ach.*

Cryptogamia, Algæ, *Linn.*

*Generic Character.*—*Thallus* coriaceo-cartilaginous, rounded or plane, branched or laciniated. *Apothecia* orbicular, adnate with the thallus; the disk colored, plano-convex, with a border at length thickened and elevated.

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## ROCCELLA TINCTORIA, *DC.*

### Dyers' Orchella Weed.

*Specific Character.*—*Thallus* suffruticose, rounded, branched, somewhat erect, grayish-brown, bearing powdery warts [*soredia*]. *Apothecia* flat, almost black and pruinose, with a scarcely prominent border.

*Habitat.*—Maritime rocks of the eastern Atlantic islands (the Madeira Isles, the Azores, the Canaries, and the Cape de Verde Isles); and the western coast of South America.

## ROCCELLA FUCIFORMIS, *DC.*

### Flat-leaved Orchella Weed.

*Specific Character.*—*Thallus* flat, branched, nearly upright, grayish-white, bearing powdery warts. *Apothecia* pruinose, bordered.

*Habitat.*—Angola, Madagascar, Madeira.

Fig. 46.

Fig. 47.

*Roccella tinctoria.* *c.* Thallus with apothecia. *Roccella fuciformis.* *R. montagnei.* *R. phycopsis.*

## Litmus. (Appendix B. I.)

A blue pigment prepared from various species of Roccella.

A considerable number of lichens have been employed by man on account of the coloring matter which they yield him. Several species of *Roccella*, of *Lecanora*, of *Gyrophora*, &c., contain principles usually, if not in all cases, organic acids (e. g., *orsellic*, *erythric*, *lecanoric*, and *gyrophoric acids*), which are colorless while in the plant, but which, under the united influence of water, atmospheric oxygen, and alkalies, yield colored products.

*Purple* and *blue* colors are yielded by several lichens. In this country purple colors (*orchil* and *cudbear*) only are obtained from them; but in Holland a blue color (*litmus*) is also prepared from these. It appears that any of the lichens which serve for the production of orchil may be used in the manufacture of litmus; but the best quality is prepared in Holland exclusively from Roccella tinctoria, while inferior sorts are made from species of Variolaria, Lecanora, and Parmelia. There are as many as nineteen sorts of litmus of varying quality, kept by the Dutch manufacturers; some of these are more than six times the value of others, notwithstanding that, according to the observations of Mr. D. Hanbury, there is by no means a corresponding difference in richness or intensity of color.

*Preparation.*—Dr. de Vry, of Rotterdam, describes the manufacture of litmus as follows: "Different species of Roccella from the Mediterranean, the Canary Islands, &c., are ground, and the powder mixed with weed ashes and water to make a pasty mixture, which is allowed to ferment. After some time, putrid urine and American potash are added to the mixture. When the paste has assumed a good blue color, it is formed into quadrangular cakes, which are dried and sold, or when they are of an inferior quality are shaken with indigo or litmus-powder of superior quality. It is, however, very difficult to obtain accurate information about this manufacture, which is kept very secret."

*Properties.*—Litmus is imported from Holland in the form of small, rectangular, light, and friable cakes of an indigo-blue color. Examined by the microscope, we find sporules, and portions of the epidermis and mesothallus of some species of lichen, moss-leaves, sand, &c. The odor of the cakes is that of violets. The violet odor is acquired while the mixture is undergoing fermentation, and is common to all the tinctorial lichens. The coloring matter of litmus is soluble in both water and spirit, yielding a solution which, in the concentrated state, has a purple hue when viewed by transmitted light; but in the dilute state it is pure blue. Viewed by transmitted candlelight, it has a reddish color. An aqueous infusion of litmus neither reddens turmeric paper nor occasions a precipitate with a solution of chloride of calcium. It contains, therefore, no free alkali or alkaline carbonate. It is reddened by acids and also by many of the metallic salts—as corrosive sublimate, sulphate of copper, sulphate of iron, &c. The infusion of litmus which has been reddened by acids has its blue color restored by alkalies, alkaline earths, the alkaline and earthy sulphurets, the alkaline carbonates, the soluble borates, the tribasic phosphate of soda, and the alkaline cyanides. It is decolorized by chlorine and by the alkaline hypochlorites. Certain deoxidizing agents also deprive it of color, as sulphuretted hydrogen, hydrosulphuret of ammonia, sulphurous acid, the hyposulphites, nascent hydrogen (obtained by adding hydrochloric acid and zinc to an aqueous infusion of litmus), and the protosalts of iron. If an infusion of litmus be left in contact with sulphuretted hydrogen in a well-stoppered bottle for a few days, the liquid is decolorized, but reacquires its color by exposure to the air or oxygen gas. The blue of litmus is distinguished from other vegetable blues by the action of acids and alkalies on it; for most vegetable blues and purples (as red-cabbage juice, syrup of violets. &c.) are changed to green by alkalies, whereas lichen-blue does not undergo this change. In the commoner varieties, however, of the litmus cakes of commerce, there is frequently found, besides the *lichen-blue*, another coloring matter, *indigo*, the existence of which was for some time entirely overlooked. Its presence is proved by the odor, the coppery lustre which they acquire when rubbed with the nail; by digesting them in oil of vitriol, by which a blue solution of sulphate of indigo is obtained; and by heating them in a watch-glass or platinum capsule, by which indigo vapor (characterized by its well-known odor and reddish-violet color) and crystals of indigo are obtained.

*Pharmaceutic Uses.*—Litmus is employed as a test for acids and alkalies. The former communicate a red color to blue litmus; the latter restore the blue color of reddened litmus. If the litmus present be reddened by an unboiled, but not by a boiled water, we may infer that the acid present is a volatile one, probably carbonic acid, or perhaps sulphuretted hydrogen.

Tincture of Litmus. (Appendix B. I.)—Take of litmus, in powder, one ounce; proof spirit, ten fluidounces. Macerate for seven days, and filter.

Blue Litmus Paper. (Appendix B. I.)—Unsized paper steeped in tincture of litmus, and dried by exposure to the air.

Unsized paper is preferred, on account of the facility with which it imbibes the liquid to be tested; and also because the alum which frequently enters into the composition of the size affects the color of litmus. Good litmus paper should be of a uniform blue tint, and neither very light nor very dark. When it has a purplish tint it is a more delicate test for acids than when its color is pure blue. When carefully dried, it may be preserved by wrapping it in stiff paper, and keeping it in well-stoppered vessels in the dark. Small books of test-papers are very convenient; they should be kept in leathern cases.

*Used* to detect the presence of acids, and of salts which react as acids.

RED LITMUS PAPER. (Appendix B. I.)—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.

*Used* as a test for alkalies, and salts which react as bases.

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## FILICES, *Juss.* FERNS.

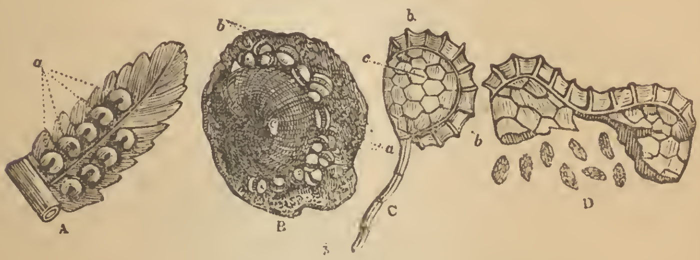
## ASPIDIUM FILIX MAS, *Sw.*

### Male Shield Fern.

Cryptogamia, Filices, *Linn. Syst.*

*Botanic Character.*—An herbaceous plant, with fronds three to four feet high, growing in a circle from a subterraneous perennial stem (*rhizome*). *Fronds* bipinnate, with oblong obtuse serrated pinnules, and

Fig. 48.




*Aspidium filix mas.*—Fructification.

A. Pinnule with nine sori (*a*).
B. Magnified portion of pinnule with a sorus. *b.* Sporangia partially covered by *c.* the involucre.
C. Magnified sporangium. *a.* Stalk. *b.* Ring. *c.* Membranous sac.
D. Ruptured sporangium, with the spores escaping.

scaly stipe and rachis, spirally coiled before expansion; *sori* round, on the back of the frond, near the central nerve; *involucre* reniform; *capsules* (*sporangia*) surrounded by a vertical ring, opening transversely. —*Woodv.* page 136, pl. 271. (*Polypodium filix mas.*)

*Habitat.*—An indigenous plant, frequent in woods and on shady banks.

### Filix, *Fern Root.*

### [Filix Mas. Mat. Med. List, U. S. P.]

The Rhizome dried.

*Collection.*—The rhizome should be collected in the month of July, August, or September.

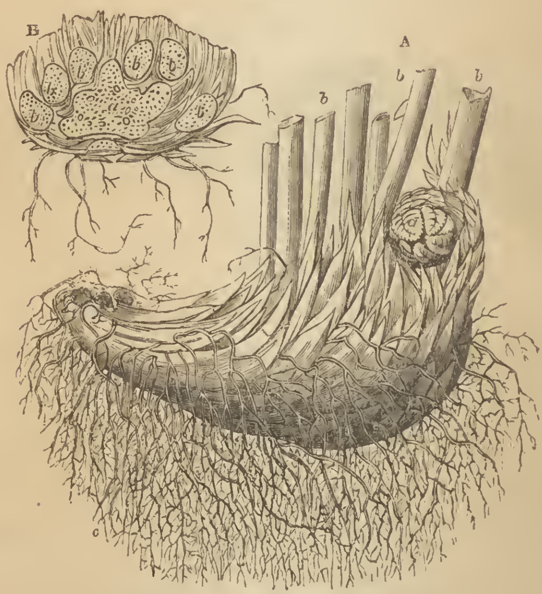
*Officinal Characters.*—Tufted, scaly, greenish-brown; powder greenish-yellow, with a disagreeable odor, and a nauseous bitter somewhat astringent taste.

*Description.*—The subterraneous stem or rhizome (*fern root*), lies obliquely in the ground (Fig. 49). It varies in length and breadth according to its age. For medical purposes it should be from three to six or more inches long, and from half an inch to an inch or more broad. It is almost completely enveloped by the thickened bases of the footstalks of the fallen fronds. These bases are arranged closely around the rhizome, overlapping each other. They are one or two inches long, curved, angular, brown, and furnished with numerous shining, reddish-yellow, thin, silky scales. The radical fibres (root, properly so called) arise from the rhizome between these footstalks. Internally, the rhizome and footstalks are, in the recent state, fleshy, of a light yellowish-green color; but in the dried state, yellowish, or reddish-white. The dried root has a feeble, earthy odor. Its taste is at first sweetish, then bitter astringent, and subsequently nauseous, like rancid fat. The powder should be preserved in well-stoppered bottles. Both the whole rhizome and powder deteriorate by keeping.

*Composition.*—Fern-root contains a green fatty oil, volatile oil, and tannic acid. The presence of tannic acid in the aqueous decoction of fern-root is shown by the persalts of iron producing a dark green color (*tannate of iron*), and by a solution of gelatin causing a yellowish precipitate (*tannate of gelatin*).

*Therapeutics.*—It is employed only as an anthelmintic. Theophrastus, Dioscorides, Pliny, and Galen used it as such. The attention of modern

Fig. 49.




*Aspidium filix mas.*—Fresh rhizome entire.
*a.* Spirally-coiled young frond. *b b b.* Footstalks of the older fronds. *c c.* Root-fibres.

practitioners has been directed to it principally from the circumstance of its being one of the remedies employed by Madame Nouffer, the widow of a Swiss surgeon, who sold her secret method of expelling tapeworm to Louis XVI. for 18,000 francs. "It is an excellent remedy," says Bremser, "against *Bothriocephalus latus*, the tapeworm of the Swiss, but not against *Tænia solium*, the tapeworm of this country; for though it evacuates some pieces of the latter, it does not destroy it."

*Administration.*—It may be administered in the form of powder, or of liquid extract. The dose of the recently prepared powder is from 50 to 150 grains. Madame Nouffer's *specific* was 100 or 150 grains of the powder taken in from four to six ounces of water in the morning fasting, and two hours afterwards a *purgative bolus*, composed of calomel ten grains, scammony, ten grains, and gamboge, six or seven grains. The bolus was exhibited to expel the worm, which the fern root was supposed to have destroyed. [Notwithstanding the doubt cast on this remedy by the late learned author, I am of opinion, with many practitioners of this country, that the oil or extract of fern root is very valuable as a destroyer and expeller of tapeworm. Numerous testimonies of its efficacy have been published.—Ed.]

Extractum Filicis Liquidum, *Liquid Extract of Fern Root.*—Take of fern root in coarse powder, two pounds; ether, four pints, or a sufficiency. Mix the fern root with two pints of the ether; pack closely in a percolator; and add the remainder of the ether at intervals, until it passes through colorless. Let the ether evaporate on a water-bath, or recover it by distillation, and preserve the oily extract.

This ethereal extract is commonly termed oil of fern. A pound of the rhizome yielded Soubeiran an ounce and a half of thick black oil, having the odor of the fern. The anthelmintic property resides in the oil. The *dose* is from half a drachm to a drachm, in the form of electuary, emulsion, or pills; an hour afterwards, an ounce or an ounce and a half of castor oil should be exhibited.

## PHANEROGAMIA—FLOWERING PLANTS.

### *Class:* Monocotyledones.

### *Sub-class:* GLUMACEÆ.

### GRAMINEÆ, *R. Brown.* Grasses.

### HORDEUM DISTICHON, *Linn.*

**Two-rowed or Long-eared Barley.** Triandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Spikelets* spiked, 3 together, 2-flowered, the upper flower being rudimentary; the *lateral flowers* male, awnless; the *central ones* hermaphrodite, distichous, close-pressed to the stalk, awned. *Glumes* 2, collateral, awned. *Stamens* 3, *Stigmas* 2. *Grain* (*caryopsis*) hairy at the summit, oblong, with a longitudinal furrow, adherent to the paleæ.

*Habitat.*—A native of Tartary, cultivated in Britain.

**Hordeum,** *Pearl Barley.* [Mat. Med. List, U. S. P.]

The seeds deprived of their husks.

*Officinal Characters.*—White, rounded, retaining a trace of the longitudinal furrow.

*Description.*—The grains, deprived of their husk by a mill, form *Scotch*, *hulled*, or *pot-barley.* When all the integuments of the grains are removed, and the seeds are rounded and polished, they constitute *pearl-barley.*

*Composition.*—The average composition of fine barley-meal is: *Starch*, 68; *gluten, albumen*, &c., 14; *fatty matter*, 2; *saline matter* or *ash*, 2; *water*, 14 = 100.

*Uses.*—Barley is used in the form of decoction as a demulcent, and as a vehicle for more active medicines.

Decoctum Hordei [U. S.], *Decoction of Barley.*—Take of pearl-barley, two ounces; distilled water, one pint and a half. Wash the barley in cold water, and reject the washings; boil with the distilled water for twenty minutes in a covered vessel, and strain. ["Take of barley, two troyounces; water, a sufficient quantity. Having washed away the extraneous matters which adhere to the barley, boil it with half a pint of water for a short time, and throw away the resulting liquid. Then, having poured on it four pints of boiling water, boil down to two pints, and strain." U. S.]

This is a valuable demulcent and emollient drink for the invalid in febrile cases and inflammatory disorders, especially of the chest and urinary organs. It is sometimes given to children as a slight laxative. It is usually flavored with sugar, and frequently with some slices of lemon.

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## TRITICUM VULGARE, *Villars.*

**Common Wheat.** Triandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Spikelets* about 4-flowered. *Flowers* distichous: *Glumes* 2, opposite, nearly equal, ribbed. *Paleæ* 2, ovate; the lower awnless, the upper bicarinate, keels ciliated. *Stamens* 3, *Stigmas* 2, feathery. *Grain* (*caryopsis*) convex externally, free.

Fig. 50.


*a.* T. vulgare, var. æstivum. *b.* T. vulgare, var. hybernum.

*Var. æstivum*, spring wheat; annual, glumes awned.

*Var. hybernum*, winter wheat; biennial, glumes awnless.

*Habitat.*—A native of the country of the Baschkirs, cultivated in Europe.

**Flour.** (Appendix A.) *Wheat Flour.*

The grain of wheat, ground and sifted.

*Composition.*—The proportion of the organic constituents of wheat-flour is liable to considerable variation, according to soil, climate, variety of seed, mode of culture, time of cutting, and quality of manure.

The percentage composition of wheat-flour varies from 52 to 75 of starch, from 10 to 23 of gluten and albumen, and from 6 to 13 of dextrine and glucose. Wheat contains at least four different proteine compounds—namely, *albumen*, *vegetable fibrine*, *gluten*, and *caseine*. They have an analogous composition, and contain each about 16 per cent. of nitrogen. If wheaten dough be washed on a sieve by a stream of water, a milky liquid passes through, and a tenacious elastic mass is left behind, called *crude gluten*. The milky liquid holds in solution gum, sugar, and albumen; and in suspension, starch: the crude gluten contains vegetable fibrine, gluten, caseine, and oil. The cold decoction of wheat-flour forms with tincture of iodine the blue iodide of starch, and recently-prepared tincture of guaiacum forms a blue color with its gluten.

*Therapeutics.*—Wheat-flour is used with great advantage as a dusting powder in burns and scalds. It cools the part, excludes the air, and absorbs the discharge, forming a crust which effectually protects the subjacent part. When the crust has become detached by the accumulation of purulent matter beneath, a poultice may be applied, and after its removal the exposed surface may be again dusted over with flour. A mixture of flour and water is used as a chemical antidote in poisoning by the salts of mercury, copper, zinc, silver, and tin, and by iodine.

*Pharmaceutic Uses.*—Flour is a constituent of the *yeast-poultice*, and is used in pharmacy for enveloping pills.

### **Amylum,** *Wheat Starch.* [Mat. Med. List, U. S. Ph.]

Starch ($C_{12}H_{10}O_{10}$) procured from the seed.

*Preparation.*—A mixture of coarsely-ground wheat is steeped in water in a vat for one or two weeks (according to the state of the weather), by which acetous fermentation is established. The acid liquor called *sours* is drawn off, and the impure starch washed on sieves to separate the bran. What passes through is received in shallow vessels termed *frames*. Here the starch is deposited. The sour liquor is again drawn off, and the *slimes* removed from the surface of the starch, which is to be again washed, strained, and allowed to deposit. When, by these processes, the starch has become sufficiently pure, it is *boxed;* that is, it is placed in wooden boxes perforated with holes and lined with canvas, where it drains. It is then cut into square lumps, placed on chalk-stones or bricks, to absorb the moisture, and dried in a stove. By this process the blocks are *crusted*. The blocks are then scraped, papered, labelled, stamped, and returned to the stove. Here they split into columnar masses (like grain tin or basaltic columns), commonly called *races*.

*Officinal Characters.*—In white columnar masses (the cold decoctions of), which become blue with solution of iodine.

*Properties.*—In commerce there are two kinds of wheat-starch—one *white*, the other *blue*. The *white* is the sort which should be employed for dietetical or medicinal purposes. When examined by the microscope, wheat-starch is perceived to consist principally of large and small granules, with but few of intermediate size. When heated in a tray in an oven to 300° F., it acquires a buff color, and is converted into dextrine or British gum. Boiled in water, wheat-starch yields a mucilage, which, when sufficiently concentrated, forms, on cooling, a jelly. The consistence of this jelly is due to the mutual adhesion of the swollen hydrated integuments of the starch-grains. When submitted to prolonged ebullition in a large quantity of water, the granule almost entirely dissolves, and the decoction, on cooling, does not gelatinize. With iodine the decoction, when cold, forms the blue iodide of starch, the color of which is destroyed by alkalies and by heat. Wheat-starch is isomeric with gum and cane-sugar.

*Therapeutics.*—Starch-powder is used as a dusting powder to absorb acrid secretions and to prevent excoriation. [Dusted over the surface, it affords great relief in erysipelas.—Ed.] Its decoction is used as an emollient and demulcent clyster in inflammatory conditions of the large intestines, and as a vehicle for the formation of other more active enemata. Starch is an antidote for poisoning by iodine, and is sometimes given in combination with this substance to prevent its local action.

*Pharmaceutic Uses.*—It is an ingredient of compound powder of tragacanth.

Mucilago Amyli, *Mucilage of Starch.*—Take of starch, one hundred and twenty grains; distilled water, ten fluidounces. Triturate the starch with the water, gradually added; then boil for a few minutes, constantly stirring.

*Uses.*—It is sometimes used alone as an enema in dysentery, irritation of the rectum, &c. It is a constituent of all the officinal enemas except enema of tobacco.

**Bread** (Appendix A.), *Bread made with Wheat Flour.*

The bread intended by the Pharmacopœia is probably the ordinary fermented loaf-bread, the ingredients of which are wheat-flour, salt, water, and yeast, to which a portion of potatoes is usually added by the baker, not for adulteration, but to assist fermentation, and to render the bread lighter. No directions, however, are given respecting its nature and composition, except that it shall be made with wheat-flour.

*Uses.*—Fermented bread is employed both in medicine and pharmacy. Wheat-flour, especially when baked, is rather constipating than purgative. In this it differs from both barley-meal and oat-meal. Infants who are fed on baked flour frequently suffer with constipation; and to relieve this it is sometimes found necessary to substitute a portion of barley-meal for an equivalent weight of wheat-flour. Wheat-flour yields the finest, whitest, lightest, and most digestible kind of bread. It owes its superiority in these respects to the large quantity of tenacious gluten which it contains. Undressed wheat-flour appears to act, by the bran which it contains, as a mechanical stimulant to the bowels; and hence brown bread is resorted to for the purpose of counteracting habitual constipation. It, however, frequently fails to produce the desired effect. In some forms of dyspepsia, fermented bread disagrees with the patient; and, in such, benefit is occasionally obtained by the substitution of unfermented bread. In diabetes ordinary bread is objectionable on account of its starch augmenting the saccharine condition of the urine. Bourchardat suggested the use of a *gluten-bread*, in diabetes, as a substitute for the ordinary wheaten bread; but in practice it has not been found available. When quite devoid of starch, it can be masticated only with extreme difficulty, and, in fact, is not eatable. *Bran-bread* is, perhaps, the best kind of bread for diabetic patients. Dr. Prout has published a receipt for a bread of this kind, devised by his patient, the late Rev. J. Rigg. The following formula yields the best product which I have seen, and has proved highly useful in one case of diabetes: Take coarse *wheat-bran*; wash it thoroughly with water on a sieve until the water passes through clear; then dry it in an oven, and grind to a fine powder by a mill. Then take 7 eggs, 1 pint of milk, $\frac{1}{4}$ lb. of butter, a few caraways or some ginger, and make into a paste with a sufficiency of the bran-flour. Divide the mass into seven equal parts, and bake each separately, in a saucer, by rather a quick oven: the time required for baking is usually about twenty minutes. Notwithstanding this condemnation of gluten-bread by the author, the editor has given no other bread to diabetic patients for many weeks together, and has found it both useful and agreeable and much preferred to bran-bread. *Crumb of bread* is sometimes used in the formation of pills; but is objectionable for this purpose, on account of the pills thus made becoming excessively hard by keeping. Furthermore, in some cases, the constituents of bread decompose the active ingredients of the pills. Thus the salt of bread decomposes nitrate of silver. Crumb of bread is most valuable for the preparation of poultices. It is an ingredient in the *charcoal poultice.* The *bread-and-water-poultice* is prepared by covering some bread in a basin with hot water: after it has stood for ten minutes, pour off the excess of water, and spread the bread about one-third of an inch thick on soft linen, and apply it to the affected part. Sometimes lint dipped in oil is applied beneath the poultice. Decoction of poppy, or Goulard's water, may be substituted for common water. This is a valuable application to phlegmonous inflammation. A *bread-and-milk-poultice*, to which lard is sometimes added, is also used to promote suppuration; but it should be frequently renewed, on account of its tendency to undergo decomposition. Both poultices are used in the treatment of irritable ulcers.

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## SECALE CEREALE, *Linn.*

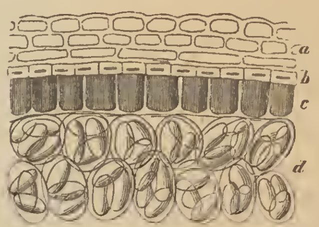
**Common Rye.** Triandria, Digynia, *Linn. Syst.*

*Botanic Character.—Spikelets* 2-flowered. *Florets* sessile, distichous, with the linear rudiment of a third terminal one. *Glumes* 2, small,

Fig. 51.

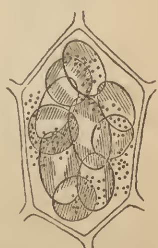

*Secale cereale.*
*e* Entire plant; *ff*, paleæ.

Fig. 52.




*Section of a healthy grain of rye (magn.).*

Fig. 53.



*Single cell of the albumen (magn.).*

Fig. 54.

*Rye starch (magn.).*

narrow, subulate, shorter than the spikelet. *Paleæ* 2, herbaceous; the lower one awned at the point, keeled, unequal sided; the upper shorter and bicarinate. *Stamens* 3. *Stigmas* 2, nearly sessile, terminal, feathery. *Grain* (*caryopsis*) hairy at the point, free.—*Steph. and Church.* pl. 113.

*Habitat.*—The Caucasian-Caspian desert. Cultivated in Europe, but little in England.

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## ERGOTA, *Ergot.* [Mat. Med. List, U. S. P.]

The grain diseased by the presence of an imperfect fungus.

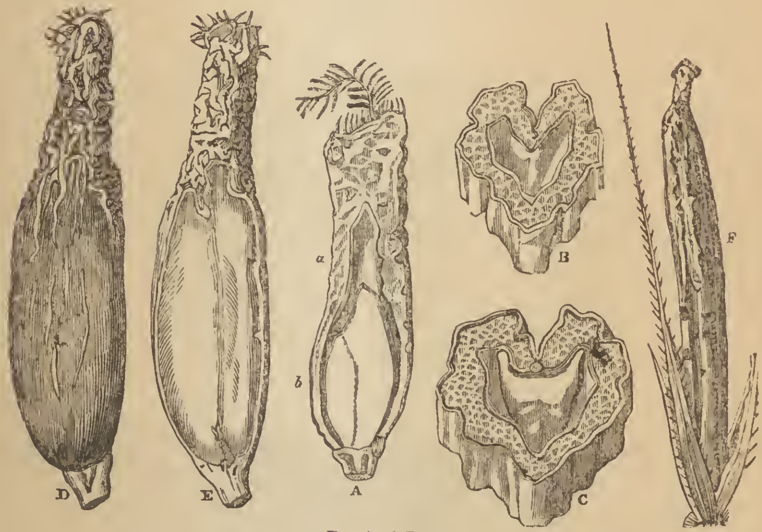
The disease termed *Ergot* is not peculiar to rye. Many other grasses

Fig. 55.


*Full-grown Ear of Rye, strongly infected with ergot* (nat. size).
*a a.* Mature ergot.

(Phœbus has enumerated thirty-one species) are subject to it. In the summer of 1838, I found the following grasses, growing in Greenwich marshes, ergotized: *Lolium perenne*, *Dactylis glomerata*, *Alopecurus pratensis*, *Festuca pratensis*, *Triticum repens*, *Arundo phragmites*, *Hordeum murinum*, and *H. pratense*. Professor Henslow found it in wheat which had been sent to the miller. I am indebted to him also for fine specimens of ergot on *Ammophila arundinacea*. But the disease is not confined to the *Gramineæ:* the *Cyperaceæ* are also subject to it. The number of grains in each spike which have become ergotized varies considerably; there may be one only, or the spike may be covered with them. Usually, the number is from 3 to 10. The mature ergot (Figs. 55, *a*; 56, F) presents scarcely any filaments and sporidia. The observations and experiments of Léveillé, Wiggers, Smith, Quekett, Berkeley, Corda, and more recently of Tulasne, have proved that ergot is a diseased and hypertrophied condition of the grain associated with one or more parasitic fungi; but the real nature of the fungus which is the special exciting cause of the ergot has been only recently determined. Mr. Quekett, who most carefully examined the development of ergot, says that the first appearance of the ergot is observed by the young grain and its appendages becoming covered with a white coating composed of multitudes of sporidia mixed with minute cobweb-like filaments. This coating extends

Fig. 56.




*Ergot of Rye.*

A. A side view of a longitndinal section of an infected grain, soon after fecundation, when the disease makes its first external appearance; magnified eight times in diameter.
B. Front view of a section of the above infected grain, cut at letter *a*; magnified sixteen times in diameter.
C. Ditto, cut at letter *b*; magnified sixteen times in diameter.
D. Side view of an unripe but advanced ergotized grain, at the upper part of which is the tuberculated portion, having a vermiform appearance, and constituting the fungus (*Sphacelia segetum*) of Léveillé.
E. Longitudinal section of the grain.
F. A full-grown ergot, within its floret, magnified twice its diameter.

over all the other parts of the grain, cements the anthers and stigmas together, and gives the whole a mildewed appearance. If we examine the ergot at an early stage of its growth (Fig. 56, A), we find it just beginning to show itself above the paleæ, and presenting a purplish-black color. By this time it has lost in part its white coating, and the production of sporidia and filaments has nearly ceased. At the upper portion of the grain, the coating now presents a vermiform appearance, which Léveillé describes as constituting cerebriform undulations. These are beautifully depicted in Mr. Bauer's drawings (Fig. 56, A, D, E). Mr. E. Quekett named this fungus, or ergot-mould, *Ergotætia abortans*, and afterwards, at the suggestion of the author, *Ergotætia abortifaciens.* Both Link and Mr. Berkeley subsequently named it *Oidium abortifaciens.* This fungus was supposed by Mr. Quekett to be the cause of ergot; but though it is often found on ergotized grains, it also occurs on grasses which are not ergotized; and his statement that its sporidia are capable of infecting healthy grains of corn may be explained by their frequently accompanying the conidia of *Cordyceps purpurea*, *Fr.*, which is now ascertained to be the true parisitic cause of ergot. Tulasne has shown, beyond the possibility of a doubt, that ergot is induced by the mycelium of *Cordyceps purpurea*, and some other species. It appears that if the ergotized grains are sown, after a few months the Cordyceps, or, as Tulasne calls the genus *Claviceps*, is developed from the mycelium, a fact which has been confirmed by Mr. Berkeley and Mr. Broome. The accompanying figures (Fig. 57, *a*, *b*, *c*, and *d*,) are after Tulasne.

*Commerce.*—Ergot is imported from Germany, France, and America.

Fig. 57.


*Specimens of Cordyceps purpurea.*

*a.* An ergotized grain of rye, giving rise to a tuft of Cordyceps purpurea (nat. size).
*b.* Upper part of a stem and head partly magnified. The perithecia project in consequence of a slight contraction of the substance.
*c.* Section of the same, showing the perithecia.
*d.* A portion of the same more highly magnified, showing the structure of the same, and the asci in the perithecia.

*Officinal 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 color on the surface, yellowish within, solid, frangible, fracture short, odor faintly marked.

*Description.*—The spurred rye, or ergot of commerce, consists of grains which vary in length from a few lines to an inch, or even an inch and a half, and whose breadth is from half a line to four lines. Their form is cylindrical or obscurely triangular, with obtuse angles, and extremities, curved like the spur of a cock, unequally furrowed on two sides, often irregularly cracked and fissured. The odor of a single grain is not detectable, but of a large quantity is fishy, peculiar, and nauseous. The taste is not very marked, but is disagreeable, and very slightly acrid. The grains are externally violet-brown or black, more or less covered by a bloom, moderately brittle, the fractured surface being tolerably smooth, and whitish or purplish-white. Their specific gravity is somewhat greater than that of water, though when thrown into this liquid, they usually float at first, owing to the adherent air. The lower part of the grain is sometimes heavier than the upper.

*Deterioration.*—The ergot of rye is fed on by a little acarus, which is about one-fourth of the size of a cheese-mite. This animal destroys the interior of the ergot, and leaves the grain as a mere shell. It produces much powdery excrementitious matter (Quekett). In four months $7\frac{1}{2}$ ounces of this fecal matter of the acari were formed in 7 pounds of ergot. I have some ergot which has been kept for eleven years in a stoppered glass vessel without being attacked by the acarus, and it has all the characteristics of good ergot. It is advisable, however, not to use ergot which has been kept for more than two years.

*Composition.*—The chemistry of this subject is at present very imperfect; 102.20 grs. of ergot contain, according to Wiggers' analysis, 1.25 of *ergotin* and 35 of a *peculiar fixed oil.*

*Ergotin* was procured by digesting ergot with ether, to remove the fatty matter, and then in boiling alcohol. The alcoholic solution was evaporated, and the extract treated by water. The ergotin remained undissolved. It was brownish-red, with an acrid bitter taste, and, when warmed, had a peculiar but unpleasant odor. It was soluble in alcohol, but insoluble in water or ether. It is probable, therefore, that it is a resinoid coloring matter. It proved fatal to a hen. Nine grains of it were equal to an ounce and a half of ergot. It appears, then, that though a poisonous principle, it is probably not the agent which acts on the uterus; for the latter is soluble in water, whereas ergotin is not. It is possible, however, that it may be rendered soluble in water by combination with some other body.

*Oil of Ergot.*—The liquid sold in the shops under the name of *oil of ergot* is obtained by submitting the ethereal tincture of ergot to evaporation by a very gentle heat. Its color is reddish-brown. Its taste is oily and slightly acrid. It is lighter than water, and is soluble in alcohol and in solutions of the caustic alkalies. It is probably a mixture of several proximate principles. The oil has been supposed to possess the same influence over the uterus as that of the crude drug; that is, to occasion powerful uterine contractions. Winckler, however, considered it quite inoperative. The tinctura ergotæ ætherea of the last London Pharmacopœia was supposed to owe at least some, if not most, of its efficacy to this oil. The compilers, however, of the British Pharmacopœia have not only rejected this preparation, but in the preparation of liquid extract of ergot have first deprived the powdered ergot of its oil by passing ether through it.

*Secalin.*—Winckler, after separating the fixed oil by means of ether, found in the watery extract of the residue, besides the ergotin of Wiggers, a volatile disagreeably-smelling nitrogenous substance, *secalin*, analogous to the volatile alkaloids. He regards ergotin as a nitrogenous acid, and considers that it forms with secalin a neutral compound, ergotate of secalin. Experiments, however, are still required to determine in which principle, or combination of principles, the efficacy of ergot resides.

[The secalin of Winckler has been shown to be identical with propylamin (propylamia) a volatile alkaloid which exists in several other plants and very largely in herring-pickle. It is this alkaloid that gives to ergot its fishy smell. Propylamin has been highly recommended by Dr. Awenarius, of St. Petersburg, as a specific remedy in all forms of rheumatism. Confirmatory statements of this have been published, but in the hands of others it has failed. I have used it in several cases with very indifferent success, and it is at present but very little used, at least in this city. It is a colorless, very volatile liquid, and may be given in doses of two to five drops, every three or four hours. Its effects in very very large doses have not been investigated.—W.]

*Physiological Effects on the Uterine System.*—The action of ergot on the uterus, *when labor has actually commenced*, is usually observed in from ten to twenty minutes after the medicine has been taken, and is manifested by an increase in the violence, the continuance. and the frequency of the pains, which usually never cease until the child is born; nay, they often continue for some minutes after, and promote the speedy separation of the placenta and the firm contraction of the uterus in a globular form. The contractions and pains caused by ergot are distinguished from those of natural labor by their continuance; scarcely any interval can be perceived between them, but a sensation is experienced of one continued forcing effort. If from any mechanical impediment (as distortion) the uterus cannot get rid of its contents, the violence of its contraction may cause its rupture, as in cases alluded to by Dr. Merriman, Mr. Armstrong, and Mr. Coward. There is usually much less hemorrhage after delivery, when ergot has been employed, than where it has not been exhibited. The lochial discharges are also said to be less; but this is certainly not constantly the case. Moreover, it has been asserted "that the menstrual discharge has not recurred after the use of the ergot in certain cases of protracted parturition." But the inference intended to be conveyed here, viz. that ergot caused the non-recurrence, is not correct; at least, I am acquainted with several cases in which this effect did not follow the employment of spurred rye, and I know of none in which it did. Ergot has been charged with causing the death of the child; but the charge has been repelled by some experienced practitioners, as being devoid of the least foundation. "The ergot," says Dr. Hosack, "has been called in some of the books, from its effects in hastening labor, the *pulvis ad partum;* as it regards the child, it may with almost equal truth be denominated the *pulvis ad mortem;* for I believe its operation, when sufficient to expel the child, in cases where nature is alone unequal to the task, is to produce so violent a contraction of the womb, and consequent convolution and compression of the uterine vessels. as very much to impede. if not totally to interrupt, the circulation between the mother and child." However, Dr. Chapman strongly denies this charge, and tells us that in 200 cases which occurred in the practice of himself and Drs. Dewees and James, the ergot was used without doing harm in any respect; and he adds, "No one here believes in the alleged deleterious influence of the article on the fœtus." It is not improbable, however, where the impediment to labor is very great, that the violent action of the uterus may be attended with the result stated by Dr. Hosack. Dr. F. H. Ramsbotham has suggested that the poisonous influence of ergot may be extended from the mother to the fœtus, as in the case of opium. He also states that of 36 cases in which he induced premature labor by puncturing the membranes, 21 children were born alive; while in 26 cases of premature labor induced by ergot only, 12 children only were born alive. This fact strongly favors the notion of the deleterious influence of the ergot on the fœtus. Given to excite abortion, or premature labor, ergot has sometimes failed to produce the desired effect. Hence many experienced accoucheurs have concluded, that for this medicine to have any effect on the uterus, it is necessary that the process of labor should have actually commenced. But while we admit that it sometimes fails, we have abundant evidence to prove that it frequently succeeds; and most practitioners, I think, are now satisfied that in a large number of cases it has the power of originating the process of accouchement. (See Dr. Shapter's able report, *Prov. Med. Journ.*, April 10, 1844.) The action of ergot *on the unimpregnated uterus* is manifested by painful contractions, frequently denominated "bearing-down pains," and by the obvious influence which it exercises over various morbid conditions of this viscus; more particularly by its checking uterine hemorrhage, and expelling polypous masses. Tenderness of the uterus, and even actual metritis, are said to have been induced by it.

*Effects on the Cerebro-Spinal System.*—Weight and pain in the head, giddiness, delirium, dilatation of the pupil, and stupor, are the principal symptoms which indicate the action of ergot of rye on the brain. Dr. Maunsell (*Lond. Med. Gaz.*, xvi. 606) has published five cases (viz. two which occurred to Dr. Churchill, one to Dr. Johnson, and two to Dr. Cusack), in which delirium or stupor resulted from the use of ergot (in doses of from 30 to 120 grains), and was accompanied by great depression of pulse. Trousseau and Pidoux found that under the repeated use of ergot, dilatation of pupil was the most common symptom of cerebral disorder. It began to be obvious in from twelve to twenty-four hours after the commencement of the use of the medicine, and sometimes continued for several days after its cessation. The cerebral disorder is frequently preceded by the uterine contractions, and usually remains for some time after these have subsided.

*Effects on the Circulatory System.*—I have known increased frequency and fulness of pulse, copious perspiration, and flushed countenance, follow the use of ergot during parturition. But in most instances the opposite effect has been induced; the patient has experienced great faintness, the pulse has been greatly diminished in both frequency and fulness, and the face has become pale or livid. In one case, mentioned by Dr. Cusack, the pulse was reduced from 120 to 90. Dr. Maunsell has referred to four other cases. These effects on the circulatory system were accompanied with cerebral disorder, of which they were probably consequences. Similar observations, as to the power of ergot to diminish the frequency of the pulse, have been noticed by others.

*Effects on the Digestive System.*—Nausea and vomiting are not uncommon consequences of the exhibition of ergot when the stomach is in an irritable condition.

*Therapeutics.*—Ergot seems to have been employed by women to promote labor-pains long before its powers were known to the profession. Camerarius, in 1683, mentions that it was a popular remedy in Germany for accelerating parturition. In Italy and France, also, it appears to have been long in use. To Dr. Stearns, of the United States, is due the credit of introducing ergot of rye to the notice of the profession as an agent specifically exciting uterine contractions. In 1814, a paper was published by Mr. Prescot, on the effects of it in exciting labor-pains, and in uterine hemorrhage. It was not employed in England until 1824. The following are the principal uses of it:—

*To increase the expulsatory efforts of the womb in protracted or lingering labors.*—When the delay of delivery is ascribable solely to the feeble contractions of the uterus, ergot is admissible, provided first, that there be a proper conformation of the pelvis and soft parts; secondly, that the os uteri, vagina, and os externum be dilated, or readily dilatable, and lubricated with a sufficient secretion; and, lastly, that the child be presenting naturally, or so that it shall form no great mechanical impediment to delivery. A natural position of the head is not an absolute essential for the use of ergot, since this medicine is admissible in some cases of breech presentation. The circumstances which especially contraindicate or preclude the use of this medicine are those which create an unusual resistance to the passage of the child: such are, disproportion between the size of the head and of the pelvis, great rigidity of the soft parts, and extraneous growths. Moreover, "earliness of the stage" of labor is laid down by Dr. Bigelow as a circumstance contraindicating the use of ergot. The proper period for its exhibition is when the head of the child has passed the brim of the pelvis. Some practitioners assert that a dilated or lax condition of the os uteri is not an essential requisite for the exhibition of ergot. It has been contended that one of the valuable properties of this medicine is to cause the dilatation of the uterine orifice: and cases are not wanting to confirm these statements.

*To hasten delivery when the life of the patient is endangered by some alarming symptoms.*—Thus, in serious hemorrhages occurring during labor, after the rupture of the membranes, and where the placenta is not situated over the os uteri, the ergot is especially indicated. It has also been employed to accelerate delivery in puerperal convulsions. Five successful cases of its use are recorded by Bayle, on the authority of Waterhouse, Mitchell, Roche, Brinkle, and Godquin. But the narcotic operation of ergot presents a serious objection to its use in cerebral affections.

*To provoke the expulsion of the placenta when its retention depends on a want of contraction of the uterus.*—In such cases ergot has often proved of great advantage. When the hemorrhage is excessive the ergot must not be regarded as a substitute for manual extraction, since, during the time required for its operation the patient may die from loss of blood. In retention of the placenta from spasmodic or irregular contraction of the uterus, as well as from morbid adhesion, ergot is improper or useless.

*To provoke the expulsion of sanguineous clots, hydatids, and polypi from the uterus.*—Coagula of blood collected within the womb after delivery may sometimes require the use of ergot to excite the uterus to expel them. Ergot is also valuable in promoting the expulsion of those remarkable formations called uterine hydatids, and which are distinguished from the acephalocysts of other parts of the body by their not possessing an independent life, so that when separated from their pedicles they die. A successful case of the use of ergot in this affection has been published by Dr. Macgill. In uterine polypus, ergot has been exhibited with the view of hastening the descent of the tumor from the uterus into the vagina, so as to render it readily accessible for mechanical extirpation; for it is well known that until this is effected the patient is continually subject to hemorrhage, which in some cases proves fatal. In some instances ergot has caused the expulsion of a polypus.

*To restrain uterine hemorrhage, whether puerperal or non-puerperal.*—Ergot checks hemorrhage from the womb, principally, if not solely, by exciting contraction of the muscular fibres of the viscus, by which its bloodvessels are compressed and emptied, and their orifices closed. The experience of physicians and surgeons in all parts of the civilized world has fully and incontestably established the efficacy of ergot as a remedy for uterine hemorrhage. Maisonneuve and Trousseau have shown that the beneficial influence of ergot is exerted equally in the unimpregnated as in the impregnated state; proving, therefore, that the contrary statement of Prescott and Villeneuve is incorrect. Even in a case of cancer of the uterus they have found it check the sanguineous discharge. In females subject to profuse uterine hemorrhages after delivery, ergot may be administered as a preventive, just before the birth of the child. Even in placenta presentations, a dose or two of ergot may be administered previously to the delivery being undertaken. To restrain excessive discharge of the lochia or catamenia, this remedy is sometimes most beneficial.

*To provoke abortion, and to promote it when this process has commenced and is accompanied with hemorrhage.*—Under certain circumstances the practitioner finds it expedient to produce abortion: as in serious hemorrhage during pregnancy, and in deformed pelves which do not admit the passage of a full-grown fœtus. In such cases the ergot may be employed with great advantage. When abortion has already commenced, ergot may be employed to quicken the process and check hemorrhage.

Ergot was first given in leucorrhœa by Dr. M. Hall. Its efficacy has been confirmed by many other practitioners.

*Administration.*—Ergot is usually given in the form either of powder or infusion. Less frequently the tincture is also used. The liquid extract *Ph. Br.* is a new preparation. The powder is only to be prepared when required for use. The *dose* of it, for a woman in labor, is twenty grains, to be repeated, at intervals of half an hour, for three times; for other occasions (as leucorrhœa, hemorrhages, &c.) five to ten or fifteen grains, three times a day: its use should not be continued for any great length of time. It may be taken mixed with powdered sugar.

Extractum Ergotæ Liquidum, *Liquid Extract of Ergot.*—Take of ergot, in coarse powder, one pound; ether, one pint; distilled water, three pints and a half; rectified spirit, eight fluidounces. Shake the ether in a bottle with half a pint of the water, and after separation decant the ether. Place the ergot in a percolator, and free it from its oil by passing the washed ether through it. Remove the marc, and digest it in three pints of the water at 160° for twelve hours. Press out, strain, and evaporate the liquor to nine fluidounces; and, when cold, add the spirit. Allow it to stand for an hour to coagulate, then filter. The product should measure sixteen fluidounces.

In this preparation, which is now introduced for the first time into the Pharmacopœia, the ether is first washed with water, to deprive it of the spirit which it contains, and which, if not removed, would dissolve out some of the active principles of the ergot. The washed ether is allowed to percolate through the ergot, which is thereby freed from its oil. The ergot then readily yields its soluble matters to water heated to 160°, a higher temperature being avoided to prevent coagulation before the active principles have been extracted. Spirit is added to the strained and evaporated liquor to preserve it, and the coagulated portion is filtered out. This preparation, which at present has had only a brief trial, is said to be very efficacious. One fluidounce of the extract is prepared from one ounce of the ergot, and is supposed to contain the whole of its active properties. The extract may, therefore, be administered in doses of fifteen or twenty minims.

[Extractum Ergotæ Fluidum, U. S., *Fluid Extract of Ergot.*—"Take of ergot, in fine powder, sixteen troyounces; acetic acid, half a fluidounce; diluted alcohol, a sufficient quantity. Mix the acid with three pints of diluted alcohol, and, having moistened the ergot with four fluidounces of the mixture, introduce it into a conical glass percolator, pressing moderately, and gradually pour the mixture upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation, first with the remainder of the mixture, and afterwards with diluted alcohol, until three pints more of tincture have been obtained. Evaporate this, by means of a water bath, at a temperature not exceeding 150°, to four fluidounces, mix it with the reserved tincture, and filter through paper." U. S.

This preparation of ergot has not its peculiar fishy smell, owing to the acetic acid fixing the alkaloid propylamia; an alkali by freeing the latter will develop the odor. Dose, fifteen to twenty minims, increased and repeated as necessary.—W.]

Infusum Ergotæ, *Infusion of Ergot.*—Take of ergot, in coarse powder, a quarter of an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for half an hour, and strain.

The *dose* for a woman in labor is one-sixth or one-fourth of this quantity, to be repeated at intervals of half an hour, until the whole be taken. Sugar, aromatics (as nutmeg or cinnamon), or a little wine or brandy, may be added to flavor it. The readiest and most efficient infusion is made in the following manner: Place twenty grains of powdered ergot in a teacup; pour upon it two or three ounces of boiling water; cover the cup, infuse for a quarter of an hour, and let the whole be drunk *without straining.* If the stomach does not retain this, the officinal infusion should be preferred.

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

*Dose.*—One drachm in lingering labors. It may be given in doses of fifteen to thirty minims every four hours in cases of hemorrhage of a slight character, but in order to exert ecbolic effects it must be given in doses of one fluidrachm every half hour for three or four doses; and this quantity is also required if we use the preparation to check violent internal hemorrhage. One or two teaspoonfuls of a tincture of ergot (prepared by digesting half an ounce of ergot in four ounces of rectified spirit) mixed with water, has been recommended as an injection into the uterus in difficult labor. It is to be introduced between the head of the child and the neck of the uterus.

[Vinum Ergotæ, U. S., *Wine of Ergot.*—"Take of ergot, in moderately fine powder, four troyounces; sherry wine, a sufficient quantity. Moisten the powder with a fluidounce of sherry wine, pack it in a conical percolator, and gradually pour sherry wine into it until two pints of filtered liquid are obtained." U. S. Dose, one to three fluidrachms repeated as often as required.—W.]

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## SACCHARUM OFFICINARUM, *Linn.*

### The Sugar Cane. Triandria, Digynia.—*Linn. Syst.*

*Botanic Character.*—*Stem* six to twelve feet high, closely jointed, solid, containing when ripe a sweet juice. *Leaves* sheathing, long, and linear. *Panicle* terminal, from one to three feet long, diffuse, of a gray color, from the long soft hairs that surround each flower. *Spikelets* all fertile in pairs, the one sessile, the other stalked, articulated at the base, two-flowered, the lower floret neuter, with one palea, the upper hermaphrodite, with two paleæ. *Glumes* two, membranous, with very long hairs on the back. *Paleæ* rose-colored, awnless, those of the hermaphrodite flower minute, unequal. *Stamens* three. *Ovary* smooth. *Styles* two, long; *stigmas* feathered.—*Nees. Plant. Med.* Plates 33, 34, 35. *Steph. and Church*, plate 148.

*Habitat.*—It is cultivated in both Indies.

### Saccharum Album, *Refined Sugar.* $C_{12}H_{11}O_{11}$.

### [Saccharum, Mat. Med. List, U. S. P.]

The crystallized refined sugar of the stem.

*Formation of Raw Sugar.*—The canes, when ripe, are cut close to the ground, stripped of their leaves, and subjected to pressure between iron rollers. Cane-juice contains from eighteen to twenty per cent. of saccharine matter, which is all crystallizable or true cane sugar; the uncrystallizable sugar, or molasses, which is obtained by evaporation from the juice, being the product of alterations effected in the crystallizable sugar by the operation. The clarification of cane-juice is effected by the combined use of heat and lime. The heat serves to coagulate any vegetable albumen which may be present. The lime neutralizes the free acid, and combines with a peculiar albuminous or proteine body not coagulable by heat or acids, and readily putrefiable, and forms with it a coagulum, the separation of which is promoted by the heat. Part of it rises to the top as a scum, and the remainder subsides as a thick muddy deposit. The clarified juice is then drawn off into the boiler, evaporated, and skimmed. When it has acquired a proper tenacity and granular aspect, it is emptied into a cooler and allowed to crystallize or *grain.* The concrete sugar is then placed in casks perforated with holes in the bottom. Here the sugar is allowed to drain for three or four weeks. It is then packed in hogsheads and sent to this country under the name *muscovado* or *raw sugar.* The drainings or uncrystallized portion of sugar constitute *molasses.*

*Sugar Refining.*—Raw sugar is a mixture of crystallizable and uncrystallizable sugar, contaminated by various organic and mineral substances. It is dissolved in water by the aid of steam; the liquid heated with bullock's blood, and filtered through canvas bags; and the clear liquor allowed to percolate slowly through enormous cylinders containing coarse-grained animal and fresh-burnt charcoal. The filtered liquor, which is nearly colorless, is boiled by the aid of steam, under diminished atmospheric pressure, at a temperature of about 170° F. When the requisite degree of concentration has been attained, the syrup is transferred to conical moulds, whose orifices are closed; and when the contents have solidified, the stoppers are withdrawn, and the moulds placed in pots, in order to allow the *green syrups* or treacle to drain off. The loaves are then *sugared* by pouring on their base a saturated syrup, which slowly percolating through the mass carries with it the coloring matter and other impurities, but does not dissolve the crystallized sugar. The loaves are finally dried in a stove. One hundred and twelve pounds of raw sugar yield by the above process about seventy-nine pounds of refined sugar and sixteen pounds of treacle.

*Officinal Characters.*—Compact crystalline conical loaves, snow-white, dry, scentless, and intensely and purely sweet.

*Properties.*—The refined loaf-sugar of commerce is porous, friable, and made up of small crystalline grains. Common or cane sugar is the sweetest of all kinds of sugar. It is permanent in the air and phosphorescent in the dark when struck or rubbed. When heated, it melts, and soon becomes colored. By this process its tendency to crystallize is diminished or destroyed. When it is subjected to a temperature of about 356° F. it melts; and at a higher temperature begins to give off water, and to suffer decomposition. If the heat be gradually augmented, it becomes brown, evolves a remarkable odor, loses its sweet taste, and acquires a bitter one. In this condition it is called *caramel* or *burnt sugar.* It is very soluble in water, both hot and cold; is soluble in rectified spirit, but not in ether. Its watery solution, aided by heat, decomposes some of the metallic salts (as those of copper, mercury, gold, and silver); but several of them (as the subacetate of copper and nitrate of silver) require nearly a boiling temperature to change them. A dilute watery solution of sugar, with a little yeast, undergoes the vinous fermentation. Sugar promotes the solubility of lime in water, and forms both a soluble and an insoluble compound with oxide of lead. Cane-sugar is capable of existing either in the crystallized or amorphous state. In this respect it resembles sulphur. By the slow cooling of a saturated aqueous solution of sugar we obtain the large and fine crystals which constitute the commercial *sugar-candy.* These crystals are doubly oblique prisms.

Cane-sugar is known by its susceptibility of undergoing the vinous fermentation; that is, of suffering a peculiar decomposition into alcohol and carbonic acid. For this purpose it is dissolved in water, and to the solution a small portion of yeast (dry yeast is to be preferred) is added, and the mixture exposed to a temperature of about 70° F. Effervescence soon takes place, carbonic acid is evolved, and a vinous or alcoholic liquor is produced. In this process the cane-sugar ($C_{12}H_{11}O_{11}$) combines with water, and becomes grape-sugar, $C_{12}H_{12}O_{12}$, which by fermentation is resolved into four atoms of carbonic acid, $4CO_2$, and two atoms of alcohol, $2C_4H_6O_2$. It is also distinguished by the following characters: Its crystallizability in prismatic crystals, its very sweet taste, its ready solubility in water, its solution being charred, and letting fall a brown or black powder when heated with a few drops of oil of vitriol, but being unchanged when treated in the same way with caustic potash and by the difficulty with which it reduces the blue hydrated oxide of copper to the orange suboxide.

*Purity.*—The purity of genuine sugar is readily judged of by its physical or sensible qualities. The impurities may also be detected by chemical means, but it is rarely necessary to resort to these. A solution of pure sugar is colorless, and yields no precipitate with oxalic acid, solution of subacetate of lead, or ammonia. Pure sugar is completely soluble in rectified spirit.

*Therapeutics.*—Sugar is but little used medicinally. In the form of lozenges, sugar-candy, &c., it is slowly dissolved in the mouth to allay tickling cough. As a chemical antidote, it has been recommended in poisoning by the salts of copper, mercury, silver, gold, and lead. But any advantage procured by its use in these cases is referable to its demulcent and emollient properties, and not to its chemical influence. The same remark may be made with respect to the benefit said to have been obtained by the use of the juice of the sugar-cane in poisoning by arsenious acid.

*Pharmaceutic Uses.*—Sugar serves to preserve, to give flavor, bulk, form, cohesiveness, and consistence; to subdivide, and to suspend oily substances in aqueous liquids. To fulfil one or more of these objects, it is a constituent of *syrups*, *confections*, *lozenges*, some *pills* and *powders*, &c. It is also useful in preserving some inorganic compounds: thus it checks, though it does not absolutely prevent, the higher oxidation of some of the protosalts of iron: hence its use in the saccharated carbonate of iron, and the syrup of iodide of iron.

Syrupus [U. S.], *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. ["Take of sugar, in coarse powder, thirty-six troyounces. Distilled water a sufficient quantity. Dissolve the sugar, with the aid of heat, in twenty fluidounces of distilled water, raise the temperature to the boiling point, and strain the solution while hot. Then add sufficient distilled water, through the strainer, to make the syrup measure two pints and twelve fluidounces, or weigh fifty-five troyounces. Lastly, incorporate the water, added through the strainer, with the solution. Syrup, thus prepared, has the specific gravity 1.317." U. S.]

Syrup is used in medicine to give flavor, cohesiveness, and consistence.

## Theriaca, *Treacle.*

*Synonym.*—Sacchari Fæx, *Lond.*

The uncrystallized residue of the refining of sugar.

*Molasses and Treacle.*—These are viscid, dark brown, dense liquids, composed of amorphous or uncrystallizable sugar, crystallizable sugar, gum, extractive, various salts, and water. They are frequently confounded, but in trade are considered distinct. *Molasses* (more correctly *Melasses*, from *Mel*, honey, because it is soft and sweet like honey) is the drainings from raw or Muscovado sugar. *Treacle* is the viscid, dark brown, uncrystallizable syrup which drains from refined sugar in the sugar-moulds. It is thicker than West Indian molasses, has a somewhat different flavor, and contains, on an average, 75 per cent. of solid matter.

*Officinal Characters.*—A thick brown fermentable syrup, very sweet; not crystallizing by rest or evaporation. Specific gravity about 1.40.

*Test.*—Nearly free from empyreumatic odor or flavor.

*Pharmaceutic Uses.*—For making pills, treacle serves to give cohesiveness, to preserve the pill mass soft, to prevent mouldiness, and in some cases to check chemical changes.

## [AVENA SATIVA, *L.* *Oats.*

*Generic Character.*—Spikelets 2—5 flowered; glumes 2, loose and membranaceous, subequal, longer than the flowers; paleæ 2, mostly hairy at the base, the lower one bifid, with a twisted or bent awn at the back.—*Wood's Class Book of Bot.*

*Specific Characters.*—*Panicle* equal. *Spikelets* two-flowered. *Florets* smaller than the calyx, naked at the base, alternately awned. *Root* fibrous, annual (*Kunth*).

*Habitat.*—Everywhere cultivated, it is said to have been first discovered in the Island of Juan Fernandez.—W.]

### [**Avenæ Farina,** *Oat Meal.* Mat. Med. List, U. S. P.

The meal prepared from the seed of the Avena sativa.

Oatmeal is prepared by grinding the grain; it is darker than wheat-flour, and has a somewhat bitterish taste. It contains three proteine compounds, albumen, gluten, and a peculiar substance, avenin, which is a proteine compound analogous to casein or curd of milk, and on which much of the nutritive value of oats depends.

Oat starch, when examined by the microscope, is perceived to consist of small particles whose normal shape is round; but modified by the mutual compression of the particles. The hilum is tolerably distinct in the rounded granules, but rings or laminæ are not visible. The great bulk of the granules are of medium size and polyhedral, frequently presenting a pentagonal outline. Unlike most other starches, little or no variation is observed in their appearance when they are viewed by polarized light; no crosses are visible.

Iodine forms, when added to the cold decoction of oats, the blue iodide of starch. Oatmeal, when mixed with water, does not form a dough as wheaten flour does; but by washing it with water on a sieve, the whole of the meal, with the exception of the coarse parts, will be washed through.

*Therapeutics.*—Oatmeal is an important and valuable article of food. With the exception of maize or Indian corn, it is richer in oily or fatty matter than any other of the cultivated cereal grains; and its proportion of protein compounds exceeds that of the finest English wheaten flour. So that both with respect to its heat and fat-making, and its flesh and blood-making principles, it holds a high rank.

A diet of unfermented oat-bread is apt to occasion dyspepsia in those unaccustomed to its use; and it was formerly suspected of producing or aggravating chronic skin diseases, but without just grounds. Oatmeal porridge, taken at breakfast, sometimes relieves habitual constipation.

Intestinal concretions, composed of phosphate of lime, agglutinating animal matter, and the small, stiff, silky bristles seen at one end of the inner integument of the oat, are very rarely formed in those who habitually employ oats as food.

As a dietetical agent, it is employed in the form of *oat-cake* or *unfermented oat-bread*, *oatmeal porridge* or *stir-about*, and *gruel*. The latter is sometimes given to infants as a substitute for the mother's milk. When there is a tendency to diarrhœa, either in adults or infants, it is advisable to substitute wheatmeal for oatmeal.

In medicine we employ *gruel*, prepared from groats or oatmeal, as a mild, nutritious, and, in most cases, easily-digested article of food in fevers and inflammatory affections. It is also in general use after parturition; and is the basis of *caudle*. In poisoning by acrid substances, it is employed as an emollient and demulcent. It is given, after the use of purgatives, to render them more efficient and less injurious. It is frequently used, either alone or in conjunction with other agents, as a clyster. *Oatmeal* is used for making poultices.

Dr. Cullen directs *oatmeal gruel* to be prepared by boiling an ounce of oatmeal with three quarts of water to a quart, constantly stirring; strain, and when cold decant the clear liquid from the sediment. Sugar, acids, or aromatics may be employed for flavoring.—W.]

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## [PALMÆ, *Juss.* (The Palm Order.)
## SAGUS RUMPHII, *Roxb.*

*Generic Characters.*—Flowers hermaphrodite or polygamo-monœcious on the same spadix. Spadix much branched, sheathed by many incomplete spathes. Amenta terete. Bract squamiform; bractlets very densely villose-bearded, connate like a cupule. Calyx three-cleft. Corolla three-partite. Stamens six: filaments subulate, connate at the base; anthers affixed by the back. Ovary subtrilocular; stigmata three, connate in a pyramid. Berry coated by reversed scales, one-seeded. Albumen ruminated or uniform. Embryo dorsal. (*Blume*, *Rumphia.*)

*Specific Characters.*—Stem of middling height. Petioles, rachides, and spathes prickly; the prickles scattered or confluent. Fruit somewhat globose, depressed on both sides. (*Blume.*)

Islands of the Indian Archipelago. Abounds in the Malacca Islands, especially where the nutmeg and clove grow naturally.

"This, the Malay Sago Palm, is the tree the pith of which is the staff of life to the inhabitants of the Moluccas." (*Roxburgh.*) The stature of this tree seldom exceeds thirty feet. Before maturity, and previous to the formation of the fruit, the stem consists of a thin, hard wall, about two inches thick, and of an enormous volume of tissue, commonly termed the medulla or pith, from which the farina called sago is obtained. As the fruit forms the farinaceous medulla disappears, and when the tree attains full maturity the stem is no more than a hollow shell. The utmost age of the tree does not exceed thirty years. There are numerous other palms inhabiting the Pacific islands and coasts which yield starches to the natives. Many of these belong to the genus sagus, others do not; and there are some of these starch producers which are cycads rather than palms.—W.]

### [Sago, *Sago.* Mat. Med. List, U. S. P.

The prepared fecula of the pith of Sagus Rumphii and of other species of Sagus. Sago occurs in two forms, in meal and granulated.

*Pulverulent Sago; Sago Meal; Sago Flour* (*Farina Sagi*).—This is imported in the form of a fine amylaceous powder. It is whitish, with a buffy or reddish tint. Its odor is faint, but somewhat unpleasant and musty. Viewed by a powerful pocket-lens it presents a glistening granular appearance. Examined by the microscope, it is found to consist of irregularly elliptical, or oval, more or less ovate, usually isolated particles, which are often somewhat narrowed or tapered at one extremity. Owing to their mutual pressure, many of them appear as if truncated, either by a single plane perpendicular to the axis of the particle, in which case they are more or less mullar-shaped, or by two inclined planes, giving the particles a dihedral extremity. Some of them resemble in form a caoutchouc bottle cut off at the neck. From their strong lateral shading they are obviously convex. Many of the particles are more or less broken. Most of them have an irregular or tuberculated surface, as if eroded. The hilum, when perfect, is circular, but it cracks in the form of a single slit, or of a cross, or in a stellate manner. The surface of the particles presents the appearance of a series of concentric rings or annular lines, which, however, are much less distinct than in potato starch. These lines are indicative of the concentric layers of which each particle is composed. When examined by the polarizing microscope, the particles show a black cross, the centre of which is the hilum.

*Granulated Sago*, *Grain Sago*.—The grains are more or less grounded masses of variable size and color. Examined by a microscope with a low object-glass (say of two or three inch focus), they are seen to be masses of glistening particles. There are two kinds of granulated sago, brown sago and pearl sago.

*Common, or Brown Sago* (*Sagus fusca*), *Sagou gris des Moluques*, Planche and Guibourt.—This is the only kind of sago which was known in English commerce prior to the introduction of pearl sago. It occurs in somewhat irregularly-rounded or globular masses or grains, which are whitish on one side and grayish-brown on the other. The ordinary brown sago of the shops consists of grains which are usually about the size of the grains of pearl barley. This may be termed the smaller or ordinary brown sago. It is the *Sagou gris des Moluques* of both Planche and Guibourt. But there is another variety, the globular masses of which are larger, sometimes as large as gray peas. Examined by the microscope, the grains of brown sago are found to consist of particles like those of sago-meal, but somewhat more broken and less regular in their shape.

Pearl sago occurs in pearl-like grains, which vary in size from that of poppy seeds to that of white mustard seeds, or even somewhat larger than these. The shape of the larger grains is more or less globular, that of the smaller ones being often much less regular. The surface of the larger grains is smooth, even, and regular; that of the small grains, often rough, uneven, and somewhat tuberculated. Occasionally two or three of the smaller grains adhere together. Some samples are white, some brownish-yellow, pink, or roseate. The colored grains are not of uniform tint over the whole of their surface; often being on one side white, on the other colored. By the aid of a solution of chloride of lime, the colored kinds can be bleached and rendered perfectly white (bleached pearl sago.) When submitted to microscopic examination, pearl sago is found to consist of the same kind of starch particles as sago meal, but all more or less ruptured, and presenting indistinct traces of rings. These peculiarities are doubtless produced by the process of granulation.

*Factitious Sago*.—This is prepared in both Germany and in France (at Gentilly, near Paris) with potato starch. It occurs both white and colored. The microscope can alone distinguish factitious sago from the real sort. It must be recollected that the starch granules of potato sago are ruptured during the preparation of the sago. They become swollen, ruptured in the direction of the long axis, and, in drying, shrivel so as to leave a long, linear, sometimes curved or even-branched line with incurved or involuted edges, indicating the situation of the rupture.

Sago has not been analyzed. The pure starch, of which it essentially consists, doubtless has the same composition as other amylaceous substances, viz., $C_{12}H_{10}O_{10}$.

Sago-meal is insoluble in cold water, but by boiling in water, it almost entirely dissolves and yields a tolerable clear solution. The decoction when cold strikes a blue color with tincture of iodine.

Granulated sago swells up in cold water, but does not completely dissolve by boiling, a more or less considerable amount of insoluble matter remaining behind.

The filtered cold aqueous infusion of some sorts of pearl sago (sagou tapioka of Guibourt) strikes a blue color with tincture of iodine. The cold infusion of brown sago is rendered milky by nitrate of silver, diacetate of lead, and protonitrate of mercury; but the cold infusions of pulverulent and of pearl sago are scarcely affected by these tests.

It is nutritive and easy of digestion, and is an important article of food in some parts of the East. "The Malay sago palm," says Dr. Roxburgh, "is the tree the pith of which is the staff of life to the inhabitants of the Moluccas." It is probable that this pith contains some nitrogenized nutritive substance in addition to the amylaceous matter.

Sago puddings are occasionally brought to the table. But the principal use of sago is to yield a light, nutritious, easily-digestible, and non-irritating article of food for the invalid in febrile and inflammatory cases. For this purpose it should be boiled in water (in some cases milk is preferred), the solution strained, and flavored with sugar and spices, or even with a little white wine, when the use of this is not contraindicated. —W.]

*Sub-class:* PETALOIDEÆ.

## MELANTHACEÆ, *R. Brown.* THE COLCHICUM ORDER.

## COLCHICUM AUTUMNALE, *Linn.* Meadow Saffron.

Hexandria Trigynia, *Linn. Syst.*

*Botanic Character.*—*Root* fibrous. *Corm* ovate, fleshy, large, covered with a loose brown membrane. *Leaves* plane, broadly lanceolate, erect, produced in the spring along with the fruit, and disappearing before the flower appears. *Flowers* several, lilac or pale purple, arising from the corm by a long narrow white tube, and surrounded by a spathe; limb campanulate, 6-partite, petaloid. *Stamens* 6, inserted into the throat of the tube; *anthers* turned outwards. *Styles* 3, filiform, long. *Capsule* 3-celled, opening through the dissepiments. *Seeds* small, spherical, with a rough brown testa; internally they are white, and consist of a minute embryo lodged in a horny elastic albumen. The flowers appear in September, and the fruit the following spring or summer. *Woodv.* pl. 177, page 483.

*Habitat.*—Moist rich meadows in many parts of England. Dioscorides says that Colchicum (κολχικὸν) grows abundantly in Messenia and at Colchis (from which latter place it received its name).

### Colchici Cormus [Colchici Radix]. *Colchicum Corm.* [Mat. Med. List, U. S. P.]

The fresh corm, collected about the end of June, and the same stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150°.

*Collection.*—The corm is biennial. It first appears about the end of June or beginning of July: it flowers in the autumn, and produces its leaves in the spring, and its seeds in the June of the following year. It then begins to shrivel, becomes leathery, and finally disappears in the succeeding spring or summer. The activity of the corm varies at different seasons of the year. It is usually considered to be greatest when it is about a year old—that is, about the month of July, between the withering of the leaves and the sprouting forth of the flower of the

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young corm. At this period it is fully developed, and has not exhausted itself by the production of the young one. But many of the corms brought to market have already pushed forth their flowers, which are broken off so as to prevent the circumstance from being observed. The London market is principally supplied from Gloucestershire, but partly, also, from Hampshire and Oxfordshire.

Fig. 58.

*Colchicum autumnale.*

*a.* The flowering plant.
*b.* Stigmas, with a portion of the styles.
*c.* Leaves and fruit.

*Officinal Characters.* — Fresh corm about the size of a chestnut, flattened on one side, where it has an undeveloped bud; furnished with an outer brown and an inner yellow coat; internally white, solid, and fleshy; yielding when cut a milky acrid and bitter juice. Dried slices about a line thick, moderately indented on one, rarely on both sides, firm, flat, whitish, amylaceous.

**Colchici Semen,** *Cholchicum Seed.* [Mat. Med. List, U. S. P.]

The seed, fully ripe.

*Officinal Characters.*—About the size of black mustard seed, very hard, reddish-brown.

*Description.*—The seeds are brown or reddish-brown, nearly the size of white mustard seed, and have a bitter acrid taste.

*Composition.*—Both the corm and the seed contain *colchicia.* Pelletier and Caventou found in the corm an alkaloid, which they supposed to be veratria, in combination with gallic acid. Geiger and Hesse subsequently found the same alkaloid in the seed, but, perceiving that it was new, named it colchicia. The following are said to be its properties: It is an alkaline substance, crystallizing in slender needles, without odor, but having a bitter taste. Its hydrate is feebly alkaline, but neutralizes acids, and forms crystallizable salts, having a bitter taste. It is soluble in water, and is precipitated by the solution of bichloride of platinum. Nitric acid colors colchicia deep violet, which passes into indigo blue, and quickly becomes, first green, and then yellow. Concentrated sulphuric acid colors it yellowish-brown. Colchicia is said to be distinguished from veratria by the following characteristics: 1st, it is soluble in water, whereas veratria is not; 2dly, it is crystallizable, whereas veratria is not; 3dly, it does not possess the acridity of veratria; and 4thly, it differs from the latter in this, that it does not irritate the organ of smell, whereas the least portion of veratria occasions a most convulsive sneezing. Colchicia is a powerful poison. One-tenth of a grain, dissolved in weak spirit, killed a young cat in about twelve hours. The symptoms were salivation, diarrhœa, vomiting, a staggering gait, cries, convulsions, and death. The stomach and intestines were violently inflamed, and had extravasated blood throughout their whole course.

*Physiological Effects.*—Colchicum is acrid and sedative. Taken internally, *in small and repeated doses*, it promotes the action of the secreting organs, especially the intestinal mucous membrane. The kidneys, the skin, and the liver, are less certainly and obviously affected by it. The most constant effects observed from the use of *larger doses* are nausea, vomiting, and purging. Reduction of the frequency of the pulse is a common, though not an invariable effect. Mr. Haden was, I believe, the first to direct attention to the advantages to be taken of this effect in the treatment of inflammatory diseases. In some experiments made on healthy individuals by Dr. Lewins, debility, a feeling of illness, and headache were experienced. This feeling of debility is not, however, to be referred to the evacuations produced; for, as Dr. Barlow has observed, the number of motions is sometimes considerable without any proportionate depression of strength ensuing. "I have known," says Dr. Barlow, "even twenty stools occasioned by a single dose of colchicum, the patient not complaining of the least debility." The action of colchicum on the secretory apparatus is not confined to that of the alimentary canal; after the use of three or four full doses of this medicine copious sweating is often produced, especially when the skin is kept warm. On other occasions the kidneys are powerfully acted on. In one case mentioned by Dr. Lewins seventy drops of vinum colchici caused the discharge of upwards of a pint of bile by vomiting. *In excessive doses* colchicum acts as a powerful poison. In one case two ounces of the wine of the seeds, in another three and a half drachms in divided doses, in a third an ounce and a half of the tincture, and in a fourth two drachms and a half of the tincture proved fatal; death being preceded in most of the cases by acute pain in the bowels, incessant vomiting, purging, tenesmus, and an imperceptible and intermitting pulse. Delirium, convulsions, and coma have also been observed.

*Therapeutics.*—For the introduction of colchicum into modern practice we are chiefly indebted to Störck, in 1763; but partly, also, to the opinion that it is the active principle of a celebrated French remedy (*eau médicinale*) for gout. The following are the principal diseases in which colchicum has been employed: *In Gout.*—The power of colchicum to alleviate a paroxysm of gout is admitted by all; but considerable difference of opinion exists as to the extent of this power, and the propriety of employing it. Sir Everard Home, from observation of its effects on his own person, regarded it as a specific in gout. Dr. Paris commends it in similar terms: "As a specific in gout its efficacy has been fully ascertained; it allays pain, and cuts short the paroxysm." But that alleviation is palliative, not curative. It has no tendency to prevent a speedy recurrence of the attack; nay, according to Sir Charles Scudamore, it renders the disposition to the disease much stronger in the system. Furthermore, by repetition its power over gouty paroxysms becomes diminished. The *modus medendi* of colchicum in gout is an interesting though not very satisfactory part of our inquiry. I have already stated that some regard this remedy as a specific; that is, as operating by some unknown influence. Others, however, and with more propriety, refer its therapeutical uses to its known physiological effects. "Colchicum," says Dr. Barlow, "purges, abates pain, and lowers the pulse. These effects are accounted for by assigning to it a cathartic and sedative operation; and it is this combination perhaps to which its peculiar virtues are to be ascribed." The fact that a combination of a drastic and a narcotic, as elaterium and opium, mentioned by Dr. Sutton, has been found to give, in several cases of gout, marked and speedy relief, seems to me to confirm Dr. Barlow's opinion. Though purging is not essential to the therapeutical influence of colchicum, it is admitted by most that, in a large number of cases at least, it promotes the alleviation of the symptoms. Hence many practitioners recommend its combination with saline purgatives, as the sulphate of magnesia. *In Rheumatism.*—The analogy existing between gout and rheumatism has led to the trial of the same remedies in both diseases. But its therapeutical powers in the latter disease are much less marked than in the former. Mr. Wigan gives in "rheumatic gout" eight grains of the powder in some mild diluent every hour until active vomiting, profuse purging, or abundant perspiration takes place; or at least till the stomach can bear no more. The usual quantity is eight or ten doses; but while some can take fourteen, others can bear only five. Though the pain ceases, the more active effects of the colchicum do not take place for some hours after the last dose. Thus administered, Mr. Wigan declares colchicum "the most easily managed, the most universally applicable, the safest, and the most certain specific, in the whole compass of our opulent Pharmacopœia." But its use in these large doses requires to be carefully watched. *In Dropsy.*—Colchicum was used in dropsy with success by Störck. It has been employed in dropsical cases with the twofold view of purging and promoting the action of the kidneys. Given in combination with saline purgatives, I have found it beneficial in some cases of anasarca of old persons. It is also sometimes given with advantage in obstinate diseases of the skin.

*Administration of the Corm.*—The corm of colchicum has been employed in powder, in *doses* of from two to eight grains.

EXTRACTUM COLCHICI, *Extract of Colchicum.*—Take of fresh colchicum corms, deprived of their coats, seven pounds; crush the corms; press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence.

*Dose.*—Gr. ss to gr. j.

EXTRACTUM COLCHICI ACETICUM [U. S.], *Acetic Extract of Colchicum.*—Take of fresh colchicum corms, deprived of their coats, seven pounds; acetic acid, six fluidounces. Crush the corms, add the acetic acid, and press out the juice; allow the feculence to subside, and heat the clear liquor to 212°; then strain through flannel, and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence. ["Take of colchicum root, in moderately fine powder, twelve troyounces; acetic acid, four fluidounces; water, a sufficient quantity. To the acetic acid, add a pint of water, and mix the resulting liquid with the colchicum root. Transfer the mixture to a conical glass percolator, and pour water gradually upon it until the liquid passes with little or no taste. Lastly, evaporate the liquid in a porcelain vessel, to the proper consistence." U. S. The fresh corm, not being readily obtainable in this country, the U. S. Ph. directs that the dried be used; but the resulting extract is probably just as efficient as the English in the same dose.—W.]

This compound contains the acetate of colchicia. It is a very favorite remedy in the treatment of gout and rheumatism, and was introduced into practice by Sir C. Scudamore. Dr. Paris observes that he has "found it useful in promoting healthy discharges of bile." He occasionally combines it with mercurial pill, calomel, or tartarated antimony. The use of the acetic acid is not very obvious, as it can scarcely modify the effect of the colchicia, which, as well as its salts, is soluble in water. The somewhat larger dose also in which it is prescribed does not indicate that it possesses greater activity than the simple extract. Both extracts are now prepared from the clear liquor *after the subsidence of the feculence*, and are therefore superior to the former extracts (*Lond. Ed.*) in which the starch was retained. Dose, gr. ss to gr. ij.

Vinum Colchici, *Wine of Colchicum.*—Take of colchicum corm, dried and sliced, four ounces; sherry, one pint. Macerate the colchicum in the wine for seven days, press and strain through calico; pour on the marc sufficient sherry to make up a pint, and having pressed and strained as before, mix the fluids.

*Dose.*—Fl. drm. ss to fl. drm. j.

*Administration of the Seed.*—Dose of the powdered seed the same as that of the corm. The seed is to be preferred to the corm as being more uniform in its properties. It is usually given in the form of tincture.

Tinctura Colchici Seminis, *Tincture of Colchicum Seed.* [Tinctura Colchici, U. S., *Tincture of Colchicum.* Tinctura Colchici Seminis, *Pharm.* 1850.]—Take of colchicum seed, bruised, two ounces and a half; proof spirit, one pint. Macerate the colchicum for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. [" Take of colchicum seed, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a cylindrical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

The average *dose* is from half a drachm to two drachms. I have repeatedly given two drachms at a dose without any violent effect. Dr. Barlow, who prefers this to the other preparations of colchicum, advises that in gout a drachm, a drachm and a half, or two drachms of the tincture, should be given at night, and repeated the following morning. If this quantity fail to purge briskly, a third dose may be administered the ensuing night. Externally, the tincture has been employed as a liniment, to relieve rheumatic, gouty, venereal, and other pains.

[Extractum Colchici Radicis Fluidum, U. S., *Fluid Extract of Colchicum Root.*—" Take of colchicum root, in fine powder, sixteen troyounces; alcohol, water, each, a sufficient quantity. Mix two measures of alcohol with one of water, moisten the colchicum root with six fluidounces of the mixture, press it moderately in a conical percolator, and gradually pour the mixture upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation until two pints more of tincture have been obtained. Evaporate this to four fluidounces, mix it with the reserved tincture, and filter through paper." U. S. Dose, 2 to 8 minims in water.

Extractum Colchici Seminis Fluidum, U. S., *Fluid Extract of Colchicum Seed.*—" Take of colchicum seed, in moderately fine powder, sixteen troyounces; alcohol, water, each, a sufficient quantity. Mix two measures of alcohol with one of water, moisten the colchicum seed with six fluidounces of the mixture, press it firmly in a conical percolator, and pour the mixture upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation until two pints more of tincture have been obtained. Evaporate this to four fluidounces, mix it with the reserved tincture, and filter through paper." Dose, 2 to 8 minims in water.

Acetum Colchici, U. S., *Vinegar of Colchicum.*—" Take of colchicum root, in fine powder, two troyounces; diluted acetic acid, a sufficient quantity. Moisten the powder with a fluidounce of diluted acetic acid, allow it to stand for half an hour, pack it firmly in a conical glass percolator, and gradually pour upon it diluted acetic acid until the filtered liquid measures two pints. Vinegar of colchicum may also be prepared by macerating the colchicum root, in moderately fine powder, with two pints of diluted acetic acid, in a close glass vessel, for seven days; then expressing the liquid, and filtering through paper." U. S. Dose, f℥ss—f℥j in water.

Vinum Colchici Radicis, U. S., *Wine of Colchicum Root.*—"Take of colchicum root, in moderately fine powder, twelve troyounces; sherry wine, a sufficient quantity. Moisten the powder with four fluidounces of sherry wine, pack it firmly in a conical percolator, and gradually pour sherry wine upon it until two pints of filtered liquid are obtained." U. S. The wine in this preparation is intended to be saturated. The dose is 10–30 minims as an alterative, f℥j as a purgative in rheumatism, &c., administered in water.

Vinum Colchici Seminis, U. S., *Wine of Colchicum Seed.*—"Take of colchicum seed, in moderately coarse powder, four troyounces; sherry wine, two pints. Macerate for fourteen days, with occasional agitation; then express, and filter through paper." U. S. Dose, f℥ss—f℥iss in water. —W.]

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## ASAGRÆA OFFICINALIS, *Lind.*

Hexandria, Trigynia, *Linn. Syst.*

*Botanic Character.*—A bulbous plant with linear grass-like *leaves* 4 feet long and 3 lines broad; and small polygamous *flowers*, arranged in a dense straight *raceme*, a foot and a half long, on a *scape* about 6 feet high. *Perianth* 6-partite; segments linear, almost equal, with a nectariferous excavation at the base. *Stamens* 6, alternately shorter; *Anthers* turned outward. *Follicles* 3, acuminate, papery, *Seeds* scimitar-shaped, corrugated, winged.—*Bot. Reg.* vol. xxv. pl. 33.

Fig. 59.


*Asagræa officinalis.*
*a.* Fruit-bearing stem.
*b.* Root, bulb, and leaves.

*Habitat.*—Eastern side of the Mexican Andes, and neighborhood of Vera Cruz.

### Sabadilla, *Cevadilla.*

The dried fruit; imported from Vera Cruz and Mexico.

*Officinal 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.

*Description.*—The follicles, commonly termed capsules, rarely exceed, or even equal, half an inch in length, and are about one line or a line and a half in diameter. They are ovate-oblong, acuminate, mutually adherent towards the base, open at the superior and internal part. The coat of each is thin and dry. The fruitstalk, and the remains of the dried and withered calyx, are usually present in the cevadilla of the shops. Internally the seeds are whitish or horny. They have little odor.

*Composition.*—Cevadilla seeds appear to consist of veratria combined with gallic acid, fatty matter, wax, resin, extractive matter, a yellow coloring ingredient, veratric acid, &c.

*Pharmaceutic Use.*—The principal use of cevadilla is for the preparation of veratria.

### [Sabadilla, *Cevadilla.* Mat. Med. List, U. S. P.

The seed of Veratrum sabadilla (*Retzius*).

The sabadilla seeds of commerce are most probably the mixed products of the officinal plants of the U. S. Pharmacopœia and the British Pharmacopœia. I append the description of veratrum sabadilla as given by Prof. Carson.

"A plant three or four feet high. Stem erect, simple, round; leaves numerous spreading on the ground all radical, ovate-oblong, obtuse, with eight to fourteen ribs, glaucous underneath. Panicle spreading, simple or a little branched. Flowers rather nodding. Pedicles very short, approximated in twos or threes; those of the fertile flowers eventually becoming turned to one side; those of the sterile flowers deciduous and leaving a scar. Ligments of the perianth ovate lanceolate, veinless, blackish purple. Ovaries three, oblong, connate obtuse. Styles acute, dilated downwards. Stigmas simple. Capsules three, in form resembling those of the larkspur, opening at the apex inside. Seeds three in each cell, imbricated, curved, blunt on one side. Sooty, acrid."—*Carson, Med. Bot.* pl. 94.—W.]

### Veratria [U. S.], *Veratria.*

An alkaloid, $C_{64}H_{52}N_2O_{16}$, obtained from cevadilla; not quite pure.

*Preparation.*—Take of cevadilla, two pounds; distilled water, a sufficiency; rectified spirit, a sufficiency; solution of ammonia, a sufficiency; hydrochloric acid, a sufficieney; 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 colored. 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 colorless. Diffuse the moist precipitate through twelve fluidounces of distilled water, and add gradually with diligent stirring sufficient hydrochloric acid to make the fluid feebly but persistently acid. Then add the animal charcoal, digest at a gentle heat for twenty minutes, filter, and allow the liquid to cool. Add ammonia in slight excess, and, when the precipitate has completely subsided, pour off the supernatant liquid, collect the precipitate on a filter, and wash it with cold distilled water till the washings cease to be affected by nitrate of silver acidulated with nitric acid. Lastly dry the precipitate first by imbibition with filtering paper, and then on the steam bath.

By the action of the cold water upon the concentrated spirituous solution the greater part of the resinous matter is precipitated, and on adding ammonia to the aqueous solution it unites with the organic acids and throws down impure veratria. This, by resolution in hydrochloric acid, decoloration by animal charcoal, and reprecipitation by ammonia, yields the officinal veratria. ["Take of cevadilla, in moderately fine powder, twenty-four troyounces; alcohol, sulphuric acid, magnesia, water of ammonia, purified animal charcoal, water, each, a sufficient quantity. Digest the cevadilla with eight pints of alcohol, for four hours, in a distillatory apparatus, with a heat approaching to boiling, and pour off the liquid. To the residue add eight pints more of alcohol mixed with the portion distilled, and, having digested for an hour, pour off the liquid as before. Digest for a third time with the same quantity of alcohol, together with the portion last distilled, and again pour off. Press the remains of the cevadilla, mix and strain the liquids, and, by means of a water-bath, distil off the alcohol. Boil the residue three or four times in water acidulated with sulphuric acid, mix and strain the liquids, and evaporate to the consistence of syrup. Add magnesia in slight excess, shake the mixture frequently, then express, and wash what remains. Repeat the expression and washing two or three times, and, having dried the residue, digest it with a gentle heat several times in alcohol, and strain after each digestion. Distil off the alcohol from the mixed liquids, boil the residue for fifteen minutes in water mixed with a little sulphuric acid and purified animal charcoal, and strain. Having thoroughly washed what remains, mix the washings with the strained liquid, evaporate with a moderate heat to the consistence of thin syrup, and drop in sufficient water of ammonia to precipitate the veratria. Lastly, wash the alkaloid with water, and dry it with a gentle heat." U. S. In this process an alcoholic extract is first obtained, which contains the alkaloid united with some vegetable acid and mixed with resinous and other impurities. Sulphuric acid and water are then added and the alkaloid dissolved out as a sulphate. This is then precipitated by magnesia. The alkaloid is then dissolved in alcohol, reconverted into the sulphate, purified by animal charcoal, and precipitated by ammonia.—W.]

*Officinal Characters.*—Pale gray, amorphous, without smell, but, even in the most minute quantity, powerfully irritating the nostrils; strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids, leaving traces of an insoluble brown resinoid matter. An active poison. ["It has an acrid, bitter taste, causing a sensation of tingling with numbness in the tongue. It is very slightly soluble in water, but readily and wholly dissolved by alcohol. It has an alkaline reaction, and is entirely dissipated by a red heat. With nitric acid it forms a yellow solution, and, by contact with concentrated sulphuric acid, becomes intensely red." U. S.]

Veratria dissolves readily in chloroform. It fuses at 122° Fah. and when mixed with dilute sulphuric acid and warmed, it gradually becomes of a deep crimson color, similar to murexid.

*Tests.*—Heated with access of air it melts into a yellow liquid, and at length burns away, leaving no residue.

*Therapeutics.*—Veratria is chiefly employed externally. *In neuralgia* it has been used in the form of ointment, containing from twenty to forty grains of veratria to an ounce of lard. The frictions are to be continued until the heat and tingling caused by the veratria have acquired a considerable degree of intensity. Though, according to my own experience, it fails to give relief in a large majority of cases, yet in some few its effects are highly beneficial, and in none is it injurious. As a remedy for neuralgia, it is, however, far inferior to *Aconite* and its alkaloid *Aconitia*. *In rheumatism* it has been employed in the form of ointment by Sir C. Scudamore and Dr. Turnbull. It should not be applied while the inflammation is of an active kind. It would appear to be best adapted for the neuralgic forms of rheumatism. [In *ptosis*, not arising from cerebral lesion, I have often used the ointment with advantage.—Ed.]

*Administration.*—Veratria should be administered cautiously in doses of $\frac{1}{8}$ or $\frac{1}{10}$ of a grain three times a day. On account of its acridity it should not be given in solution, but in the form of pills.

Unguentum Veratriæ [U.S.], *Ointment of Veratria.*—Take of veratria, eight grains; prepared lard, one ounce; olive oil, half a fluidrachm. Rub the veratria and the oil together; then mix them thoroughly with the lard. ["Take of veratria, twenty grains; lard, a troyounce. Rub the veratria with a little of the lard; then add the remainder, and thoroughly mix them." U. S. This is more than twice as strong as the British ointment.—W.]

## [VERATRUM VIRIDE, *American Hellebore.*

*Generic Characters.*—Perianth entirely free; the obovate or oblong sepals longer than the stamens, without glands, not clawed. Anthers confluently one-celled. Pod three-horned, septicidal; seeds flat, membranaceous margined. Flowers panicled, monœcious.

*Specific Character.*—Stem short, very leafy to the top. Sheaths of the oval leaves clasping, strongly plaited. The dense, spike-like racemes of the pyramidal panicle spreading. A coarse perennial plant, growing some three or four feet high in swamps, banks of streams, and low meadows, with a striate pubescent annual stem, and large more or less plaited leaves. The flowers are small, dull yellowish-green, appearing during the summer months. The tunicated root is large, fleshy, and acrid. It should be gathered in the autumn.

*Habitat.*—Canada to Georgia.—W.]

## [VERATRUM ALBUM, *White Hellebore.*

Fig. 60.

*Veratrum album.*

*Specific Characters.*—"Panicle decompound. Bracts equalizing the flowers. Pedicels pubescent. Segments of the perianth somewhat erect and obtuse, serrulate. Leaves ovate-oblong, plaited." (*Sprengel.*) *Root* composed of numerous fleshy brownish-white fibres, arising from a perennial, cylindrical, fleshy, subterraneous stem or *rhizome*, which is brown externally, brownish-white internally, and is placed obliquely in the earth. *Stem* one to four feet high. The plant flowers from June to August.

*Habitat.*—Mountainous regions of Europe.

Prof. Asa Gray considers these two plants as possibly one species, and I am unable to point out any specific differences.—W.]

[**Veratrum Viride,** *American Hellebore.* Mat. Med. List, U. S. P.

The rhizoma of veratrum viride.

The dried rhizome is about one or two inches long, is regularly conical, with its base an inch or so in diameter, its apex very blunt or truncated. Its texture is compact. It is covered with rootlets, or their remains, and generally has some of the stem adherent. Its taste is at first sweetish, then bitter, followed by an acrid, burning, very persistent sensation in the mouth. The odor, disagreeable in the recent root, is lost in drying, and in fact all the sensible and medical properties of the root are deteriorated by age: it should therefore not be kept from year to year, but a fresh supply obtained every autumn.

*Composition.*—Veratrum viride contains the alkaloid veratria in considerable quantity, but it also contains another principle, to which it owes

Fig. 61.


Fig. 62.

Fig. 63.

Fig. 64.

Fig. 65.

*Veratrum viride.*

Fig. 61, the plant; Fig. 62, the root; Fig. 63, the flower; Fig. 64, the seed envelope; Fig. 65, the early appearance of the plant.

its peculiar effects on the system more than to the veratria. This principle is supposed to be a resin, at least a resinous precipitate has been obtained by adding a saturated tincture to water and evaporating off the alcohol which contains it. Dr. Geo. B. Wood thinks "that the so-called resin will be found to be a complex body, possibly containing a distinct alkaloid." U. S. D.

*Therapeutics.*—The following experiment, made by Mr. Worthington on himself, will serve to illustrate the effects of veratrum viride on the system. He took the fourth of a grain of the *Alcoholic Extract*, which caused an acrid burning sensation in the mouth, and communicated to the throat and fauces a sense of dryness and heat, which finally reached the stomach. In the course of about an hour, this dryness and burning sensation in the throat and stomach became intense, and a disposition to hiccough was excited, which soon commenced, gradually increasing in frequency until it reached fifteen or twenty times per minute. This was attended with some sickness and retching until vomiting took place. This was violent, and seemed to come on about every ten or fifteen mintues for the space of an hour. During this time, dizziness and tremor were created, which passed off with the effect of the dose. With the hiccough there was a copious secretion of saliva and discharge of mucus from the stomach and nose. During the action of this dose, the pulse was weakened so as to be scarcely perceptible, and reduced from sixty-eight to fifty-two pulsations per minute.

The experiment just detailed was repeated three times, and in neither trial was there a disposition to catharsis.

The burning sensation spoken of as felt in the throat, fauces, and stomach, and the hiccough, I have never heard complained of or noticed, but the other symptoms are precisely those ordinarily following a very large dose of the drug. The lowering of the pulse is not dependent upon the nausea, as it precedes it, and it is possible so to vary the dose as to produce a great effect on its force and frequency, without causing much if any sickness of the stomach. Almost all the secretions of the body are very greatly increased, the skin is bathed in a profuse perspiration, and when the vomiting is very great, large quantities of bile are rejected. The advantage which this drug has seemed to me to possess over other arterial sedatives, is in the union of great power and temporary action. Its effects rapidly pass off, and are easily controlled by the exhibition of brandy. It has been used with advantage in diseases of the heart with excessive action; but its great usefulness is in cases of high inflammation, with an excited condition of the circulation. In the early stages of acute sthenic pneumonia, its remedial powers are very great, so great that some have thought that it must exert a specific sedative action on the lung tissue. In cases of wounds, where it is desirable to prevent inflammation it is also very useful. I have known of a woman whose abdomen was torn open by a bull; the integuments, muscles, peritoneum, &c., were rent for at least six inches, and nearly the whole of the sigmoid flexure of the colon protruded. The dust and dirt were washed off with warm water, the intestine replaced, the wound sewed up, the patient restricted to low diet, and a saturated tincture freely but very carefully administered, so as to keep the pulse very low and yet avoid vomiting as much as possible, to aid in which opium was also exhibited. The patient recovered without a bad symptom. It was tried (during my residence) in the Philadelphia Hospital in cases of *mania a potu*, following the digitalis treatment. In this affection it failed entirely: indeed, one death was attributed to it. There are, however, certain cases in which there is great irritation of the brain, owing to the blood being loaded with poisonous and effete matters, in which, in large doses, it does good indirectly, by causing the excretion of the morbid materials from the blood. It is said to have been used successfully in inflammatory rheumatism. Any over effects may be counteracted by opiates and alcoholic and ammoniacal stimulants. The practitioner should give it very carefully, but not too timidly, commencing with a small dose, rapidly increasing, closely watching the patient, until some effects are produced. It should never be used as an emetic.

In case of poisoning from it or any of its preparations, after free vomiting has occurred, the patient should be forced to retain the *recumbent position*, and if he needs must vomit, to vomit into a towel; sinapisms should be applied to the epigastrium, artificial heat to the extremities, if necessary, and *undiluted* brandy administered in teaspoonful doses, with opium in moderate quantity, and ammonia by inhalation and the stomach. In very alarming cases, where these remedies seem insufficient, ether might be inhaled in *such quantities* as to get *only* its *stimulant* action. The root is never given in substance.

Extractum Veratri Viridis Fluidum, U. S., *Fluid Extract of American Hellebore.*—"Take of American hellebore, in fine powder, sixteen troyounces; alcohol, a sufficient quantity. Moisten the hellebore with six fluidounces of alcohol, introduce it into a cylindrical percolator, press it firmly, and gradually pour alcohol upon it until half a pint of tincture has passed. Set this aside, and continue the percolation until two pints and a half more of tincture have been obtained. Evaporate this, by means of a water-bath, at a temperature not exceeding 150°, to half a pint, mix it with the reserved tincture, and filter through paper."

*Dose.*—Gtt. j—iij, continually increasing until symptoms of its action are manifest. If a rapid impression is desired, the dose should be repeated every hour, and increased ½—1 gtt. each time, the patient being carefully watched.

Tinctura Veratri Viridis, U. S., *Tincture of American Hellebore.*—"Take of American hellebore, in moderately fine powder, sixteen troyounces; alcohol, a sufficient quantity. Moisten the powder with four fluidounces of alcohol, pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it until two pints of tincture are obtained." U. S.

*Dose.*—Gtt. iij—v, with the same variations and precautions as in the preceding preparation.—W.]

[**Veratrum Album,** *White Hellebore.* Mat. Med. List, U. S. P.

The rhizoma of veratrum album.

This rhizome is cylindrical or more frequently in the form of a truncated cone, two to four inches long, rough, wrinkled, with numerous rootlets, as well as some fine, soft, hairlike fibres. It is composed of an inner spongy cylinder, a thick woody ring, and an outer dense epidermal layer. The odor of the dried rhizome is feeble; the taste first bitter, then acrid. Its more important constituents are veratria, gallo-tannic acid, starch, gum, woody fibre, and fatty matters.

*Therapeutics.*—Its *local* action is that of a powerful irritant. Applied to the Schneiderian membrane, it excites violent sneezing. Epistaxis even is said to have been induced by it. Its operation, when swallowed or placed in contact with the skin, is also that of an energetic irritant.

Its *remote* action is on the secretory apparatus, the stomach and intestines, and the nervous system. In *small* and *repeated doses*, it promotes secretion from the mucous surfaces, the salivary glands, the kidneys, and the uterus, and increases the cutaneous exhalation. In *larger doses*, it causes vomiting, purging, pain in the abdomen, tenesmus, and occasionally bloody evacuations, and great prostration of strength. In some instances, a few grains even have had these effects. Schabel says there is no substance which so certainly and promptly provokes vomiting; and Horn employed it as a sure emetic. In addition to the local action which it exercises, when swallowed, on the stomach and intestines, it possesses a specific power of influencing these viscera: for Etmuller has seen violent vomiting result from the application of the rhizome to the abdomen; and Schröder observed the same occurrence where the rhizome was used as a suppository. In *excessive doses*, it operates as a narcotic-acrid poison, producing gastro-intestinal inflammation and an affection of the nervous system. The symptoms are violent vomiting and purging (sometimes of blood), tenesmus, burning sensation of the mouth, throat, œsophagus, stomach, and intestines, constriction of the throat, with a sense of strangulation, griping pain in the bowels, small, and, in some cases, almost imperceptible pulse, faintness, cold sweats, tremblings, giddiness, blindness, dilated pupils, loss of voice, convulsions, and insensibility, terminating in death. It is very rarely used in medicine, but has been recommended in chronic skin diseases, in mania, melancholia, epilepsy and allied nervous diseases, and in gout. Its powder is sometimes mixed with starch and snuffed up the nostrils as an errhine: not more than two grains should thus be taken.

*Dose.*—Gr. ij, cautiously increased.—W.]

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## LILIACEÆ, *Lindl.* The Lily Order.

### ALOE, *Linn.*

Hexandria, Monogynia, *Linn. Syst.*

*Generic Character.*—*Perianth* tubular, 6-cleft, nectariferous at the base. *Stamens* hypogynous, as long as the perianth, or even longer. *Capsule* membranous, scarious, 3-cornered, 3-celled, 3-valved, with a loculicidal dehiscence. *Seeds* numerous, in 2 rows.

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### ALOE VULGARIS, *Lam.*

### The Yellow-flowering Aloe.

*Specific Character.*—A succulent plant, with a short woody simple cylindrical *stem*, and curved fleshy glaucous-green and slightly mottled lanceolate *leaves*, armed with hard distant reddish spines. *Scape* branched. *Flowers* yellow, forming a cylindrical-ovate spike, at first erect, then spreading, afterwards pendulous.—*Steph. and Church.*, pl. 109.

*Habitat.*—Barbadoes.

The species yields *Barbadoes aloes.* The brownish-yellow, bitter, resinous juice, which by inspissation forms aloes, is contained in parallel greenish vessels beneath the epidermis of the leaves. When the leaf is first broken across, the juice is nearly colorless, but as it exudes, it quickly acquires a brownish-yellow color from exposure to the air.

According to Sir R. Schomburgk and Dr. Christison, *A. ferox* and some other species are also cultivated in Barbadoes [but there is no evidence that they produce aloes having the officinal characters.—Ed.]

**Aloe Barbadensis,** *Barbadoes Aloes.* [Mat. Med. List, U. S. P.]

The juice of the leaf, inspissated.

*Preparation.*—The finest kind of aloes is obtained by evaporating the juice which flows spontaneously from the transversely-cut leaves. The exudation of it is promoted by gravity, by dipping the leaves in hot water, and by making fresh sections of the leaves. But if pressure be employed the proper aloetic juice becomes mixed with the mucilagious liquid of the leaves, and thus an inferior kind of aloes is obtained. A still inferior variety is procured by boiling the leaves, from which the juice has been previously allowed to escape, in water. In Barbadoes, the aloes is best obtained as follows: "The leaves, being cut near the roots, are thown into tubs with their broken ends downwards; and as the leaves are full of large longitudinal veins or vessels, they yield an easy passage to the juice (which is of a greenish-yellow color) to drip out. This being boiled for about five hours in a copper or kettle, the watery particles evaporate, and the remainder comes to a consistency and thickening as sugar doth when sufficiently boiled. The way to know when it is enough boiled is to dip a stick in the liquor, and observe whether the aloe sticking to it, when cold, breaks short: if it doth, then it is boiled to perfection, and fit to be poured into gourds or calabashes, or other vessels, for use." (Hughes, *Natural History of Barbadoes.*) The finest Barbadoes aloes is the inspissated juice, which I have heard called by an inhabitant of the island *cold-drawn Barbadoes aloes*, to distinguish it from the extract of the decoction, which is of inferior quality.

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

*Description.*—Barbadoes aloes varies from a yellowish-brown or liver color to a dark-brown or black: even in the same gourd a difference of color is occasionally observed. Its unpleasant odor (which is much increased by breathing on it) will always distinguish it from other kinds. Its powder is of a dull olive-yellow color.

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## [ALOE SPICATA, *Th.*

*Specific Character.*—*Stem* three to four feet high, as thick as a man's arm. *Leaves* thick, fleshy, broad at the base, gradually narrowing to the point, channelled, full two feet long, distantly toothed, with a few white spots; their parenchyma almost colorless. *Spike* a foot long, very compact, with the flowers campanulate and horizontal. The three petals broader, ovate, obtuse, white, with a triple green line, the sepals narrower, less concave. *Stamens* much longer than the perianth. The flowers are filled with a purplish honey. (*Lindley.*)—This species is a native of the interior of the Cape of Good Hope.—W.]

### [**Aloe Capensis,** *Cape Aloes.* Mat. Med. List, U. S. P.

The inspissated juice of the leaves of Aloe spicata (Thunberg), and of other species of aloes (U. S.).

This kind is imported, as its name indicates, from the Cape of Good Hope. It is brought over in chests and skins, the latter being preferred, as the aloes contained therein are usually purer and more glossy. It has a shining resinous appearance, is of a deep brown color, with a greenish tint, and has a glossy or resinous fracture; its edges, or thin laminæ, viewed by transmitted light, have a yellowish red or ruby color; its odor is stronger and more disagreeable than the Barbadoes aloes; its powder is greenish yellow. Some of the commoner kinds of Cape aloes have a rough fracture.—W.]

## ALOE SOCOTRINA, *Lam.*

### The Socotrine Aloe.

*Specific Character.—Stem* woody, straight, one and a half feet high or more, naked below. *Leaves* amplexicaul, ascending ensiform, green, curved inwards at the point, convex below, rather concave above, marked with numerous small white marginal serratures, the parenchyma abounding in a bright brownish-yellow juice. *Raceme* cylindrical, unbranched. *Flowers* scarlet at the base, pale in the middle, green at the point. *Stamens* unequal three of them longer than the flowers.—*Steph. and Church.* pl. 110.

Fig 66.

*Aloe socotrina.*
Various species of aloes.

*Habitat.*—Socotra. Lieut. Wellstead says that the hills on the west side of Socotra are covered for an extent of miles with aloe plants; and he observes that it is not likely, at any future period, that the whole quantity will be collected which might be required.

The aloes prepared in the island of Socotra is probably procured from *Aloe socotrina*, and perhaps also from *A. purpurascens.*

**Aloe Socotrina,** *Socotrine Aloes.* [Mat. Med. List, U. S. P.]

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

*Preparation.*—In the island of Socotra the leaves are plucked at any period, and by any one who chooses to take the trouble; and after being placed in a skin, the juice is allowed to exude from them. (Wellstead.) The following mode of preparing Socotrine aloes, as related by Hermann, was communicated to Ray by Dr. Palmer: "When the leaves which have been pulled from the roots are gently compressed by the hand or an instrument, the juice drops from them into a receiving vessel; and being allowed to stand during a night, deposits the grosser parts. The next day it is transferred to another vessel, in which it is exposed to the sun that it may harden and become dry, when it acquires a brownish-yellow color."

[About the year 1840 the island of Socotra was visited by Mr. Hunt, who brought thence a large quantity of Socotrine aloes, of which he gave me specimens. These varied much in quality, some being finer, others more or less impure. Mr. Hunt's account of the preparation of the drug corresponded with the previous account of Lieut. Wellstead. No aloes is kept prepared for sale, but when any vessel stops at the island, and aloes is asked for, the leaves are cut and the juice allowed to drain out into a sack made of goats' skin. The sack with its contents is then put on board the vessel, and secured to the mast, or in some other place where it is constantly exposed to the sun, to facilitate evaporation. The vessels which touch at Socotra are mostly those which sail between Bombay and the eastern coast of Africa, or the Red Sea.—Ed.] Sir Whitelaw Ainslie, however, says that the greater part of the extract sold under the name of Socotrine aloes is prepared in the kingdom of Melinda; and I am informed by an eminent drug-merchant, that both Socotrine and hepatic aloes have been imported into London directly from Zanzibar. It is usually brought by way of Bombay.

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

*Description.*—It comes over in skins, casks, kegs, and chests. Its consistence and color are subject to considerable variation. The exterior portion is usually hard, but the internal portion is frequently soft, or even semiliquid. In general this arises from insufficient evaporation of the aloe juice. The hardened portions vary in color in different parts of the same mass; sometimes they are garnet-red, at other times much paler, and when quite dry are golden-red, and yield a golden-yellow powder. By exposure to the air the color is deepened. The fracture of fine selected pieces is smooth, glassy, and conchoidal; but Socotrine aloes of excellent quality often breaks with a roughish fracture. The finest kind which I have met with had the semitransparent red color observed when we break a fine tear of myrrh. Thin films of pure and hardened Socotrine aloes are usually translucent or nearly transparent. The odor of fresh-broken pieces (especially when breathed on) is very fragrant, and is much stronger in recent and soft specimens. The same agreeable odor is obtained by heating the aloes on the point of a knife in a candle. By distillation with water we obtain a liquid having the same odor, but free from any bitter taste. When fresh, socotrine aloes possesses considerable acidity.

Some time since a large importation was made of what appears to me to be the raw or unboiled juice of the plant yielding what is known in commerce as Socotrine aloes; I propose to distinguish it from the ordinary soft Socotrine aloes by the name of "*Socotrine Aloe Juice.*" Messrs. Horner, the holders of the whole of this juice, informed me that it was purchased of the Arabs up the Red Sea by a merchant who was assured by the vendors that it was very fine aloe juice, and had not been boiled or otherwise altered. It was imported into London by way of Madras, in casks each containing six cwt. I am informed that the contents of some of the packages underwent decomposition during the voyage. Its consistence is that of treacle or very thin honey; its color deep orange or palm-oil yellow; its odor powerful, fragrant, and resembling that of fine Socotrine aloes. By standing it separates into two parts—an inferior, paler-colored, opaque, finely granular portion, and a superior, darker-colored, transparent liquid. The latter forms, however, a very small portion of the whole mass. When the granular portion is submitted to microscopic examination it is found that the opacity and granular appearance arise from myriads of beautiful prismatic crystals. If a temperature of 132° F. be applied to the juice, these crystals melt or dissolve, and the juice becomes deep red and transparent; and when the liquid becomes cold it retains its transparency, and does not deposit any crystals. By evaporation the juice yields a solid, transparent extract, having all the characters of fine Socotrine aloes, in which no trace of crystalline texture can be discovered. Mr. Jacob Bell ascertained that 14 lbs. of the juice yielded 8 lbs. 12 ozs. of solid extract, or 62½ per cent. When the juice is mixed with cold distilled water it becomes opaque yellow, and renders the water turbid, but is not miscible with it.

If, however, heat be applied, the juice dissolves in the water, forming an almost clear rich red liquid. As the solution cools, it at first becomes turbid, owing to the separation of an opaque yellow precipitate, which, apparently, is the crystalline principle in an amorphous form. This gradually separates from the liquid and collects as a clear resiniform mass (commonly called the *resin* of aloes) at the bottom of the vessel, leaving the supernatant liquid tolerably clear. If the juice be shaken up with rectified spirit of wine an uniform clear mixture is obtained, from which numerous yellow crystals rapidly fall to the bottom of the liquid. Similar results are obtained when we mix the juice with equal parts of rectified spirit and water.

This crystalline constituent of Socotrine aloes is, doubtless, similar to the *aloin* formerly obtained from Barbadoes aloes, and described by Messrs. T. and H. Smith, of Edinburgh, and by Dr. Stenhouse. Dr. Stenhouse finds them identical. It has since been obtained from Socotrine aloes by Mr. Groves. I shall therefore term this crystalline principle the *aloin of Socotrine aloes.* On comparing it with a fine specimen of aloin kindly presented to me by Messrs. Smith, I find its crystals smaller and more tapering, the summits of the crystals being more acute. In drying, the crystals of the Socotrine aloin have a strong tendency to break up; so that crystals which in the moist state are moderately large

Fig. 67.

Fig. 68.

*Microscopic Appearances of Crystals of Aloin.*

Fig. 67. Aloin, prepared from Barbadoes aloes, by Messrs. Smith.
Fig. 68. Aloin contained in Socotrine aloe juice.
The magnifying power used was the same in both cases.

and regular, become small and pulverulent when dry. Like the aloin of Messrs. Smith, the crystals of Socotrine aloes strongly doubly-refract and depolarize light, and are, therefore, beautiful objects when viewed by the polarizing microscope.

[Although, in accordance with the principle adopted in this abbreviation of the author's larger work, Hepatic aloes, being no longer officinal, is not described, it is proper to state the conclusions at which the author arrived respecting the common source of Socotrine and Hepatic aloes. Having stated that these two kinds of aloes have a similar odor; that they frequently arrive intermixed in the same cask; that Hepatic aloes, when digested in rectified spirit, yields a yellowish granular powder, insoluble in cold water, alcohol, and ether, which appears under the microscope to consist of minute prismatic crystals; that Socotrine aloes and artificial Socotrine aloes (prepared by evaporating aloe juice), when digested in rectified spirit, yielded a dark brown insoluble portion, which, in the former case at least, contains depolarizing crystals; and that melted Hepatic aloes is found to have acquired the transparency of the Socotrine sort—he concludes that Socotrine and Hepatic aloes are obtained from the same plant; that the consolidation of the clear portion of the juice has produced the so-called Socotrine aloes; while the opaque aloin, containing no portion of juice, has yielded what is termed Hepatic aloes; that Socotrine aloes differs from Hepatic aloes in the circumstance of its having been prepared by the aid of artificial heat, by which its aloin constituent has become altered; that Hepatic aloes is the juice of the Socotrine aloes plant which has been solidified without the aid of artificial heat; and that Hepatic aloes owes its opacity to the presence of minute crystals of aloin.

[The Editor regrets that he is obliged to differ from the author in most if not all of these conclusions, as well as in some of his premises. The odor of the two aloes is, in his opinion, dissimilar; the intermixture in the same cask certainly occurs; but the opaque portions are probably not Hepatic but opaque Socotrine aloes. The transparent Socotrine aloes, probably formed by the upper part of the juice, which has deposited while concreting spontaneously (see *Preparation*, page 351), is, indeed, generally free from crystals; while the opaque kind he has always found full of them. They are conveniently seen by crushing a piece of opaque Socotrine aloes in a drop of proof spirit between two glasses and examining the aloes, as it dissolves, with a quarter inch, or even half inch power. Streams like mucilage filled with minute crystals almost immediately ooze out from the aloes, and in a short time thousands of them cover the field. Opaque Socotrine aloes is characterized by the profusion of these crystals. Hepatic aloes is equally opaque; yet a similar microscopic examination with a $\frac{1}{4}$ inch power will seldom discover more than a mere trace of very minute crystals. The statements of Mr. Hunt and Lieutenant Wellstead are directly opposed to the idea that Socotrine aloes is prepared by heat. Mr. Hunt's specimens were full of characteristic crystals, and did not at all resemble Hepatic aloes. The Editor is therefore of opinion that Socotrine and Hepatic aloes are not obtained from the same plant.]

*Composition.*—The following appear to be the most important constituents of aloes: *Aloetin*, *aloesin*, *amorphous aloin*, *bitter principle of aloes.*—This is the principal constituent of aloes, of which it forms about sixty per cent. It is contained in the cold infusion of aloes, and also in a decoction which has cooled; it may be obtained from either by evaporation. Thus procured, it is a brown and bitter mass, readily soluble in water, but difficultly so in spirit of wine. In pure alcohol or ether it is said to be insoluble, or nearly so. Its insolubility in ether distinguishes it from the bitter principle of rhubarb. It is probably a mixture or compound of various proximate principles. *Crystallized or hydrated Aloin.* $C_{34}H_{18}O_{14},HO$. Inodorous; taste at first sweetish, afterwards intensely bitter. The aqueous solution oxidizes rapidly at 212° F., and becomes uncrystallizable. Boiling alcohol and ether produce the same effect. It is soluble in six hundred parts of cold water, and in two of boiling alcohol. (See page 353, Figs. 67, 68.) *Aloe Resin.*—The substance which deposits from a decoction of aloes as it cools is usually denominated resin. I believe this to be aloin in a modified state. It is transparent, brown, fusible, soluble in alcohol, ether, and alkaline solutions, from the latter of which it is thrown down by acids. The alcoholic tincture of aloes does not become turbid when mixed with water. *Aloesic*

*Acid.*—This is the acid which Trommsdorff supposed to be *gallic acid.* A solution of aloes reddens litmus, darkens ferruginous solutions, but does not precipitate gelatin; hence Trommsdorff assumed the presence of gallic acid. But while gallic acid causes a blue color with the persalts of iron, infusion of aloes produces an olive-brown one. Furthermore, if excess of subacetate of lead be added to this infusion, a yellow precipitate occurs of aloetin and resin in combination with oxide of lead; and if sulphuretted hydrogen be passed through the filtered liquor, to throw down the excess of lead, the boiled and strained liquor possesses the property of becoming olive-brown on the addition of perchloride of iron. Hence it appears to me that the acid is a peculiar one, and I have accordingly termed it *aloesic acid.* Aloes, when heated with caustic potash or soda, yields an abundance of ammonia, so that it must contain a considerable quantity of nitrogen, although none of the principles at present isolated indicate that element.

*Physiological Effects.*—Taken internally *in small doses*, aloes acts as a tonic to the alimentary canal, assisting the digestive process, strengthening the muscular fibres and promoting the secretions, especially that of the liver, which organ it is thought specifically to influence. In *larger doses* it acts as a purgative. "One or two grains seldom fail to produce one stool, which seems to be merely an evacuation of what may be supposed to have been present for the time in the great intestines" (*Cullen*). There are, however, some peculiarities attending its cathartic operation deserving of notice. In the first place, these effects are not so speedily produced as by some other purgatives; for eight, twelve, and sometimes twenty-four hours elapse before they are produced. Secondly, it acts especially on the large intestines, and a full dose is in some persons apt to produce heat and irritation about the rectum and tenesmus; and in those troubled with hæmorrhoids it is said not unfrequently to increase, or even to bring on, the sanguineous discharge. The uterus, in common with all the pelvic viscera, is stimulated by aloes. A determination of blood towards these organs, and a fulness of the blood-vessels (especially of the veins), are produced, and thus uterine irritation and menorrhagia are apt to be increased by it, while in amenorrhœa and chlorosis it may occasionally act as an emmenagogue. According to Dr. Wedekind, the operation of aloes depends on the increased secretion of bile, which is produced by the specific action of this medicine on the liver. He found that as long as the stools were white or gray in icterus, aloes did not purge even when exhibited in large doses; but the purgative effect supervened immediately after the fecal matter began to contain bile, proving that the presence of bile in the intestinal canal is a necessary condition of its purgative effect. Socotrine aloes is said not to be so apt to occasion hæmorrhoids as the Barbadoes. Some years since, Dr. Clutterbuck instituted numerous experiments at the General Dispensary, Aldersgate Street, which I witnessed, to determine the effects of the different kinds of aloes, but scarcely any difference in their operation on the human subject was perceptible. Socotrine aloes has long been regarded as the best kind, though its commercial value is now below that of Barbadoes aloes. It is, I suspect, inferior in activity. [Barbadoes aloes is always preferred by veterinarians. Perhaps it is most effectual as a purgative, while Socotrine is the best tonic and stomachic.—Ed.] As a purgative, aloes holds an intermediate rank between rhubarb and senna. Vogt places it between jalap and rhubarb. From rhubarb it is distinguished by its more stimulant influence over the large intestines and the pelvic organs; from senna by its feebler action as a purgative, by its slow operation, and by its tonic influence when given in small doses. It irritates less powerfully than either jalap or scammony; further, its influence over the bloodvessels of the pelvic viscera is greater than these.

*Therapeutics.*—The uses of aloes may be readily inferred from the remarks already made. It is evidently not adapted for those cases in which a speedy effect is required; and it is, therefore, useless to add it to purgatives to quicken their operation. It is well fitted for cases of costiveness where there is a scanty secretion of bile, and for torpid conditions of the large intestines, especially when attended with deficient uterine action. Some of the ill effects ascribed to the use of aloes are probably imaginary, and others are much exaggerated. It is, however, advisable to avoid the use of this purgative in inflammatory conditions and organic diseases of the liver, in biliary calculi, in mechanical impediments to the passage of the blood through the branches of the portal veins, in hemorrhage from any of the pelvic organs (as the uterus and rectum), in irritation of the rectum, prostate gland, or bladder, in pregnancy, &c. The following are some of the cases in which the use of aloes has been advised: *In loss of appetite and dyspepsia*, depending on a debilitated condition of the digestive organs, accompanied by costiveness, but unattended with any signs of local irritation, aloes may be given in small doses as a stomachic. *In habitual costiveness*, depending on deficiency of bile, or on a sluggish condition of the large intestines, particularly in hypochondriacal or studious persons, or in those whose habits or occupations are sedentary—aloes, given in sufficient doses to purge, will be found a very useful medicine. A torpid state of the colon, with large fecal accumulation, is not unusual in females. In such the use of aloes is often attended with much benefit. *To excite the menstrual discharge* aloes is frequently employed. It has been supposed that by determining an afflux of blood to the pelvic organs, it would stimulate the uterine vessels, and thus relieve deficient menstruation connected with atonic conditions of the uterus. But it often fails; indeed Dr. Cullen says that it rarely succeeds. *To reproduce the hæmorrhoidal discharge* aloes has been frequently employed in large doses. Serious affections of the head, or of other parts, have sometimes disappeared on the occurrence of the hæmorrhoidal flux; and therefore, in persons who have been subject to this discharge, but in whom it has stopped, it is advisable to attempt its re-establishment, with the view of relieving other more serious disorders. *To promote the secretion of bile* where a deficiency of this fluid does not arise from hepatic inflammation, as in some forms of jaundice which are unconnected with biliary calculi, inflammation, mechanical obstruction of the ducts, &c. *In cerebral affections* the compound decoction of aloes is a most valuable stimulating purgative for elderly persons in whom a tendency to apoplexy exists, especially in cold and phlegmatic habits. It will frequently be necessary to conjoin other cathartics, as the infusion of senna. *As an anthelmintic*, a decoction of aloes, used as an enema, has been efficacious in the small thread-worm (*Ascaris vermicularis*).

*Administration.*—On account of its nauseous taste, aloes is frequently given in the form of pill. The ordinary dose is from three to five grains.

*Preparations of Barbadoes Aloes.*

Enema Aloes, *Enema of Aloes.*—Take of aloes, forty grains; carbonate of potash, fifteen grains; mucilage of starch, ten fluidounces. Mix, and rub together.

Either kind of aloes may be employed in this preparation, which is *used* to dislodge ascarides from the rectum.

Extractum Aloes Barbadensis, *Extract of Barbadoes Aloes.*—Take of Barbadoes aloes, in small fragments, one pound; boiling distilled water, one gallon. Add the aloes to the water, and stir well until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water bath or a current of warm air to a proper consistence.

*Dose.*—Gr. v to gr. x.

The object of this preparation is to deprive the aloes of the substance called *resin*, on which its irritating and griping qualities have been supposed to depend. This, according to Winkler, it very imperfectly accomplishes. [In order to ascertain the correctness of the above supposition, I gave, at different times, to about sixty hospital patients suffering from costiveness, three grains of crude aloes, of extract of aloes, and of the *resinous* deposit from the decoction of aloes. Most of them took the aloes in one or other of these states, several times. The result was remarkably uniform. The crude aloes and the watery extract produced from one to three evacuations from the bowels in twelve or eighteen hours. There was little difference in their action, and the crude drug *did not gripe* more than the extract. Perhaps the extract acted a little more speedily. The dried resinous deposit was almost inert. It did not gripe, and seldom produced any evacuation. It does not follow from the inertness of the resin when separated from the aloesin, that it is inert when combined with it; indeed, the equal activity in the above-mentioned experiments of the crude drug and the watery extract rather indicates the contrary; but I think that the griping effects of the resin have been somewhat over-estimated. A similar trial with socotrine aloes, its watery extract, and its resin, gave similar results. Dr. Garrod, after a corresponding series of experiments with aloes, its watery extract, and its resin, arrived at the same conclusions.—Ed.]

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 fluidrachm; confection of roses, one ounce. Beat all together until thoroughly mixed.

*Dose.*—Gr. v to gr. x.

Barbadoes aloes is also used in the compound pill of gamboge, the compound pill of colocynth, and the pill of colocynth and hyoscyamus.

*Preparations of Socotrine Aloes.*

Decoctum Aloes Compositum, *Compound Decoction of Aloes.* (*Decoctum Aloes*, *Ed.*)—Take of extract of Socotrine aloes, ninety grains; myrrh, bruised, sixty grains; saffron, chopped fine, sixty grains; carbonate of potash, forty grains; extract of liquorice, half an ounce; compound tincture of cardamoms, four fluidounces; distilled water, a sufficiency. Triturate the aloes, myrrh, and carbonate of potash together; add the saffron and extract of liquorice, and boil in fourteen ounces of the water for ten minutes in a covered vessel. Cool, strain through flannel, and add the tincture of cardamoms, with as much water as may be necessary to make up the quantity to sixteen fluidounces.

The quantity of aloes in this preparation is one half greater than in the Edinburgh decoction, and exceeds that of the London in a still greater ratio, the proportion to the 16 ounces being 60 grains in the Edinburgh, and 53 in the London. It is a most valuable compound; a mild cathartic, tonic, antacid, and emmenagogue, used in the before-mentioned cases in *doses* of fl. oz. ss to fl. oz. ij. Acids, acidulous salts, and most metallic salts, are incompatible with it. If it be desirable to conjoin chalybeates with it, either the tartarated iron, or the citrate of iron and ammonia may be added to the cold decoction without undergoing decomposition. The quality of the aloes used, the length of time the decoction is boiled, and the purity of the extract of liquorice, affect the transparency or turbidity of this decoction, which is never so bright as tincture of aloes.

ENEMA ALOES. (*See Preparations of Barbadoes Aloes.*)

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 it is dissolved. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water bath or a current of warm air to a proper consistence.

[ALOE PURIFICATA, U. S., *Purified Aloes.*—"Take of Socotrine aloes, twenty-four troyounces; stronger alcohol, four fluidounces. Heat the aloes, by means of a water-bath, until it is completely melted. Then add the alcohol, and, having stirred the mixture thoroughly, strain it through a fine sieve, which has just been dipped into boiling water. Evaporate the strained mixture by means of a water-bath, constantly stirring, until a thread of the liquid becomes brittle on cooling. Lastly, break the product, when cold, into pieces of a convenient size, and keep it in a well-stopped bottle." U. S.

*Officinal Characters.*—Purified aloes, is in brittle pieces, of a dull-brown or reddish-brown color, and having the peculiar aromatic odor of Socotrine aloes. When powdered and subjected to the action of alcohol, it is dissolved, with the exception of a slight residue. Dose, as a laxative, gr. iij—v; as a purgative, gr. viij—xij.—W.]

PILULA ALOES SOCOTRINÆ, *Pill of Socotrine Aloes* (*Pilula Aloes*, *Ed.*)—Take of Socotrine aloes, in powder, two ounces; hard soap, in powder, one ounce; volatile oil of nutmeg, one fluidrachm; confection of roses, one ounce. Beat all together until thoroughly mixed.

This pill is a valuable purgative in habitual costiveness.

*Dose.*—Five to ten grains.

[PILULÆ ALOES, U. S.—"Take of Socotrine aloes, in fine powder, soap, in fine powder, each, a troyounce. Beat them together with water so as to form a pilular mass, to be divided into two hundred and forty pills." As a laxative, 1—3 pills; as a purgative, 4—6 pills.—W.]

PILULA ALOES ET ASSAFŒTIDÆ, *Pill of Aloes and Assafœtida.*—Take of Socotrine aloes, in powder, one ounce; assafœtida, one ounce; hard soap, in powder, one ounce; confection of roses, one ounce. Beat all together until thoroughly mixed.

*Used* in dyspepsia attended with flatulence and costiveness, and in the costiveness of hysterical women.

*Dose.*—Ten to twenty grains.

[PILULÆ ALOES ET ASSAFŒTIDÆ, U. S.—"Take of Socotrine aloes, in fine powder, assafœtida, soap, in fine powder, each, half a troyounce. Beat them together with water so as to form a pilular mass, to be divided into one hundred and eighty pills." Dose, 2—5 pills.—W.]

PILULA ALOES ET MYRRHÆ, *Pill of Aloes and Myrrh.*—Take of Socotrine aloes, two ounces; myrrh, one ounce; saffron, dried, half an ounce; confection of roses, two ounces and a half. Triturate the aloes, myrrh, and saffron together, and sift; then add the confection of roses, and beat together into a uniform mass.

*Used* as a purgative in chlorosis and amenorrhœa.

*Dose.*—Ten to fifteen grains.

[Pilula Aloes et Myrrhæ, U. S.—"Take of Socotrine aloes, in fine powder, two troyounces; myrrh, in fine powder, a troyounce; saffron, in fine powder, half a troyounce; syrup, a sufficient quantity. Beat the whole together so as to form a pilular mass, to be divided into four hundred and eighty pills." Dose, 3—6 pills.—W.]

Tinctura Aloes [U. S.], *Tincture of Aloes.*—Take of Socotrine aloes, in coarse powder, half an ounce; extract of liquorice, an ounce and a half; proof spirit, one pint. Macerate for seven days, filter the liquor, and add sufficient proof spirit to make one pint. Purgative and stomachic. ["Take of Socotrine aloes, in fine powder, a troyounce; liquorice, three troyounces; alcohol, half a pint; distilled water, a pint and a half. Macerate for fourteen days, and filter through paper." U. S.]

*Dose.*—Fl. drs. ij to fl. drs. iij.

[Tinctura Aloes et Myrrhæ, *Tincture of Aloes and Myrrh.*—"Take of Socotrine aloes, in moderately fine powder, myrrh, in moderately fine powder, each, three troyounces; saffron, in moderately coarse powder, a troyounce; alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with two fluidounces of alcohol, pack it moderately in a conical percolator, and gradually pour alcohol upon it until two pints of tincture are obtained. This tincture may also be prepared by macerating the powders with two pints of alcohol for fourteen days, and filtering through paper." U. S. Used as a stimulating purgative and emmenagogue in chlorosis. It is a modification of the *elixir proprietatis* of Paracelsus. Dose, f℥ss—fʒiiss.—W.]

Vinum Aloes [U. S.], *Wine of Aloes.*—Take of Socotrine aloes, one ounce and a half; cardamoms, ground, eighty grains; ginger, in coarse powder, eighty grains; sherry, two pints. Digest for seven days, and strain through calico. This preparation is one-quarter weaker in aloes than Lond. ["Take of Socotrine aloes, in fine powder, a troyounce; cardamom, in moderately fine powder, ginger, in moderately fine powder, each, sixty grains; sherry wine, a pint. Macerate for seven days, with occasional agitation, and filter through paper." U. S.]

*Dose.*—Fl. drm. j to fl. drs. ij.

[Pilulæ Aloes et Mastiches, U. S., *Pills of Aloes and Mastic.*—"Take of Socotrine aloes, in fine powder, a troyounce and a half; mastic, in fine powder, red rose, in fine powder, each, half a troyounce. Beat them together with water so as to form a pilular mass, to be divided into four hundred pills." Dose, 3—6 pills.—W.]

[Pulvis Aloes et Canellæ, U. S., *Powder of Aloes and Canella.*—"Take of Socotrine aloes, in fine powder, twelve troyounces; canella, in fine powder, three troyounces. Rub them together until they are thoroughly mixed." A popular remedy in amenorrhœa, under the name of *hiera picra*. Dose, gr. x—xx.—W.]

Socotrine aloes is also employed in the preparation of compound rhubarb pill, and its extract in the preparation of compound extract of colocynth.

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## URGINEA SCILLA, *Steinheil.*

### Officinal Squill.

[*Synonym.*—Scilla maritima, *Linn.*]

Hexandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A bulbous plant, with broad lanceolate *leaves*, twelve to eighteen inches long, appearing after the flowers, and a *scape* about two feet high, terminated by a long dense *raceme*. *Bracts* long. *Perianth*, white, of six distinct spreading parts. *Stamens* six, shorter than the perianth; *filaments* smooth, somewhat dilated at the base, acuminate, entire; *anthers* yellow. *Ovary* three-parted, glandular; *style* smooth, simple; *stigma* obscurely three-lobed, papillose. *Capsule* rounded, three-cornered, three-celled. *Seeds* numerous, in two rows, flattened, with a membranous testa.—*Woodv.* page 322, pl. 118 (*Scilla maritima*).

*Habitat.*—Shores of the Mediterranean, viz., Spain, France, Sicily, Africa, &c. Navarino has long been celebrated for its squills. In its native soil the plant flowers about August.

### **Scilla**, *Squill.* [Mat. Med. List, U. S. P.]

The bulb from the Mediterranean coast, sliced and dried.

*Officinal Characters.*—Bulb pear-shaped, weighing from half a pound to four pounds; outer scales membranous, brownish-red or white; inner scales, thick, whitish, fleshy, juicy; taste, mucilaginous, intensely and disagreeably bitter, somewhat acrid. The dried slices are white or yellowish-white, slightly translucent, scentless, disagreeably bitter, brittle, and easily pulverizable if very dry, but, if exposed, readily recovering moisture and flexibility.

*Description.*—The fresh bulb varies from the size of the fist to that of a child's head, and is composed of smooth scales, attenuated at their edges, closely applied over each other, and attached to a conical disk, which projects inferiorly, and gives origin to the root fibres, the remains of which are to be frequently found in the bulbs of commerce. Two kinds of squill are met with in commerce, viz. the *white* and the *red*, both of which are so called from the color of the scales. The white is preferred in England. Squill is also imported from St. Petersburg and Copenhagen. As the affinity of dried squill for moisture is great, it should be preserved in well-stoppered bottles, or in a very dry place.

*Composition.*—M. Maudet found in squill two principles, one *scillitine*, which is expectorant and diuretic, and not poisonous, the other *skuleine*, which is an irritant poison.

*Physiological Effects.*—*In small doses* squill acts as a stimulant to the excretory organs. Thus it promotes secretion from the mucous membranes (especially the bronchial and gastro-intestinal) and the kidneys. Its most marked effect is that of a diuretic. Its expectorant effects are less obvious and constant. Sometimes, when it fails to act on the kidneys, it increases cutaneous exhalation. Its influence on secreting organs is probably to be referred to the local stimulus communicated to their vessels by the active principle of squill in its passage out of the system. When it proves diuretic in dropsies, it usually promotes the absorption of the effused fluid—an effect which is, I think, indirect, and a consequence of the diuresis. *In full medicinal doses*, squill excites nausea and vomiting; purging, also, is not unfrequently produced. When it proves emetic or purgative, its diuretic operation is much less obvious—a circumstance which Cullen refers to the squill being prevented reaching the bloodvessels and kidneys. Home, however, alleges that the diuretic effects are not to be expected unless there be some operation on the stomach. But the operation on the stomach may be, as Cullen suggests, a mere test of its activity. *In excessive doses*, squill acts as a narcotico-acrid poison, and causes vomiting, purging, griping pain, strangury, bloody urine, convulsions, inflammation, and gangrene of the stomach and intestines. Twenty-four grains of the powder have proved fatal. Considered with reference to its diuretic effect, it is comparable with digitalis. But it exceeds the latter in its stimulant influence over the urinary organs. On the other hand, digitalis is characterized by its powerfully sedative effect on the vascular system; for though squill has, in some instances, reduced the frequency of the pulse, this effect is by no means common.

*Therapeutics.*—Pythagorus is said to have written a volume on the medicinal properties of squill, and to have invented the *acetum scillæ*. Hippocrates employed squill (σκιλλα) internally, externally, and as a pessary. The principal uses of squill are those of an emetic, diuretic, and expectorant. *As a diuretic in dropsies*, it is applicable to those cases of dropsy requiring the use of stimulating or acrid diurectics, and is improper in inflammatory cases. It is an unfit remedy for dropsy complicated with granular kidney or vesical irritation; but when these conditions are not present, it is adapted for torpid leucophlegmatic subjects. Hence it is more serviceable in anasarca than in either ascites or hydrothorax. It should be given so as to excite a slight degree of nausea. By this means its absorption is promoted. The acetate or acid tartrate of potash may be conjoined. In hydrothorax mercurial pill squill and digitalis form a very efficient combination. *As an expectorant in chronic pulmonary affections*, admitting of the use of a substance stimulating the capillary vessels of the bronchial membrane, as chronic catarrh, humid asthma, and winter cough, it is often employed with considerable benefit. It is, of course, improper in all acute cases, accompanied with inflammation or febrile disorder. In old persons it is often combined with the camphorated tincture of opium, and with good effect. The syrup of squill may be given to relieve troublesome chronic coughs in children. *As an emetic*, it is occasionally used in affections of the organs of respiration requiring or admitting of the use of vomits. Thus the syrup may be given, with the view of creating sickness and promoting expectoration, to children affected with hooping-cough: and sometimes, though with less propriety, in mild cases of croup. The great objection to its use is the uncertainty of its operation; in one case it will hardly excite nausea, in another it causes violent vomiting. Furthermore, it is, of course, highly objectionable as an emetic for delicate children with irritable stomachs, on account of its acrid properties, and the irritation it is capable, in these cases, of setting up. [It succeeds best as an emetic when combined with ipecacuan.—Ed.]

*Administration.*—*Powdered Squill.*—The Dublin College formerly gave directions for the preparation of this as follows: Remove the membranous integuments from the bulb of the squill, cut it into slices, and dry with an inferior heat (between 90° and 100° F.); then reduce them to powder, which ought to be kept in glass bottles with ground stoppers. The bulb loses about four-fifths of its weight by drying; so that six grains of the dry powder are equal to half a drachm when fresh. Powdered squill readily attracts water from the atmosphere, and becomes soft and mouldy; hence the necessity of preserving it in stoppered bottles and in a dry place. I have seen it become hard and massive, like dyachylon plaster. It is usually administered in the form of pill. The dose of the powder, as an emetic, is from six to fifteen grains, ten grains being the average. As an expectorant or diuretic, we should commence with one grain, and gradually increase the dose until slight nausea is excited.

Pilula Scillæ Composita, *Compound Squill Pill* (*Pilula Scillæ, Ed.*). [Pilulæ Scillæ Compositæ, U. S., *Compound Pills of Squill.*]—Take of squill, in fine powder, one ounce and a quarter; ginger, in fine powder, one ounce; ammoniac, in powder, one ounce; hard soap, one ounce; treacle, by weight, two ounces, or a sufficiency. Reduce the soap to powder, and triturate it with the squill, ginger, and ammoniac; then add the treacle, and beat into an uniform mass. This preparation contains nearly twice as much squill as the London, and about one-third less than the Edinburgh pill. Expectorant and diuretic. Principally used in chronic bronchial affections. *Dose*, from five to ten grains. It readily spoils by keeping. ["Take of squill, in fine powder, sixty grains; ginger, in fine powder, ammoniac, in fine powder, each one hundred and twenty grains; soap, in fine powder, one hundred and eighty grains; syrup, a sufficient quantity. Mix the powders; then beat them with syrup so as to form a pilular mass, to be divided into one hundred and twenty pills." U. S. Each pill contains one-half grain of squill, and two may be given as the commencing dose.—W.]

[ACETUM SCILLÆ, U. S., *Vinegar of Squill.*—"Take of squill, in moderately coarse powder, four troyounces; diluted acetic acid, a sufficient quantity. Moisten the powder with a fluidounce of diluted acetic acid, pack it in a conical glass percolator, and gradually pour upon it diluted acetic acid until the filtered liquid measures two pints. Vinegar of squill may also be prepared by macerating the squill with two pints of diluted acetic acid for seven days, expressing the liquid, and filtering through paper." *Dose*, as an expectorant, fʒss to fʒj.—W.]

SYRUPUS SCILLÆ [U. S.], *Syrup of Squill.*—Take of squill, bruised, two ounces and a half; dilute acetic acid, one pint; refined sugar, two pounds; proof spirit, one fluidounce and a half. Digest the squill in the dilute acetic acid for three days, with a gentle heat; express, add the spirit, and filter; then mix in the sugar, and dissolve with the aid of heat. The product should weigh three pounds two ounces, and should have the specific gravity 1.330. This preparation is intended to take the place of the oxymel of squill, which contained nearly double the proportion of squill, or as eight to five. ["Take of vinegar of squill, a pint; sugar, in coarse powder, twenty-four troyounces. Dissolve the sugar in the vinegar of squill, with the aid of a gentle heat, and strain the solution while hot." U. S.] *Used* as an expectorant in chronic catarrhs. *Dose*, from one drachm to two drachms, or more.

[SYRUPUS SCILLÆ COMPOSITUS, U. S., *Compound Syrup of Squill.*—"Take of squill, in moderately coarse powder, seneka, in moderately fine powder, each four troyounces; tartrate of antimony and potassa, forty-eight grains; sugar, in coarse powder, forty-two troyounces; diluted alcohol, water, each a sufficient quantity. Mix the squill and seneka, and, having moistened the mixture with half a pint of diluted alcohol, allow it to stand for an hour. Then transfer it to a conical percolator, and pour diluted alcohol upon it until three pints of tincture have passed. Boil this for a few minutes, evaporate it by means of a water-bath to a pint, add six fluidounces of boiling water, and filter. Dissolve the sugar in the filtered liquid, and, having heated the solution to the boiling point, strain it while hot. Then dissolve the tartrate of antimony and potassa in the solution while still hot, and add sufficient boiling water through the strainer to make it measure three pints. Lastly, mix the whole thoroughly together." In this preparation the stimulant properties of the squill and senegæ are modified by the tartar emetic, and at the same time their expectorant powers probably increased. In large doses it is a certain emetic, and frequently purges. Under the name Cox's Hive Syrup it is much used in the nursery as an emetic and expectorant remedy in false or simple spasmodic croup. When ordering it, one should always bear in mind that it contains one grain of tartar emetic to the fluidounce. *Dose*, as an expectorant, fʒss to fʒj; as an emetic, fʒiij to fʒvj.—W.]

TINCTURA SCILLÆ [U. S.], *Tincture of Squill.*—Take of squill, bruised, two ounces and a half; proof spirit, one pint. Macerate the squill for forty-eight hours with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. ["Take of squill, in moderately coarse powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.] *Used* in chronic bronchial affections. *Dose*, min. xv to min. xxx.

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## [ALLIUM SATIVUM, *Linn.* *Garlic.*

*Generic Character.*—*Flowers* umbellate, with a membranous *spathe*. *Perianth* six-parted, permanent, equal. *Stamens* inserted into the base of the perianth; *filaments* either all alike. or every other one tricuspidate, with the *anther* on the middle point. *Style* subulate, *stigma* simple. *Capsule* usually obtusely three-cornered or three-lobed, depressed, three-celled, bursting into three valves, through the dissepiments, and containing two or one black angular seed in each cell. (*Lindley.*)

*Specific Character.*—*Bulb* surrounded by smaller ones. *Leaves* linear, entire. *Umbel* bulbiferous, globose. *Spathe* ovate, rounded. *Segments of the perianth* ovate obtuse. *Pistil* and *stamens* exsert. *Stem* about two feet high. *Flowers* whitish.

*Habitat.*—(?) Cultivated in kitchen gardens.

### **Allium**, *Garlic.* Mat. Med. List, U. S. P.

Garlic, or, as it is known in the markets, English garlic, occurs in somewhat globular bulbs, with, in most cases, a small portion of the stem remaining. The bulb is surrounded by a dry, husky membrane, and is composed of usually five or six little bulblets or cloves, each of which has its own proper membrane. The taste and smell are too well known to be described; they are alliaceous or garlicky. Garlic depends upon an acrid volatile oil for its medical properties. This oil is of a dark brown color, possessing the sensible properties of the bulb in a high degree, and may be obtained by distillation.

*Therapeutics.*—A stimulant expectorant, antispasmodic, and rubefacient. When given internally, it quickens the circulation, promotes digestion, expectoration, and the secretions generally. It also stimulates the nervous system. When applied externally, it not only acts as a powerful rubefacient, but its volatile oil appears to be absorbed, and exert its influence on the system. Garlic poultices are therefore much used in infantile catarrh, spasmodic affections, and convulsions. In the one case they should be applied to the chest; in the other over the seat of spasm, and to the spine and feet. They may be made by simply bruising the garlic.

SYRUPUS ALLII, U. S., *Syrup of Garlic.*—"Take of garlic, sliced and bruised, six troyounces; sugar, in coarse powder, twenty-four troyounces; diluted acetic acid, a pint. Macerate the garlic with ten fluidounces of the diluted acetic acid, in a glass vessel, for four days, and express the liquid. Then mix the residue with the remainder of the acid, and again express, until sufficient additional liquid has been obtained to make the whole, when filtered, measure a pint. Lastly, introduce the sugar into a two-pint bottle, pour upon it the filtered liquor, and agitate until it is dissolved." *Used* in stimulant cough mixtures. *Dose* f℥ss.—W.]

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### [ALETRIS FARINOSA, *Linn.* *Star Grass, Colic Root.*

*Generic Character.—Stamens* six, inserted in the throat of the warty-roughened and tubular six-toothed perianth. *Leaves* flat.

*Specific Character.—Flowers* oblong-tubular, white. *Lobes* lanceolate-oblong.

*Habitat.*—United States.

**Aletris,** *Star Grass.* Secondary List, U. S. P.

The root of aletris farinosa.

Aletris is, in small doses, a pure bitter, and may be used wherever such a remedy is indicated. In large doses it is an emeto-cathartic. It is best exhibited in the form of tincture. *Dose*, as a tonic, gr. x, or its equivalent.—W.]

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## SMILACEÆ, *Lindl.* The Sarsaparilla Order.

### SMILAX OFFICINALIS, *Humb. and Bonpl.*

Diœcia, Hexandria, *Linn. Syst.*

*Botanic Character.—Stem* twining, shrubby, prickly, quadrangular, smooth; the young shoots unarmed, and almost round. *Leaves* ovate-oblong, acute, cordate, netted, five to seven-ribbed, coriaceous, smooth, a foot long, and four to five inches broad; the young ones are narrow, oblong, acuminate, and three-ribbed; *petioles* smooth, an inch long, bearing two tendrils above the base. *Flowers* and *fruit* unknown.

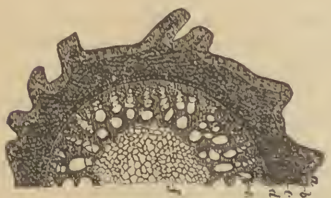
*Habitat.*—Grows in New Granada, on the banks of the Magdalena, near Bajorque (Humboldt); and, as I have been informed by wholesale dealers, on the Mosquito shore on the eastern coast of Honduras and of St. Juan.

**Sarsa,** *Jamaica Sarsaparilla.*

[**Sarsaparilla,** *Sarsaparilla.* Mat. Med. List, U. S. P.]

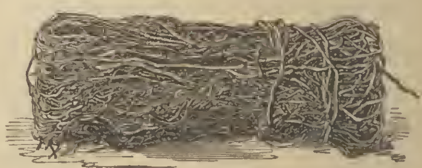
The dried root, native of Central America, imported from Jamaica. [The root of Smilax officinalis (*Humboldt and Bonpland*), and of other species of smilax.—U. S. P.]

Fig. 69.



*Jamaica Sarsaparilla (Section magnified).*

Fig. 70.



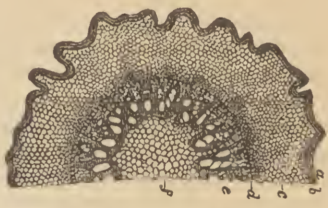
*Bundle of Jamaica Sarsaparilla.*

Jamaica sarsaparilla is not the produce of the island whose name it bears, but is imported into Jamaica from the eastern coast of Honduras, from Guatemala, Columbia, and New Granada. Humboldt states that the natives of New Granada transmit large quantities of it to Carthagena and Mompox, whence it is shipped for Jamaica and Spain.

*Officinal 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.

*Description.*—The roots of Jamaica or *Red bearded Sarsaparilla* are folded and made up in bundles of about a foot or half a yard long, and four or five or more inches broad. These bundles are neither trimmed nor closely packed. The roots are long, slender, furnished with numerous small fibrous rootlets called the *beard*. By a transverse section the roots are seen to consist of a cortex or rind, and a ligneous cord or meditullium inclosing the pith, somewhat in the manner of an exogenous stem. Its cortex is brown, with a reddish tint. It contains comparatively little starch, agreeing in this respect with Lima sarsaparilla, and differing widely from the starchy or *mealy* Honduras and Lisbon sarsaparillas, none of which are officinal. When chewed, Jamaica sarsaparilla tinges the saliva. Its taste is not remarkably mucilaginous, but slightly bitter, and after a few minutes slightly acrimonious. The *color* of the root is not to be absolutely depended on, but roots having a reddish-brown tint are preferred. *Taste*, perhaps, is the best criterion; the more acrid the taste the better is the quality of the root. This test has been much insisted upon by Dr. Hancock, who found that the collectors of the root judged of its value by its acridity. The *beard* is another criterion of goodness; the greater the quantity of root fibres or *beard* the better the sarsaparilla. Its decoction is deepened

Fig. 71.



*Mealy Honduras Sarsaparilla (Section magnified).*

Fig. 72.

*Honduras Sarsaparilla (Small bundle).*

Fig. 73.

*Honduras Sarsaparilla (Large bundle).*

in color by a solution of iodine, but no blue is perceptible. Its powder is pale reddish-brown, and when rubbed with water and tincture of iodine, becomes blue, but less intensely so than the powder of the Honduras variety. It yields a larger quantity of extract than the other varieties; its extract is perfectly soluble in cold water. From three pounds of average quality about one pound of extract may be obtained (Hennell, also Battley). Eight hundred and seventy-four grains of the cortical portion of the root yielded four hundred and eighty-four grains of extract (Battley).

*Composition.*—Sarsaparilla contains a very small quantity of volatile oil and smilacin. *Volatile Oil.*—This is heavier than water, is soluble in rectified spirit, and has the odor and acrid taste of sarsaparilla. *Smilacin* is procured by decolorizing a concentrated hot alcoholic tincture of sarsaparilla by animal charcoal. The tincture deposits, on cooling, impure smilacin, which may be purified by repeated solution and crystallization. Smilacin is a white, crystallizable, odorless, and in the anhydrous state, almost tasteless substance, very slightly soluble in cold water, more so in boiling water, and depositing from the latter as it cools. Its solution has the bitter acrid taste of sarsaparilla, and froths on agitation. It is soluble in alcohol, ether, and oils. It does not combine with acids to form salts. Strong sulphuric acid colors it red, then violet, and lastly yellow.

*Physiological Effects.*—Diaphoresis is by far the most common effect of its internal use. In some conditions of system, especially those of a cachectic kind, sarsaparilla acts as a powerful and valuable alterative tonic. Its continued use is often attended with improvement of appetite and digestion, augmentation of strength, increase of flesh, and the palliation, or, in some cases, complete disappearance, of various morbid symptoms, as eruptions, ulcerations, and pains of a rheumatic character. Sarsaparilla differs in several respects from the bitter vegetable tonics. Though it is not devoid of, yet it does not, as they do, abound in a bitter principle. It is not adapted for the cure of intermittents, or of simple debility. But its best effects are seen in those depraved conditions of system which the public, and even some medical men, ascribe to the presence of a morbid poison, or to a deranged condition of the fluids. Hence it is frequently denominated *a purifier of the blood.* Those who do not adopt the pathological notion here referred to call it *alterative.*

*Therapeutics.*—By many practitioners sarsaparilla is considered to possess no remedial properties; by others it is regarded as a medicine of great efficacy. Considering that more than 100,000 lbs. of it (*i. e.* of all the various kinds of sarsaparilla) are annually consumed in this country, the number of those who entertain the latter opinion cannot be small. It has been justly remarked by Mr. Lawrence that physicians have no confidence in it, and surgeons a great deal. I think that this fact is readily explained by the circumstance that physicians are much less frequently called in to prescribe for those forms of disease in the treatment of which surgeons have found sarsaparilla so efficacious. But so often has it been found that various diseases, which had resisted all other tried remedial means, and were gradually increasing, became stationary, and afterwards subsided, under the use of sarsaparilla, that a large majority of British surgeons, including the most eminent of the present day, have been compelled to admit its therapeutic power. Sarsaparilla has been found especially serviceable in the following maladies: *In inveterate venereal disease.* It is beneficial principally when the malady is of long continuance, and the constitution is enfeebled and emaciated, either by the repeated attacks of the disease or by the use of mercury. In such cases it is, as Sir William Fordyce correctly observed, "the great restorer of appetite, flesh, color, strength, and vigor." When the disease resists, or is aggravated by, the use of mercury, sarsaparilla evinces its most salutary powers. It is given to relieve venereal pains of a rheumatic character; to remove venereal eruptions; to promote the healing of ulcers of the throat; and to assist in the cure when the bones are affected. In recent chancre, or bubo, it is of little use; nor does it appear to possess the least power of preventing secondary symptoms. We cannot ascribe to it "the same anti-syphilitic properties—that is, the same power of arresting or curing the venereal disease—that experience warrants us in attributing to mercury." Sarsaparilla is sometimes given alone, but more frequently with other remedies, as with stimulating diaphoretics (mezereon, sassafras, and guaiacum). *In chronic rheumatism* sarsaparilla is often advantageously conjoined with powerful sudorifics and anodynes (as opium or hyoscyamus), especially when any suspicion exists as to the venereal origin of the disease. *In obstinate skin diseases* benefit is frequently obtained by the use of sarsaparilla. Its employment is not confined to cutaneous affections of one particular elementary form, since it is given with good effect in papular, vesicular, pustular, and tubercular skin diseases of a chronic kind, when they occur in enfeebled and emaciated constitutions. Though, in these cases, its value principally depends on its tonic and alterative effects, its diaphoretic operation is to be encouraged by the use of diluents and warm clothing. *In cachectic conditions of the system generally* sarsaparilla may be given, often with the best effects, and never with any ill consequences, save that of producing slight nausea. Indeed, one of the great advantages of sarsaparilla over many other alteratives and tonics is that, although it may fail in doing good, it never does any harm beyond that of now and then causing slight disorder of stomach. In chronic abscesses, attended with profuse discharge, diseases of the bones, obstinate ulcers, chronic pulmonary affections accompanied with great wasting of the body, enlarged glands, and various other maladies connected with a depraved state of the system, sarsaparilla is often a very useful medicine.

*Administration.*—Sarsaparilla is administered in the form of decoction, compound decoction, and extract.

Decoctum Sarsæ, *Decoction of Sarsaparilla.*—Take of Jamaica sarsaparilla, not split, two ounces and a half; boiling distilled water, one pint and a half. Digest the sarsaparilla in the water for an hour; boil for ten minutes in a covered vessel, cool and strain. The product should measure a pint.

Half a pint less water is used for this than for the London decoction, and hence that quantity less has to be boiled off. Decoction of Jamaica sarsaparilla usually produces little or no blue color with tincture of iodine; whereas the corresponding preparations of Honduras sarsaparilla (the kinds usually met with in the shops, cut in small split lengths) become bluish black on the addition of a solution of iodine. The *dose* is from fl. oz. iv to fl. oz. viij.

Decoctum Sarsæ Compositum [Decoctum Sarsaparillæ Compositum, U. S.], *Compound Decoction of Sarsaparilla.*—Take of Jamaica sarsaparilla, not split, two ounces and a half; sassafras, in chips, a quarter of an ounce; guaiac wood turnings, a quarter of an ounce; fresh liquorice root, bruised, a quarter of an ounce; mezereon, sixty grains; boiling distilled water, one pint and a half. Digest all the ingredients in the water for an hour; boil for ten minutes in a covered vessel; cool and strain. The product should measure a pint. ["Take of sarsaparilla, sliced and bruised, six troyounces; bark of sassafras root, sliced, guaiacum wood, rasped, liquorice root, bruised, each, a troyounce; mezereon, sliced, one hundred and eighty grains; water, a sufficient quantity. Macerate with four pints of water for twelve hours; then boil for a quarter of an hour, strain, and add sufficient water, through the strainer, to make the decoction measure four pints." U. S.]

This preparation is an imitation of the celebrated *Lisbon diet drink*. *Dose*, from fl. oz. iv to fl. oz. vj. The extract is usually conjoined with it. During its use the skin should be kept warm.

Extractum Sarsæ Liquidum, *Liquid Extract of Sarsaparilla*. [Extractum Sarsaparillæ Fluidum, U. S., *Fluid Extract of Sarsaparilla*.] —Take of Jamaica sarsaparilla, not split, one pound; distilled water, at 160° F., fourteen pints; rectified spirits, one fluidounce. Macerate the sarsaparilla in one half of the water for six hours, and decant the liquor. Digest the residue in the remainder of the water for the same time, express and filter the mixed liquors, and evaporate them by a water-bath to seven fluidounces, or until the specific gravity of the liquid is 1.13. When cold, add the spirit. The specific gravity should be about 1.095.

This is a great improvement on the preparation of former pharmacopœias, from the sarsaparilla being unsplit, and macerated with the water at a temperature that will not dissolve the starchy matter of the root.

["Take of sarsaparilla, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, ten troyounces; diluted alcohol, a sufficient quantity. Moisten the sarsaparilla with half a pint of diluted alcohol, pack it firmly in a cylindrical percolator, and gradually pour upon it diluted alcohol until four pints of tincture have been obtained. Evaporate this, by means of a water-bath, to a pint; then add the sugar, and continue the evaporation until the liquid is reduced to the measure of a pint, and strain while hot." U. S.]

Extract of sarsaparilla is declared by many writers to be an inert and useless preparation. I have extensively used it, and believe that when properly prepared from Jamaica sarsaparilla, it is a most valuable and efficient remedy; and the enormous quantity of it which is consumed by the profession generally (including some of the most eminent of its members) is a proof that many others entertain a similar opinion. It is given in doses of from half a drachm to two or three drachms three or four times a day. Alkalies render its flavor somewhat disagreeable, though they frequently increase greatly its remedial powers.

[Extractum Sarsaparillæ Fluidum Compositum, U. S., *Compound Fluid Extract of Sarsaparilla*. Extractum Sarsaparillæ Fluidum, *Ph.* 1850.—"Take of sarsaparilla, in moderately fine powder, sixteen troyounces; liquorice root, in moderately fine powder, bark of sassafras root, in moderately fine powder, each, two troyounces; mezereon, in moderately fine powder, three hundred and sixty grains; sugar, twelve troyounces; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with ten fluidounces of diluted alcohol, pack it firmly in a cylindrical percolator, and gradually pour upon it diluted alcohol until four pints of tincture have been obtained. Evaporate this, by means of a water-bath, to twelve fluidounces; then add the sugar, and continue the evaporation until the liquor is reduced to the measure of eighteen fluidounces, and strain while hot." U. S.

This preparation represents, in a concentrated form, the compound decoction of sarsaparilla, and is exhibited to meet similar indications.—*Dose*, f℥ss—f℥iss.—W.]

[SYRUPUS SARSAPARILLÆ COMPOSITUS, U. S., *Compound Syrup of Sarsaparilla.*—"Take of sarsaparilla, in moderately coarse powder, twenty-four troyounces; guaiacum wood, in moderately coarse powder, three troyounces; pale rose, in moderately coarse powder, senna, in moderately coarse powder, liquorice root, in moderately coarse powder, each, two troyounces; oil of sassafras, oil of anise, each, five minims; oil of gaultheria, three minims; sugar, in coarse powder, ninety-six troyounces; diluted alcohol, a sufficient quantity. Mix the solid ingredients, except the sugar, with three pints of diluted alcohol, and allow the mixture to stand for twenty-four hours; then transfer it to a cylindrical percolator, and gradually pour diluted alcohol upon it until ten pints of tincture have passed. Evaporate this, by means of a water-bath, to four pints, filter, and, having added the sugar, dissolve it with the aid of heat, and strain the solution while hot. Lastly, rub the oils with a small portion of the solution, and mix them thoroughly with the remainder." U. S.

This preparation is very much used in this country as a vehicle, on account of its powerful and agreeable flavor. It probably disguises the strong, disagreeable, metallic taste of iodide of potassium better than any other suitable vehicle. Corrosive sublimate is sometimes administered in it, but is said to be converted by it into the simple chloride (calomel). A solution in it of a soluble, persistent salt of mercury may be obtained by dissolving in it iodide of potassium and then adding the bichloride, the iodo-hydrargyrate of potassium being formed. *Dose*, f℥ss.—W.]

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## IRIDACEÆ, *Lindl.* THE IRIS ORDER.

## CROCUS SATIVUS, *Allioni.*

### The Saffron Crocus. Triandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Corm* roundish. *Leaves* linear, with a white central stripe, and surrounded at their base with long membranous sheaths. *Perianth* light purple, shorter than the leaves, with a slender tube twice as long as the limb; limb 6-partite, equal, erect. *Stamens* 3, inserted into the tube; *anthers* turned outwards, sagittate. *Stigma* protruded, drooping, in three deep linear divisions. *Capsule*, under ground, elevated by a short peduncle from the corm, which peduncle elongates after the decay of the flowers, and the capsules appear above ground.—*Steph. and Church*, pl. 101.

*Habitat.*—A native of Asia Minor; now naturalized and cultivated in France, Spain, and Italy. It flowers in September and October.

### Crocus, *Saffron.* [Mat. Med. List, U. S. P.]

The stigma and part of the style, dried; imported from Spain, France, and Naples.

*Preparation.*—The flowers are gathered in the morning, and the stigmas, with a portion of the style, plucked out for use, the rest of the flower being thrown away. The stigmas are then dried on paper, either by means of portable kilns, or in a room by the sun.

*Officinal Characters.*—Consists of a thread-like style, terminated by three long orange-brown stigmas, which are broadest at their summit;

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has a powerful aromatic odor. When rubbed on the moistened finger, it tinges it intensely orange-yellow.

*Description.*—*Hay saffron*, the only kind now found in the shops, consists of the stigmas, with part of the style, which have been very carefully dried. They are from an inch to an inch and a half long, thin, brownish-red; the upper portion (stigma) is expanded, notched at the extremity; the lower portion, which constitutes part of the style, is narrow, capillary, yellowish. The odor is penetrating, aromatic, and, of large quantities, narcotic. The taste is bitter, somewhat aromatic. When chewed, saffron tinges the mouth and the saliva yellow. I find by careful examination that one grain of good commercial saffron contains the stigmas and styles of nine flowers; hence 4320 flowers are required to yield one ounce of saffron. *Spanish saffron* constitutes the best saffron of the shops. From the concurrent accounts of pharmacologists it would appear that formerly Spanish saffron was spoiled by being dipped in oil to preserve it. But the saffron now imported from Spain has not been subjected to this treatment. Occasionally any kind of saffron is oiled by the dealers, to give it an appearance of freshness. *French saffron* is usually considered in commerce to be of second quality. The *Neapolitan* is rather more plump than the Spanish, but hardly as valuable.

*Test.*—When pressed between folds of white filtering paper, it leaves no oily stain.

*Adulteration.*—To give saffron flexibility and an appearance of freshness, as well as to augment its weight, it is sometimes damped or oiled. To detect either *water* or *oil*, a small portion of saffron should be subjected to pressure between folds of white blotting-paper; if this become either moistened or greased, the adulteration is obvious. Another adulteration practised on saffron is intermixing it with the florets of *safflower* (*Carthamus tinctorius*), which is sometimes called *bastard saffron*. The safflower readily escapes the eye of a superficial observer. If rubbed with the moistened finger on paper, it produces a slightly yellow mark only, whereas genuine saffron causes a very intense orange-yellow stain. The fraud may also be detected by carefully examining the suspected portion by a magnifying-glass. The fraud is the more easily detected if the suspected saffron be previously macerated in hot water. Genuine saffron consists of a filiform style, divided at one extremity into three long, convoluted, deep orange stigmas, which are a little dilated upwards, and notched at the extremity. Safflower, on the other hand, is composed of florets, each consisting of a monopetalous, tubular, five-toothed red corolla, inclosing five syngenesious stamens, and a style. Moreover, the corolla is devoid of the softness and flexibility of the stigmas of saffron, but is, on the contrary, dry and brittle. [*Carthamus* is officinal in the U. S. Secondary List, and has very similar medical properties to saffron. It is often sold under the name of American Saffron, and used in domestic practice instead of the genuine drug.—W.] *Cake saffron* was formerly prepared by compressing hay saffron. But the cakes now almost universally met with in this country are composed of safflower and gum-water, made into a paste, and rolled out into oval cakes, which are dried in a stove. They are shining, and of a brownish-red color.

*Therapeutics.*—Hippocrates employed saffron in uterine and other maladies, but in the modern practice of medicine it is scarcely employed therapeutically.

*Pharmaceutic Uses.*—It is used as a coloring and flavoring ingredient in compound decoction of aloes, pill of aloes and myrrh, aromatic powder, compound tincture of cinchona, tincture of rhubarb, and in the following preparation:—

TINCTURA CROCI, *Tincture of Saffron.*—Take of saffron, one ounce; proof spirit, one pint. Macerate the saffron for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator; and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.

*Used* as a coloring liquid. *Dose*, fl. drm. j.

[There are two species of the genus *Iris*, officinal in the Secondary List of the U. S. Pharmacopœia. Of these, the *Iris florentina* is the well known Orris root, which is much used in tooth powder, on account of its violet-like odor. It is in large doses an emeto-cathartic. The other is the *Iris versicolor*, the common blue flag of our swamps and meadows. The fresh root should be employed; it has a nauseous acrid taste, and yields to water and alcohol. It is a harsh emeto-cathartic and diuretic. It is said to act powerfully on the liver. An impure oleoresin has been prepared from it, and is sold under the name of iridin or irisin. This may be given in doses of three or four grains. The dose of the powdered root is twenty grains. It may be administered in infusion or tincture. —W.]

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## [ORCHIDACEÆ, *R. Brown.*

## VANILLA AROMATICA, *Swartz.*

*Generic Character.*—Fruit a long pulpy pod, with round seeds not inclosed in a loose membrane. (Lindley.)

*Vanilla Aromatica*, Swartz, in Act. Upsal. vi. 66. Fruit cylindrical, very long.—South America: Brazil.—Said by Martius to yield the *true vanilla* (*veræ siliquæ vanillæ.*)

*Habitat.*—Tropical America.

### Vanilla, *Vanilla.* Mat. Med. List, U. S. P.

The prepared unripe capsules of Vanilla Aromatica.

The vanilla bean is imported from Mexico, central and northern South America. The finest variety comes from Mexico. This is imported from Vera Cruz, tied in bundles of fifty pods, weighing, when of good quality, about nine and a half or ten ounces. The heavier the bundle, the better the quality, and the greater the value per pound. The bundles come packed in tin cases, each holding sixty bundles. There are two varieties.

*Finest Mexican Vanilla.*—This consists of pods which are seven or eight inches long, one-third of an inch wide, tapering at the extremities, and curved at the base. They are longitudinally wrinkled, soft, clammy, and dark brown. Their odor is very fragrant, resembling, but being more delicious than, that of balsam of Peru. By keeping, they become coated with brilliant acicular crystals, and are then called *crystallized vanilla.*

*Second Mexican Vanilla.*—The pods of this sort are shorter (being about five inches long), narrower, drier, paler, and less odorous than the preceding. with only a few isolated or no crystals on them.

The nature of the *odorous principle* of vanilla has not been satisfactorily made out. It probably resembles that of the balsam of Peru, and belongs to the cinnameine series. By distillation with water, alcohol, or ether, vanilla yields no volatile oil; the liquid obtained by distillation with water being nearly inodorous. It is said that when the fruit is mature it yields from two to six dops of a liquid which has an exquisite odor, and bears the name of *balsam of vanilla*—none of which, however, reaches Europe, though it is stated to be used in Peru.

The *soft needle-like crystals* which incrust the finest kind of vanilla are usually regarded as either benzoic or cinnamic acid. They are slightly soluble in hot water, and the solution, according to my experiments, reddens litmus. Bley, who examined them, denies that their solution reddens litmus, and considers them to be a peculiar solid volatile oil.

*Physiological Effects.*—Vanilla is an aromatic stimulant. Its effects probably resemble those of balsam of Peru. It is considered to have an exhilarating effect on the mental functions, to prevent sleep, to increase the energy of the muscular system, and to act as an aphrodisiac.

*Uses.*—As a medicinal agent it is not employed in England or the U. States. On the Continent of Europe it has been used in hysteria, melancholia, impotency, asthenic fevers, rheumatism, &c. Its principal use in this country is to flavor chocolate and various articles of confectionery (ices, creams, &c.), liqueurs, &c. It is also employed in perfumery.

*Administration.*—It is exhibited in the form of powder or tincture.—W.]

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### [CYPRIPEDIUM PUBESCENS, *Willd.*
### *Large Yellow Lady Slipper.*

*Generic Character.*—Anthers two; lip a large and inflated sack somewhat slipper form.

*Specific Character.*—Sepals elongated, lanceolate; lip flattened laterally, pale yellow.

*Habitat.*—Bogs and damp low woods. United States.

**Cypripedium,** *The Root of Cypripedium pubescens.*
Secondary List, U. S. P.

This root is said to be a nervous stimulant and narcotic. An impure oleoresin has been prepared by the so-called "eclectic" physicians, and is sold under the name of Cypripedin. I have not been able to obtain any sensible effects from this in fifteen-grain doses. Cypripedium has been exhibited with asserted advantage in neuralgia, hypochondriasis, and allied nervous diseases. The dose of the powder, according to the U.S. Dispensatory, is gr. xv t. d., of the resin gr. iij t. d.—W.]

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## ZINGIBERACEÆ, *Lindl.* The Ginger Order.

### ZINGIBER OFFICINALE, *Roscoe.*

**The narrow-leaved Ginger.** Monandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Rhizome* perennial, creeping. *Stems* annual, erect, invested by the long smooth sheaths of the leaves; generally three or four feet high. *Leaves* linear-lanceolate, smooth. *Spike* radical, elevated, solitary, about three to four inches long, consisting of one-flowered imbricated obovate bracts, with membranous margins. *Corolla*, with the outer limb three-parted, dark-purple. *Filament* lengthened beyond the anther into a simple incurved beak. *Stigma* funnel-shaped. *Capsule* roundish, unilocular. *Seeds* numerous; mostly abortive.—*Woodv.* page 31, pl. 11 (*Amomum Zingiber*).

*Habitat.*—Cultivated in the tropical regions of Asia and America, the West Indies, and Sierra Leone. Native soil doubtful, probably Asia.

Fig. 74.


*Zingiberis officinale.*

**Zingiber**, *Ginger*. [Mat. Med. List, U. S. P.]

The rhizome, scraped and dried; from plants cultivated in the West Indies, India, and other countries.

*Preparation.*—The dried rhizomes, called *ginger*, are prepared when the stalks are wholly withered, and the rhizomes are about a year old. The rhizomes are dug up and separately picked, washed, and scraped; and afterwards dried in the sun and open air. The product is the uncoated ginger of the shops. The coated ginger is prepared in a nearly similar manner, but has not been scraped. The uncoated ginger is alone officinal.—[Br. Pharm.]

*Officinal Characters.*—Irregular lobed decorticated pieces, three or four inches long, subcompressed, yellowish-white but not chalky on the surface, with a short mealy fracture, hot taste, and agreeable aroma. Powder yellowish-white.

*Description.*—Ginger occurs in flattish jointed branched palmate pieces, called *races* or *hands*, which rarely exceed four inches in length. Barbadoes ginger, the old sorts brought from Malabar and Bengal, and part of the African ginger, are covered by a dry shrivelled epidermis commonly called the "coat;" hence these sorts are usually said to be *coated* or *unscraped*, whereas the ginger of Jamaica, and the new sorts which of late years have been brought from Malabar and Bengal have been deprived of their epidermis, and are therefore said to be *uncoated* or *scraped*. The external color varies in the different sorts from pale or bright yellow to brown; the palest sort is the fine Jamaica ginger; the darkest being the Bengal old sort, and the other sorts being intermediate. The internal varies like the external color; the best ginger is that which cuts pale but bright. The consistence of ginger, as ascertained by cutting, varies from soft to hard, or, as it is termed in trade, "flinty," the soft being preferred.

*Varieties.*—Several kinds of ginger, distinguished partly by their place of growth, and partly by their quality, are known in English commerce. *Jamaica ginger* is an uncoated pale sort, and, when of fine quality, occurs in large bold fleshy races, which cut soft bright and pale colored. Inferior samples are small in the race, darker colored, more or less flinty, and shrivelled. *Barbadoes ginger* is a coated sort, in short flat races, which are darker colored than Jamaica ginger, and are covered with a corrugated epidermis. *Malabar* and *Bengal gingers* occur both coated and uncoated, and vary in color, consistence, and flavor, but are generally hard and dark. They are more liable to be wormeaten than either the West Indian or African sorts. *Uncoated Malabar ginger*, *Tellicherry ginger*, *Calicut ginger*, or *Cochin ginger*, is a pale uncoated sort, which resembles Jamaica ginger, both in external appearance and flavor, but has externally more of a brownish tint. *Sierra Leone ginger*, *African ginger*, is imported both coated and uncoated. The races are plump, smaller than those of Jamaica ginger, have a reddish-brown tint, and cut soft and bright. They are very warm in flavor, and, though low-priced, are a sound and good ginger. *Washed Ginger; Bleached Ginger.*—Ginger is sometimes washed in water, and then dried, by wholesale dealers, prior to its being offered for sale to the retailers. Some of the darker sorts are bleached by washing them in a solution of chloride of lime, and sometimes by exposing them to the fumes of burning sulphur. By this treatment the ginger acquires a chalky-white character, and is then often termed *white-washed* ginger.

*Adulteration.*—Powdered ginger is said to be sometimes mixed with flour and other amylaceous substances. The microscope would readily detect the adulteration, except in the case of East Indian arrowroot.

*Composition.*—Ginger contains a volatile oil, resin, and starch. *Volatile Oil of Ginger* is pale yellow, very fluid, lighter than water: odor that of ginger; taste, at first mild, afterwards acrid and hot. *Resin.*—Obtained by digesting the alcoholic extract of ginger first in water, then in ether, and evaporating the ethereal tincture. The residual resin is yellowish-brown, soft, combustible, has an aromatic odor and a burning aromatic taste, and is readily soluble in alcohol, ether, oil of turpentine, and hot almond oil. *Starch.*—Ginger-starch consists of thin flat disks, which resemble those of East Indian arrowroot (*Curcuma angustifolia*).

*Physiological Effects.*—Ginger is one of the aromatic stimulants, and possesses considerable pungency or acridity. The rhizome, chewed, is a powerful sialagogue. The powder mixed with hot water, and applied to the skin, causes a sensation of intense heat and tingling, and slight redness. When taken into the stomach, ginger operates as a stimulant—first, to the alimentary canal; secondly to the body generally, but especially to the organs of respiration. It is less acrid than pepper.

*Therapeutics.*—As a *stomachic* and *internal stimulant*, it serves several important purposes. In enfeebled and relaxed habits, especially of old and gouty individuals, it promotes digestion, and relieves flatulency and spasm of the stomach and bowels. It checks or prevents nausea and griping, which are apt to be produced by some drastic purgatives. It covers the nauseous flavor of many medicines, and communicates cordial and carminative qualities to tonic and other agents. As a *sialagogue*, it is sometimes chewed to relieve toothache, relaxed uvula, and paralytic affections of the tongue. As a *counter-irritant*, I have frequently known a ginger plaster (prepared by mixing together powdered ginger and warm water, and spreading the paste on paper or cloth) relieve violent headache when applied to the forehead.

*Administration.*—Powdered ginger may be administered, in doses of from ten grains to a scruple or more, in the form of a pill.

*Pharmaceutic Use.*—Ginger is an ingredient in compound rhubarb powder, compound scammony powder, and wine of aloes.

[Infusum Zingiberis, U. S., *Infusion of Ginger.*—"Take of ginger, bruised, half a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain."

*Dose.*—f℥ij.—W.]

Tinctura Zingiberis [U. S.], *Tincture of Ginger.*—Take of ginger, bruised, two ounces and a half; rectified spirit, one pint. Macerate the ginger for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.

This tincture is twice the strength of the London and Edinburgh tinctures, and rather more than half the strength of the Dublin tincture. It is a very valuable carminative, and is commonly employed as an adjunct to tonic, stimulant, and purgative mixtures. The tincture, if made with proof spirit, becomes turbid by keeping, in consequence of the mucilage it contains.

*Dose.*—Fl. drm. ss to fl. drm. j.

["Take of ginger, in fine powder, eight troyounces; alcohol, a sufficient quantity. Moisten the powder with two fluidounces of alcohol, pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it until two pints of tincture are obtained." U. S. This tincture is very much stronger than the British.

*Dose.*—Gtt. xx—f℥j.—W.]

Syrupus Zingiberis [U. S.], *Syrup of Ginger.*—Take of tincture of ginger, one fluidounce; syrup, seven fluidounces. Mix with agitation.

This syrup is now prepared, as in the Dublin Pharmacopœia, by mixing tincture of ginger with syrup, by which means the mucilage of the London and Edinburgh syrups is avoided, and a clearer syrup is formed, which is not liable to decomposition. It is used for flavoring, and for the same purposes as the tincture.

*Dose.*—Fl. drm. j to fl. drs. ij.

["Take of tincture of ginger, six fluidounces; carbonate of magnesia, half a troyounce; sugar, in coarse powder, one hundred and eight troyounces; water, four pints. Evaporate the tincture to three fluidounces with a gentle heat; then rub it first with the carbonate of magnesia and two troyounces of the sugar, and afterwards with the water, gradually added, and filter. To the filtered liquid add the remainder of the sugar, and, having dissolved it with the aid of a gentle heat, strain the solution while hot." U. S.

*Dose.*—f℥ss.—W.]

[Oleoresina Zingiberis, U. S., *Oleoresin of Ginger.*—"Take of ginger, in fine powder, twelve troyounces, stronger ether twelve fluidounces; alcohol, a sufficient quantity. Put the ginger into a cylindrical percolator, press it firmly, and pour upon it the stronger ether. When this has been absorbed by the powder, add alcohol until twelve fluidounces of filtered liquid have passed. Recover from this, by distillation on a water-bath, nine fluidounces of ether, and expose the residue, in a capsule, until the volatile part has evaporated. Lastly, keep the oleoresin in a well-stopped bottle."

A very thick dark fluid, with the odor and intensely pungent taste of ginger. Dose, gtt. i, diluted.—W.]

[Extractum Zingiberis Fluidum, U. S., *Fluid Extract of Ginger.*—"Take of ginger, in fine powder, sixteen troyounces; alcohol, a sufficient quantity. Moisten the ginger with four fluidounces of alcohol, introduce it into a cylindrical percolator, press it firmly, and gradually pour alcohol upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation until twenty fluidounces more of tincture have been obtained. Evaporate this to four fluidounces, mix it with the reserved tincture, and filter through paper." Each minim of this preparation represents a grain of the root.

*Dose.*—Minims xx—xxx, in water.—W.]

[TROCHISCI ZINGIBERIS, U. S., *Troches of Ginger.*—"Take of tincture of ginger, a fluidounce; tragacanth, in fine powder, one hundred and twenty grains; sugar, in fine powder, twelve troyounces; syrup of ginger, a sufficient quantity. Mix the tincture of ginger with the sugar, and, having, exposed the mixture to the air until dry, reduce it to fine powder; to this add the tragacanth, and mix it thoroughly. Lastly, with syrup of ginger form a mass, to be divided into troches, each weighing twenty grains."

*Used* for flatulent colicky pains.—W.]

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## CURCUMA LONGA, *Linn.*

**The Long-rooted Turmeric.** Monandria, Monogynia. *Linn. Syst.*

*Botanical Character.*—*Rhizome* tuberous, with numerous long, cylindrical branches, deep orange inside. *Leaves* radical, broadly lanceolate, with long sheathing petioles. *Scape* simple. *Spike* erect, somewhat imbricated at the base with bracts or saccate spathes. *Flowers* dull yellow, 3 to 5 together, surrounded by bracteoles. Tube of the *corolla* gradually enlarged upwards; limb 2-lipped, each 3-parted. *Filament* broad. *Anther* incumbent, with 2 spurs at the base. *Style* capillary. *Capsule* 3-celled. *Seeds* numerous, arillate.

*Habitat.*—Much cultivated about Calcutta, and in all parts of Bengal, in Malabar, Madras, and Java, also in China and Cochin-China.

### **Turmeric** (Appendix B. I.). The Rhizome.

### [**Curcuma.** TURMERIC. Secondary List, U. S. P.]

*Description.*—The *rhizomes* called in the shops *turmeric* are of two kinds; one *round*, the other *long*, but both produced on the same plant. The first are round, oval, or ovate, about two inches long and one inch in diameter, pointed at one end, and marked externally with numerous annular wrinkles. The second are cylindrical, not exceeding the thickness of the little finger, two or three inches long, somewhat contorted, tuberculated. Both kinds are yellowish externally, internally more or less orange-yellow, passing into reddish-brown. The fractured surface has a waxy appearance. The odor is aromatic, somewhat analogous to ginger, but peculiar; the taste is aromatic. When chewed, it tinges the saliva yellow. Its powder is orange-yellow. The tubers are frequently worm-eaten. If to tincture of turmeric boracic acid be added, and the mixture be evaporated to dryness, an orange-red residue is obtained, whereas, without the acid, the residue is yellow. By this test the yellow coloring matter of turmeric can be distinguished from that of rhubarb (see *Rheum*). Sulphate of copper causes a yellowish precipitate with an infusion of turmeric. A similar effect is produced by perchloride of iron.

*Uses.*—Used as a test, to detect the presence of free alkalies, which change its yellow color to a reddish-brown. But alkaline earths and the alkaline carbonates, borates, and sulphurets, as well as boracic, sulphuric, and hydrochloric acids, change the color of turmeric from yellow to brown. Though not a very delicate test, it is often a very useful one.

TURMERIC TINCTURE (Appendix B. I.)—Take of turmeric, bruised, one ounce; proof spirit, six fluidounces. Macerate for seven days, and strain.

Fig. 75.

*Bengal Turmeric.*

Fig. 76.

*China Long Turmeric.*

Fig. 77.

*China Round Turmeric.*

Fig. 78.

*Madras Long Turmeric.*

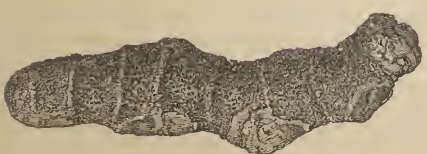
Fig. 79.

*Madras Round Turmeric.*

Fig. 80.

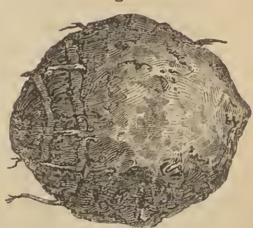
*Malabar Turmeric.*

Fig. 81.



*Java Turmeric.*

Fig. 82.



*Batavian Turmeric.*

This tincture will be better made with the rectified spirit. It is employed for the preparation of turmeric paper. Diluted with water, it yields a slightly turbid yellow liquid, which is sometimes used as a test for alkalies, &c.

TURMERIC PAPER (Appendix B. I.).—Unsized paper steeped in tincture of turmeric, and dried by exposure to the air.

Turmeric paper is employed as a test for alkalies, &c., which render it reddish or brownish.

## ELETTARIA CARDAMOMUM, *Maton.*

**The Malabar Cardamom.** Monandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A perennial plant, with a creeping *rhizome. Stems* perennial, erect, smooth, enveloped in the spongy sheaths of the leaves; from 6 to 9 feet high. *Leaves* in 2 rows, membranous, lanceolate, acuminate, pubescent above, silky beneath, 1 to 2 feet long. *Scapes* several (3 or 4) from the base of the stems, flexuose, jointed, branched, 1 to 2 feet long. *Branches* or *racemes* alternate, one from each joint of the scape, suberect, 2 or 3 inches long. *Bracts* solitary, sheathing. *Flowers* alternate, short-stalked, solitary at each joint of the racemes. *Calyx* funnel-shaped, 3-toothed at the mouth, about three-quarters of an inch long, finely striated, permanent. Tube of *corolla* slender, as long as

Fig. 83.


*Elettaria cardamomum.*

the calyx; limb double, exterior of 3 oblong, concave, nearly equal, pale greenish-white divisions; inner lip obovate, much larger than the exterior divisions, slightly 3-lobed, marked chiefly in the centre with purple-violet stripes. *Filament* short, erect; *anther* 3-lobed, emarginate. *Ovary* oval, smooth; *style* slender, *stigma* funnel-shaped. *Capsule* oval, somewhat 3-sided, 3-celled, 3-valved. *Seeds* many, angular.—*Maton, Trans. Linn. Soc.* vol. x., pl. 4, 5.

*Habitat.*—Mountainous parts of the coast of Malabar.

**Cardamomum,** *Cardamoms.* [Mat. Med. List, U. S. P.]

The seeds, contained in their capsules, which are to be removed when the seeds are employed.

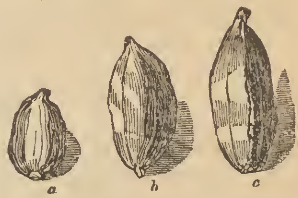
*Production.*—Cardamoms are produced naturally or by cultivation.

The cardamoms of the Wynaad, which are esteemed the best, are cultivated.

*Officinal Characters.*—Seeds obtusely angular, corrugated, reddish-brown, internally white, with a warm aromatic agreeable taste and odor, contained in ovate-oblong triangular pale-brown coriaceous ribbed capsules.

*Description.*—100 parts of the fruit yield 74 parts of seeds and 26 parts of pericarpial coats. Three varieties of Malabar cardamoms are distinguished in commerce; viz: *shorts*, *short-longs* and *long-longs*. The two latter differ from each other in size merely. *Shorts.—Malabar cardamoms, properly so-called; Wynaad cardamom.*—From 3 to 6 lines long, and from 2 to 3 lines broad; more coarsely ribbed, and of a browner color, than the other varieties. This is the most esteemed variety. *Short-longs.*—Differs from the third variety in being somewhat shorter and less acuminate. *Long-longs.*—From 7 lines to an inch long, and from 2 to 3 lines broad, elongated, somewhat acuminate. This, as well as the last variety, is paler and more finely ribbed than the shorts. The seeds also are frequently paler and more shrivelled. The shorts are usually the dearest. The long-longs are seldom brought over.

Fig. 84. Fig. 85. Fig. 86.



a b c

Shorts. Short-longs. Long-longs.

*Composition.*—Good short cardamoms yield about 4.6 per cent. of *volatile oil*. This is colorless, has an agreeable odor, and a strong, aromatic, burning taste. Its sp. gr. is 0.943. It is very soluble in alcohol, ether, oils (both fixed and volatile), and acetic acid. It is insoluble in solution of potash. By keeping, it becomes yellow, viscid, and loses its peculiar taste and smell. It then detonates with iodine, and takes fire when placed in contact with concentrated nitric acid. On this oil depend the odor, flavor, and aromatic qualities of the seeds. Its composition is analogous to that of oil of turpentine, being $C_{20}H_{16}$.

*Physiological Effects.*—The effects of cardamoms are those of a very agreeable and grateful aromatic, devoid of all acridity.

*Therapeutics.*—Cardamoms are employed partly on account of their flavor, and partly for their cordial and stimulant properties. They are rarely administered alone, but generally either as adjuvants or correctives of other medicines, especially of stimulants, tonics, and purgatives.

*Pharmaceutic Uses.*—They are used in aromatic powder, compound extract of colocynth, compound tincture of gentian, tincture of rhubarb, and wine of aloes.

[TINCTURA CARDAMOMI, U. S., *Tincture of Cardamom.*—"Take of cardamom, in fine powder, four troyounces; diluted alcohol a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a cylindrical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained."

*Dose.*—f℥ss—f℥ij.—W.]

TINCTURA CARDAMOMI COMPOSITA [U. S.], *Compound Tincture of Cardamoms.*—Take of cardamoms, bruised, a quarter of an ounce; caraway, bruised, a quarter of an ounce; raisins, freed from their seeds, two ounces; cinnamon, bruised, half an ounce; cochineal, in powder, sixty grains; proof spirit, one pint. Macerate the cardamoms, and other ingredients, for forty-eight hours, with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. About one-third stronger than the London, Edinburgh, and Dublin tinctures. It most resembles the latter, but differs from it in containing raisins. This compound is agreeably aromatic.

["Take of cardamom, in moderately fine powder, three hundred and sixty grains; caraway, in moderately fine powder, one hundred and twenty grains; cinnamon, in moderately fine powder, three hundred grains; cochineal, in moderately fine powder, sixty grains; clarified honey two troyounces; diluted alcohol a sufficient quantity. Mix the powders, and, having moistened the mixture with half a fluidounce of diluted alcohol, pack it in a cylindrical percolator, and gradually pour diluted alcohol upon it until two pints and six fluidounces of tincture are obtained. Lastly, mix this with the clarified honey, and filter through paper." U. S.]

It is used as an adjunct to cordial, tonic, and purgative mixtures, and is an ingredient in the compound decoction of aloes. Moreover, its color often renders it useful in prescribing.

*Dose.*—Fl. drm. j to fl. drs. ij.

## [ORONTIACEÆ, *Lindl.*

### ARISÆMA TRIPHYLLUM, *Torrey.* Indian Turnip.

Fig. 87.

*Arisæma triphyllum.*

*Generic Character.*—Flowers naked, monœcious or diœcious, covering only the base of the spadix. Spadix surrounded by a spathe.

*Specific Character.*—Leaves mostly 2, divided into 3-elliptical-ovate pointed leaflets; spadix often diœcious, club-shaped, obtuse. A curious rather handsome plant, with the inner side of the conspicuous spathe often variegated with dark purple and whitish stripes and spots.

*Habitat.*—Rich woods northern United States.

### Arum, *Indian Turnip.*

The cormus of Arum triphyllum, Secondary List, U. S. P.

This corm is turnip shaped, very farinaceous, and when dried much contracted and wrinkled. In the recent state it is excessively acrid, vesicating, and inflaming the skin when applied to it, and when taken into the mouth causing an insupportable burning sensation, which persists for hours. Its acrid principle is volatile and is greatly lost during drying; when long kept the corm becomes entirely inert.

*Therapeutics.*—When fresh a powerful rubefacient; taken internally it stimulates the secretions, especially of the skin and lungs. It has been recommended in chronic catarrh, chronic rheumatism, &c. The recently dried root should be employed.

*Dose.*—Gr. v—x, gradually increased, given in emulsion.—W.]

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## [**SYMPLOCARPUS FŒTIDUS**, *Skunk Cabbage.*

*Generic Character.*—Flowers perfect, covering the whole of the oval spadix, each with a calyx of 4-hooded sepals all combined into one mass in fruit.

*Specific Character.*—Leaves radical, ovate, heart shaped, one to two feet long, short petioled; spadix much shorter than the fleshy spathe. The flowers appear in March and April, and with the rest of the plant have a very offensive odor. It is very common in moist grounds throughout the northern United States. The root should be gathered late in the fall or early in spring before flowering.

### Dracontium.

The root of Dracontium fœtidum (Symplocarpus fœtidus), Secondary List U. S. P.

The taste of this root is acrid and persistent, its odor that of the plant. It is said to be stimulant and antispasmodic, expectorant and narcotic; in very large dose producing vomiting, with headache, dimness of vision, and vertigo. It has been recommended in asthma, chronic catarrh, hysteria, and chronic rheumatism.

Dose of the powder gr. xx. It may be given in infusion.—W.]

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## [**ACORUS CALAMUS**, *Linn.* *Calamus—Sweet Flag.*

Fig. 88.


*Acorus calamus.*

*Generic Character.*—*Flowers* arranged upon a *spadix*. *Spathe* replaced by a two-edged leaf-blade. *Perianth* of 6 pieces or scales, inferior, persistent. *Stamens* 6, filiform. *Stigma* sessile. *Ovaries* 2—3-celled. *Berries* 1-celled, 1—3-seeded. *Seeds* albuminous.

*Specific Characters.*—*Spathe*, a continuation of the 2-edged *scape*, rising much above the spadix.

*Rhizome* thick, rather spongy, with many long roots, aromatic, like every part of the herbage, but much more powerfully so. *Leaves* erect, like those of the flag, two or three feet high, bright green, near an inch broad. Stalk like the leaves, except being thicker below the spadix and not so tall. Spadix about a foot above the root, a little spreading, two or three inches long, tapering, covered with a mass of numerous thick set, pale green flowers, which have no scent except when bruised.

*Habitat.*—Europe, naturalized in Asia and the United States. It grows in wet swampy places, on the banks of river ditches, &c.

### Calamus.

The rhizoma of Acorus calamus, Secondary List U. S. P.

The dried underground stem occurs in the shops in flattened pieces four or five or more inches long, and about as broad as the thumb; jointed, somewhat curved, of a spongy or corky texture. Their fracture is short: their upper surface is marked transversely with the vestiges of the leaves which were attached to it; the lower surface has numerous dark points, surrounded by small light-colored elevated circles, from which the roots arise. Their taste is warm and bitter; their odor is aromatic. In Germany, the rhizome is usually peeled before drying it (*rhizoma decorticata*); but the operation is unnecessary and wasteful. In this state, the rhizome is grayish-white and easily pulverizable.

The rhizome should be gathered in spring or late in the autumn, and dried quickly. It is usually gathered on the banks of the Thames about May for the London market.

The Philadelphia market is supplied from the low grounds of the Delaware River. The epidermis is generally scraped off and the rhizome sold in long pieces.

The active constituents are oil, resin, and the extractive. The oil of the common sweet flag is obtained by distilling the fresh rhizome with water. Its odor is similar to, though less agreeable, than that of the rhizome. Its color is yellow.

*Therapeutics.*—An aromatic stimulant and mild tonic. It is rarely employed by medical practitioners, though it might be frequently substituted, with good effect, for the more costly oriental aromatics. It is a useful adjunct to other stimulants and tonics. It has been employed in continued asthenic fevers accompanied with much prostration of strength and greatly weakened digestive power. It is well adapted for dyspeptic cases accompanied with, or dependent on, an atonic condition of the digestive organs, and is especially serviceable in gouty subjects. It has also been used as a local agent, viz., in the formation of aromatic baths, poultices, and gargles, as an application to foul-conditioned ulcers, &c. It is employed, I am informed, by some rectifiers to flavor gin.

*Administration.*—In *powder*, the rhizome may be given in doses of from a scruple to a drachm. The *infusion* is, perhaps, the most eligible preparation; it is made by digesting ℥j of the rhizome in ℥xij of boiling water; the dose is two or three fluidounces.—W.]

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## [MARANTACEÆ, *Lind.*

### MARANTA ARUNDINACEA, *L.* *Arrowroot.*

*Generic Character.*—Corolla unequal, one of the inner segments in the form of a lip. Stamens petaloid, with half an anther on the edge. Style hooded. Ovary 3-celled, smooth, ovules solitary. Fruit dry, 1-seeded.

*Specific Character.*—Culm branched, herbaceous. Leaves ovate, lanceolate, somewhat hairy underneath. Peduncles 2-flowered. Rhizome white, articulated, tuberous, placed horizontally in the earth, and giving origin to several, tuberous, jointed stoles, similar to itself but covered with scales. Stem two or three feet high. Leaves alternate with leafy, long, hairy sheaths. Flowers white, small.

*Habitat.*—West Indies. Cultivated throughout the colder portions of the tropics, also in southern United States.

**Maranta,** *Arrowroot.* Mat. Med. List, U. S. P.

The fecula of the rhizoma of the Maranta arundinacea.

The process by which the fecula is obtained from the root is purely mechanical and varies somewhat as practised in different countries. The tubers are taken from the earth when two years old, washed, carefully skinned, and then reduced to pulp by washing or rasping, mixed with cold water, any fibres that may be present removed by passing through a hair sieve; and the milky fluid then carefully dried. The skin or rind of the tuber contains a resinous material, which, if allowed to remain, imparts its color and flavor to the starch. The arrowroot seen in the United States market, comes chiefly from the West Indies and the Southern United States. The Bermuda arrowroot is generally the most esteemed.

*Properties.*—The starch or fecula (*amylum* vel *fæcula marantæ*), called in the shops *West Indian Arrowroot*, or simply *arrowroot*, is white, odorless, and tasteless. It is in the form either of a light opaque white powder, or of small pulverulent masses. When passed between the fingers it feels firm, and when rubbed produces a slight crackling noise. When viewed by a good pocket lens it is seen to consist of glistening particles. When examined by a microscope, these are seen to be convex, more or less elliptical. The shape is more or less irregular, but often oblong, or usually somewhat ovate-oblong, frequently obscurely triangular, or oyster-shaped, or mussel-shaped. After having been digested for a short time in water, one, or rarely two, mammillary processes are, in some samples, seen projecting from the surface of the particles. In some specimens, these processes have appeared like short spines. The rings are very distinct, though fine. The nucleus, central cavity, or hilum is usually very distinct, generally towards one end of the particle normally circular, but frequently cracked in a linear or stellate manner. When viewed by the polarizing microscope, the particles show very distinct crosses; the junction of the arms of the cross indicates the position of the hilum. They vary from .0002 to .0005 of an inch in length.

Dr. Prout regards arrowroot as a low variety of starch analogous to the low sugar of honey; while wheat-starch he considers to be the most perfect form of starch, analogous to sugar-candy; its formula, according to him, is $C_{12}H_{10}O_{10}$.

Other cheaper feculas are sometimes substituted for the genuine arrowroot; especially sago-meal, potato-starch, and tapioca-starch, or Brazilian arrowroot.

The fraud is readily detected by the microscope. When squeezed in the hand, the sago-meal crackles like arrowroot; but when submitted to microscopic examination, the truncated extremity of many of the particles giving them either a muller shape or dihedral summit, the irregular or tuberculated surface, and the size of the particles, readily served to distinguish it from arrowroot.

Potato-starch is sometimes sold for West Indian arrowroot. I have met with it in commerce under the name of English arrowroot. It is devoid of the dull or dead white appearance presented by West Indian arrowroot. The naked eye, or still better a pocket lens, readily distinguishes its large glistening particles from those of genuine arrowroot. The microscope instantly detects the difference. The particles of potato-starch are larger than those of arrowroot, and have coarser and more distinct rings. Moreover, the shape of the particles serves to distinguish them (see *Potato-starch*). Lampadius observed that potato-starch evolves a peculiar odor when boiled with water and sulphuric acid, and that arrowroot does not evolve this odor when treated in a similar way. Arrowroot, moreover, "is destitute of that fetid, unwholesome oil, extractable by alcohol from potato-starch." Mixed with one and a half, or twice its weight, of concentrated hydrochloric acid, arrowroot yields an opaque paste, whereas that produced by potato-starch is transparent. Arrowroot takes a longer time than potato-starch to become viscid when mixed with equal parts of acid and water.

*Therapeutics.*—Arrowroot is rather an article of food than a medicine. It forms an agreeable, unirritating diet for invalids and infants, and may be advantageously used whenever a farinaceous diet is indicated; as it is somewhat demulcent it is especially adapted to cases in which there is irritation of a mucous membrane. In preparing it one or two tablespoonfuls should be made into a paste with a little cold water, which should then be thoroughly mixed with a pint of boiling water or milk, and sweetened according to taste; when no contraindication exists, its flavor may be improved by adding lemon-juice or wine.—W.]

[**Canna,** *Canna.* Mat. Med. List, U. S. P.

The fecula prepared from the rhizoma of an undetermined species of canna:—

*Tous-les-mois* or canna is extracted from the tuber by first rasping, and then washing it, straining, decanting the supernatant liquor, and desiccating the deposited starch.

To the naked eye it greatly resembles potato-starch. On account of the large size of its particles, it has a satiny or glistening appearance, and is devoid of that dead white or opaque appearance presented by the West Indian arrowroot. Examined by a pocket lens, the sparkling and glistening appearance of its particles is very obvious. Its particles are very large (in this respect exceeding those of all other starches), somewhat egg-shaped, and have a very distinct nucleus, central cavity, or hilum, and concentric rings indicative of their laminated structure. Strictly speaking, their shape is oval or oblong; but generally more or less ovate. The circular hilum is usually placed at the narrow extremity; very rarely it is double. The rings are numerous, regular, close, but somewhat unequally so. The hilum and the body of the particle are frequently cracked.

Potato-starch is the only amylaceous substance which can be confounded with tous-les-mois. The two starches may be distinguished by a careful attention to their relative sizes and shapes, to the appearance of their rings, the position of the hilum, and the action of polarized light on them.

First, the particles of potato-starch are on the average smaller than those of tous-les-mois, and are subject to greater irregularity of size.

Secondly, the larger particles of potato-starch are more irregular in shape than those of tous-les-mois; the latter are more constantly rounded or oblong or ovate-oblong; the former are oval, often approximating in shape to an oyster-shell, a mussel-shell, or a triangle with rounded corners, and being frequently gibbous or tumid at different parts of their surface.

Thirdly, the rings seen on particles of tous-les-mois are fine, regular, uniform, concentric, and crowded; those of potato-starch are coarser, irregular, often eccentric, irregularly drawn out, distorted, or more and unequally distant from each other. In potato-starch a greater number of complete rings is visible, and we can trace the lines around the hilum, even in the case of many of the larger rings; but in tous-les-mois this can be done with a very few of the smaller rings only.

Fourthly, in both the hilum is situated nearer to the end of the particle; but in potato-starch this character is less obvious, the hilum frequently being less distant from the centre of the particle than in the case of tous-les-mois.

Lastly, when viewed by polarized light the cross is less frequently regular in potato-starch than in tous-les-mois; in the former, the arms are often distorted.

Tous-les-mois of commerce contains about 16.74 per cent. of hygroscopic water. It is very soluble in boiling water; and, according to Dr. Sheir's experiments, yields a jelly, which is considerably more tenacious than the jelly of any other starch; but which, in clearness or translucency, is inferior to that of arrow-root, and of some other substances.

The composition of tous-les-mois starch is assumed to be the same as that of other starches, viz., $C_{12}H_{10}O_{10}$.

In its dietetical qualities tous-les-mois resembles other starches. It yields very agreeable articles of food for invalids and others, and appears to be very readily digested.—W.]

## *Class:* DICOTYLEDONES.

### *Sub-class:* MONOCHLAMYDEÆ.

### CONIFERÆ, *Linn.* THE FIR ORDER.

### PINUS, *DC.*

Monœcia, Monadelphia, *Linn. Syst.*

*Generic Character.—Flowers*, monœcious. *Males: catkins* racemose, compact and terminal; squamose; the *scales* staminiferous at the apex. *Stamens* 2; the *anthers* 1-celled. *Females: catkins* simple, imbricated with acuminate scales. *Ovaries* 2. *Stigmas* glandular. *Scales* of the *cone* oblong, club-shaped, woody; umbilicato-angular at the apex. *Seeds* in pairs, covered with a sharp-pointed membrane. *Cotyledons* digitato-partite. *Leaves* 2 or many, in the same sheath. Hardy, evergreen trees.

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## PINUS PALUSTRIS, *Miller.*

### The Swamp Pine.

*Specific Character.*—A large *tree* 60 or 70 feet high, the trunk being about 15 or 18 inches in diameter for two-thirds of this height. *Leaves* in threes, about a foot long, of a brilliant green color. *Cones* very long, subcylindrical, muricated.—*Lambert Pinus*, vol. i., pl. 20.

*Habitat.*—Grows in dry sandy soil, from the southern parts of Virginia to the Gulf of Mexico.

The names by which the tree is known in the Southern States are *long-leaved pine*, *yellow pine*, and *pitch pine;* but the first is the most appropriate, as the last two are applied also to other species. It furnishes by far the greater proportion of *turpentine*, *tar*, &c. consumed in the United States, or sent from that to other countries.

## PINUS TÆDA, *Linn.*

### The Frankincense Pine.

*Specific Character.*—A large *tree*, 70 or 80 feet in height. *Leaves* in threes, elongated, rigid, with long sheaths. *Cones* often in pairs, oblong-pyramidal, 3–4 inches long, somewhat truncate at the apex; *scales* with short incurved prickles.—*Lambert Pinus*, vol. i., pl. 16.

*Habitat.*—Abundant in Virginia.

Yields *common turpentine*, but of a less fluid quality than that which flows from the preceding species.

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## PINUS PINASTER, *Aiton.*

### The Cluster Pine.

A large *tree*. *Leaves* twin, very long, rigid, pungent, furnished at the base with a reflexed scale. *Cones* oblong-conical, obtuse, very smooth, bright, shorter than the leaves. *Scales* bristly.—*Lambert Pinus*, vol. i., pl. 9, 10.

*Habitat.*—Southern maritime parts of Europe. Very abundant in the neighborhood of Bordeaux, and between that town and Bayonne. Flowers in May.

It yields *Bordeaux turpentine* and *tar*.

**Oleum Terebinthinæ,** *Oil of Turpentine.* [Mat. Med List, U. S. P.]

The oil distilled from the turpentine (chiefly of the above-mentioned species of Pinus); imported from America and France.

*Preparation of the Turpentine.*—The term *Turpentine* (*terebinthina*) is applied to the liquid or soft solid oleoresinous juice of the above-mentioned officinal and other coniferous plants. When submitted to distillation, these oleoresins are resolved into *volatile oil* and *resin*. At first they are liquid, but by age and exposure to the air they become, more or less speedily, solid, partly by the volatilization, and partly by the resinification, of the volatile oil. They have a certain general similarity in taste and odor. They soften and become very fluid by heat, readily take fire in the air, and burn with a white flame, and, if the supply of air be limited, with the copious deposition of finely-divided carbon (*lamp black*). They are almost completely soluble in alcohol and ether. Water acquires a terebinthinate flavor when digested with them; and by the aid of the yelk or the white of egg, or still better by that of vegetable mucilage, forms an emulsion with them.

Until the commencement of the American war, the London market was almost exclusively supplied with turpentine from the United States of America, through New York, a small portion only being occasionally imported from Bordeaux. At the present time (1865) it is imported only from Bordeaux and Bayonne. *American* or *white turpentine* is procured chiefly from the *Pinus palustris*, partly also from the *Pinus tæda*, and perhaps some other species inhabiting the Southern States. Our commerce was almost exclusively supplied from North and South Carolina and the southeastern parts of Virginia. The method of procuring this turpentine is as follows: A hollow is cut in the tree a few inches from the ground, and the bark removed for the space of about 18 inches above it. The turpentine runs into this excavation and is transferred thence into casks. When imported from New York it is yellowish-white, with an aromatic odor, and a warm, pungent, bitterish taste, translucent or opaque. Its consistence varies, being semi-fluid, or, in cold weather, that of a soft solid. It contains various impurities (leaves, twigs, chips, &c). That got from the first tappings is the best, and is called *virgin turpentine*. American turpentine is melted and strained, and in this state it is sometimes called *refined turpentine*. *Bordeaux turpentine* is obtained from Pinus pinaster, which grows abundantly on the Landes, and is brought from Bordeaux, Bayonne, and Dax.

*Preparation of the Oil.*—It is obtained by submitting to distillation a mixture of American turpentine (which has been melted and strained) and water in due proportions, in the ordinary copper still, with a naked fire. The distilled product is found to consist of oil of turpentine swimming on water; the residue in the still is resin. If no water be employed, a much higher temperature is required to effect the distillation, and danger is thereby incurred of causing empyreuma. Mr. Flockton, a large distiller of turpentine in this metropolis, informs me that the average quantity of oil yielded by American turpentine is from 14 to 16 per cent. He also tells me that Bordeaux turpentine yields an oil having a more disagreeable odor, and a resin of inferior quality. The common or unrectified oil of turpentine, sold in the shops under the name of *turps*, contains resin, and is, in consequence, denser and more viscid than the rectified oil. Its sp. gr. varies from 0.87 to 0.884. To deprive it of all traces of resinous and acid matters, oil of turpentine should be re-distilled from a solution of potash; and this is actually done, as Mr. Flockton informs me. The essential oil is frequently though erroneously called *spirits or essence of turpentine*.

*Officinal Characters.*—Limpid, colorless, with a strong peculiar odor, and pungent and bitter taste.

*Properties.*—Pure oil of turpentine is a volatile, very inflammable fluid, burning with a very sooty flame. It has a peculiar, and, to most persons, disagreeable odor, and a hot taste. Its composition is $C_{20}H_{16}$. When pure, it is neutral to test paper. Its sp. gr. is 0.86 at about 70° F. It boils at about 314° F.; the density of its vapor is 4.76. It evaporates without leaving any greasy stain on paper. It is almost insoluble in water, and very slightly soluble in weak alcohol; but 100 parts of alcohol, of sp. gr. 0.840, dissolve 13 or 14 parts of it, and absolute alcohol takes up a still larger proportion. The oil is also soluble in ether. It readily mixes with and is soluble in the fixed and volatile oils. Exposed to the air, it absorbs oxygen, becomes yellowish and somewhat denser, owing to the formation of resin (*pinic* and *sylvic acids*). This resinification is accompanied with the production of a small quantity of formic acid. Oil of turpentine has the power of rotating the ray of plane-polarized light; but the direction of rotation is different in the English oil (obtained by distillation from American turpentine), and the French oil (obtained by distillation from Bordeaux turpentine)—in the former being right-handed, in the latter left-handed.

*Physiological Effects.*—In *small doses* (as six or eight drops to a fluidrachm) it creates a sensation of warmth in the stomach and bowels, becomes absorbed, circulates with the blood, and in this way affects the capillary vessels, and is thrown out of the system by the different excretories, on the secerning vessels of which it acts in its passage through them. The exhalations of the skin and bronchial membranes acquire a marked terebinthinate odor, while the urine obtains the smell of violets. By its influence on the renal vessels it proves diuretic. By the same kind of local influence on the cutaneous vessels it proves sudorific. It appears to have an astringent effect on the capillary vessels of the mucous membranes, for, under its use, catarrhal affections of, and hemorrhages from, these parts are frequently checked, and often are completely stopped. Its continued use sometimes brings on irritation of the urinary organs, or when this state pre-existed, it is often aggravated by the use of turpentine. In a *medium dose* of one or two drachms, its effects are not constant. Dr. Ed. Percival saw two drachms given without any unpleasant effect being produced either on the digestive or urinary organs; they acted as an agreeable stomachic, and promoted the catamenia. Mr. Stedman, on the other hand, has seen this dose produce strangury, bloody urine, suppression of this secretion, fever, thirst, and vomiting. These two cases, however, may be regarded as the opposite extremes; and, in general, we may expect, from a medium dose, a feeling of heat in the stomach and bowels, accelerated peristaltic motion, increased frequency of pulse, diaphoresis, diuresis, and sometimes irritation of the urinary organs. Occasionally it provokes the catamenia. In *a large* or *maximum dose* of half an ounce to two ounces its effects are not constant. It usually causes a sensation of abdominal heat, sometimes nauseates, and in general operates as a tolerably active purgative, without causing any unpleasant effects. I have administered from one to two fluidounces in a considerable number of cases of tapeworm, and have rarely seen any ill consequences therefrom. "It has been given," says Dr. Duncan (*Edinb. Dispensatory*), "even to the extent of four ounces in one dose, without any perceptible bad effects, and scarcely more inconvenience than would follow from an equal quantity of gin." Cases are reported, however, in which it has failed to produce purging, and in such it has acted most violently on the system, accelerating the pulse, depressing the muscular power, and giving rise to a disordered state of the intellectual functions, which several persons have compared to intoxication. It is said to be more apt to act thus in persons of a full and plethoric habit. A remarkable and well-detailed instance of this occurred in the person of Dr. Copland (*Lond. Med. and Phys. Journ.*, vol. 46), who refers the disorder of the cerebral functions, in his case, to diminished circulation of blood in the brain; while the gastric heat, &c., he ascribes to increased vascular activity in the abdominal region. The oil passed off most rapidly by the skin and lungs (principally by the latter), and the air of the apartment became strongly impregnated with its effluvia. Applied *externally* it is rubefacient.

*Therapeutic Effects.*—The following are the principal uses of the oil of turpentine: *As an anthelmintic.*—It is the most effectual remedy for *tapeworm* we possess. It both causes the death of, and expels the parasite from the body. To adults it should be given in doses of an ounce at least. I have frequently administered an ounce and a half, and sometimes two ounces. To prevent any disorder of the cerebral functions, an oleaginous purgative should be either conjoined with it, or given at an interval of four or five hours after it. An excellent and safe method of employing it is to combine it with a castor-oil emulsion. A very effectual remedy for the *small threadworm* is the turpentine enema.

*In mucous discharges.*—In small doses oil of turpentine sometimes checks or stops profuse chronic discharges from the mucous membranes. In gonorrhœa and gleet I have frequently, and in leucorrhœa occasionally, used it with success. In chronic pulmonary catarrh, and in chronic diarrhœa and dysentery, it has proved advantageous. In the two latter diseases it has a direct local action on the affected part, besides exerting its influence over this in common with other mucous membranes after its absorption.

*In hemorrhages.*—In sanguineous exhalations, called hemorrhages, from the mucous surfaces, oil of turpentine may, under some circumstances, act efficaciously. On the same principle that it checks excessive secretion of mucus in catarrhal conditions of these tissues, so we can readily conceive it may stop the exhalation of blood. But it is only admissible in cases of a passive or a tonic character, in the absence of plethora and acute inflammation, or a disposition thereto. [Its benefit is most obvious in hemorrhage from the stomach or bowels, in which case it acts locally as well as after absorption; but I have often also derived advantage from small doses in moderate but obstinate hemorrhage from the bronchial mucous surface, which acetate of lead and gallic acid and alum had checked but not suppressed. I have also occasionally found it useful in purpura.—Ed.]

*In puerperal fever.*—The use of the oil of turpentine as a specific in this disease was introduced by Dr. Brenan, of Dublin, and strong testimony was subsequently borne to its efficacy. Dr. Brenan gave one or two tablespoonfuls of the oil every three or four hours, in cold water, sweetened, and applied flannel soaked in the heated oil to the abdomen. But the apparent improbability of a stimulant like turpentine curing an inflammatory disease has prevented many practitioners placing any faith in it, or even giving it a trial. Lastly, it has failed, in the hands of some of our most accurate observers, to produce the good effects which have been ascribed to it, and in some instances has appeared to aggravate the malady. These reasons have been conclusive against its employment in the way advised by Dr. Brenan. [Small doses, however, as ten minims, are not liable to the same objections, and are employed at the present time, as they were thirty or forty years ago, with probably more success than any other remedy.—Ed.] At all events, there are two valuable uses which may be made of turpentine in puerperal fever: it may be given in the form of clyster to relieve a tympanitic condition of the intestines, and, for this purpose, no remedy, perhaps, is superior to it; secondly, flannel soaked in the hot oil, as recommended by Dr. Brenan, may be applied to the abdomen, to cause rubefaction, as a substitute for a blister, to the employment of which several objections exist.

*In tympanites and constipation.*—To relieve flatulent distension of the stomach and bowels, and the colic thereby induced, both in infants and adults, oil of turpentine is a most valuable remedy. It should be given in full doses, so as to act as a purgative; or when, from any circumstance, it cannot be exhibited by the mouth, it may be employed in the form of clyster. Dr. Ramsbotham speaks in the highest terms of the efficacy of the oil of turpentine in the acute tympanites of the puerperal state, and thinks that most of the cases of the so-called puerperal fever which yielded to this oil were, in fact, cases of acute tympanites; and in this opinion he is supported by Dr. Marshall Hall. In a case of *obstinate constipation*, with a tympanitic condition of the intestines, Dr. Kinglake found oil of turpentine a successful cathartic, after the ordinary means of treating these cases had been assiduously tried in vain. Dr. Paris also speaks highly of it in obstinate constipation, depending on affections of the brain.

*In suppression of urine.*—I have seen oil of turpentine succeed in reproducing the urinary secretion when other powerful diuretics had failed.

*In dropsy.*—Oil of turpentine has occasionally proved serviceable in the chronic forms of this disease. Its efficacy depends, in part, on its derivative operation as a stimulating diuretic; and in part, as I conceive, on its powerful influence over the capillary and secerning vessels, by which it exercises a direct power of checking effusion. It is contraindicated in dropsies attended with irritation of the urinary organs; but in the atonic form of dropsy, especially in leucophlegmatic subjects, attended with deficient secretion of the skin and kidneys, it is calculated to be of benefit.

*In rheumatism.*—In chronic rheumatism, oil of turpentine has long been celebrated. Its beneficial influence depends on its stimulant and diaphoretic operation, and is more likely to be evinced in old and debilitated persons. I have found medium doses occasionally succeed when small ones have failed. But for the most part I have not met with sufficient success with it in chronic rheumatism to induce me to place much confidence in it. In the form of liniment it has often proved serviceable. It has sometimes succeeded admirably, mostly in medium doses, in rheumatic inflammation of the iris and choroid. *In sciatica and other neuralgic affections.*—Oil of turpentine was proposed as a remedy for sciatica by Drs. Pitcairn and G. Cheyne. Its efficacy was subsequently confirmed by Dr. Home. More recently it has been extensively employed and with great success, in France, in sciatica, as well as in various other neuralgias. My own experience does not lead me to speak very favorably of it.

*As an external remedy.*—Oil of turpentine is employed externally as a *rubefacient* in numerous diseases, on the principle of counter-irritation, Thus, in the form of liniment, it is used, either hot or cold, in chronic rheumatism, sprains, sore-throat, neuralgic affections of the extremities, &c. In the form of fomentation, the hot oil is applied to produce redness of the skin in puerperal peritonitis and pleuro-pneumonia. As a powerful local *stimulant* it was recommended by Dr. Kentish, as an application to burns and scalds, his object being to restore the part gradually, not suddenly, to its natural state, as in the treatment of a case of frostbite. The practice is most successful when the local injury is accompanied with great constitutional depression. I can bear testimony to its efficacy in such cases, having employed it in several most severe and dangerous burns, with the happiest results. In that form of gangrene which is not preceded by inflammation, and is called *dry* or *chronic*, oil of turpentine may occasionally prove serviceable, especially when the disease affects the toes and feet of old people.

*Administration.*—When given as a diuretic, and to affect the capillary and secerning vessels (in catarrhal affections of the mucous membranes, dropsy, suppression of urine, hemorrhage, &c.), the dose is from six or eight minims to a fluidrachm; as a general stimulant (in chronic rheumatism, &c.), or to produce a change in the condition of the intestinal coats (in chronic dysentery), from one to two fluidrachms; as an anthelmintic (in tapeworm), or as a revulsive (in apoplexy. in epilepsy previous to an expected paroxysm, &c.), from half a fluidounce to two fluidounces. It may be taken floating on some aromatic water to which some hot aromatic tincture, as *tincture of capsicum* has been added; or it may be diffused through water by the aid of mucilage or an emulsion; or it may be made into a confection with honey or some aromatic syrup, as in confection of turpentine. The readiest mode of using it as a fomentation is to dip a flannel into water as hot as the hands can bear, and, having then wrung out the water, to sprinkle the warm oil freely on the surface and apply the flannel.

CONFECTIO TEREBINTHINÆ, *Confection of Turpentine.*—Take of oil of turpentine, one fluidounce; liquorice root, in powder, one ounce; clarified honey, two ounces. Rub the oil of turpentine with the liquorice, add the honey, and mix them together to a uniform consistence.

*Dose.*—Gr. lx to oz. ss.

ENEMA TEREBINTHINÆ, *Enema of Turpentine.*—Take of oil of turpentine, one fluidounce; mucilage of starch, fifteen fluidounces. Mix.

*Used* as an anthelmintic in ascarides; as an antispasmodic and purgative in colic, obstinate constipation, tympanites, and hysteria. Dr. Montgomery says "it is much used in cases of peritoneal inflammation."

LINIMENTUM TEREBINTHINÆ [U. S.], *Liniment of Turpentine.*—Take of oil of turpentine, five fluidounces; 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 is the Dublin liniment, which contains about half as much oil of turpentine as the London liniment, and about two-thirds of the quantity ordered by Edinburgh.

["Take of resin, twelve troyounces; oil of turpentine, half a pint. Add the oil to the cerate, previously melted, and mix them." U. S.]

It was introduced by Dr. Kentish as a dressing for burns and scalds. The parts being first bathed with warm oil of turpentine, alcohol, or camphorated spirit, are to be covered with pledgets of lint thickly spread with this liniment. When the inflammation excited by the fire has subsided, milder applications are then to be resorted to. This liniment may also be used in any other cases requiring the employment of a more stimulant application than the ordinary soap liniment.

LINIMENTUM TEREBINTHINÆ ACETICUM, *Liniment of Turpentine and Acetic Acid.*—Take of oil of turpentine, one fluidounce; acetic acid, one fluidounce; liniment of camphor, one fluidounce. Mix.

A useful, and rather powerful counter-irritant.

UNGUENTUM TEREBINTHINÆ, *Ointment of Turpentine.*—Take of oil of turpentine, one fluidounce; resin, in coarse powder, sixty grains; yellow wax, half an ounce; prepared lard, half an ounce. Mix the ingredients together by the heat of a steam or water-bath. When they are melted, remove the vessel and stir until the mixture becomes solid.

## **Thus Americanum**, *Common Frankincense.*

### [**Terebinthina,** *Turpentine.* Mat. Med. List, U. S. P.]

The concrete turpentine of Pinus palustris, and Pinus Tæda, from the Southern States of North America.

[Until the appearance of the British Pharmacopœia, the officinal Thus was always referred to *Abies excelsa*, of which it was stated to be a spontaneous exudation. There is no doubt that this is a correct description of the original Thus, and both the author and I received authentic specimens of this oleoresin from Mr. Daniel Hanbury, who collected it in the autumn of 1849 from the *Abies excelsa* in Switzerland. It has, however, long ceased to be imported under the name of Thus, though it still comes to us, after being melted and strained, as Burgundy pitch. The old Thus may, therefore, still be procured in its purified form under the name of Burgundy pitch. But the article which is now known as Thus in the London market, and which has entirely superseded the original crude Thus, is concrete American turpentine. This is now made officinal, and is distinguished from the European Thus by the epithet *Americanum.* The appearance of this oleoresin, mixed with the numerous pieces of adherent bark, indicates that it has concreted spontaneously on the tree. The finer and more recent pieces are of a bright lemon-yellow color, but older pieces are amber color and even brown. —ED.]

*Officinal Characters.*—A softish bright yellow opaque solid, resinous but tough, having the odor of American turpentine.

*Use.*—It is only used to improve the consistence and color of pitch plaster.

### **Resina**, *Resin.* [Mat. Med. List, U. S. P.]

The residue of the distillation of the turpentines from various species of Pinus, *Linn.*, and Abies, *Lam.*

*Preparation.*—Resin or *Rosin* is the residue of the process for obtaining oil of turpentine. It is run, while liquid, into metallic receivers coated with whiting to prevent adhesion, and from these is ladled into wooden moulds or casks. When the distillation is not carried too far, the product contains a little water, and is the officinal resin.

Since the abolition of the duty, in 1853, a good deal of American resin has been brought to this market, though the supply is at present interrupted by the American war. It is very much purer than the English, and the difference, independently of color, is distinguishable by the naked eye. On looking through moderately sized pieces, the English resin shows little specks (impurities), while the American is free from them. The latter fetches from twenty-five to one hundred per cent. more than the former.

*Officinal Characters.*—Translucent, semi-opaque, yellowish, brittle, pulverizable; fracture shining; odor and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke.

*Properties.*—Resin is compact and solid, becomes electric by friction, is fusible at a moderate heat, and is decomposed at a higher temperature. It is insoluble in water, but soluble in alcohol, ether, and the volatile oils. With wax and the fixed oils it unites by fusion; with the caustic alkalies it unites to form a *resinous soap.* The officinal resin (*yellow rosin*) is opaque and yellow, or yellowish white. Its opacity is owing to water, with which it is incorporated. By continued fusion this is got rid of, and the resin then becomes transparent (*transparent rosin*).

*Composition.*—Resin is a compound or mixture of *pinic acid*, *colophonic acid*, *sylvic acid*, and traces of *an indifferent resin.*

*Pharmaceutic Use.*—The principal value of resin is in the formation of plasters and ointments, to which it communicates great adhesiveness, and some slightly stimulant properties.

EMPLASTRUM RESINÆ [U. S.], *Resin Plaster.*—Take of resin, in powder, four ounces; litharge plaster, two pounds; hard soap, in powder, two ounces. To the litharge plaster, previously melted with a gentle heat, add the resin and soap, first liquefied, and heat them until they are thoroughly mixed. This is the Dublin resin plaster, which differed from the London and Edinburgh plasters in containing soap and a smaller proportion of resin. ["Take of resin, in fine powder, six troyounces; plaster of lead, thirty-six troyounces. To the plaster, melted over a gentle fire, add the resin, and mix them." U. S.] It is commonly known as *adhesive plaster*, and is kept in the shops ready spread. It is employed to retain the lips of wounds in contact, as in cuts, surgical operations, &c. It is more adhesive than litharge plaster, but at the same time somewhat more irritating, and it occasionally causes excoriation.

UNGUENTUM RESINÆ (*Ceratum Resinæ, Lond.*), *Ointment of Resin.* [CERATUM RESINÆ, U. S., *Resin Cerate, Basilicon Ointment.*]—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. The Dublin formula is followed. Less resin is used than in the London and Edinburgh ointments, and considerably less wax than in the former. Simple ointment is preferred to either lard (*Ed.*, *Dub.*) or oil (*Lond.*) [" Take of resin, ten troyounces; yellow wax, four troyounces; lard, sixteen troyounces. Melt them together, strain the mixture through muslin, and stir it constantly until cool." U. S.] A mild stimulant, digestive, and detergent application to ulcers which follow burns, or which are of a foul and indolent character, and to blistered surfaces to promote a discharge.

[CÉRATUM RESINÆ COMPOSITUM, U. S. *Compound Resin Cerate.*—" Take of resin, suet, yellow wax, each twelve troyounces; turpentine, six troyounces; flaxseed oil, seven troyounces. Melt them together, strain the mixture through muslin, and stir it constantly until cool." U. S. Owing to the turpentine which it contains, this ointment is more stimulating than the simple resin cerate. It is used for similar purposes, when a more decided impression is desired. Under the name of Deshler's Salve, it is widely known in the United States as a popular remedy in indolent ulcers, &c.—W.]

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## PINUS SYLVESTRIS, *Linn.*

### Scotch Fir.

*Specific Character.*—A tall, straight *tree*. *Leaves* in pairs, rigid. *Cones* ovato-conical, acute; young ones stalked, recurved, as long as the leaves; generally in pairs. Crest of the *anthers* very small. *Embryo* five-lobed.

*Habitat.*—Highlands of Scotland, Denmark, Norway, and other northern countries of Europe.

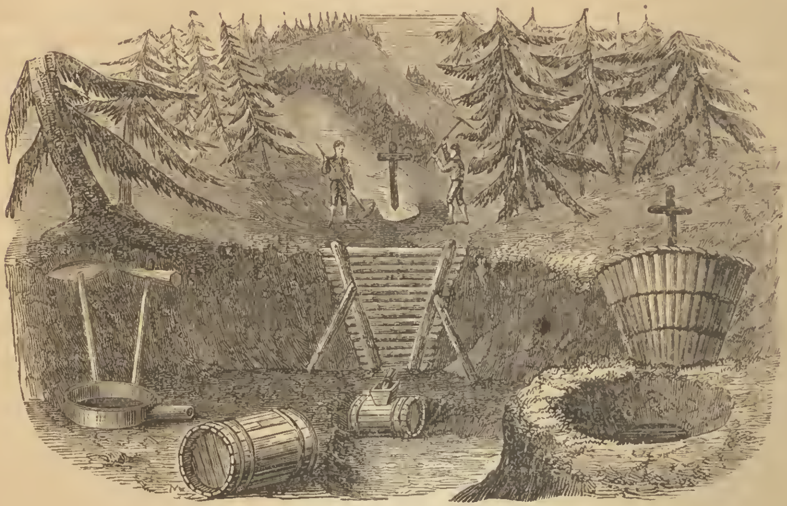
### Pix Liquida, *Tar.* [Mat. Med. List, U. S. P.]

A bituminous liquid, obtained from the wood of Pinus sylvestris, and other pines, by destructive distillation.

*Preparation.*—Two kinds of *tar* are known in commerce, *mineral tar* and *wood tar*. Mineral tar is either a natural production, as *petroleum* (*e. g.*, Barbadoes tar, which was formerly officinal), or an artificial product, as *coal tar*, which is obtained in the destructive distillation of coal.

Of wood tar there are also two sorts; one obtained as a secondary product in the manufacture of pyroligneous acid and gunpowder charcoal; the other produced by the destructive distillation of fir timber in the northern parts of Europe and in America, and known in commerce as *Stockholm tar*, *Archangel tar*, *American tar*, &c. The last of these is the kind used in medicine. That which is procured from *Pinus sylvestris* in the northern part of Europe, is considered to be much superior to American tar. The process now followed is a kind of *destillatio per descensum* of the roots and other woody parts of old pines. As now carried on in Bothnia, it is thus described by Dr. Clarke: " The situation most favorable to the process is in a forest near to a marsh or bog, because the roots of the fir from which tar is principally extracted are always most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank or sloping hill); and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. To prevent the volatile parts from being dissipated, the whole is then covered with turf, which, by means of a heavy wooden mallet and wooden stamper, worked separately by two men, is beaten down and rendered as firm as possible about the wood. The stack of billets is then kindled, and a

Fig. 89.



slow combustion of the fire takes place, without flame, as in working charcoal. During this combustion the tar exudes, and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled they are bunged, and ready for immediate exportation."

*Commerce.*—Wood tar is imported into this country chiefly from the northern parts of Europe (Russia, Sweden, Norway, Denmark, and North Germany), but partly from the United States of America. Tar is also produced in this country.

*Officinal Characters.*—Thick, viscid, brownish-black, of a well-known peculiar aromatic odor. Water agitated with it acquires a pale brown color, sharp empyreumatic taste, and acid reaction.

*Properties.*—It is a viscid, semi-liquid substance, which preserves during a long period its softness. Its viscidity is destroyed by heat. It is soluble in alcohol, ether, and the oils, both fixed and volatile. Submitted to distillation, it yields an aqueous acid liquor (*pyroligneous acid*), and a volatile oily matter (*oil of tar*); the residue in the still is *pitch*. The vapor of tar is highly inflammable.

*Composition.*—Wood tar is a very complex substance. It consists principally of *pyrogenous resin*, *pyrogenous oil*, *acetic acid*, and *water*. The tar obtained from coniferous woods contains in addition *resin* and *oil of turpentine*.

*Physiological Effects.*—The effects of tar are analogous to those of turpentine, but modified by the presence of acetic acid and the pyrogenous products. Locally it acts as a stimulant; and when applied to chronic skin diseases and indolent ulcers, it frequently induces a salutary change in the action of the capillary and secerning vessels, evinced by the improved quality of the secretions, and the rapid healing of the sores. In such cases it is termed detergent, digestive, or cicatrizant.

*Therapeutics.*—Tar is rarely employed *internally.* Applied *externally,* it is used in lepra and other obstinate skin diseases, especially those which affect the scalp.

[INFUSUM PICIS LIQUIDÆ, U. S., *Infusion of Tar, Tar Water.*—"Take of tar, a pint; water, four pints. Mix them, and shake the mixture frequently during twenty-four hours. Then pour off the infusion, and filter through paper." The water dissolves out of the tar the acetic acid, creasote, empyreumatic oils, more or less resinous matter, and probably other of the numerous complex ingredients. It acquires the taste and odor of tar, and a sort of brownish wine color. It may be used internally in chronic catarrh and cystitis, as an alterative and stimulant to the mucus membrane. Dose, Ōss to Oiss, taken in the course of twenty-four hours.—W.]

[UNGUENTUM PICIS LIQUIDÆ, U. S., *Tar Ointment.*—"Take of tar, suet, each, twelve troyounces. Mix the tar with the suet previously melted with a moderate heat, and, having strained the mixture through muslin, stir it constantly while cooling."]

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## ABIES, *DC.*

Monœcia, Monadelphia, *Linn. Syst.*

*Generic Character.*—*Flowers* monœcious. *Males: Catkins* solitary, not racemose; the *scales* staminiferous at the apex. *Stamens* two; the *anthers* 1-celled. *Females: Catkins* simple. *Ovaries* 2. *Stigmas* glandular. *Scales* of the *cone* imbricated, thin at the apex, rounded, neither thickened angular nor umbilicated on the back. *Leaves* solitary in each sheath.

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## ABIES EXCELSA, *DC.*

### The Norway Spruce Fir.

*Specific Character.*—A very lofty tree, growing sometimes to the height of 150 feet. *Leaves* tetragonal. *Cones* cylindrical; the *scales* rhomboid, flattened, jagged, and bent backward at the margin.—*Woodv.* page 573, pl. 208 (*Pinus Abies*).

*Habitat.*—A native of Germany, Russia, Norway, and other parts of Europe, and of the northern parts of Asia. Commonly cultivated in England.

**Pix Burgundica,** *Burgundy Pitch.* [Mat. Med. List, U. S. P.]

A resinous exudation from the stem, melted and strained; imported from Switzerland.

*Preparation.*—True Burgundy pitch is prepared by melting the original frankincense (or the resinous exudation of the spruce fir) in hot water, and straining through a coarse cloth. By this process part of the volatile oil and the impurities are got rid of. The substance sold as Burgundy pitch in the shops is rarely prepared in this way, but is fictitious. Its principal constituent is resin, rendered opaque by the incorporation of water, and colored by palm oil. It is frequently prepared from concrete American turpentine, common frankincense. A sample of genuine Burgundy pitch was prepared by Mr. D. Hanbury from Thus collected by himself from the spruce fir in Switzerland. In color it somewhat resembled litharge plaster. Its odor resembled the Burgundy pitch imported from Hamburgh, which, when strained, constitutes the best commercial Burgundy pitch. *Hamburg Burgundy pitch* is of a dark dun color, and contains many mechanical impurities, and numerous vesicles which are full of a watery fluid. It would appear to be the melted but unstrained exudation of the spruce fir. It yields, when remelted and strained, a Burgundy pitch which is darker-colored, but which otherwise agrees with the genuine sample prepared by Mr. Hanbury.

Fig. 90.

*Abies Excelsa.*

*Officinal Characters.*—Hard and brittle, yet gradually taking the form of the vessel in which it is kept; opaque, varying in color, but generally dull reddish-brown; of a peculiar, somewhat empyreumatic perfumed odor, and aromatic taste.

*Properties.*—Genuine Burgundy pitch is hard, brittle when cold. It softens by the heat of the hand, and strongly adheres to the skin. Its odor is not disagreeable. Fictitious Burgundy pitch is usually of a yellower color than the genuine, and has a somewhat less agreeable odor.

*Tests.*—Without bitterness; free from vesicles; gives off no water when it is heated.

*Composition.*—Consists of *resin* principally, and a small quantity of *volatile oil.*

*Physiological Effects.*—Its local action is that of a mild irritant. In some persons it excites a troublesome vesiculo-pustular inflammation.

*Therapeutics.*—It is employed as an external agent only, spread on leather, forming the well-known (*Burgundy*) *pitch plaster*, which is applied to the chest in chronic pulmonary complaints, to the loins in lumbago, to the joints in chronic articular affections, and to other parts to relieve local pains of a rheumatic character. It acts as a counter-irritant or revulsive.

[EMPLASTRUM PICIS BURGUNDICÆ, U. S., *Plaster of Burgundy Pitch.*—"Take of Burgundy pitch, seventy-two troyounces; yellow wax, six troyounces. Melt them together, strain, and stir constantly until they thicken on cooling."]

EMPLASTRUM PICIS, *Pitch Plaster.*—Take of Burgundy pitch, twenty-six ounces; common frankincense, thirteen ounces; resin, four ounces and a half; yellow wax, four ounces and a half; expressed oil of nutmeg, one ounce; olive oil, two fluidounces; water, two fluidounces. 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.

This is the London plaster. Edinburgh ordered one-third more Burgundy pitch and no frankincense. It is stimulant and rubefacient.

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## [ABIES CANADENSIS, *Michaux.*

*Specific Characters.*—Cones hanging, terminal; the bracts evanescent; the scales persistent on the axis; sterile catkins scattered; anther cells opening lengthwise. Leaves 2-ranked, flat, whitened underneath.

The *Hemlock Spruce* is a large tree, attaining a height of seventy or eighty feet, with a circumference of six or nine feet. The leaves are six or eight lines long, very narrow, flat, and downy at the time of their expansion. The cones are a little longer than the leaves, oval, pendulous, and situated at the extremity of the branches.

This species of Abies is solely a native of North America, and belongs to the coldest regions of the continent, beginning to appear about Hudson's Bay. In the vicinity of Lake St. John and near Quebec, the forests are filled with it, and it is found in all the Northern States. It prefers high situations, and those the most humid and gloomy.

The wood of this tree is of little value; the bark contains a large amount of tannin, and is used in the tanneries where the oak is scarce.

### Pix Canadensis, *Canada Pitch.* Mat. Med. List, U. S. P.

The prepared concrete juice of Abies Canadensis (Michaux, *N. Am. Sylva*).

Hemlock pitch does not flow from the bark by incision, but is invariably the result of spontaneous exudation from knots or excrescences, the heat of the sun bringing it to the surface; and it is always obtained from old trees or those approaching decay. The proportion of trees from which any resin can be procured is not more than one in a hundred.

The quantity from good-sized trees is from six to ten pounds, the average from four to five. The color of it as it exudes is nearly white; it hardens immediately, and changes to yellow, brown, and sometimes nearly black. It is said to be prepared by boiling the bark, to which it is adherent in water, and skimming of the melted resin as it rises to the surface. Canada pitch is in masses, very brittle. It is a resin in combination with a small quantity of volatile oil. It is heavier than water, sp. gr. 1.034. The odor is peculiar, and unlike turpentine. To purify it, it should be melted and strained. From its adhesiveness and stimulating properties, it affords a plaster which is equal to that made with Burgundy pitch, if not superior.

Emplastrum Picis Canadensis U. S., *Plaster of Canada Pitch.* (*Hemlock Pitch Plaster*).—"Take of Canada pitch, seventy-two troyounces; yellow wax, six troyounces. Melt them together, strain, and stir constantly until they thicken on cooling." U. S.

Used for the same purpose as the Canada pitch.—W.]

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## ABIES BALSAMEA, *Aiton.*

### Balm of Gilead Fir.

*Specific Character.*—*Leaves* flat, emarginate, subpectinate, suberect above. *Scales* of the flowering *cone* acuminate, reflexed. An elegant *tree*, seldom rising more than 40 feet, *Lambert Pinus*, pl. 31 (*Pinus Balsamea*).

*Habitat.*—Inhabits Canada, Nova Scotia, Maine, Virginia, and Carolina.

**Terebinthina Canadensis,** *Canada Balsam.* [Mat. Med. List, U. S. P.]

The turpentine, obtained from the stem by incision, in Canada.

*Production.*—*Canada balsam* is obtained from *Abies balsamea* in Canada and the state of Maine. Between the bark and the wood of the trunk and branches of these trees are vesicles containing this oleoresin, which exudes when they are broken, and is received in a bottle. It gradually solidifies by age.

*Officinal Characters.*—A pale yellow, ductile oleoresin, of the consistence of thin honey, with a peculiar agreeable odor, 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.

*Canada balsam* is valuable on account of its purity and agreeable flavor. When mixed with magnesia the acid resins combine with the magnesia, and form solid compounds, which absorb the volatile oil. Canada balsam, however, will not in general solidify with the quantity of magnesia stated in the officinal characters until some hours have elapsed. Bonastre obtained from it 18.6 per cent. of volatile oil.

*Therapeutics.*—It is, with some exceptions, applicable to the same purposes as oil of turpentine. The following are the principal cases in which it is employed: *In mucous discharges from the urino-genital organs*; as gonorrhœa, gleet, leucorrhœa, and chronic cystirrhœa. *In chronic catarrh, both mucous and pituitous*, occurring in old person of a lax fibre and lymphatic temperament. *In chronic rheumatism*, especially sciatica and lumbago.

*Administration.*—The dose of Canada balsam is from twenty to thirty grains. It is best given in the form of *pill.*

## JUNIPERUS, *Linn.*

Diœcia, Monadelphia, *Linn. Syst.*

*Generic Character.*—Diœcious, rarely monœcious. *Flowers* in small axillary catkins.—*Males:* Anther-cells, 4–8, attached to the lower edge of a broad scale.—*Females:* Lower scales of catkin dry and empty; upper 3 fleshy, coalescing, having each at their base an erect ovule. *Stigmas* gaping. *Fruit* a *galbulus*, consisting of three united fleshy *scales*, and containing 3 triquetrous osseous *seeds.*

## JUNIPERUS COMMUNIS, *Linn.*

### Common Juniper.

*Specific Character.*—A bushy *shrub.* *Leaves* evergreen, numerous, 3 in each whorl, spreading, linear-subulate, keeled, mucronate, glaucous on the upper side, dark green beneath. *Flowers* diœcious. *Fruit*, commonly called a *berry*, purplish black, covered with bloom, and scarcely more than half the length of the leaves. It requires two seasons to arrive at maturity.—*Woodv.* fasc. v., pl. 95, page 259.

*Habitat.*—North of Europe. Indigenous, growing on hills and healthy downs, especially where the soil is chalky.

*Commerce.*—Juniper berries are imported from Rotterdam, Hamburgh, Leghorn, Trieste, and other European ports, but are no longer officinal.

Fig. 91.

*Juniperus Communis.*
Branch with male flower.

Fig. 92.


*Female Flower and Fruit of Juniperus Communis.*

*a.* Female catkin (magnified).
*b.* Ditto, at a later stage of evolution (magnified).
*c.* Two ovaries; the third having been removed to expose the ovules.
*d.* Fruit approaching maturity.
*e.* Ripe galbulus, seen from above.
*f.* Ditto, seen from below.

[**Juniperus.** Mat. Med. List, U. S. P.

The fruit of Juniperus Communis.]

**Oleum Juniperi** [U. S.], *English Oil of Juniper.*

The oil distilled in England from the unripe fruit.

*Preparation.*—Oil of juniper is obtained by submitting the fruit to distillation with water. The full-grown green fruit yields more than the ripe fruit, for in the act of ripening a portion of the oil becomes converted into resin.

[Prepare this oil from juniper bruised by the general formula.[1]—W.]

*Officinal Characters.*—Colorless or pale greenish-yellow, of a sweetish odor and warm aromatic taste.

*Description.*—It is limpid, transparent, and lighter than water, and causes the left-handed rotation of polarized light—in this respect agreeing with French oil of turpentine. It has the odor of the fruit. It dissolves with difficulty in alcohol. It is a carburet of hydrogen, $C_{20}H_{16}$, and isomeric with oil of turpentine. Its density is 0.839.

*Adulteration.*—The foreign oil is frequently distilled from the tops and wood and scarcely differs from oil of turpentine.

*Administration.*—The dose of the English oil is from two to six drops either in the form of pill or of spirit of juniper.

[1] [Most of the distilled oils of the U. S. P. are prepared by the following general formula. "Put the substance from which the oil is to be extracted into a retort, or other vessel suitable for distillation, and add enough water to cover it; then distil by a regulated heat into a large refrigeratory. Separate the distilled oil from the water which comes over with it." U. S. P.]

Spiritus Juniperi, *Spirit of Juniper.*—Take of English oil of juniper, one fluidounce; rectified spirits, nine fluidounces. Dissolve.

This spirit contains about ninety-five (*eighty-five*) times as much oil of juniper as spiritus juniperi, *Lond.* It is used as an adjunct to diuretic mixtures. The *dose* is from min. xx to fl. drm. j.

[Spiritus Juniperi Compositus, U. S., *Compound Spirit of Juniper.*—"Take of oil of juniper, a fluidrachm and a half; oil of caraway, oil of fennel, each, ten minims; diluted alcohol eight pints. Dissolve the oils in the diluted alcohol." A powerful stimulant, diaphoretic, carminative, and diuretic, closely resembling gin in its action on the system. Dose f℥j to f℥ss in hot water as a carminative or diaphoretic, in cold water as a diuretic.

Infusum Juniperi, U. S., *Infusion of Juniper.*—"Take of juniper, bruised, a troyounce; boiling water, a pint; macerate for an hour in a covered vessel, and strain." This is a favorite vehicle for the administration of bitartrate of potash—the stimulating oil aiding the diretic action of the salt, and making it more acceptable to the stomach. Dose Oj, to be taken in the twenty-four hours.—W.]

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## JUNIPERUS SABINA, *Linn.*

### Common Savin.

*Specific Character.*—A small bushy *shrub. Leaves* small, ovate, convex, densely imbricated, erect, decurrent, opposite, glandular. *Galbulus* round, purple, somewhat smaller than that of juniper.—*Woodv.* pl. 94, page 256.

*Habitat.*—Midland and southern parts of Europe and Asiatic Russia. Cultivated in gardens in this country.

### Sabina, *Savin.* [Mat. Med. List, U. S. P.]

The fresh and dried tops; collected in spring, from plants cultivated in Britain.

*Officinal Characters.*—Twigs densely covered with minute imbricated appressed leaves in four rows; odor strong, peculiar, and unpleasant; taste acrid, bitter, resinous, and disagreeable.

*Description.*—The officinal parts of the plant are the *tops*, which consist of the young branches with their attached leaves. The odor described in the officinal characters belong to the tops in their fresh state, especially when rubbed. The dried tops are yellowish-green, and less odorous than the fresh ones.

*Physiological Effects.*—Oil of savin, the active principle of the herb, is a powerful local irritant. When applied to the skin, its acts as a rubefacient and vesicant. On wounds and ulcers its operation is that of an acrid (not chemical) caustic. Swallowed in large doses, it occasions vomiting, purging, and other symptoms of gastro-intestinal inflammation. The emmenagogue power of savin is fully established.

*Therapeutics.*—Savin is not much used internally; but in cases of amenorrhœa and chlorosis depending on or accompanied by a torpid condition or deficient action of the uterine vessels, it may be given as a powerful uterine stimulant. In such cases it proves a most efficient remedy. According to my own observation, it is the most certain and powerful emmenagogue of the whole materia medica. My experience of it, therefore, confirms the statements of Home. Though I have employed it in numerous cases, I never saw any ill effects result from its administration. Of course its use is contraindicated where irritation of the uterus, or indeed of any of the pelvic viscera, exists, or when the female is in a pregnant state. As a topical agent, savin is frequently employed, mostly in the form of the ointment, to make *perpetual blisters.* Equal parts of savin and verdigris, in powder, form one of the most efficacious applications for the removal of venereal warts. [In excessive menstruation and leucorrhœa, dependent on an atonic condition of the uterus, without organic lesion, the oil of savin in doses of five drops, three or four times a day, is one of our most reliable remedies—of course iron and tonics should be given at the same time, to render permanent the temporary action of the oil.—W.]

Fig. 93.

*Juniperus sabina in fruit.*

*Administration.*—By drying, savin loses part of its volatile oil, and hence the *powder* is not the best preparation of it. It is, however, sometimes given in doses of from five to fifteen grains.

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

This preparation is intended for internal use. One fluidrachm should be equivalent to six or seven grains of dried savin. It may, therefore, be given as an emmenagogue in doses of one to two fluidrachms, but the oil would be more certain.

Unguentum Sabinæ, *Ointment of Savin* (*Ceratum Sabinæ, Ed.*).—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. The ingredients and proportions ordered by the London and Edinburgh colleges are retained, except that the savin is a little increased. Fresh savin is ordered, not dried as in the Dublin Pharmacopœia, and the boiling ordered by Edinburgh is omitted. The color of this ointment should be a fine green, and its odor that of the plant; the former property depends on chlorophyll, and the latter on the presence of oil of savin.

[Ceratum Sabinæ, U. S., *Cerate of Savin.*—"Take of savin, in fine powder, three troyounces; resin cerate twelve troyounces; ether a sufficient quantity. Moisten the savine with ether, pack it firmly in a cylindrical percolator, and pour on ether until the filtered liquid passes nearly colorless. Evaporate this spontaneously to the consistence of syrup, add the concentrated liquid to the resin cerate, softened by a gentle heat, and mix them thoroughly."]

Savin ointment is used as a dressing to blistered surfaces, to produce what is termed a *perpetual blister.* Is is preferred to the ointment of cantharides, as being less acrid, and not liable to cause strangury. It is sometimes applied to seton tapes, to increase the discharge from setons.

### Oleum Sabinæ [U. S.], *English Oil of Savin.*

The oil distilled in England from fresh savin.

*Preparation.*—Oil of savin is obtained by submitting the fresh tops to distillation with water. The tops yield about three per cent. of the oil.

[" Prepare this oil from savine, bruised, by the general formula," U.S., given at page 399.]

*Officinal Characters.*—Colorless, or pale yellow.

*Description.*—It is a limpid liquid, of a light yellow color, having the unpleasant odor of the plant, and a bitter acrid taste. Its specific gravity is 0.915. Its boiling point is 315°. Its composition is isomeric with that of oil of turpentine. It is very soluble in ether, but forms a turbid mixture with rectified spirit. The odor is the best and the most characteristic test.

*Administration.*—The *oil* is by far the most convenient and certain preparation of savin. The *dose* of oil of savin, as an emmenagogue, is from two to six drops, diffused in a mucilaginous or oleaginous mixture.

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## [JUNIPERUS VIRGINIANA, *Linn. Red Cedar, American Savin.*

*Specific Characters.*—Leaves four ranked, much crowded on young plants or shoots, awl-shaped, and somewhat spreading in pairs or threes; on older twigs very small, scale-like, appressed, closely imbricate, triangular ovate.

A small tree (10 to 20 feet high), growing in rocky hills all through the eastern United States.

### Juniperus Virginiana, *Red Cedar*, Secondary List, U. S. P.

The tops of Juniperus Virginiana.

These tops so closely resemble European savin, that they can only be distinguished by their different odor. Their medical properties are similar to those of the true savin; but they are not nearly so powerful or reliable, and are seldom used.—W.]

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## LIQUIDAMBARACEÆ, *Richard.* THE LIQUIDAMBAR ORDER.

### LIQUIDAMBAR ORIENTALE, *Miller.*

*Botanic Character.*—A *tree*, 20 to 60 feet high. *Leaves* palmately 5-cleft, rarely 3 or 7-cleft, smooth, truncate or subcordate at the base. lobes ovate-lanceolate, serrated mostly irregularly; with 1-3 lateral lobules. *Flowers* unisexual; female flowers in globular catkins. *Capsule* 2-celled, 2-lobed, many-seeded. *Seeds* winged, albuminous.—Plate, *Pharm. Journ.* vol. xvi. p. 462.

*Habitat.*—Southwest of Asia Minor, forests near Melasso and Moughla, in the district of Giova and Ulla, and opposite Rhodes. Also. in Cyprus, where it is called *Xylon Effendi*, the wood of Our Lord.

## **Styrax Præparatus**, *Prepared Storax.*

## [**Styrax**, *Storax.* Mat. Med. List, U. S. P.]

A balsam, obtained from the bark in Asia Minor, purified by means of rectified spirit and straining.

*Extraction of the Balsam.*—[Mr. Daniel Hanbury has given the following important information respecting liquid storax, which he obtained in 1857, from Sydney Maltass, Esq., of Smyrna; Lieutenant Campbell, R. N., H. B. M. Consul in the Island of Rhodes; and Dr. James McCraith, of Smyrna. Liquid storax is obtained from *Liquidambar orientale*, *Miller.* The outer bark is removed, and the inner bark is then stripped off and thrown into pits, until a sufficient quantity is obtained. Mr. Maltass states that it is then packed in strong horse-hair bags, and submitted to pressure in a wooden press. After removal from the press, hot water is thrown on the bags, and they are pressed a second time, after which the greater part of the resin, or balsam, will have been extracted. According to Lieutenant Campbell and Dr. McCraith, the bark is first boiled over a brisk fire, and the balsam which separates removed. The residual bark is afterwards pressed, to yield an additional quantity. The product is the opaque semi-fluid substance called *liquid storax*, which is exported to Alexandria, Smyrna, and Constantinople. From Smyrna it is shipped mostly to Trieste. The whole, both of the balsam and the residual bark, was formerly bought by the merchants of Rhodes. The latter is known to pharmacologists as Cortex Thymiamatis and Cortex Thuris; the former occasionally finds its way from Rhodes to Bombay, by way of Alexandria and the Red Sea, under the name of Rose Malloes or Rosa Mallas. Mr. Hanbury adds that the original storax produced by *styrax officinale*, always scarce and valuable, has in modern times wholly disappeared from commerce.—Ed.] *Common or opaque liquid storax* is imported from Trieste. It is opaque, of a gray color, has the consistence of birdlime, and the odor of storax, frequently accompanied with a feeble odor of benzole or naphthaline.

*Preparation.*—Prepared storax is prepared from liquid storax by heating it until the water with which it is usually mixed is evaporated, and then straining it. During the process it evolves a very fragrant odor. The impurities are stones, sand, &c.

*Officinal Characters.*—A semitransparent, 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 vapor bath it becomes more liquid, but gives off no moisture; boiled with solution of bichromate of potash and sulphuric acid, it evolves the odor of hydride of benzule.

*Composition.*—Simon found liquid storax to consist of a volatile oil (styrole), cinnamic acid, styracine, and resins. *Volatile Oil*, *Styrole*, $C_{16}H_8$. A colorless, extremely volatile, transparent liquid, which has a burning taste and a peculiar aromatic odor, resembling a mixture of benzole and naphthaline. Sp. gr. 0.924. It is soluble in alcohol and ether, burns with a sooty flame, and boils at about 295° F. *Cinnamic Acid*, $HO,C_{18}H_7O_3$. This acid is also a constituent of the balsams of Peru and Tolu, and is formed by the oxidation of oil of cinnamon. It is a colorless, crystalline acid, having a feebly aromatic, acrid taste; sparingly soluble in cold water, but readily soluble in alcohol. It fuses at 250°, and boils at 560° F. It has some resemblance to benzoic acid, for which it was formerly mistaken, but it may be distinguished by boiling it with a solution of chromic acid, when it gives rise to the production of oil of bitter almonds, of which benzoic acid does not yield a trace. *Styracine.*—This is found in the still after the distillation of styrole. It is a crystallizable substance, soluble in boiling alcohol and in ether, but insoluble in water. The *resins* are two, hard and soft.

*Physiological Effects.*—Storax is a stimulant expectorant, closely allied in its operation to balsam of Tolu and benzoin, but is less powerful than the latter.

*Therapeutics.*—In chronic bronchial affections admitting of the use of stimulants it may be used as an expectorant. It may be exhibited in the form of pill, in doses of from 18 to 20 grains.

*Pharmaceutic Use.*—Prepared storax is an ingredient of compound tincture of benzoin.

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## [SALICACEÆ, *Lindl.* The Willow Order.

## SALIX ALBA, *Linn.* *Common White Willow.*

*Generic Character.*—*Flowers* diœcious, or rarely monœcious, amentaceous; *scales* imbricated; a *gland* surrounding the stamens or ovary. Males: *Stamens* 2 to 5, usually 2, sometimes the 2 united into 1, and then the anther is 4-celled. Females: *Seeds* comose; the *radicle* inferior (*Bot. Gall.*).

*Specific Character.*—Leaves elliptic-lanceolate, pointed, serrate, silky on both sides; the lowest serratures glandular; stamens hairy; ovary smooth, almost sessile; stigmas deeply cloven; scales rounded. A tall tree, flowering in May and growing on river sides, moist woods, &c.

*Habitat.*—Great Britain; introduced it into the United States.

### Salix, *Willow.* Secondary List, U. S. P.

The bark of Salix alba.

This bark occurs in the shops in quills of various sizes. It is nearly odorless, and has a bitter astringent taste. It contains tannin, salicine, resinous extract, gum, and other unimportant substances.

Salicine is its active principle. It crystallizes in silky needles and laminæ, is white, very bitter, inodorous, neutral to vegetable colors, fusible at 230° F., and combustible at a higher temperature. It rotates to the left a ray of plane polarized light. It is much more soluble in boiling than in cold water, 100 parts of which dissolve only 5.6 parts of salicine. It is also soluble in alcohol, but not so in ether or the volatile oils. It is not precipitated by any agent. Sulphuric acid colors it blood-red. By this test the presence of salicine is detected in its solutions, and in decoctions of willow and poplar barks. Chromic acid (or a mixture of bichromate of potash and sulphuric acid) converts salicine ($C_{26}H_{18}O_{14}$) into hydruret of salicyle (also called salicylous acid), $C_{14}H_5O_4,H$ (*oil of meadow-sweet*) carbonic acid and formic acid. Hence this acid may be employed as a test for salicine. For this purpose 3 parts of salicine, 3 of bichromate of potash, and 24 of water, are to be dissolved in water, and to the solution $4\frac{1}{2}$ parts of oil of vitriol diluted with 12 parts of water are to be added. On the application of heat, the well-known odor of the flowers of meadow-sweet (*Spiræa ulmaria*) is evolved. If diluted hydrochloric or sulphuric acid be boiled with a solution of salicine, the fluid becomes suddenly turbid, and deposits a precipitate of saliretine, glucose being at the same time formed.

*Therapeutics.*—Willow bark is tonic and slightly astringent. It has been employed as an indigenous substitute for cinchona. The indications for its use, therefore, are the same as those for the latter. It is given in intermittents, dyspeptic complaints accompanied with, or dependent on, a debilitated condition of the digestive organs, passive hemorrhages, chronic mucous discharges, in the stage of convalescence after fever, and as an anthelmintic. As a local astringent, the powder or infusion is sometimes employed, but there are many more efficient remedies of this kind. Salicine may be used as an antiperiodic, when quinia is not obtainable. From 20 to 40 grains should be taken in the intervals between the paroxysms of an intermittent. It appears not to be as reliable as salts of quinia, although it frequently will cut short a malarial fever.

The willow bark may be given in powder, decoction, or tincture. The tincture is the most elegant form of administration. ℥ss to ℥j of the bark, or its equivalent, may be given at a dose.—W.]

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## [JUGLANDACEÆ, *De Cand.* The Walnut Order.

## JUGLANS CINEREA, *Linn.* *Butternut.*

*Generic Character.*—Monœcious. *Sterile flowers;* ament imbricate, scales mostly five-parted. *Perianth* five to six-parted. *Stamens* eighteen to thirty-six. *Fertile flowers; perianth* double, each four-parted. *Styles* one or two. *Drupe* partly spongy; *nut* rugose and irregularly furrowed.

*Specific Character.*—*Leaves* pinnate; *leaflets* numerous, lanceolate, serrate, rounded at the base, soft pubescent beneath; *petioles* villous; *fruit* oblong ovate, with a terminal projection, viscid and hairy, on a long peduncle; nut oblong, acuminate, conspicuously sculptured (Beck, *Botany of North. and Mid. States*, p. 335).

This plant is the *J. cathartica* of *Michaux*. The common names by which it is known are *white walnut* and *butternut.* In some situations it is a large tree, with numerous branches and a smooth cinereous bark. The fruit is less rank and strong than the black walnut, but by age becomes rancid and unpleasant; it abounds in oil. Early in the spring, if the bark be pierced, there exudes a saccharine juice.

*Habitat.*—Butternut abounds in Canada and the northern and middle sections of the United States, in rich bottom lands and along streams. It flowers in May, and the fruit ripens in September and October.

### Juglans, Mat. Med. List, U. S. P.

The inner bark of Juglans cinerea.

The inner bark, when first separated from the tree, is of a pure white color, but soon begins to change, and by the time it becomes dry, is of a deep brown color. It comes into the market in pieces, which have a fibrous fracture. If the epidermis has not been removed, they are smooth externally. The bark from the root is most active. When in the fresh state a rubefacient effect is stated to be made upon the skin. The period for collecting it is in May. The odor is feeble, and the taste is bitter and pungent. The active principle has not as yet been isolated. The bark is said to contain resin, fixed oil, saccharine matter, &c. Water extracts the virtues of the bark. It is always administered in the form of extract.

Extractum Juglandis, U. S., *Extract of Butternuts.*—"Take of butternut, in moderately coarse powder, twelve troyounces; water, a sufficient quantity. Moisten the butternut with four fluidounces of water, pack it in a conical percolator, and gradually pour water upon it until the infusion passes but slightly impregnated with the properties of the butternut. Boil the liquid to three-fourths of its bulk; then strain. and, by means of a water-bath, evaporate to the proper consistence." U. S.

Extract of butternut is of a black color, having a caromel-like odor, and bitter astringent taste. It is a pretty certain, mild cathartic, operating without pain or irritation, and evacuating the alimentary canal without depletion. For a long time it has been employed as a purgative throughout the country, and is one of the articles to which Dr. Rush directed attention. Dr. Barton, in his *Collections*, also speaks highly of it. By all the subsequent writers upon Materia Medica, it is noticed as one of the most valuable of our indigenous productions. The cases to which it is adapted are, fevers, with disturbance of the liver and congestion of the abdominal organs, habitual costiveness, and dysenteric affections. By combination with a mercurial, as blue pill or calomel, its powers are increased. The dose is 10 to 30 grains, in pill. The extract which is brought in from the country, and made by decoction, is objectionable, from the little care taken in its preparation.

A decoction is sometimes used, but the taste and the quantity required render it inferior to the officinal preparation.—W.]

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## CUPULIFERÆ, *Richard*. The Oak Order.

## QUERCUS.

Monœcia Polyandria, *Linn. Syst.*

*Generic Character.*—Monœcious. *Male Flowers: Catkins* long, lax, and pendulous. *Calyx* 5–7 parted. *Stamens* 5 to 10. *Female Flowers: Involucre* scaly; the *scales* numerous, imbricated; combined below into a coriaceous, hemispherical cup. *Calyx* 6-lobed, adhering to the ovary. *Ovary*, 3-celled; 2 of the cells abortive. *Stigmas* 3. *Nut* 1-celled, 1-seeded, surrounded at the base by the enlarged cup-shaped involucre (*cupule*).

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## QUERCUS PEDUNCULATA, *Willd.*

### The Common British Oak.

*Specific Character.*—A large and handsome *tree*, remarkable for its longevity. *Leaves* deciduous, shortly-stalked, oblong-obovate, deeply sinuate, with obtuse lobes. *Fruits* 2 or 3 upon a long peduncle. *Woodv.* page 344, pl. 126. (*Q. Robur.*)

*Habitat.*—Indigenous, growing in woods and hedges. It is found in most European countries.

### Quercus, *Oak Bark.*

The dried bark of the small branches and young stems; collected in spring, from plants growing in Britain.

*Preparation.*—In the spring the barks of trees contain more astringent matter, and are more readily separated from the wood. The usual time for barking the oak is from the beginning of May to the middle of July. The bark is then carefully dried in the air, and is afterwards stacked.

*Officinal Characters.*—Covered with a grayish, shining epidermis, cinnamon-colored on the inner surface, fibrous, brittle, and strongly astringent.

*Description.*—Oak bark consists of pieces of from one to two feet long, which vary in their appearance according to the age of the stem or branch from which they have been taken. The bark of young stems is thin, moderately smooth, covered externally with a silver or ash-gray epidermis, and is frequently beset with lichens. Internally it is, in the fresh state, whitish; but when dried, brownish-red, fibrous. This alone is officinal. The bark of old stems is thick, very rough externally, cracked and wrinkled, and is usually of inferior quality.

Fig. 94.


*Quercus pedunculata.*

*a.* Branch with male flowers. *b.* Branch with female flowers.
*c.* A male catkin. *d.* Nut (acorn), and cupule.

*Composition.*—According to Braconnot, oak bark contains *tannic acid*, *tannates of lime*, *magnesia* and *potash*, and *gallic acid*. The quantity of *tannin* obtained by Davy from 100 parts of oak bark is as follows: Entire bark of oak, cut in spring, 6.0; entire bark of oak, cut in autumn, 4.4; white interior cortical layers of oak bark, 15.0. Decoction of oak bark reddens litmus, and becomes dark blue or purple on the addition of perchloride of iron (*tannate of iron*). A solution of gelatin causes a precipitate with it (*tannate of gelatin*). A solution of tartarated antimony causes no precipitate with the decoction.

*Physiological Effects.*—The effects of oak bark are similar to those of other vegetable astringents containing tannic acid.

*Therapeutics.*—The principal value of oak bark in medicine arises from its astringent property. Thus we employ a decoction of it as a gargle in relaxed conditions of the uvula, and in chronic inflammatory affections of the throat; as a wash in flabby, ill-conditioned, or bleeding ulcers; as an injection in leucorrhœa, in piles, or in prolapsus of the uterus or rectum; as an internal astringent in old diarrhœas, in the last stage of dysentery, and in alvine hemorrhages. As a tonic, oak bark has been employed in medicine, but it is much inferior to cinchona. Mr. Lizars states that he has obtained "wonderful success" in the cure of reducible herniæ by bathing the groin (the hernia having been previously reduced) three or four times daily with a warm inspissated decoction of oak bark, and then applying a truss. The practice, however, is not a new one.

Decoctum Quercus, *Decoction of Oak Bark.*—Take of oak bark, bruised, one ounce and a half; distilled water, one pint and a half. Boil for ten minutes in a covered vessel, and strain.

This is the Dublin preparation, which is about one third stronger than the London and Edinburgh decoctions. *Used* as a local astringent for various purposes, in the form of gargle, injection, or lotion. Administered in *doses* of from two to six ounces.

## [QUERCUS TINCTORIA, *Bartram.*

*Specific Character.*—Leaves more or less rusty, pubescent when young, obovate oblong, slightly or deeply sinuate, pinnatified; acorn nearly spherical, flattened at the top.

This is one of the largest forest-trees of the United States, attaining. in favorable situations, the height of ninety or one hundred feet, with spreading branches, and a rough, dark-colored bark. It is commonly called the black oak.

## QUERCUS ALBA, *Linn.*

*Specific Character.*—Leaves smooth, pale or glaucous underneath, bright green above, obovate, oblong; obliquely divided into obtuse lobes; *segments*, oblong entire; *cup* hemispherical, tuberculated, much shorter than the ovoid or oblong acorn.

This tree is less elevated than the *Q. tinctoria.* It forms, however, a larger and more regularly-expanded head, with numerous horizontal branches. The trunk and branches have a whitish hue, hence the name *White Oak.* The leaves are of a silvery appearance, with a hoary under surface. The young leaves are covered with a fine silky down.

### Quercus tinctoria, *Black Oak Bark.* Mat. Med. List, U. S. P.

The bark of the Quercus Tinctoria.

The bark when separated is thick and rugged, full of fissures, and black externally; internally, it is fibrous and of a red color increased by drying. It breaks with a rough fracture. That obtained from the young shoots and smaller branches is smoother externally, and the inner fibres are finer. The odor is strong, and the taste is bitter and styptic, tinging the saliva yellow when chewed. The cellular integument contains a yellowish-brown coloring principle. The interior layer when separated constitutes *Quercitron Bark*, used for the purpose of dyeing; it is shipped to Europe.

In consequence of the color imparted to leather, it is not as much used for tanning. As it soils the clothes an objection is urged against it in medicine.

### Quercus alba, *White Oak Bark.* Mat. Med. List, U. S. P.

The bark is rough externally, of a light color; the effete epidermis being arranged in flat layers. On drying, the internal layer becomes brown. It breaks with a stringy fracture. The odor is decided and tan-like; taste astringent and bitter. This bark is used in tanning. For medicinal purposes it is preferred to the black oak.

The medicinal properties and uses of these two oaks are precisely those of Q. pedunculata.

Decoctum Quercus Albæ, U. S., *Decoction of White Oak Bark.*— "Take of white oak bark, bruised, a troyounce; water, a sufficient quantity. Boil the white oak bark in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint."—W.]

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## QUERCUS INFECTORIA, *Olivier.*

### The Gall, or Dyer's Oak.

*Specific Character.*—A small *tree* or *shrub*, from 4 to 6 feet high. *Stem* crooked. *Leaves* ovate-oblong, sinuate-dentate, very smooth, deciduous, on short petioles, with a few short mucronate teeth on each side. *Fruit* sessile, very long, 2 or 3 times as long as the cupule.—*Steph.* and *Church.* pl. 152.

*Habitat.*—Asia Minor, from the Bosphorus to Syria, and from the Archipelago to the frontiers of Persia.

### Galla, *Galls.* [*Nutgall.*] [Mat. Med. List, U. S. P.]

Excrescences on *Quercus infectoria*, *Olivier*, caused by the punctures and deposited ova of *Diplolepis Gallæ tinctoriæ*, *Latr.*

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

*Description.*—The *galls* (or nutgalls) of commerce are produced by the *Diplolepis Gallæ tinctoriæ* on the *Quercus infectoria.* Ollivier says that this insect lives on this species of Quercus only. On the sides and at the ends of the branches and shoots of this tree the female makes a puncture with her ovipositor and deposits her egg. An excrescence or gall is soon formed, within which the larva is developed. As soon as the perfect insect is produced, it eats its way out. If we examine those galls from which the animal has escaped we observe externally a circular hole, of about a line in diameter, leading to a small canal which passes to the centre of the gall. But in those galls in which the insect has not put off its pupa state we find neither an external hole nor an internal canal.

The galls of different countries vary in their size, shape, weight, and quality of surface. *Levant Galls* are the ordinary galls of the shops. They are in general about the size of a hazelnut, somewhat round, tuberculated or warty. They are imported from Syria, Smyrna, and Constantinople. The most esteemed *Syrian galls* are the produce of Mosul on the Tigris: these are the *Mosul galls.* The *Aleppo galls* usually pass for Mosul galls. *Tripoli galls* come from Tripoli, and are inferior to the Aleppo galls. The *Turkey galls* usually come from Constantinople or Smyrna; they are the produce of Anatolia. *Smyrna galls* are not so heavy, are lighter-colored, and may be ranked with Tripoli galls, which are now rarely met with, and contain a larger admixture of white galls than those brought from Aleppo. The galls brought from Bombay (*East India galls*) are probably the produce of Persia or neighboring parts. They are heavy, but less sightly than those from the Levant. In commerce three kinds of Levant galls are distinguished, viz., *black* or *blue*, *green*, and *white;* but there is no essential distinction between the two first. *Black* or *blue galls*, *green galls.* These are gathered before the insect has escaped. They vary from the size of a pea to that of a hazelnut, and have a grayish color. The smallest have a blackish-blue tint, and are distinguished by the name of *black* or *blue galls;* while the larger and greener varieties are called *green galls.* Externally they are frequently tuberculated, but the surface of the tubercles and of the intervening spaces is usually smooth. Their texture is compact but fragile. They have no odor, but a styptic and powerfully astringent taste. These are the officinal galls. *White galls.*—These are for the most part gathered after the insect has escaped; and hence they are perforated with a circular hole. They are larger, lighter-colored (being yellowish or whitish), less compact, less heavy, and less astringent. They are of inferior value.

*Composition.*—Sir H. Davy found in 100 parts of good Aleppo galls tannin 26, gallic acid with a little extractive 6.2. Pelouze found tannic acid 40, gallic acid 3.5. Infusion of nutgalls reddens litmus paper, forms an inky compound on the addition of a persalt of iron (*tanno-gallate of iron*), and a yellowish-white precipitate with a solution of gelatin (*tannate of gelatin*). If a piece of skin, depilated by lime, be immersed in the infusion, and agitated with it from time to time, all the tannic acid is absorbed, the filtered liquor striking a blue color with the persalts of iron (*gallate of iron*), but giving no precipitate with a solution of gelatin.

*Physiological Effects.*—As galls contain a larger portion of tannic acid than any other known vegetable production, they possess in the highest degree the properties of an astringent.

*Therapeutics.*—Hippocrates employed the gall (κηκίς) as an astringent, both internally and externally. The following are the principal uses of galls: *As an astringent in hemorrhages*, especially passive alvine hemorrhages. *In chronic mucous discharges*, as old diarrhœas. *As a chemical antidote*, galls may be given in poisoning by ipecacuan, emetia, the organic alkaloids generally, and those vegetable productions whose activity depends on an organic alkaloid; as opium, colchicum or nux-vomica. Their efficacy arises from the tannic acid, which combines with the vegetable alkali to form a tannate possessing less activity than the other salts of these bases; perhaps because of its slight solubility. Galls are recommended as an antidote in cases of poisoning by emetic tartar, but I very much doubt their efficacy. *As a topical astringent.*—Galls are applicable in any cases requiring the topical use of a powerful vegetable astringent. Thus, in the form of gargle, in relaxation of the uvula; as an injection, in gleet and leucorrhœa; as a wash, in flabby ulcers, with profuse discharge, in prolapsus of the rectum or vagina; and in the form of ointment, in piles.

*Administration.*—The *dose* of the *powder* is from ten to twenty grains. Galls are also used in the form of *ointment* and *tincture.*

TINCTURA GALLÆ [U. S.], *Tincture of Galls* [*Tincture of Nutgall*].—Take of galls, bruised, two ounces and a half; proof spirit, one pint. Macerate the galls for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. ["Take of nutgall, in moderately fine powder, four troyounces; diluted alcohol a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a glass percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

A powerful astringent. *Dose*, from half a drachm to two drachms.

Diluted with water, it forms a very useful and convenient astringent gargle and wash. Its principal use is as a chemical test, especially for the persalts of iron, gelatin, and the vegetable alkaloids. After it has been kept for some time its tannic acid becomes converted into gallic acid, and it then ceases to occasion precipitates in solutions of gelatin and of the vegetable alkaloids, although it still serves to detect iron. Paper impregnated with it, serves as a portable test for solutions of iron.

Unguentum Gallæ [U. S.], *Ointment of Galls* [*Ointment of Nutgall*].—Take of galls in very fine powder, eighty grains; simple ointment, one ounce. Mix thoroughly. [" Take of nutgall, in very fine powder, a troyounce; lard, seven troyounces. Mix them." U. S.]

Astringent.—Mixed with zinc ointment, it is applied to piles after the inflammatory stage is passed. Mr. B. Bell recommends an ointment composed of equal parts of powdered galls and hog's lard or butter, in external hemorrhoidal swellings.

Unguentum Gallæ cum Opio, *Ointment of Galls and Opium.*—Take of ointment of galls, one ounce; opium, in powder, thirty-two grains. Mix thoroughly.

This ointment is intermediate in strength between the London and Edinburgh ointments, being about twice as strong as the former.—An excellent astringent application to *blind piles* (*i. e.* piles without hemorrhage) and prolapsus ani. The opium diminishes the pain which the galls might otherwise occasion, when the hemorrhoidal tumors are very sensible. From twenty to thirty grains of camphor are frequently added to this ointment. Dr. Carson remarks that a smoother ointment, and one which leaves no gritty or rough deposit on irritable surfaces, is prepared by adding sixty grains of an aqueous extract of galls to one ounce of simple ointment.

## Acidum Tannicum [U. S.], *Tannic Acid.*

An acid, $C_{54}H_{22}O_{34}$, obtained from galls.

*Preparation.*—Take of galls, in coarse powder, eight ounces; ether, three pints; distilled water, five fluidounces. Mix the water and ether by agitation, and after a few minutes pour the ethereal solution in successive portions upon the galls previously introduced into a glass or porcelain percolator with a receiver so attached as to prevent loss of ether from evaporation. The liquid which accumulates in the receiver consists of two distinct strata; separate the heavier liquid, evaporate it to dryness on a water-bath, and complete the drying in a hot-air chamber, the temperature of which should not exceed 212°. From the lighter liquid the ether may be recovered by distillation. [" Take of nutgall, in fine powder, ether, each, a sufficient quantity. Expose the nutgall to a damp atmosphere for twenty-four hours, and then mix it with sufficient ether, previously washed with water, to form a soft paste. Set this aside, covered closely, for six hours; then, having quickly enveloped it in a close canvas cloth, express it powerfully between tinned plates, so as to obtain the liquid portion. Reduce the resulting cake to powder, and mix it with sufficient ether, shaken with one-sixteenth of its bulk of water to form again a soft paste, and express as before. Mix the liquids, and expose the mixture to spontaneous evaporation until it assumes a syrupy consistence; then spread it on glass or tinned plates, and dry it quickly in a drying closet. Lastly, remove the dry residue from the plates with a spatula, and keep it in a well-stopped bottle." U. S.]

The ether employed, after the agitation which removes the alcohol, contains about 10 per cent. of water. The tannic acid is at first dissolved by the ether, but is afterwards separated, in the form of a thick syrup, by the water contained in the ether. The syrupy stratum consists chiefly of the water holding the tannic acid in solution.

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

*Description.*—Tannic acid is a spongy, brilliant, light, odorless, white, or commonly yellowish, uncrystalline solid. It dissolves in water, alcohol, and ether; but less so in ether than in alcohol. Water is its best solvent.

*Properties.*—The aqueous solution, when boiled, becomes turbid. Provided it be not exposed to air, but kept in a bottle quite full, the aqueous solution may be preserved for a long time without undergoing chemical change. If exposed to air, it becomes dark-colored, mouldy, and loses its property of precipitating gelatin; but it does not appear that there is any production of gallic acid when the tannic acid is pure. The conversion of tannic acid into gallic acid appears to depend on a species of fermentation, from the presence of some nitrogenous matter, of the same nature as ordinary ferment, contained in the crude gall. The conversion to gallic acid is prevented by all those substances which destroy the fermenting properties of yeast. It has been hitherto considered that the excess of oxygen is necessary to this change; but according to Regnault, oxygen or air is not required; and in this respect the gallic resembles the alcoholic fermentation. Regnault states that gallic acid is the result of the decomposition of an extract of galls, even in a vessel hermetically sealed. It is not improbable, therefore, that the production of gallic acid may be in some cases increased by the addition of ordinary ferment (yeast), as it is often procured with difficulty and only in small quantity from common galls.

The following are the *characteristics* of this substance: It has an intensely astringent taste, and a slightly acid reaction. It produces with a solution of gelatin a white precipitate (*tannate of gelatin*); with a solution of a persalt of iron, a deep blue compound (*tannate of iron*); and with solutions of the vegetable alkaloids, white precipitates (*tannates*), slightly soluble in water, but very soluble in acetic acid. The mineral acids also cause precipitates with concentrated solutions of tannic acid, as do the alkalies and their carbonates. The carbonates are decomposed by a strong solution of it. The diluted sulphuric or hydrochloric acid, on boiling, converts it into gallic acid. Gelatinous alumina rapidly absorbs tannic acid from its solution, and forms an insoluble compound with it. When a few drops of a solution of this acid are added to a glass of lime-water, a dense white precipitate is formed (*tannate of lime*), acquiring rapidly a gray and a dingy green color. It thence passes through various shades to a dark purple-brown color. Tannic acid is dissolved by strong sulphuric acid, forming a dingy purple-brown solution, almost black. It does not produce the red or crimson color of gallic acid under the same circumstances, and there is a black deposit when it is added to water.

*Test.*—It leaves no residue when burned with free access of air.

*Physiological Effects.*—Tannic acid is a powerful astringent. As a *topical* remedy, it is probably the most powerful of all vegetable astringents or styptics. Its chemical action on fibrin, albumen, and gelatin explains this. It is the active principle of a very large proportion of vegetable astringents. Tannic acid operates as a constipating agent, when given in a sufficient dose and frequently repeated. The *remote* effects of tannic acid are not so obvious, but they appear to be astringent, though in a much feebler degree. As the tannic acid becomes changed into gallic acid during its passage through the system, it is probably the latter agent which operates on remote parts as an astringent when tannic acid is administered. If this opinion be correct, tannic acid would act, as Dr. Garrod has suggested, less powerfully, as a remote astringent than an equal weight of gallic acid. But, as a topical astringent, tannic is far more powerful than gallic acid; because its chemical reaction on albumen, gelatin, and fibrin is energetic, while gallic acid exerts no action on these principles.

*Therapeutics.*—Tannic acid is used as an astringent chiefly in hemorrhages and profuse secretions; and also to constringe relaxed fibres. In hemorrhages it has been used both topically as a styptic (in bleeding gums, piles, and uterine hemorrhage), and remotely as an astringent (in hemorrhage from the lungs, stomach, bowels, kidneys, and uterus). In chronic fluxes it has likewise been employed both as a topical and remote remedy: topically, in gonorrhœa, gleet, leucorrhœa, ophthalmia, and cystirrhœa. It has been recommended to restrain the phthisical sweating. To constringe fibres, it is applied to spongy gums and prolapsed bowel. It has likewise been given as an antidote to check excessive vomiting from ipecacuan or emetia.

*Administration.*—Tannic acid may be administered in doses of from three to ten or more grains, in powder, pill, or solution. When we employ it as a remote agent, the pill-form seems to be the most appropriate mode of exhibition. As a lotion or injection, it may be used in the form of aqueous solution, containing from four to six or more grains in the fluidounce. It has also been employed in the form of ointment, composed of a quarter of an ounce of the acid dissolved in a quarter of an ounce of distilled water, and mixed with an ounce and a half of lard.

*Pharmaceutic Use.*—The officinal preparations are the lozenge and the suppository. Tannic acid is also employed as a reagent or test. Its solution should be made fresh when used, and preserved in a bottle kept full.

TROCHISCI ACIDI TANNICI, *Tannin Lozenges.*—Take of tannic acid, three hundred and sixty grains; tincture of tolu, half a fluidounce; refined sugar, in powder, twenty-five ounces; gum arabic, in powder, one ounce; mucilage of gum arabic, two fluidounces; boiling distilled water, one fluidounce. Dissolve the tannic acid in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and with the gum and the sugar, also previously well mixed, form a proper mass. Divide into seven hundred and twenty lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains half a grain of tannic acid. This is a convenient and very effectual mode of employing tannic acid in relaxed sore throat and loss of voice, the astringent substance being applied slowly and continuously to the relaxed part.

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

To be used as a local astringent in diarrhœa.

[UNGUENTUM ACIDI TANNICI, U. S., *Ointment of Tannic Acid.*—"Take of tannic acid, thirty grains; water, half a fluidrachm; lard, a troyounce. Rub the acid first with the water, and then with the lard, until they are thoroughly mixed, avoiding the use of an iron spatula." U. S. A very elegant, astringent ointment; preferable to the ointment of galls in piles, because it is always perfectly smooth, whereas the latter, if at all carelessly prepared, contains little irritating fragments of the galls.—W.]

### Acidum Gallicum [U. S.], *Gallic Acid.*

An acid, $3HO,C_{14}H_3O_7+2HO$, prepared from galls.

*Preparation.*—Take of galls, in coarse powder, one pound; distilled water, a sufficiency. Place the galls in a porcelain dish, pour on as much of the water as will convert them into a thick paste, and keep them in this moistened condition for six weeks, at a temperature of between 60° and 70°, adding distilled water from time to time to supply what is lost by evaporation. At the end of that time boil the paste for twenty minutes with forty-five fluidounces 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 by a temperature not exceeding 212°. By boiling the undissolved portion of the galls with forty-five additional ounces of water, filtering into a capsule containing the liquor decanted from the crystals in the preceding process, evaporating to the bulk of ten ounces, and cooling to 80°, an additional quantity of acid may be obtained, which, however, is usually a little darker in color than the product of the previous crystallization.

This is the first of the two processes given in the Dublin Pharmacopœia. [" Take of nutgall, in fine powder, thirty-six troyounces; purified animal charcoal, distilled water, each, a sufficient quantity. Mix the nutgall with sufficient distilled water to form a thin paste, and expose the mixture to the air, in a shallow, glass or porcelain vessel in a warm place, for a month, occasionally stirring it with a glass rod, and adding from time to time sufficient distilled water to preserve the semi-fluid consistence. Then submit the paste to expression, and, rejecting the expressed liquid, boil the residue in eight pints of distilled water for a few minutes, and filter while hot through purified animal charcoal. Set the liquid aside that crystals may form, and dry them on bibulous paper. If the crystals be not sufficiently free from color, they may be purified by dissolving them in boiling distilled water, filtering through a fresh portion of purified animal charcoal, and again crystallizing." U. S.] In this process the tannic acid of the galls is assumed to absorb atmospheric oxygen, and to be converted into gallic acid, carbonic acid, and water. This process is favored by the presence of a nitrogenized matter, which acts as a ferment; and the decomposition is termed the *gallic fermentation.*

*Officinal Characters.*—In acicular prisms; sometimes white, but generally of a pale fawn-color; very sparingly soluble in cold water, but freely so in boiling water, rectified spirit, and ether. It gives a bluish-black precipitate with a persalt of iron. [" It is soluble in one hundred parts of cold, and in three of boiling water." U. S.]

*Properties.*—Pure gallic acid is a colorless, crystallizable acid, with an acidulous and styptic taste. Its solutions in water, alcohol, and ether have a strongly acid reaction. It produces a deep blue color with the salts of the peroxide of iron, in which circumstance it agrees with tannic acid; but it differs from the latter acid in not precipitating solutions of gelatin, albumen, or the salts of the alkaloids. To detect gallic acid mixed with tannic acid, the latter may be previously removed from its solution by precipitation with a solution of gelatin. The gallic acid may then be detected by the salts of the peroxide of iron. It does not occasion any precipitate with the salts of the pure protoxide of iron. Its aqueous solution is not decomposed by keeping, except when exposed to air. It then becomes brown, a vegetable mould is formed on the surface, and the liquid acquires the property of precipitating gelatin. Gallic acid, when in excess, forms stable salts with alkaline bases; but when the alkali predominates, oxygen is absorbed, and the liquid undergoes various changes of color. Potash and ammonia poured on crystals of gallic acid produce a rich red-colored solution. A small quantity of a solution of gallic acid added to a glass of lime-water produces at first a white precipitate (*gallate of lime*), which rapidly becomes blue, and passes through a violet tint to a dark purple color. The crystals dissolved in boiling concentrated sulphuric acid produce a rich crimson-red solution, and when poured into cold water a red crystalline precipitate is formed, having the formula $C_{14}H_4O_8$, the gallic acid merely losing two equivalents of water. It deoxidizes nitric acid, producing a red color like that caused by morphia. When a solution of gallic acid is added to a solution of nitrate of silver, there is no precipitate, but the silver is slowly reduced. If the mixture be warmed, the reduction of the metal is instantaneous. On account of this property, gallic acid is much used in photography. Gallic acid equally reduces the solutions of gold.

*Tests.*—It leaves no residue when burned with free access of air. Its solution gives no precipitate with gelatin.

*Physiological Effects.*—Gallic acid acts principally as a remote astringent: as a topical agent it is greatly inferior to tannic acid. Unlike tannic acid, it causes precipitates neither in gelatinous nor in albuminous solutions; and a piece of skin does not absorb gallic acid from its aqueous solution, as it does tannic acid from its solution. Its chemical action on the constituents of the animal tissues is thus much weaker than that of tannic acid. No obvious effects result from the introduction of a few grains into the stomach. Twenty-four grains have produced a sweetish taste and a slight feeling of internal heat, but no other effect. For reasons already stated, it is probable that, in equal doses, it is more powerful as a remote astringent than tannic acid.

*Therapeutics.*—Dr. Todd says that in all cases of hemorrhage—whether hæmoptysis, hæmatemesis, hæmaturia, or any other form dependent on hemorrhagic tendency—he considers gallic acid to be the best styptic we possess. [It is now very frequently used to restrain internal hemorrhage, though its power is scarcely equal to that of acetate of lead. In acute and even in chronic renal dropsy, and the dropsy of scarlatina, I have also found it very serviceable in diminishing the albumen.—Ed.] In cases of acute tonsillitis and scarlatinal sore throat, great benefit is derived from the use of the undermentioned gargle: ℞. Acidi Gallici, gr. xl; Liq. Sodæ Chloratæ, fl. drs. ij; Aquæ destillatæ calidæ, fl. oz. viij. M. This gargle assumes a dark olive-brown color, owing to the action of the excess of alkali in the chlorinated soda upon the gallic acid, but the taste is said not to be unpleasant.

*Administration.*—The *dose* of it is from three to ten grains or more three or four times a day. It may be used in the same forms as tannic acid.

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## ULMACEÆ, *Mirbel.* The Elm Order.

## ULMUS CAMPESTRIS, *Linn.*

### The Broad-leaved Elm. Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—A large *tree*, with a rugged bark. *Leaves* alternate, broadly ovate, very unequal at the base, acuminate, doubly-serrated, usually rough. *Flowers* hermaphrodite, reddish-brown, in dense clusters. *Calyx* campanulate, four or five-toothed. *Stamens* five. *Ovary* superior, compressed, two-celled, with solitary *ovules*. *Styles* two, diverging. *Fruit* green and leaf-like, broadly ovate or orbicular, slightly notched, one-seeded.—*Woodv.* pl. 197, page 540.

*Habitat.*—Southern parts of England.

### Ulmus, *Elm Bark.*

The dried inner bark, deprived of its outer layers; from trees indigenous and cultivated in Britain.

*Officinal 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 gelatin.

*Composition.*—Elm bark contains about twenty per cent. of *gum* and *ulmin*, and three per cent. of *tannin*, and a little *resin*. An infusion becomes green on the addition of a persalt of iron (*tannate of iron*), and forms a precipitate with a solution of gelatin (*tannate of gelatin.*)

*Therapeutics.*—A decoction has been recommended in cutaneous, especially scaly, eruptions. Dr. Lettsom found it successful in ichthyosis. It has been employed as a cheap substitute for sarsaparilla, but has now almost fallen into disuse.

Although it has been retained in the Pharmacopœia, no preparation of it has been given.

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## [ULMUS FULVA, *Michaux. Slippery Elm.*

*Specific Characters.*—*Leaves* very scabrous above, rather unequal, and somewhat cordate at base. *Buds* clothed with a fulvous tomentum. *Flowers* in dense sub-sessile fascicles. *Samara* orbicular, naked on the margin. (*Beck. Bot.*)

This tree is sometimes called, also, red elm. It is from twenty to forty feet high, with rugate branches. The leaves are from four to six inches long, and two or three inches broad, lanceolate oval, or obovate oblong, conspicuously acuminate, doubly serrate, the upper surface scabrous, beneath tomentose pubescent, especially along the nerves and midrib, petioles about one-third of an inch long, pubescent. *Stipules* pilose. *Flowers* on short pedicels, numerous, in dense lateral clusters. *Calyx* about seven cleft; segments obtuse, clothed, and ciliate, with a reddish tawny pubescence. *Stamens* often seven, much exserted; anthers dark-purple. *Styles* granular pubescent, purple. *Samara* orbicular, about half an inch in diameter, radiately veined, pubescent in the centre, on a slender pedicel as long as the calyx; margin smooth, cleft at apex between the styles; segments acuminate by the pubescent adnate styles, and so incurved and overlapped as to give the margin the appearance of being entire at apex. (*Darlington.*)

This plant is common in the United States, growing in low grounds, rich woods, and along fences.

**Ulmus Fulva,** *Slippery Elm Bark* (Ulmus, Pharm. 1850), Mat. Med List, U. S. P.

The inner bark of Ulmus fulva (*Michaux*).

The inner bark is fibrous, and is removed from the trunk and large branches of the trees in long pieces. It is found in the shops in this form or ground into powder. It is bland and demulcent, and used as a substitute for flaxseed and other demulcent articles. From the powder can be made an excellent poultice by mixing with the requisite quantity of hot water. The infusion is used as a demulcent in cases of dysentery, irritation of the mucous membrane of the urinary organs, bronchi, &c.

Mucilago Ulmi, U. S., *Mucilage of Slippery Elm Bark*, Infusum Ulmi, Pharm. 1850.—"Take of slippery elm bark, sliced and bruised, a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." To be taken *ad libitum*, as a demulcent, nutritious drink.—W.]

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## CANNABINACEÆ, *Lindl.* The Hemp Order.

## CANNABIS SATIVA, *Linn.*

### Common Hemp. Diœcia, Pentandria, *Linn. Syst.*

*Botanic Character.*—Annual. *Stem* three to six feet high, erect, branched, angular. *Leaves* on long weak petioles, digitate, serrated, roughish. *Stipules* subulate. *Flowers* diœcious. *Males: Flowers* racemose. *Calyx* five-parted, imbricated. *Stamens* five. *Females: Flowers* in spikes. *Calyx* (bract?) one-leaved, acuminate, rolled round the ovary. *Ovary* roundish. *Style* short. *Stigmas* two, filiform, pubescent. *Fruit*, one-celled, two-valved. The whole plant has a clammy feel.—*Rheede*, *Hort. Malab.* plate 61, vol. x.

Fig. 95.

*Cannabis sativa.*

*Habitat.*—Cultivated in India. The plant which grows in India, and has been described by some botanists under the name of *Cannabis indica*, or *Indian hemp*, does not appear to possess any specific differences from the common hemp. Roxburgh and most other distinguished botanists have accordingly considered it identical with the *Cannabis sativa*, *Linn.*

### Cannabis Indica, *Indian Hemp.*

The flowering tops of the female plant from which the resin has not been removed, dried.

*Officinal 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 color and a characteristic odor.

*Description.*—The dried hemp plant which has flowered, and from which the resin has not been removed, is sold, under the name of Gunjah, in the Calcutta bazaars, for smoking chiefly, in bundles of about two feet long and three inches in diameter, each containing twenty-four plants. That which I have received from Dr. O'Shaughnessy, and also found in commerce, consists of cylindrical or fusiform masses (about the size and shape of the fingers) of a grayish or greenish-brown color, and composed of stems, leaves, and petioles pressed together. It has a faint odor and feeble, bitterish taste. The more abundant resinous secretion of the Indian plant is easily accounted for, as suggested by Dr. Royle, by its exposure to greater light and heat. The hemp cultivated in Edinburgh by Dr. Christison exhibited no resin. Plants collected in the Regent's Park contained about one-tenth as much as oriental plants. Dr. Fronmuller, of Fuerth, says that French and German hemp appear to be richer in resin, Italian still more so; while Greece and Asia Minor yield quite a powerful product; but the produce of Persia and India far exceeds them all. The resinous exudation removed from the leaves, slender stems, and flowers, is called *churrus.* It is collected in India, Herat, and Persia, and is employed for its intoxicating effects in the East, but is not officinal in this country.

*Composition.*—Besides the resin (*cannabin*), which appears to be the active ingredient, hemp contains some gum, extractive, and a little ethereal oil, about twelve drops in twenty-eight ounces (Fronmuller), but there is no evidence at present that the oil possesses any activity.

*History.*—This plant was well known to the ancient Greeks and Romans, but they do not appear to have been acquainted with its narcotic properties. Dioscorides merely mentions that the expressed juice of the seeds of κάνναβις allays ear-ache, and the same statement is made by Galen. Herodotus mentions it, and states that the Scythians threw the seeds on red-hot stones, and used the perfumed vapor thereby obtained as a bath, which excited from them cries of exultation. This, I presume, refers to the intoxicating properties of its smoke. The hemp may have been, as Dr. Royle suggests, the "assuager of grief," or the *nepenthes* (φάρμακον νηπενθές) of which Homer speaks as having been given by Helen to Telemachus in the house of Menelaus. Helen is stated to have received the plant from a woman of Egyptian Thebes. It is known in India as the "increaser of pleasure," the "exciter of desire," the "cementer of friendship," the "cause of a reeling gait," and the "laughter-mover."

*Physiological Effects.*—Indian hemp owes its celebrity chiefly to its exhilarating and inebriating effects on orientals. In these the inebriation or delirium produced by it is usually of an agreeable or cheerful character, exciting the individual to laugh, dance, and sing, and to commit various extravagances—acting as an aphrodisiac, and augmenting the appetite for food. In some it occasions a kind of reverie. It renders others excitable and quarrelsome, and disposes to acts of violence. It may also produce a cataleptic condition, in which the muscles are moderately contracted, but flexible and pliant, and the limbs retain any position or attitude in which they may be placed. The following illustrative cases are taken from Dr. O'Shaughnessy's paper on Indian hemp: "At two P. M. a grain of the resin of hemp was given to a rheumatic patient. At four P. M. he was very talkative, sang, called loudly for an extra supply of food, and declared himself in perfect health. At six P. M. he was asleep. At eight P. M. he was found insensible, but breathing with perfect regularity, his pulse and skin natural, and the pupils freely contractile on the approach of light. Happening by chance to lift up the patient's arm, I found that it remained in the posture in which I placed it. It required but a very brief examination of the limbs to find that the patient had, by the influence of this narcotic, been thrown into the state of *catalepsy*. We raised him to a sitting posture, and placed his arms and limbs in every imaginable attitude. A waxen figure could not be more pliant or more stationary in each position, no matter how contrary to the natural influence of gravity on the part. To all impressions he was meanwhile almost insensible. He continued in this state till one A. M., when consciousness and voluntary motion quickly returned. Another who had taken the same dose, fell asleep, but was aroused by the noise in the ward. He seemed vastly amused at the strange aspects of the statue-like attitudes in which the first patient had been placed. On a sudden he uttered a loud peal of laughter, and exclaimed that four spirits were springing with his bed into the air. In vain we attempted to pacify him; his laughter became momentarily more and more uncontrollable. We now observed that his limbs were rather rigid, and in a few minutes more his arms and legs could be bent and would remain in any desired position. His limbs in less than an hour gained their natural condition, and in two hours he expressed himself perfectly well and excessively hungry." In Europeans I have never heard of a cataleptic state being produced by this drug. In a case of tetanus under my care in the London Hospital, and which was carefully watched by Dr. O'Shaughnessy and myself, the resinous extract of Indian hemp was given in increasing doses up to twenty grains. It caused stupor and cessation of spasms, but no perfectly cataleptic state. The only tendency to this condition which was observed was when the arm of the patient was lifted and then cautiously let go: it fell slowly and gradually, not quickly as it would have done under ordinary conditions; the patient was at this time quite insensible. [The exhilarating effects so constantly experienced by Asiatics, appears to be almost equally unknown in this country. The cause of this may be in great part due to the difference in the European and Asiatic temperaments; but probably the hemp loses some of its properties during its transmission; for in the author's large work are described by Drs. Taylor and Rees the inebriating and phantasmic effects on Mr. B. Taylor while at Damascus, which are not surpassed by any of the extravagances to which it gives rise in Asiatics.—Ed.] Dr. Fronmuller thinks it probable that the Indian hemp contains some ethereal ingredient which is dissipated on the passage. (See *Composition*.) Dr. O'Shaughnessy, when in England, satisfied himself of the difference of the effect of Indian hemp in this country and in Bengal; and he observes, that while in India he had seen marked effects from half a grain of the extract, or even less, and had been accustomed to consider one grain and a half a large dose; in England he had given ten or twelve or more grains to produce the desired effect. Dr. Fronmuller, who has used it in 1,000 cases, considers eight grains of the extract the smallest dose. By internal use it acts as a *mydriatic*, causing preternatural dilatation of the pupil. But Dr. Lawrie states that when applied around the eye it does not cause dilatation of the pupil. Indian hemp does not appear much to affect the secretions. It neither excites nausea nor lessens the appetite. It neither causes dryness of the tongue nor constipation of the bowels. It does not appear to check or otherwise affect the bronchial secretions.

*Therapeutics.*—Indian hemp is chiefly employed as a medicine for its hypnotic, anodyne, and antispasmodic properties; occasionally, also, as a phrenic. As a *hypnotic*, I have used it with advantage in spirit-drinkers, and have succeeded in one or two cases in producing sleep with it where large doses of morphia had failed. Dr. Fronmuller ranks it next to opium. As an *anodyne* it is, I think, in general, decidedly inferior to opium; but in acute and subacute rheumatism, in gout, and in neuralgia, it frequently alleviates the pain. As an *anæsthetic*, Mr. Donovan found that under its influence his sense of touch and feeling gradually became obtuse, until at length he lost all feeling unless he pinched himself severely. As an *antispasmodic*, it has been employed in tetanus, hydrophobia, and chorea. In the cases of tetanus (both traumatic and idiopathic) and of hydrophobia which I have seen treated with it, it completely failed to give permanent relief. Mr. O'Brien treated seven cases of tetanus in the native hospital, Calcutta, with ten grain doses of the extract. Four of these recovered. Professor Miller, of Edinburgh, records three successful cases of traumatic tetanus in children about seven years of age, who took thirty drops of the tincture every half hour, and all of whom recovered; but most of the cases recorded are examples of its failure. In chorea I have found it serviceable, sometimes as an antispasmodic, at others as a hypnotic; and the same may be said of its use in hysteria. As a *phrenic*, or medicinal agent affecting the mental functions, Indian hemp has also been employed. Dr. Clendinning speaks favorably of its use as a nervine stimulant, in removing languor and anxiety, and raising the pulse and spirits; and Dr. Conolly thinks that it may be useful in some chronic forms of mania. Dr. Sutherland has not obtained any good effect from it.

EXTRACTUM CANNABIS INDICÆ, *Extract of Indian Hemp.* [EXTRACTUM CANNABIS, U. S., *Extract of Hemp.*]—Take of Indian hemp, in coarse powder, one pound; rectified spirit, four pints. Macerate the hemp in the spirit for seven days, and press out the tincture. Distil off the spirit, and evaporate by a water bath to a proper consistence. ["An alcoholic extract of the dried tops of Cannabis sativa, variety *Indica.*" Mat. Med. List, U. S. P.]

Mr. Robertson, of Calcutta, obtained from one cwt. of the plant about eight lbs. of alcoholic extract.

[EXTRACTUM CANNABIS PURIFICATUM, U. S., *Purified Extract of Hemp.*—"Take of extract of hemp, two troyounces; alcohol, a sufficient quantity. Rub the extract with two fluidounces of alcohol until they are thoroughly mixed; and, having added twelve fluidounces of alcohol, allow the mixture to macerate for twenty-four hours. Then filter the tincture through paper, passing sufficient alcohol, through the filter, to exhaust the dregs completely. Lastly, by means of a water bath, at a temperature not exceeding 160°, evaporate to dryness." U. S.]

The *dose* of the alcoholic extract of Indian hemp is generally from one grain to five. I have usually found one grain of the extract kept in the London shops to act as a narcotic. The Messrs. Smith state that two-thirds of a grain of the pure resin produced on themselves and others powerful narcotic effects. In a case of tetanus under my care in the London Hospital, the dose of the extract (supplied by Dr. O'Shaughnessy, who watched the case with me) was gradually increased to gr. xx. [I have already stated that Dr. O'Shaughnessy considered that ten or twelve grains are required in England to produce the effects which follow one grain in India, and that Dr. Fronmuller considers eight grains of the extract *the smallest dose.*—ED.] [There is no other officinal drug which is at once so powerful and so utterly uncertain. I have known one-eighth of a grain, repeated every three or four hours, after three or four doses, to cause great mental disturbance, amounting amost to delirium. On the other hand, ten or even fifteen grains frequently fail to produce any symptoms. One great cause of these differences is no doubt the bad quality and worthlessness of much of the extract kept in the shops—but it has seemed to me that there is a very remarkable difference in the susceptibility of patients to the influence of the same preparation. Any one who habitually used five or even two grains of the purified extract as a *commencing* dose, would certainly sooner or later meet with a case in which it would produce serious and alarming, if not fatal, symptoms. The practitioner should be assured that his preparation is good and then carefully feel his way with the small fractional doses.—W.]

It may be administered in the form of pill; or better, by diffusion through an emulsion (prepared by rubbing the extract with olive oil, in a warm mortar, and gradually adding mucilage, and afterwards water.)

Tinctura Cannabis Indicæ, *Tincture of Indian Hemp.* [Tinctura Cannabis, U. S.]—Take of extract of Indian hemp, one ounce; rectified spirit, one pint. Dissolve the extract of hemp in the spirit. ["Take of purified extract of hemp, three hundred and sixty grains; alcohol, a pint. Dissolve the extract in the alcohol, and filter through paper." U. S.]

The tincture is prepared from the alcoholic extract instead of from the herb, to secure greater uniformity of strength, as the latter varies much in the quantity of resinous secretion. The proportions are those directed to be used by Dr. O'Shaughnessy; but, probably by a typographical error, he has ordered *proof* spirit instead of rectified spirit. The tincture may be administered in an emulsion or mucilaginous mixture, or in water sweetened with sugar. It should be swallowed soon after it has been added to the aqueous liquid, as the resin is precipitated, and is apt to adhere to the side of the vessel.

Dose from ♏x to fl. drm. j. Dr. O'Shaughnessy gives in tetanus a fluidrachm every half hour until the paroxysms cease or catalepsy is induced; in cholera, ten drops every half hour. [If, however, we adopt the doses of the extract recommended for Europeans by Dr. O'Shaughnessy and Dr. Fronmuller, we shall probably find it necessary to give somewhat larger doses of the tincture, as one fluidrachm is only equivalent to two and a half grains of the extract. I have found one-drachm doses well borne in chorea by children twelve or fourteen years of age. —Ed.]

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## HUMULUS LUPULUS, *Linn.*

### The Hop. Diœcia, Pentandria, *Linn. Syst.*

*Botanic Character.*—A perennial plant. *Stems* annual, long, weak, climbing, scabrous. *Leaves* opposite, petiolate, three to five-lobed, sharply toothed, rough. *Flowers* diœcious, greenish-yellow. *Male flowers* in loose *panicles*. *Calyx* of five segments. *Stamens* five. *Female flowers* in ovoid heads or catkins (*strobiles*), consisting of large persistent imbricated *bracts*, each having a flower in its axil. *Calyx* a solitary obtuse sepal, enfolding the ovary. *Ovary* one. *Styles* two. *Fruit* (*achenium*) small, hard, nearly globular. *Seed* one, with an arillus. —*Steph.* and *Church.* pl. 41.

*Habitat.*—Thickets and hedges in many parts of Europe. Indigenous. The female plant is cultivated in several counties in England, especially

Fig. 96.


*Humulus lupulus.* *a.* The male flower. *b.* The female ditto.

Kent, Sussex, Surry, Worcestershire, and Herefordshire. The *gathering* or *picking* takes place in September. The strobiles are dried in kilns.

### Lupulus, *Hop.*

### [Humulus. Mat. Med. List, U. S. P.]

The dried catkins of the female plant, cultivated in England.

*Officinal Characters.*—Scales of a greenish-yellow color, with an adherent golden-yellow powder (Lupuline) at their base; odor aromatic, taste bitter.

### [Lupulina, *Lupulin.* Mat. Med List, U. S. P.

Fig. 97.

*Dried Lupulinic grain, with its hilum (magnified.*

"The yellow powder attached to the strobiles of Humulus Lupulus." U. S.]

*Description.*—The strobiles of the hop, in commerce termed *hops*, consist of scales, nuts, and lupulinic glands or grains. The *scales* are the enlarged and persistent bracts, which inclose the nuts; they are ovate, membranous, and at their base glandular. The *nuts*, or achenes, are covered with aromatic, superficial, globose glands. These *lupulinic glands* or *grains* (commonly termed *yellow powder* or *lupuline*) are the most important parts of the strobiles. They are rounded, of a cellular texture, golden-yellow, and somewhat transparent. They are sessile, or nearly so. The common centre, around which the cells are arranged, has been called the *hilum*. By drying, they lose their spherical form. Placed in water they give out an immense number of minute globules. Under other, circumstances they become ruptured, and allow an inner envelope to escape.

*Composition.*—According to Payen, the lupulinic grains contain two per cent. of *volatile oil*, 10.30 of *bitter principle*, and 50 to 55 of *resin*. The scales also contain *tannin*. *Volatile Oil of Hops* resides in the lupulinic grains. It is obtained by submitting these, or hops which contain them, to distillation with water. Its color is yellowish, its odor that of hops, its taste acrid. It is soluble in water, but still more so in alcohol and ether. Its specific gravity is 0.910. By keeping, it becomes resinified. It is said to act on the system as a narcotic. The water which comes over, in distillation, with the oil, contains acetate of ammonia, and blackens silver, from which circumstance the presence of sulphur is inferred. *Bitter Principle of Hops*, *Lupulite*, is procured by treating the aqueous extract of the lupulinic grains, united with a little lime, with alcohol. The alcoholic tincture is to be evaporated to dryness, the residue treated with water, and the solution evaporated. The residue, when washed with ether, is lupulite. It is neutral, uncrystallizable, yellowish-white, very bitter, soluble in twenty parts of water, very soluble in alcohol, and slightly so in ether. The aqueous solution froths by agitation; it forms no precipitate with either tincture of galls or acetate of lead. Lupulite contains no nitrogen. It is devoid of the narcotic property of the oil. *Tannic Acid*, *Tannin.*—In the manufacture of beer, this principle precipitates the nitrogenized or albuminous matter of the barley, and therefore serves for clarification. All genuine beer, however, contains tannic acid. The *resin* is of a golden yellow color, and becomes orange-yellow by exposure to the air. It is soluble in both alcohol and ether. It appears to be the oil changed into resin, partly by oxidizement. A decoction of hops reddens litmus, owing to the presence of free acid, sulphuric acid having been formed in the common process of drying hops with the vapor of burning sulphur mixed with coke or charcoal. Perchloride of iron strikes an olive-green color (*tannate of iron*). A solution of gelatin renders the filtered decoction turbid (*tannate of gelatin*).

*Physiological Effects.*—The odorous emanations of hops (vapor of the volatile oil) possess narcotic properties. Hence, a pillow of hops promotes sleep, as I have several times witnessed. Moreover, we are told that stupor has occasionally been induced in persons who have remained for a considerable time in hop warehouses. The lupulinic grains are aromatic and tonic. They appear also to possess soothing, tranquillizing, and, in a slight degree, sedative and soporific properties. But the existence of any narcotic quality has been strongly denied by Dr. Bigsby, Magendie, and others. Dr. Maton found that it allayed pain, produced sleep, and reduced the frequency of the pulse from ninety-six to sixty in twenty-four hours. Both infusion and tincture of hops are mild but agreeable aromatic tonics. Their sedative, soporific, and anodyne properties are very uncertain.

*Therapeutics.*—A pillow of hops is occasionally employed in mania and other cases in which inquietude and restlessness prevail, and in which the use of opium is considered objectionable. In hop countries it is a popular remedy for want of sleep. The benefit said to have been obtained from it by George III., for whom it was prescribed by Dr. Willis, in 1787, brought it into more general use. Hops are given internally to relieve restlessness consequent upon exhaustion and fatigue, and to induce sleep in the watchfulness of mania and of other maladies; to calm nervous irritation, and to relieve pain in gout, arthritic rheumatism, and after accouchement. Though they sometimes produce the desired effect, they frequently fail to give relief. Dr. Maton used it, with good effect, as an anodyne in rheumatism. As a tonic, hops are applicable in dyspepsia. [Dr. J. R. Farre found both the tincture and extract very useful in gouty spasm of the stomach.—Ed.]

*Administration.*—The *Yellow Powder*, *Lupulinic Grains*, or *Lupuline*, separated from the strobiles by rubbing and sifting, may be taken in the form of powder or pills. This is the best preparation of hops for internal use. *Dose.*—Gr. vj to gr. xij.

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 water for one hour, then express the liquor, strain, and evaporate by a water-bath to the consistence of a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140° to a proper consistence.

This extract differs from the London and Edinburgh extracts in being prepared with spirit as well as with water. Hence it will contain the resin as well as the bitter principle and some of the volatile oil.

*Dose.*—Gr. v to gr. xx.

Infusum Lupuli, *Infusion of Hop* [Infusum Humuli, U. S., *Infusion of Hops*].—Take of hop, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for two hours, and strain.

The quantity of hop is a little increased in the present infusion, and the time of infusion diminished. ["Take of hops, half a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel and strain." U. S.]

*Dose.*—Fl. oz. j to fl. oz. ij.

Tinctura Lupuli, *Tincture of Hop* [Tinctura Humuli, U. S., *Tincture of Hops*].—Take of hop, two ounces and a half; proof spirit, one pint. Macerate the hop for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. ["Take of hops, in moderately coarse powder, five troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it very firmly in a cylindrical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

[*Preparations of Lupulin.*—As all of the active properties of hops reside in the lupulin, and as the amount of the latter in the hops varies very much, the preparations of the lupulin itself are very much more certain, less unequal than those of hops, and are therefore preferable.

Tinctura Lupulinæ, U. S., *Tincture of Lupulin.*—"Take of lupulin, four troyounces; alcohol, a sufficient quanity. Pack the lupulin in a narrow cylindrical percolator, and gradually pour alcohol upon it until two pints of tincture is obtained." *Dose*, fʒj to fʒiij in sweetened or mucilaginous water.

Extractum Lupulinæ Fluidum, U. S., *Fluid Extract of Lupulin.*—"Take of lupulin, sixteen troyounces; stronger alcohol, a sufficient quantity. Introduce the lupulin into a percolator, press it firmly, and, having covered it with a piece of muslin, pour upon it stronger alcohol very gradually until twelve fluidounces of tincture have passed. Set this aside in a close vessel, and continue the percolation until twenty fluidounces more of tincture have been obtained. Evaporate this, by means of a water-bath, at a temperature not exceeding 150° to four fluidounces, and mix it with the reserved tincture." U. S.

A fluidounce of this preparation represents a troyounce of the lupulin. *Dose*, f℥ss, best administered in syrup of gum arabic.

Oleoresina Lupulinæ, U. S., *Oleoresin of Lupulin.*—"Take of lupulin, twelve troyounces; ether a sufficient quantity. Put the lupulin into a narrow cylindrical percolator, press it firmly, and gradually pour ether upon it until thirty fluidounces of filtered liquid have passed. Recover from this, by distillation on a water-bath, eighteen fluidounces of ether, and expose the residue, in a capsule, until the remaining ether has evaporated. Lastly, keep the oleoresin in a wide-mouthed bottle, well stopped."

Lupulin yields all its active constituents to ether. The resulting extract is dark in mass, reddish-brown in thin layers, with the odor and taste of lupulin, of a semifluid consistency, and less than half the bulk of the original lupulin. *Dose*, gr. iij to vj, in pill.—W.]

## MORACEÆ, *Lindl.* The Mulberry Order.

## MORUS NIGRA, *Linn.* The Mulberry.

Monœcia, Tetrandria, *Linn. Syst.*

*Botanic Character.*—A small *tree*, with rugged bark. *Leaves* cordate, ovate, lobed, or unequally dentate, rough and thickish. *Flowers* greenish, monœcious. *Catkins* unisexual. *Calyx* four-lobed; the lobes concave. *Stamens* four, alternate with the segments of the calyx. *Ovary* three. *Stigmas* two. *Fruit* (*sorosis*) dark purple, consisting of the female flowers, become fleshy and coherent, inclosing a dry membranous one-seeded pericarp.—*Steph.* and *Church.* plate 39.

Fig. 98.

*Morus nigra.*

*Habitat.*—Native of Persia and China. Cultivated in Britain.

### Mori Succus, *Mulberry Juice.*

The juice of the ripe fruit.

*Officinal Characters.*—Of a dark violet color, with a faint odor, and an acidulous sweet taste.

*Description.*—The fruit has an agreeable odor; its taste is peculiar and pleasant. The juice is dark violet red.

*Composition.*—The juice has not been analyzed. Its principal constituents are *violet-red coloring matter*, *tartaric acid*, and *sugar*.

*Uses.*—Mulberry juice is employed for its color and flavor.

Syrupus Mori, *Syrup of Mulberries.*—Take of mulberry juice, one pint; refined sugar, two pounds; rectified spirit, two fluidounces and a half. Dissolve the sugar in the juice by a gentle heat, and set aside for twenty-four hours. Then remove the scum, and pour off the clear liquid from the dregs, if any appear. Lastly, add the spirit. The product should weigh three pounds six ounces, and should have the specific gravity 1.330.

*Used* as a coloring and flavoring substance. Its acidity prevents its being used with alkalies, earths, or their carbonates.

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## FICUS CARICA, *Linn.*

### The Fig.

Polygamia, Triœcia, *Linn. Syst.*

*Botanic Character.*—A small *tree*. *Leaves* cordate, palmate, scabrous above, pubescent beneath. *Flowers* monœcious, numerous, pedicellated, inclosed within a green, fleshy, hollow receptacle, which is umbilicated, and nearly closed at the apex, with two or three bracteal scales at the base. *Calyx* three to five-lobed; lobes acuminate. *Male flowers* near the umbilicus. *Stamens* three to five. *Female flowers: Style* 1. *Stigmas* 2. *Achenium* one-seeded, sunk into the pulpy receptacle. *Pericarp* fragile, crustaceous, *Steph.* and *Church.* plate 154.

Fig. 99.


*Ficus carica.*

*Habitat.*—Native of Asia and south of Europe. The specific name *Carica* is derived from Caria, in Asia Minor.

### Ficus, *Fig.*

The dried fruit; imported from Smyrna.

*Officinal Characters.*—Compressed, soft, but tough, brown, covered with a saccharine efflorescence, containing a viscid sweet pulp, and numerous small hard seeds (*achenia*).

*Description.*—Figs constitute that kind of collective fruit called by Mirbel a *syconus*. They consist of fleshy, hollow, pyriform receptacles, within which are numerous small seed-like bodies (*achenia*). In the unripe state they contain an acrid and bitter juice, but which, when they are ripe, is replaced by sugar. Ripe figs are dried in the sun, or in ovens, and are afterwards packed in drums and baskets, in which they are imported. Dried figs have a brownish or yellowish color, are somewhat translucent, and have a peculiar and agreeable odor. *Turkey* or *Smyrna figs* are the largest, most juicy, and sweetest; hence they are sometimes termed *fat figs;* they are distinguished into *pulled* and *flat*. They come from the provinces of Aiden and Erbeli. The finest are termed *Eleme* figs, *i. e., choice.*

*Physiological Effects.*—Figs are emollient, demulcent, and laxative.

*Uses.*—In the Old Testament we are informed that Hezekiah (who lived six hundred years before Christ) used figs as a topical application to a boil. [It was probably the fresh fruit that was used for this purpose. —Ed.]

Dried figs enter into the composition of *confection of senna.*

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## PIPERACEÆ, *DC.* The Pepper Order.

## PIPER NIGRUM, *Linn.*

### The Black Pepper.

Diandria, Trigynia, *Linn. Syst.*

*Botanic Character.—Stem* shrubby, round, trailing, or climbing, eight to twelve feet long, jointed, swollen, and rooting at the joints, dichotomous. *Leaves* ovate or elliptical, acuminate, subcordate, five to seven-ribbed, coriaceous, smooth, recurved at the margin, dark green above, glauco-greenish beneath. *Spikes* opposite the leaves, shortly pedunculated, pendulous, covered with flowers on all sides. *Flowers* unisexual or hermaphrodite. *Stamens* 3. *Fruits* distinct, baccate, sessile, one-seeded, at first green, then red, afterwards black.—*Woodv.* plate 187, page 513.

Fig. 100.

*Piper nigrum.*

*Habitat.*—Cultivated in various parts of India and its islands, and also in the West Indies.

### Piper, *Black Pepper.* [Mat. Med. List, U. S. P.]

The dried unripe berries; chiefly from the West (*East?*) Indies.

*Preparation.*—When any of the berries on a spike change from green to red, the whole are considered fit for gathering; for if they are allowed to become fully ripe, they are somewhat less acrid, and, moreover, easily drop off. When collected, they are spread out and dried in the sun, and the stalks separated by hand rubbing. They are afterwards winnowed. The dried and shrivelled berries constitute *black pepper.*

*Commerce.*—Pepper is imported from the East, not the West Indies, as stated in the Pharmacopœia. The pepper countries extend from about the longitude of 90° to that of 115° E., beyond which no pepper is to be found; and they reach from about 5° S. latitude to about 12° N., where it again ceases.

*Officinal Characters.*—Small, roundish, wrinkled; tegument brownish-black, containing a grayish-yellow globular seed. Odor aromatic. Taste pungent and bitterish.

*Description.*—*Black pepper* is round, covered externally with a brownish-black corrugated layer (the remains of the succulent portion of the berry), which may be readily removed by softening it in water. Internally we have a hard, whitish, spherical smooth seed, which is horny externally, but farinaceous internally. The taste of both seed and covering is acrid and hot. Amongst wholesale dealers three sorts are distinguished—*Malabar pepper* is the most valuable; it is *brownish-black,* free from stalks, and nearly free from dust. *Sumatra* and *Penang* or *Batavia* peppers are of inferior quality. They are black or earthy-colored, and generally contain from one to ten per cent. of dust and occasionally stalks. The grains of Penang pepper are large. The heavier the pepper is, the more it is esteemed in the market. The heaviest of all, being hard and smooth, is called *shot pepper.* Most dealers sift their black pepper before offering it for sale, and use the dust (called P. D.) for pickling or grinding.

*White pepper* is prepared from the best and soundest grains, gathered when quite ripe. These being soaked in water, swell and burst their tegument, which is afterwards carefully separated by drying in the sun, hand-rubbing and winnowing.

*Composition.*—Black pepper contains acrid soft resin, volatile oil, and piperin. *Resin of Pepper.*—This is a very acrid substance, soluble in alcohol and ether, but not so in volatile oils. It possesses in high perfection the acrid properties of pepper. Dissolved in ether, it was employed by Dr. Lucas in intermittents, and in two out of three cases with success. In the museum of the Pharmaceutical Society are two kinds of pepper resin; one called the "green resin," the other the "red resin." *Volatile Oil of Pepper*, $C_{20}H_{16}$.—When pure, this is colorless; it has the odor and taste of pepper. Its specific gravity is 0.9932. It has been used in some forms of dyspepsia depending on general debility. *Piperin*, $C_{34}H_{19}O_6N$.—This substance exists in black pepper, and probably also in cubebs. It is a crystalline substance, the crystals being rhombic prisms, with inclined bases. It fuses at 212° F., is insoluble in cold water, and is only very slightly soluble in boiling water. Its best solvent is alcohol: the solution throws down piperin when water is added to it. Ether dissolves it, but not so readily as alcohol. Acetic acid is likewise a solvent for it. Piperin, when pure, is white; but as met with in commerce it is usually straw-yellow. It is tasteless and inodorous. It was at first supposed to be an alkaloid; but Pelletier has shown that it possesses no analogy with vegetable alkaloids, and that it is related to the resins. With strong sulphuric acid it forms a blood-red liquid. Nitric acid colors it first greenish-yellow, then orange, and afterwards red. The action of hydrochloric acid is similar.

*Physiological Effects.*—The great acridity of pepper is recognized when we apply it to the tongue. On the skin it acts as a rubefacient and vesicant. Swallowed, it stimulates the stomach, creates a sensation of warmth in this viscus, and, when used in small doses, assists the digestive functions, but if given in large quantities induces an inflammatory condition. Cases have been reported in which inflammatory symptoms supervened after the immoderate use of pepper. On the vascular and secreting systems pepper acts as a stimulant. It accelerates the frequency of the pulse, promotes diaphoresis, and acts as an excitant to the mucous surfaces. It has long been regarded as a stimulant to the urino-genital apparatus. The opinion is supported by the well-known influence of the peppers over certain morbid conditions of these organs. Moreover the beneficial effect of pepper in some affections of the rectum leads us to suspect that this viscus is also influenced by these fruits.

*Therapeutics.*—The ancient Greeks were acquainted with pepper (πέπερι), their knowledge of which must have been derived, directly or indirectly, from the Hindoos. Hippocrates employed it in several diseases. Pliny notices its uses as a condiment. It is employed as a condiment, partly for its flavor, and partly for its stimulant influence over the stomach, by which it assists digestion. As a gastric stimulant it is a useful addition to difficultly digestible foods, as fatty and mucilaginous matters, especially for persons who suffer in consequence of a torpid or atonic condition of the stomach. Infused in brandy it is a popular remedy for preventing the return of the paroxysms of intermittent fevers, given shortly before the expected attack. The practice is not recent, for Celsus advises warm water with pepper to relieve the cold fit. The febrifuge power of this spice has been fully proved, in numerous cases, though Schmitz denies it. In relaxed uvula, paralysis of the tongue, and other affections of the mouth or throat requiring the use of a powerful acrid, pepper may be employed as a masticatory. Mixed with mustard it is employed to increase the acridity of sinapisms.

*Administration.*—The *dose* of black pepper is from five to fifteen grains; the powder may be given in the form of pills.

### *Officinal Preparation.*

CONFECTIO PIPERIS. *Confection of Pepper* (*Electuarium Piperis, Ed.*)—Take of black pepper, in fine powder, two ounces; caraway, in fine powder, three ounces; clarified honey, fifteen ounces. Rub them well together in a mortar.

The elecampane (*Lond.*) and the liquorice root (*Edinb.*, *Dub.*) are now omitted, and caraway is substituted for fennel. No sugar is used, and the honey is mixed at once with the other ingredients, as in Edinburgh and Dublin preparations. This confection is intended to be a substitute for a quack medicine, called "*Ward's Paste*," which has obtained some celebrity as a remedy for fistula, piles, and ulcers about the rectum. Its efficacy doubtless depends on the gentle stimulus it gives to the affected parts. Sir B. Brodie observes, that severe cases of piles are sometimes cured by it; and he thinks that it acts on them topically, the greater part of the paste passing into the colon, and becoming blended with the feces, and in this way coming in contact with the piles, on which it operates as a local application, much as wine of opium acts on the vessels of the conjunctiva in chronic ophthalmia. In confirmation of this view, he mentions the case of a patient attended by Sir Everard Home, who was cured by the introduction of the paste into the rectum. Confection of pepper is adapted for weak and leucophlegmatic habits, and is objectionable where much irritation or inflammation is present. As it is apt to accumulate in and distend the colon, gentle aperients should be exhibited occasionally during the time the patient is taking the confection.

The *Dose* of it is from 60 to 180 grains twice or thrice a day. "It is of no use," says Sir B. Brodie, "to take this remedy for a week, a fortnight, or a month; it must be persevered in for two, three, or four months."

[OLEORESINA PIPERIS, U. S., *Oleoresin of Black Pepper.* (Extractum Piperis Fluidum, *Pharm.* 1850.)—"Take of black pepper, in fine powder, twelve troyounces; ether, a sufficient quantity. Put the black pepper into a cylindrical percolator, press it firmly, and gradually pour ether upon it until twenty-four fluidounces of filtered liquid have passed. Recover from this, by distillation on a water-bath, eighteen fluidounces of ether, and expose the residue, in a capsule, until the remaining ether has evaporated, and the deposition of piperin in crystals has ceased. Lastly, separate the oleoresin from the piperin by expression through a muslin strainer, and keep it in a well-stopped bottle." U. S.

This is a thick greenish oily fluid, which contains all the volatile oil, and acrid resin of the pepper, the inert piperin being left in the powder. A pound of the pepper is said to yield about six drachms of the oleoresin. Dose—gtt. i–iii—given in emulsion, or added to other substances made into a pill.—W.]

## CUBEBA OFFICINALIS, *Miq.*

### The Cubeb Pepper.

Diandria, Trigynia, *Linn. Syst.*

*Botanic Character.—Stem* climbing. *Leaves* stalked, smooth; the lower ones unequal, somewhat cordate at the base, ovate, acute; the upper ones more oblong-ovate, with rounded base, and smaller; those of the male plant 5-ribbed, of the female plant, 5—9-ribbed. *Spike* solitary, opposite the leaves. *Flowers* diœcious. *Ovary* sessile. *Stigmas* 3, sessile. *Fruit* baccate, stalked, shorter than the stalk. *Seed* roundish, with mealy albumen.—*Steph.* and *Church.* plate 175.

*Habitat.*—Grows wild in Bantam, the western part of Java; also on some of the neighboring islands. Cultivated in the lower parts of Java.

### Cubeba, *Cubebs.* [*Cubeb.*] [Mat. Med. List, U. S. P.]

The unripe fruit, dried; cultivated in Java.

*Officinal 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 odor.

*Description.*—The dried unripe fruit of this plant constitutes the *cubebs* (*piper caudatum*) of the shops. In appearance cubebs resemble black pepper, except that they are lighter-colored, and are each furnished with a stalk two or three lines long, from which circumstance they have received their name *caudatum.* The cortical portion of cubebs (that which constituted the fleshy portion of the fruit) appears to have been thinner and less succulent than in black pepper. Within it is a hard spherical seed, which is whitish and oily. The taste of cubebs is acrid, peppery, and camphoraceous; the odor is peculiar and aromatic.

*Composition.*—Cubebs contain volatile oil, resin, and cubebin. *Volatile Oil of Cubebs.*—(See below.) *Resin of Cubebs.*—Vauquelin has described two resins of cubebs; one is green, liquid, acrid, and analogous, both in color and taste, to copaiva; the other is brown, solid, acrid, and insoluble in ether. *Cubebin.*—From cubebs is obtained a principle to which the term *cubebin* has been applied. It crystallizes in small needles and is very analogous to piperin. Cassola, a Neapolitan chemist, says it is distinguished from the latter principle by the fine crimson color which it produces with sulphuric acid, and which remains unaltered for twenty or twenty-four hours. According to Monheim, cubebin is identical with piperin, and he asserts that it is combined with a soft acrid resin. In this state it is soluble in ether, alcohol, the fixed oils, and acetic acid; but it is insoluble in oil of turpentine and dilute sulphuric acid. It fuses at 248° F.

*Physiological Effects.*—Cubebs belong to the class of acrid substances. Their sensible operation is very analogous to that of black pepper. Taken in moderate doses, they stimulate the stomach, augment the appetite, and promote the digestive process. In larger quantities, or taken when the stomach is in an irritated or inflammatory condition, they cause nausea, vomiting, burning pain, griping, and even purging. These are their local effects. The constitutional effects are those resulting from the operation of an excitant, namely, increased frequency and fulness of pulse, thirst, and augmented heat. They probably stimulate all the mucous surfaces, but unequally so. In some instances cubebs give rise to an eruption on the skin like urticaria. Cubebs appear to exercise a specific influence over the urino-genital apparatus. Thus, they frequently act as diuretics, and at the same time deepen the color of, and communicate a peculiar aromatic odor to the urine. Their stimulant operation on the bladder is well illustrated by a case related by Sir Benjamin Brodie. A gentleman, laboring under chronic inflammation of the bladder, took fifteen grains of cubebs, every eight hours, with much relief. Being anxious to expedite his cure, he, of his own accord, increased the dose to sixty grains. This was followed by an aggravation of the symptoms: the irritation of the bladder was much increased, the mucus was secreted in much larger quantity than before, and ultimately the patient died—"his death being, I will not say occasioned," adds Sir Benjamin, "but certainly very much hastened, by his imprudence in overdosing himself with cubebs."

*Therapeutics.*—The principal use of cubebs is in the treatment of gonorrhœa. They should be given in as large doses as the stomach can bear, in the earlier part of the disease; for experience has fully proved that in proportion to the length of time gonorrhœa has existed, the less amenable is it to the influence of cubebs. In some instances an immediate stop is put to the progress of the malady. In others the violent symptoms only are palliated; while in many (according to my experience in most) cases no obvious influence over the disease is manifested. The presence of active inflammation of the urethra does not positively preclude the use of cubebs, though I have more than once seen them aggravate the symptoms. Mr. Jeffreys thinks the greatest success is met with in the more inflammatory forms of the disease. Cubebs have been charged with inducing swelled testicle; but I have not observed this affection to be more frequent after the use of cubebs than when they were not employed. Mr. Broughton gave them to fifty patients, and in forty-five they proved successful. Of these only two had swelled testicle. The explanation of the *methodus medendi* is unsatisfactory. Sir A. Cooper thinks that cubebs produce a specific inflammation of their own on the urethra, which has the effect of superseding the gonorrhœal inflammation. The occasional occurrence of a cutaneous eruption from the use of cubebs deserves especial attention, as I have known it create a suspicion of secondary symptoms. In abscess of the prostate gland, twenty or thirty grains of cubebs, taken three times a day, have in many cases appeared to do good. They seemed to give a gentle stimulus to the parts, and to influence the disease much in the same way that Ward's Paste operates on abscesses and fistulæ, and ulcers of the rectum. In cystirrhœa also they have occasionally proved serviceable in small doses. The efficacy of cubebs in mucous discharges is not confined to the urino-genital mucous membrane. In catarrhal affections of the membrane lining the air-passages, it proves exceedingly useful, especially when the secretion is copious and the system relaxed.

*Administration.*—Cubebs, in the form of *powder*, are given in doses varying from ten grains to one hundred and fifty. In affections of the bladder and prostate gland, the dose is from ten grains to thirty grains. In gonorrhœa, on the other hand, they should be administered in large doses.

### **Oleum Cubebæ** [U. S.], *Oil of Cubebs.* [*Oil of Cubeb.*]

The oil distilled in England from cubebs.

["Prepare this oil from cubeb, bruised, by the general formula," see page 399.—W.]

*Officinal Characters.*—Colorless or pale greenish-yellow, having the peculiar odor and taste of cubebs.

*Description.*—The oil is prepared by grinding the fruit, and distilling with water. By distillation, cubebs yield about 10.5 per cent. of a transparent, slightly-colored, or when pure colorless, volatile oil, which is lighter than water (sp. gr. 0.929), and has the cubeb odor, and a hot, aromatic, bitter taste. Its formula is $C_{30}H_{24}$. By keeping, it sometimes deposits crystals (*cubeb stearoptene* or *cubeb camphor*), the primary form of which is the rhombic octahedron. These crystals are a hydrate whose composition is $C_{30}H_{24}$,2HO. Their odor is that of cubebs; their taste, at first, that of cubebs and camphor, afterwards cooling. They are fusible at 156° F., soluble in alcohol, ether, and oils, but insoluble in water. Oil of cubebs is an excellent and most convenient substitute for the powder.

*Administration.*—The *Dose* of it, at the commencement of its use, is ten or twelve drops. This quantity is to be gradually increased as long as the stomach will bear it. In some instances I have given it to the extent of a fluidrachm for a dose. It may be taken suspended in water by means of mucilage, or dropped on sugar, or in the form of *gelatin capsules of cubebs.* A combination of oil of cubebs and oil of copaiva forms a very useful medicine in some cases of gonorrhœa.

[Tinctura Cubebæ, U. S., *Tincture of Cubeb.*—"Take of cubeb, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." Dose, f℥ss to f℥ij, best given in mucilaginous water.

Oleoresina Cubebæ, U. S., *Oleoresin of Cubeb.* Extractum Cubebæ Fluidum, *Pharm.* 1850.—"Take of cubeb, in fine powder, twelve troyounces; ether, a sufficient quantity. Put the cubeb into a cylindrical percolator, press it moderately, and gradually pour ether upon it until twenty-four fluidounces of filtered liquid have passed. Recover from this, by distillation on a water-bath, eighteen fluidounces of ether, and expose the residue, in a capsule, until the remaining ether has evaporated. Lastly, keep the oleoresin in a well-stopped bottle." A darkish often greenish-brown liquid, which contains volatile oil, resin, and cubebin. Dose, gtt. v to f℥ss administered in emulsion.

Trochisci Cubebæ, *Troches of Cubeb.*—"Take of oleoresin of cubeb, a fluidounce; oil of sassafras, a fluidrachm; liquorice, in fine powder, gum arabic, in fine powder, sugar, in fine powder, each, three troyounces; syrup of tolu, a sufficient quantity. Rub the powders together until they are thoroughly mixed; then add the oleoresin and oil, and incorporate them with the mixture. Lastly, with syrup of tolu form a mass, to be divided into troches, each weighing ten grains." Each troche contains about a drop of the oleoresin. They are used for their local action on the fauces in cases of relaxation or chronic inflammation.—W.]

## ARTANTHE ELONGATA, *Miquel.*

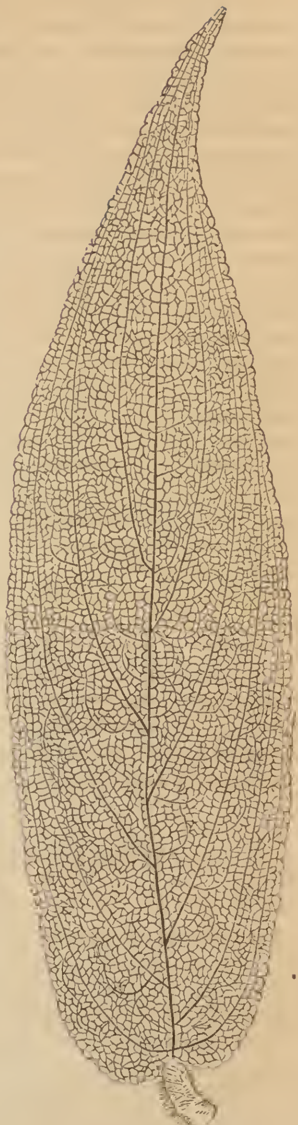
### The Matico Plant.

Diandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A *shrub* of about twelve feet high, with jointed *stem* and branches. *Leaves* harsh, short-stalked, oblong-lanceolate, acuminate, pubescent beneath, tessellated or rough on the upper side, on account of the sunken veins. *Spikes* solitary, cylindrical, and opposite the leaves. *Bracts* peltate. *Flowers* hermaphrodite. *Style* 0.—*Ruiz and Pavon, Flor. Peruv.* plate 57 (*Piper angustifolium*).

*Habitat.*—It grows at Huanuco and elsewhere in Peru.

Fig. 101.



*Artanthe elongata.*

## **Matica**, *Matico.*

### [**Matico.** Mat. Med. List, U. S. P.]

The dried leaves, imported from Peru.

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

*Description.*—Matico, as imported, consists of the dried leaves, stalks, and spikes (some unripe, others ripe), more or less compressed into a lump. The color of the dried plant is greenish; and the leaves in structure somewhat resemble those of sage, and are easily reducible to powder. The plant has an aromatic odor, somewhat similar to that of cubebs.

*Composition.*—Matico contains in it *an aromatic volatile oil*, *a bitter principle*, and *a soft dark green resin.* The *oil of matico* has a light green color, and, when recent, the consistence of good castor oil, but becomes thick and crystalline on keeping. The *bitter principle*, called *maticine*, is soluble in alcohol and water, but not in ether. The existence, however, of maticine has been denied, and the soft resin has been found by Mr. Stell ruby-red, the green color being attributed to chlorophyll. Infusion of matico yields a dark greenish color and precipitate with the perchloride of iron, but undergoes no change on the addition of gelatin, tartarated antimony, or corrosive sublimate. It therefore contains little or no tannin. Acetate of lead and infusion of galls, each occasions copious colored precipitates.

*History.*—This plant has long been in use among the natives of Peru in venereal diseases; and having been employed on some occasion by a soldier as a mechanical agent to stanch blood, it got the name of the *Soldier's herb.* Dr. Ruschenberger, who became acquainted with matico during a visit to Peru in 1834, introduced it into the United States; and in 1863 it was admitted into the primary list of the Materia Medica of the U. S. Pharmacopœia. It was introduced into this country in 1839 as an internal styptic; but until 1864 it was only admitted into the Dublin Pharmacopœia.

*Physiological and Therapeutic Effects.*—Matico is an aromatic bitter stimulant. As an *internal* remedy, it is applicable as a substitute for cubebs, in discharges from the mucous surfaces, as leucorrhœa and gonorrhœa, and in catarrh of the bladder. It has been greatly lauded, especially in the United States, as an internal styptic or astringent in internal hemorrhages. But the botanical, chemical, and sensible qualities of matico are opposed to the idea of its astringent properties. If matico have any styptic power, it is derived, not from tannic or gallic acids, but from the volatile oil which the plant contains; and in that case the oils of pepper, cubebs, or turpentine, would be much more energetic and preferable. The latter, indeed, is decidedly efficacious as an internal remedy for hemorrhage. But matico is more decidedly useful (like lint, felt, or cobweb) as a topical application for stanching blood, or from slight cuts and other wounds of the face and gums, or leech-bites. It acts mechanically as a styptic by the structure of its leaf, which divides the blood and promotes its coagulation. Dr. Ruschenberger applied it to arrest hemorrhage after an operation on the side of the neck below the angle of the jaw, in which there was considerable bleeding and difficulty in taking up the divided vessels, owing to the induration of the part from chronic inflammation; and the application was successful. That it acts mechanically in producing this effect, is probable from the circumstance that the same power of stanching blood, and even the name *Matico*, is also ascribed to other leaves, as those of *Eupatorium glutinosum*, Kunth, which is not botanically allied to *Artanthe elongata*, but much resembles it in the appearance and texture of its leaves.

*Administration.*—Matico is administered in the form of powder and infusion. The *dose* of the *powder* is from thirty to sixty grains.

### *Officinal Preparation.*

Infusum Maticæ, *Infusion of Matico.*—Take of matico, cut small, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for half an hour, and strain.

*Dose.*—From fl. oz. j to fl. oz. ij.

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## EUPHORBIACEÆ, *Juss.* The Spurge Order.

## CROTON, *Linn.*

Monœcia, Monadelphia, *Linn. Syst.*

*Generic Character.*—*Flowers* monœcious, or very rarely diœcious. *Calyx* five-parted. *Males: Petals* five. *Stamens* ten or more, distinct. *Females: Petals* none. *Ovary* superior; *styles* three, divided into two or more partitions. *Capsule* tricoccous, with one seed in each cell. *Seeds* albuminous.

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## CROTON TIGLIUM, *Lam.*

### The Croton-Oil Plant.

*Specific Character.*—A small *tree*, from fifteen to twenty feet high. *Bark* smooth, ash-colored. *Leaves* thin and membranous, oblong-ovate, sometimes cordate, acuminate, three to five-ribbed, slightly serrate, with two flat round glands at their base; when young, covered on both surfaces, but especially the lower one, with minute stellate hairs. *Raceme* terminal, erect, simple. *Petals* of male flower white. *Stamens* fifteen.—*Steph.* and *Church.* plate 4.

*Habitat.*—Continent of India, islands forming the Indian Archipelago, and Ceylon.

*Description of Seeds.*—Croton seeds are oval, about six lines in length, and three or four lines in breadth; the testa is dark brown or blackish, containing a thin pale internal seed-coat, and a yellowish oily albumen, which envelops the embryo, whose cotyledons are foliaceous or membranous. The seeds are without odor; their taste is at first mild and oleaginous, afterwards acrid and burning. When heated, they evolve an acrid vapor.

Fig. 102.

*Croton tiglium.*

**Oleum Crotonis,** *Croton Oil.*

[**Oleum Tiglii.** Mat. Med. List, U. S. P.]

*Synonym.*—Tiglii Oleum, *Lond.*

The oil expressed from the seeds in England.

*Officinal Characters.*—Slightly viscid; color brownish yellow, taste acrid, odor faintly nauseous.

*Description.*—Croton oil is the expressed oil of the seeds. [It is occasionally imported from India and Ceylon; but Mr. Horner informs me that the oil at present found in the London market is all expressed in London.—Ed.] English croton oil varies in color from brownish-yellow to dark reddish-brown, like the deepest colored sherry. Its consistence is unctuous, and increases with age. It has an unpleasant but marked odor, and an acrid taste, and leaves behind an acrid sensation in the fauces. It reddens litmus, and is soluble in ether and in the fixed and volatile oils. The difference of color depends chiefly on the condition of the seeds; sound and fresh seeds yielding the palest oil. English croton oil, viewed by reflected light, has a greenish tinge, and affords a good example of the phenomenon termed Fluorescence. *Foreign* or *East Indian croton oil* is paler than London expressed oil. Some samples are very transparent and pale yellow, like Canada balsam. Others (the more usual sort) are of a pale amber color. It is not often found in the London market.

*Test.*—Agitated with its own volume of alcohol, and gently heated, it forms a clear solution, from which about three-fourths of the oil separate on cooling.

Mr. Warrington has recently shown that this test is so modified by the temperature at which the experiment is made as well as by the age of the croton oil, &c., that it is perfectly useless as a reliable indication of purity.—*Pharm. Journal*, January, 1865.

*Physiological Effects.*—*Rubbed on the skin*, it causes rubefaction and a pustular or vesicular eruption, with sometimes an erysipelatous swelling of the surrounding parts. When rubbed into the abdomen, it sometimes, but not invariably, purges. Rayer mentions a case in which thirty-two drops rubbed upon the abdomen produced purging, large vesicles, swelling and redness of the face, with small prominent, white, crowded vesicles on the cheeks, lips, chin, and nose. *Swallowed in small doses*, as of one or two drops, it usually causes an acrid burning taste in the mouth and throat, and acts as a drastic purgative, giving rise to watery stools, and frequently increasing the urinary secretion. Its operation is very speedy. Frequently it causes evacuations in half an hour; yet it is somewhat uncertain, sometimes six, eight, or even ten drops having been given at a dose without affecting the bowels. In comparing croton oil with other violently acrid purgatives, we find it distinguished by its speedy operation, the great depression of the vascular system as well as the general feeling of debility which it produces, and by the uncertainty of its operation.

*Therapeutics.*—The value of croton oil as an internal remedial agent depends principally on two circumstances: first, its powerful and speedy action as a drastic cathartic, by which it is adapted for obviating constipation, or for operating on the bowels as a counter-irritant; and, secondly, on the smallness of the dose, which in practice presents many advantages. These circumstances render it peculiarly applicable in cases requiring powerful and speedy catharsis, and in which the patient cannot swallow, or does so with extreme difficulty, as in *trismus*, *coma*, and *some affections of the throat;* or where he will not swallow, as in *mania.* In all such cases the oil may be dropped on the tongue. *In obstinate constipation*, whether from the poison of lead or from other causes, it has sometimes succeeded where other powerful cathartics had been tried in vain. It is especially serviceable where the stomach is irritable, and rejects more voluminous purgatives. *In torpid conditions of the intestinal canal*, *in tendency to apoplexy*, *in dropsy* unconnected with inflammation, *in paralysis*—in a word, in any cases in which a powerful and speedy intestinal irritant is required, either for the purpose of evacuating the canal merely, or for acting as a revulsive or counter-irritant, and thereby relieving distant parts, croton oil is a very useful, and, on many occasions, most valuable cathartic. In employing it, two cautions are necessary: it must be avoided, or at least used with great caution, in extreme debility; and it is improper in inflammatory affections of the digestive organs. The great drawback to its use is its uncertainty. In one case it acts with extreme violence, in another it scarcely produces any effect. *In the diseases of children*, when a powerful purgative is required, croton oil has been administered, on account of the minuteness of the dose and the facility of its exhibition. In hydrocephalus, and other head-affections of children, I have several times used it where other cathartics had failed, or where extreme difficulty was experienced in inducing the patients to swallow the more ordinary remedies of this class. In some of these it has disappointed me. In the case of a child of four years of age, affected with incipient hydrocephalus, I gave six doses, of one drop each, of the oil without any effect. *Rubbed on the skin*, croton oil has been employed to produce rubefaction and a pustular eruption, and thereby to relieve diseases of internal organs, on the principle of counter-irritation. *Inflammation of the mucous* *membrane lining the air-passages*, *peripneumonia*, *glandular swellings*, *rheumatism*, *gout*, and *neuralgia*, are some of the diseases against which it has been applied in this way, and doubtless frequently with benefit. It is sometimes used in the undiluted form, but more commonly with twice or thrice its volume of olive oil, oil of turpentine, soap liniment, alcohol, ether, or some other convenient vehicle. But in all the cases just enumerated it has never appeared to me to present any advantage over many other counter-irritants in common use, as tartarated antimony; while the chance of causing purging is, in some cases, an objection to its use. Frictions with it on the abdomen have been used to promote alvine evacuations, but it frequently fails to produce the desired effect. To promote the absorption of the oil in these cases, it should be dissolved in ether or alcohol, and the frictions should be assiduously made.

*Administration.*—Croton oil is exhibited in doses of one, two, or three drops. In some instances it is simply placed on the tongue, as in coma, tetanus, and mania; or it may be taken in a teaspoonful of syrup. These methods of administering it are objectionable, on account of the acrid taste produced. The usual mode of employing it is in the form of pill, made with conserve of roses or bread-crumb. Some have employed it in the form of emulsion, flavored with a carminative oil or a balsamic substance; but the burning of the mouth and throat to which it gives rise is an objection to its use.

*Antidotes.*—In case of poisoning by the oil, the first object is to remove the oil from the stomach. Mild, demulcent, and emollient drinks are then to be given. Alkaline substances have been recommended as chemical antidotes, but their efficacy is not proved. Full doses of opium will be requisite to check the diarrhœa. To relieve a failing circulation, ammonia and brandy may be given, and the warm bath employed.

### *Officinal Preparation.*

Linimentum Crotonis, *Liniment of Croton Oil.*—Take of croton oil, half a fluidounce; olive oil, three fluidounces and a half. Mix.

Olive oil is now substituted for oil of turpentine (*Dub.*), as was formerly suggested by the author; [but the advantage of the alteration is very doubtful, as the present liniment acts much more slowly and feebly. —Ed.] Rubbed repeatedly on the skin, this liniment should occasion redness and a pustular eruption. It is used as a counter-irritant.

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## CROTON ELUTERIA, *Bennett.*

### Sweet-wood Bark, or Bahama Cascarilla.

A small compact *shrub*, three to five feet in height, or occasionally a small *tree*. *Stem* erect, unbranched below; bark marked irregularly with grayish stains, and various, mostly crustaceous lichens. *Leaves* scanty, alternate, two or three inches in length, petiolate, slightly cordate, acuminate, obtuse, pale or grayish-green, with a few peltate scales above, and a dense clothing of shining silvery scales beneath. *Flowers* monœcious, white, numerous, small, closely set, and shortly pedunculate, in terminal or axillary spikes, very fragrant. *Fruit* a small roundish-oblong lobed capsule, about the size of a pea, covered with silvery peltate scales, three-celled, each cell containing a dark-brown oblong shining *seed.*—Plate *Pharm. Journ.* 2d ser. vol. iv. p. 150.

*Habitat.*—Tolerably abundant in the larger Bahama Islands, from one of which, Elutheria, its specific name has been derived, owing to the great supply of bark it formerly yielded.

### Cascarilla, *Cascarilla.* [Mat. Med. List, U. S. P.]

The bark from the Bahama Islands.

*Officinal 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 odor when burned.

*Description.*—*Cascarilla bark* is in the form of fragments or quills about one or two, more rarely three or four, inches long; the fragments being thin, and usually curved transversely, and the quills varying in size from that of a writing-pen to that of the little finger. The bark is compact, hard, moderately heavy, and has a short, resinous fracture, not fibrous or splintery, as in cinchona barks. Some of the pieces are partially or wholly covered with a whitish rugous epidermis, cracked both longitudinally and transversely. If a longitudinal section of the bark be examined by the microscope, cells are observed filled with an orange-red matter (oleoresin?). The cortical layers are of a dull brown color. The taste of this bark is spicy; its odor is peculiar, but agreeable. As the absence of adulteration cannot be easily determined when the bark occurs in small fragments, the pharmacopiœa orders the quills.

*Commerce.*—It is imported from Nassau, in New Providence, one of the Bahama Islands; but it frequently comes viâ New York.

*Composition.*—Cascarilla bark contains volatile oil, resin, and extractive. *Volatile Oil.*—This possesses the odor and taste of the bark. Its specific gravity is 0.938. Its color is variable, sometimes being greenish, at others yellow or blue. It consists of two oils, one boiling at 344°, which contains no oxygen; the other less volatile and oxygenated. Nitric acid converts it into a yellow, pleasant-smelling resin. By distillation with water the bark yields about 1-120th of its weight of this oil. *Resin.*—Separated from the alcoholic tincture of the cascarilla, by the addition of water. It is reddish-brown; has a balsamic, slightly bitter, not astringent taste; and when thrown on hot coals, evolves an agreeable odor. *Extractive.*—Has a bitter, but not balsamic taste. Its watery solution reddens litmus, and is unchanged by either ferruginous solutions or tincture of galls. The perchloride of iron deepens the color of the infusion of cascarilla. The tincture of gall causes turbidness, and at the end of twenty-four hours, a very slight precipitate.

*Physiological Effects.*—Cascarilla bark belongs to the *aromatic bitters;* that is, it produces the combined effect of an aromatic and of a moderately-powerful tonic; but it does not possess any astringency. Some pharmacologists place it with aromatics, others with tonics. Cullen, though at one time uncertain as to which of these classes it belonged, ultimately classed it with the tonics.

*Therapeutics.*—Cascarilla has been employed as a substitute for cinchona; and, although it is inferior to the latter in tonic and febrifuge properties, its aromatic quality frequently enables it to sit easily on the stomach, without causing either vomiting or purging, which in irritable affections of the alimentary canal, cinchona is apt to produce. In this country it is principally employed in those forms of dyspepsia requiring an aromatic stimulant and tonic; and in chronic bronchial affections, to check excessive secretion of mucus.

*Administration.*—The *powder* may be given in doses of from ten to thirty grains; but it is a less agreeable form than the infusion.

*Officinal Preparation.*

INFUSUM CASCARILLÆ [U. S.], *Infusion of Cascarilla.*—Take of cascarilla, in coarse powder, one ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain.

This is the Dublin infusion, which is rather stronger than the infusions of London and Edinburgh. The time of infusion is reduced, as in the Dublin preparation from two hours to one hour. A light and aromatic bitter tonic. It is a good vehicle for acids and alkalies. The tincture of cascarilla is usually joined with it, as it quickly spoils.

*Dose.*—From fl. oz. j to fl. oz. ij.

[" Take of cascarilla, in moderately coarse powder, a troyounce; water, a sufficient quantity. Moisten the powder with half a fluidounce of water, pack it firmly in a conical percolator, and gradually pour water upon it until the filtered liquid measures a pint. This infusion may also be prepared by macerating the cascarilla with a pint of boiling water, for two hours in a covered vessel, and straining." U. S. This is not so strong as the British infusion, and may be taken in doses of from f℥ij to f℥iij.—W.]

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

Percolation is now ordered as in the Edinburgh Pharmacopœia, by which the process is much shortened. Generally employed as an adjunct to tonic and stomachic infusions.

*Dose.*—From fl. drm. j to fl. drs. ij.

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## RICINUS COMMUNIS, *Linn.*

### The Castor Oil Plant.

Monœcia, Polyadelphia, *Linn. Syst.*

*Botanic Character.*—*Stem* perennial, arborescent, attaining a height of fifteen or twenty feet; younger branches pruinose. *Leaves* alternate, peltato-palmate, seven to ten-lobed, the lobes lanceolate, serrated; petiole with glands at the apex. *Flowers* in terminal glaucous panicles; the lower male, the upper female. *Calyx* three to five-parted, valvate. *Petals* none. *Males: Filaments* numerous, irregularly united into several branches. *Females: Style* short; *stigmas* three, deeply bi-partite, feathery. *Fruit* prickly, capsular, tricoccous, with one seed in each cell.—*Bot. Mag.* pl. 2209.

*Habitat.*—Cultivated all over India. The castor oil plant grown in this country is usually an annual, four or five feet high; but in India, Crete, Sicily, and Spain, it is woody and long-lived, and forms a stem as thick or thicker than a man's thigh, and attains a height of twenty feet. Trees of these dimensions may now be seen in this country in the conservatory of the Crystal Palace.

*History.*—Hippocrates employed the root in medicine. It was termed κρότων by the Greeks and *ricinus* by the Romans, on account of the resemblance of its seeds to a little insect bearing these names, which infests dogs and other animals, and whose common name in English is the *tick*.

Fig. 103.

*Ricinus communis.*
*a.* Stamens. *b.* Anther. *c.* Stigmas. *d.* Transverse section of capsule. *e.* Seed. *f.* Embryo.

*Description of the Seeds.*—These are oval, somewhat compressed, about four lines long, three lines broad, and a line and a half thick; externally they are pale gray, but marbled with yellowish-brown spots and stripes. The *seed-coats* consist of a hard thick testa and an internal membrane. A fleshy tumid body termed the *strophiole* is situated at one end of the seed. The *nucleus* of the seed consists of oily *albumen* and an *embryo*, the cotyledons of which are membranous or foliaceous. Two varieties of the seed are known—the large and the small. The latter yields the most oil.

*Composition of the Seeds.*—The seeds, in addition to the fixed oil, contain an acrid principle, probably of a resinous nature, which resides both in the albumen and the embryo. The residual cake left after the expression of the oil from the seeds excites vomiting when given in doses of about eight grains. A single seed has caused violent and long-continued vomiting and purging; and a girl eighteen years of age died of gastro-enteritis after eating about twenty seeds.—*Lond. Med. Gaz.*, vol. xix. p. 944.

**Oleum Ricini,** *Castor Oil.* [Mat. Med. List, U. S. P.]

The oil expressed from the seeds in England, or imported from the East Indies and America.

*Preparation.*—Castor oil may be obtained from the seeds by expression or decoction. The chief part, if not the whole of the oil consumed in England, whether imported or extracted in England, is procured by expression. Soubeiran considers all processes in which heat is employed as objectionable, as a quantity of fatty acids is produced which render the oil acrid. In America, on the contrary, heat is considered useful by expelling a volatile acrid principle. It cannot be doubted that too high a temperature develops acrid matter. In England the oil is expressed either by Bramah's hydraulic press or by the common screw press, in a room artificially heated. It is purified by rest, decantation, and filtration. It is bleached by exposure to light on the tops of houses. The oil expressed in Calcutta is afterwards heated with water in a tin boiler until the water boils, by which the mucilage or albumen is separated as a scum. The oil is then strained through flannel, and put into oblong tins. The best Indian castor oil is sold in London as cold drawn. In the southern provinces of India, according to Ainslie, castor oil is obtained by decoction. Much of the American castor oil is prepared by mere expression, rest and decantation; but the following are the outlines of the process usually employed in the United States by those who prepare it on the large scale: The seeds, cleansed from the dust and fragments of the capsules, are placed in a shallow iron reservoir, where they are submitted to a gentle heat, insufficient to scorch or decompose them, and not greater than can be readily borne by the hand. The object of this step is to render the oil sufficiently liquid for easy expression. The seeds are then introduced into a powerful screw press, and submitted to pressure, by which a whitish oily liquid is obtained, which is boiled with a considerable quantity of water in clean iron boilers, and the impurities skimmed off as they rise to the surface. The water dissolves the mucilage and starch, and the heat coagulates the albumen, which forms a whitish layer between the oil and water. The clear oil is now removed, and boiled with a minute portion of water until aqueous vapor ceases to arise, and till a small portion of the liquid taken out in a phial preserves a perfect transparency when it cools. The effect of this operation is to clarify the oil, and to render it less irritating by driving off the volatile acrid matter. But much care is requisite not to push the heat too far, lest the oil acquire a brownish hue and an acrid, peppery taste, similar to the West India oil, which is obtained by decoction, but none of which is imported into this country. In America the seeds yield about twenty-five per cent. of the best oil.

*Varieties.*—In the London market there are chiefly four sorts of castor oil, namely, the oil expressed in London from imported seeds, East India oil, American, and Italian.

*English Castor Oil.*—By this is meant castor oil drawn in England from imported seeds. It differs somewhat from the imported oil. I am informed that it is not bleached so completely by exposure to light as the East India oil. This is usually ascribed to the seeds having suffered some change before they are pressed. But something is probably due to the mode of preparation. In England the oil is not heated in boiling water, as it is in Calcutta. *East Indian Castor Oil* is the principal kind employed in this country. It is imported from Bombay and Calcutta. It is an oil of exceedingly good quality, both in respect to color and taste, and is obtained at a very low price. It is procured from *Ricinus communis* and *R. lividus.* I am informed that occasionally it solidifies by keeping.

*American* or *United States Castor Oil* is, for the most part, imported from New York. All the samples which I have examined have been of very fine quality; and, in my opinion, had a less unpleasant flavor than the East Indian variety. Our druggists object to it, on the ground of its depositing a white substance (*margarine*) in cold weather—a circumstance which has led some persons to imagine that it had been mixed with some other fixed oil.

*Italian Castor Oil* has appeared in the London market since the *Exhibition* of 1862. It is an oil of the finest quality and commands the highest price.

*Officinal Characters.*—Viscid, colorless, or pale straw-yellow, having a slightly nauseous odor, and a somewhat acrid taste.

*Description.*—Castor oil, when fresh, has a mild taste. It is lighter than water, its specific gravity being, according to Saussure, 0.969 at 55° F. When cooled down to about 0°, it congeals into a transparent yellow mass. By exposure to the air it becomes rancid, thick, and ultimately congeals, without becoming opaque: and hence it is called a *drying oil.* When heated to a little more than 500° F. it begins to decompose. Castor oil is remarkable for its ready solubility in alcohol. Strictly speaking castor oil and alcohol exercise a mutual solvent action on each other. When they are shaken together, a homogeneous transparent mixture is obtained. Rectified spirit of wine may be substituted frequently with a similar result; but with some samples of genuine oil the mixture does not become clear until heat is applied; and, moreover, by standing a separation takes place into two strata, an upper spirituous one, holding oil in solution; and an inferior oleaginous one containing spirit. In one experiment 65 vols. of oil and 65 vols. of rectified spirit were mixed, and by shaking a transparent uniform mixture was obtained: after several weeks a separation had taken place: the upper stratum measured 12 vols., the lower one 118 vols. Of three samples of genuine oil, one English, a second West Indian, and the third East Indian, I find the English to be the most, and the East Indian the least soluble in rectified spirit. Ether readily dissolves castor oil.

*Tests.*—Entirely soluble in one volume of alcohol, and in two volumes of rectified spirit.

*Adulteration.*—Two kinds of frauds have been practised with regard to castor oil. One consists in the admixture of a small quantity of croton oil to it, with the view of increasing its activity. This mixture is introduced into gelatin capsules, and sold as *concentrated castor oil.* This fraud is a very dangerous one. I have heard of several cases in which very violent and dangerous effects were produced by these capsules on pregnant females. The other fraud consists in the adulteration of the castor oil with some bland viscid cheaper oil. I have been informed that the oleine of lard, called *lard oil*, has been used for this purpose, but I have not been enabled to procure evidence of it. This kind of fraud is said to be detected by alcohol, which dissolves the genuine castor oil, but not the admixed oil; and accordingly, in the late Edinburgh Pharmacopœia (and now in the British Pharmacopœia), the test of the purity of the oil is that "it is entirely soluble in one volume of alcohol." Unfortunately, however, for this test, castor oil enables other fixed oils (olive, nut, lard, &c.) to dissolve in alcohol, and may be adulterated with 33 per cent. of another fixed oil, and yet be soluble in its own volume of alcohol. If 1 vol. of olive oil, 2 vols. of castor oil, and 2 vols. of rectified spirit, be mixed and heated, a transparent homogeneous solution is obtained.

*Physiological Effects.*—*Injected into the veins*, castor oil gripes and purges, and causes a nauseous oily taste in the mouth: hence it would appear to have a specific influence over the mucous lining of the alimentary canal. *Swallowed* to the extent of one or two ounces, it usually acts as a mild but tolerably certain purgative or laxative, without producing any uneasiness in the bowels. "It has this particular advantage," says Dr. Cullen, "that it operates sooner after its exhibition than any other purgative I know of, as it commonly operates in two or three hours. It seldom gives any griping, and its operation is generally moderate—to one, two, or three stools only." When castor oil has been taken by the mouth, it may be frequently recognized in the alvine evacuations; but it presents itself under various forms, "sometimes resembling caseous flakes, or a soap-like scum, floating on the more fluid part of the dejection; occasionally it has been arranged in a form not unlike bunches of grapes, or more nearly of hydatids of a white color; more generally, however, it is found mixed up with the feces as a kind of emulsion; and in some few instances it has been discharged under the form of solid tallow-like masses." Mr. Brande says in one case it was discharged from the bowels in the form of indurated nodules, which were at first regarded as biliary concretions. A remarkable case is mentioned by Dr. Ward of a woman on whom this oil did not act as a purgative, but exuded from every part of her body.—*Lond. Med. Gaz.*, vol. x. p. 377.

*Therapeutics.*—Castor oil is used to evacuate the contents of the bowels in all cases where we are particularly desirous of avoiding the production of abdominal irritation, especially of the bowels and urinogenital organs. The principal, or I might say the only objection to its use in these cases, is its somewhat nauseous taste. The following are the leading cases in which we employ it: *In inflammatory affections of the alimentary canal*, as enteritis, peritonitis, and dysentery, a mild but certain purgative is oftentimes indicated. No substance, I believe, answers the indication better, and few so well, as castor oil. *In obstructions and spasmodic affections of the bowels*, as intussusception, ileus, and colic, especially lead colic, this oil is the most effectual evacuant we can employ. *In inflammatory or spasmodic diseases of the urino-genital organs*, inflammation of the kidneys or bladder, calculous affections, gonorrhœa, or stricture, castor oil is a most valuable purgative. *In affections of the rectum*, especially piles, and stricture, no better evacuant can be employed. *As a purgative for children and pregnant women*, as well as after parturition, it is useful on account of its mildness. *In habitual costiveness*, also, it has been recommended. Dr. Cullen observed that if castor oil be frequently repeated the dose might be gradually diminished; so that persons who, in the first instance, required half an ounce or more, afterwards needed only two drachms.

*Administration.*—The dose of castor oil for children is one or two teaspoonfuls and for adults one to three tablespoonfuls. To cover its unpleasant flavor, some take it floating on spirit (especially gin), but which is frequently contraindicated; others on coffee, or on peppermint or some other aromatic water, or infusion of cloves; it may be made into an emulsion by the aid of the yelk of egg or mucilage of tragacanth, or the addition of a little solution of potash.

*Pharmaceutic Use.*—It is used to combine the ingredients of the compound calomel pill.

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**ROTTLERA TINCTORIA,** *Roxb.* Diœcia, Polyandria, *Linn. Syst.*

*Botanic Character.*—A small *tree*, from ten to fifteen feet in height, with alternate, oblong, pointed, entire *leaves*, which are 3-nerved, and

4–8 inches long. *Flowers* diœcious, in terminal panicles. *Male: Calyx* 2-cleft. *Corolla* 0. *Stamens* 30–40. *Female: Calyx* 3–5-toothed. *Corolla* 0. *Ovary* ovate. *Styles* 3, feathered. *Capsule* roundish, 3-furrowed, 3-celled, 3-valved, the size of a small cherry, covered with minute sessile roundish semi-transparent glands of a bright red color. *Seeds* solitary, globular.—*Roxb. Corom.*, pl. 168.

*Habitat.*—India, Ceylon, China, Northern Australia, and Southern Arabia.

## Kamela, *Kamela.*

### [Rottlera, *Kameela.* Secondary List, U. S. P.]

The powder which adheres to the capsules; imported from India.

*Officinal Characters.*—Granular, of an orange-red color, inflammable; it is with difficulty mixed with water, but when boiled with alcohol the greater part is dissolved, forming a red solution.

*Test.*—The greater part is soluble in ether, the residue consisting principally of tufted hairs (*and ferruginous sand*).

*Description.*—The powder is of a brick-red color, and is known throughout India, where it is used as a dye for silk, by the names of Kamala and Wurrus. When examined with a microscope it is seen to consist of minute garnet-red semi-transparent roundish granules, more or less mixed with stellate hairs and grains of sand, the former of which may be easily removed by sifting. It resembles lycopodium in the difficulty with which it is mixed with water, and in igniting when thrown over the flame of a candle. It has little smell or taste, is insoluble in cold water, and nearly so in boiling water; but ether, alcohol, and solutions of caustic alkalies or of alkaline carbonates, dissolve a considerable part of it, and acquire a deep-red color. Leube found that ether dissolved about 46 per cent.

*Composition.*—Kamela appears to consist of resinous coloring substances, gum, cellulose and albuminous matters. From the ethereal solution of the resinous part Dr. Thomas Anderson, of Glasgow, has obtained a yellow crystallized body which he has called *Rottlerine*, $C_{22}H_{10}O_6$. It is insoluble in water, sparingly soluble in alcohol, but readily soluble in ether and alkaline solutions. Leube was unable to obtain this, and considers that the active constituent of kamela is the resin, and that a tincture, or a dried ethereal extract are the best preparations of it.

*Physiological Effects.*—Our knowledge of the physiological and therapeutic effects of kamela are chiefly derived from the observations of Drs. Mackinnon and Anderson in India. Kamela usually purges speedily. Some nausea and slight griping are frequently experienced, but quite as frequently no uneasiness whatever is felt from its operation. A single dose of 180 grains usually purges from five to seven times. In feeble persons such a dose may operate twelve or fourteen times. [One man to whom I gave it was purged at least ten times by 60 grains.—Ed.]

*Therapeutics.*—Dr. Mackinnon administered the powder to 50 patients suffering from tænia, and only twice failed to expel the worm. In almost every case the long slender neck of the worm appeared in the motion. He came to the conclusion that "kamelia is a safe and efficient remedy for tapeworm, and more certain than either turpentine or kousso." Dr. Anderson writes: "The worm is generally passed entire, and almost always *dead*, and in all the cases I have examined (fifteen) *I was able to detect the head.*" He was only aware of two failures out of ninety-five cases in which it was prescribed. It has not yet had an extensive trial in this country, but the reports of its efficacy are mostly favorable.

*Administration.*—Dr. Mackinnon considers that to a strong European 180 grains may be safely given as a dose, but that to a person of feeble habit, or to a female, 90 grains, followed if necessary by half an ounce of castor oil, is a sufficient dose. Until we have had more experience of it in this country, the dose may be stated as from 30 to 150 grains. A second dose is seldom required. The Pharmacopœia has given no preparation of kamela, but Dr. Anderson says that a tincture, formed by macerating eight ounces of the powder in twenty fluidounces of rectified spirit, and taken in the dose of from one to four fluidrachms, is more certain and milder than the powder, and is rarely followed by nausea and griping.

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## [MANIHOT UTILISSIMA, *Pohl.*

### Bitter Cassava.

*Synonym.*—Janipha Manihot, *Hooker.*

*Generic Character.*—*Flowers* monœcious. *Calyx* corolline, campanulate, five-cleft, convolute. *Corolla* none. *Stamens* ten, inserted on the margin of a fleshy disk, free, the alternate ones shorter; *filaments* filiform; *anthers* turned inwards, two-celled. *Ovary* placed on the fleshy disk, three-celled, with one ovule in each cell. *Style* short. *Stigmas* three, many-lobed, the lobes consolidated into a conical sinuated-sulcated mass. *Capsule* three-coccous; the cocci two-valved and one-seeded (Endlicher).

*Specific Character.*—*Leaves* with very long petioles, deeply seven-parted, palmate; the segments lanceolate, acuminate, attenuated at the base, quite entire, the outer ones smaller, unequal, diverging, straggling. *Root* whitish-yellow (Pohl).

*Root* large, thick, tuberous. fleshy; containing an acrid, milky, highly poisonous juice. *Flowers* axillary, racemose.

*Habitat.*—Native of the Brazils; where, as well as in other parts of South America, it is cultivated.

There are two cassava plants, the bitter and the sweet. These are regarded by most botanists as being not specifically distinct. The sweet has its leaves five-parted, and its root reddish, with a milky non-poisonous juice. The milky juice of the Bitter Cassava Root is very poisonous; half a pint of it is said to have caused death in an hour. The symptoms produced by it are pain and swelling of the abdomen, vomiting and purging, dimness of sight, syncope, rapid diminution of the powers of life. It contains hydrocyanic acid, and its poisonous properties are entirely dissipated by heat. Dr. Wright says that the scrapings of the fresh root are successfully applied to ill-disposed ulcers; and Dr. Hamilton speaks of the instantaneous relief which he experienced on himself from the application of a cataplasm of the rasped roots, with all their juices unexpressed, to the spot where a nest of chigres (*Pulex penetrans*) had been dislodged. The root is used to catch birds, which, by eating it, lose the power of flying. It yields cassava meal and cassava starch.

### Tapioca, *Tapioca.* Mat. Med. List, U. S. P.

The fecula of the root of Janipha Manihot.

The fecula or starch deposited from the expressed juice of the cassava root, after being washed and dried in the air without heat, constitutes the *tapioca meal* or *Brazilian arrowroot* of commerce. It is usually imported into this country from Rio Janeiro. For some years past it has been imported into France from Martinique, and is sold as arrowroot (Guibourt). It is white and pulverulent, and resembles in external appearance genuine arrowroot (maranta starch). When examined by the microscope, however, it is readily distinguished.

Fig. 104.

*Janipha manihot.*

Cassava starch, when examined by the microscope, is found to consist of small single grains, which, in the living plant, were united in groups or compound grains, each composed of two, three, or four grains. Most of the grains are muller-shaped, and, therefore, have been united in groups of two each: when seen endwise, they appear circular or globular. Some of them are truncated egg-shaped grains, with one or two facets at the truncation. The nucleus, central cavity, or hilum, is circular, surrounded with rings, and bursts in a stellate manner.

These statements apply equally to *bitter cassava starch* and *sweet cassava starch* sent to me from Demerara by Dr. Shier, as well as to starch obtained by myself from sweet cassava root received from Jamaica. (*Pereira.*)

Cassava starch has not been analyzed; but there can be no doubt but that its composition is similar to that of other starches, and that its formula is $C_{12}H_{10}O_{10}$. Its effects and uses are also like those of other starches.

*Tapioca* is imported from Bahia and Rio Janeiro. It is cassava meal, which while moist or damp has been heated, for the purpose of drying it, on hot plates. By this treatment the starch grains swell, many of them burst, and the whole agglomerate in small irregular masses or lumps. In consequence of the change thus effected in the starch grains, tapioca is partially soluble in cold water; and the filtered cold infusion strikes a blue color with tincture of iodine. The drying to which it has been subjected renders it difficult of solution. In boiling water it swells up, and forms a transparent viscous jelly-like mass. Submitted to prolonged ebullition in a large quantity of water, it leaves an insoluble residue, which precipitates. This, when diluted with water and colored by iodine, appears to consist of mucous flocks.

Made into puddings, tapioca is employed as a dietetical substance. Boiled in water or milk, and flavored with sugar, spices, or wine, according to circumstances, it is used as an agreeable, nutritious, light, easily digestible article of food for the sick and convalescent. It is devoid of all irritating and stimulating properties.—W.]

## [EUPHORBIA COROLLATA. *L.*

### Flowering Spurge.

*Generic Character.*—Staminate flowers many, each merely of a single stamen, inclosed in the involucre, the single pistillate flower projecting from it on its stalk. Pod three-lobed. Calyx and corolla absent.

*Specific Character.*—Glands of involucre five, entire, with (white) petal-like appendages. Perennial. Leaves without stipules, alternate or scattered, up to where flowering begins. A conspicuous plant, growing two to three feet high, in sandy places or rich soil, the showy, false, white lobes of the involucre appearing to be true flowers.

### E. IPECACUANHÆ.

### American Ipecac.

*Specific Character.*—Leaves without stipules, all opposite; involucres solitary, peduncled in the forks of the stem; root very long, perpendicular, perennial. A small plant, with many erect or prostrate, diffusely spreading stems from a single root, often attaining the height of from a half to one foot. The leaves and stems are often of a dark purple color.

*Habitat.*—Sandy soil, near Atlantic coast of the United States.

The roots of both of these plants are officinal in the Secondary List of the U. S. Pharmacopœia. They are both emetics, and in large doses acrid emeto-cathartics, causing great irritation of the gastro-intestinal mucous membrane. They are very seldom used. In small doses, E. ipecacuanhæ is said to be diaphoretic and expectorant. Dose of the dried root, as an emetic, fifteen to twenty-five grains.—W.]

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## [STILLINGIA SYLVATICA, *Linn.*

### Queen's Delight.

*Generic Character.*—Flowers monœcious, both kinds with a calyx, but no corolla, not in an involucre, in a terminal spike. Stamens two. Stigmas three. Simple.

*Specific Character.*—Leaves almost sessile, oblong lanceolate, serrulate; glands of the spike saucer-shaped.

A smooth, herbaceous perennial, with alternate leaves, yellow flowers in a spike, in the upper part of which are the male, in the lower the female, or pistillate flowers. It attains the height of two or three feet, and flowers in May and June.

*Habitat.*—Dry sandy places from Virginia to Florida.

### Stillingia, *Stillingia.* Mat. Med. List, U. S. P.

The root of Stillingia sylvatica.

This root is thick and woody. It occurs "in long cylindrical pieces, from a third to more than an inch thick, wrinkled from drying, of a dirty yellowish-brown color externally; when cut across exhibiting an interior soft yellowish, ligneous portion surrounded by a pinkish colored bark." U. S. D. The taste is bitterish and persistently acrid. It yields to water and alcohol, and is said to be impaired by keeping.

*Therapeutics.*—In large doses an acrid emeto-cathartic. In small doses it is said to be an alterative, resembling in its action sarsaparilla. It has been recommended very strongly in cases of secondary syphilis, scrofula, obstinate cutaneous affections, &c. It is best given in decoction or tincture. The decoction should not be stronger than an ounce; the tincture than two ounces to the pint. They should be made in the usual way, and given in such quantities that the patient will take the equivalent of xv to xx grains of the powder t. d.—W.]

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## ARISTOLOCHIACEÆ, *Lindl.* THE BIRTHWORT ORDER.

## ARISTOLOCHIA SERPENTARIA, *Linn.*

### The Virginia Snake Root.

Gynandria, Hexandria, *Linn. Syst.*

*Botanic Character.*—*Stem* flexuous, ascending. *Leaves* alternate, cordate, acuminate, on both sides pubescent. *Peduncles* nearly radical, unifloral. *Calyx* tubular, ventricose at the base, dilated and extended at the apex. *Anthers* 6, subsessile, inserted on the style. *Stigma* 6-lobed. *Capsule* 6-angled, 6-celled.—*Steph.* and *Church.* pl. 180.

*Habitat.*—North America, in Western Pennsylvania and Virginia, in Ohio, Indiana, and Kentucky.

**Serpentaria,** *Serpentary.* [Mat. Med. List, U. S. P.]

The dried root; from the southern parts of North America.

*Officinal Characters.*—A small roundish root-stock with a tuft of numerous slender-radicles, about three inches long, yellowish, of an agreeable camphoraceous odor, and a warm, bitter camphoraceous taste.

Fig. 105.

*Aristolochia serpentaria.*

*Description.*—It consists of a tuft of long, slender, yellowish or brownish fibres, attached to a long contorted head or rhizome. The odor is aromatic; the taste warm and bitter.

*Composition.*—Serpentary contains volatile oil and bitter extractive. *Volatile Oil.*—Grassman obtained only half an ounce from 100 lbs. of the root. Its color is yellowish, its odor considerable, its taste not very strong. Grassmann compares the odor and taste to those of valerian and camphor combined. *Bitter Principle, Extractive.* This is very bitter, and slightly acrid. It is soluble in both water and spirit. Its solution, which is yellow, is rendered brown by alkalies, but is unchanged by the ferruginous salts.

*Physiological Effects.*—In *small doses* serpentary promotes the appetite. In *large doses* it causes nausea, flatulence, uneasy sensations at the stomach, and frequent but not liquid stools. After its absorption, it increases the frequency and fulness of the pulse, augments the heat of the skin, and promotes secretion and exhalation. Furthermore, it would appear, from the experiments heretofore referred to, that it causes disturbance of the cerebral functions, and produces headache, sense of oppression within the skull, and disturbed sleep. In these properties serpentary bears some analogy to, but is much weaker than camphor.

*Therapeutics.*—Its employment is indicated in cases of torpor and atony. It was formerly termed *alexipharmic*, on account of its fancied power of curing the bite of a rattlesnake and of a mad dog. At the present time it is rarely employed. It has been much esteemed as a stimulant in *fevers*, both continued and intermittent. A scruple of serpentary, taken in three ounces of wine, is mentioned by Sydenham as a cheap remedy for tertians in poor people. Dr. Cullen considered it as suited for the low and advanced stage of typhus only.

*Administration.*—The dose of it in substance is from ten to thirty grains. The infusion is the best form for the administration of serpentary.

*Pharmaceutic Use.*—Serpentary is an ingredient in the compound tincture of cinchona.

### *Officinal Preparations.*

Infusum Serpentariæ [U. S.], *Infusion of Serpentary.*—Take of serpentary, a quarter of an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for two hours, and strain.

This preparation is not altered except in the diminution of the time of infusion from four to two hours. ["Take of serpentaria, in moderately coarse powder, half a troyounce; water, a sufficient quantity. Moisten the powder with two fluidrachms of water, pack it firmly in a conical percolator, and gradually pour water upon it until the filtered liquid measures a pint. This infusion may also be prepared by macerating the serpentaria with a pint of boiling water for two hours, in a covered vessel and straining." U. S.]

*Dose.*—Fl. oz. j to fl. oz. ij.

Tinctura Serpentariæ [U. S.], *Tincture of Serpentary.*—Take of serpentary, bruised, two ounces and a half; proof spirit, one pint. Macerate the serpentary for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. The strength of this tincture is increased. The cochineal of the Edinb. preparation is omitted, and percolation adopted.

["Take of serpentaria, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

Tonic and diaphoretic. Used as an adjunct to tonic infusions.

*Dose.*—From fl. drm. j to fl. drs. ij.

[Extractum Serpentariæ Fluidum, U. S., *Fluid Extract of Serpentaria.*—"Take of serpentaria, in moderately fine powder, sixteen troyounces; diluted alcohol, a sufficient quantity. Moisten the serpentaria with five fluidounces of diluted alcohol, introduce it into a conical percolator, press it firmly, and gradually pour upon it diluted alcohol until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation until two pints and a half more of tincture have been obtained. Evaporate this at a temperature not exceeding 150° until it is reduced to four fluidounces, mix it with the reserved tincture, and filter through paper."

A fluidounce of this preparation represents a troyounce of the root. *Dose*, f℥ss.—W].

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[**ASARUM CANADENSE,** *Linn. Wild Ginger. Canada Snake Root.*

*Generic Character.*—Calyx regular; the limb 3-cleft or parted; stamens 12, with more or less distinct filaments. Fruit fleshy, globular, bursting irregularly.

*Specific Character.*—Calyx bell-shaped, its tube wholly coherent with the ovary; filaments slender, much longer than the short anthers; leaves kidney-shaped.

Fig. 106.

*Asarum Canadense.*

This is a stemless herb, with an aromatic rhizome, which gives origin to three hairy leaf stalks, which bear the pubescent, membranous, 4 to 5 inches wide, leaves. The flower is on a very short peduncle, is brown-purple inside, and frequently lies so close to the ground as to be concealed beneath the dry dead leaves around. It grows in rich woods, on hill and mountain-sides; flowers in April and May.

*Habitat.*—Northern United States.

**Asarum**, *Wild Ginger.* Secondary List, U. S. P.

The root of Asarum Canadense.

This rhizome has a warm, aromatic taste simulating that of ginger. It depends for its virtues upon a volatile oil. It is an elegant aromatic tonic and stomachic. According to Dr. Black, of Indiana, it is also diuretic. It may be exhibited in tincture, or infusion made with boiling water.—W.]

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## [CHENOPODIUM ANTHELMINTICUM, *Linn.* *Wormseed.*

*Sex. Syst.* Pentandria, Digynia.

*Generic Characters.*—*Calyx* five-parted, with five angles. *Corolla* none. *Style* bifid, rarely trifid. *Seed* one, lenticular, horizontal, covered by a closing calyx. (*Nuttall.*)

*Specific Characters.*—*Leaves* oblong, lanceolate, sinuate, and dentate, rugose. *Racemes* naked. *Style* one, three-cleft (Elliot).

Fig. 107.

*Chenopodium anthelminticum.*

The common names by which this plant is known in the United States are Jerusalem Oak, Wormseed, Goosefoot, and Stinkweed.

*Description.*—The root of the plant is perennial and branched. Stem upright, herbaceous, much branched, deeply grooved, from two to four feet high. Branches fastigiate, giving to the plant a shrubby appearance. Leaves sessile, scattered, and alternate, attenuate at each end, with strongly marked nervures, oval or oblong, deeply sinuate, studded beneath with small globular, oleaginous dots. Flowers small, numerous, of a yellowish-green color, and collected in long, axillary, dense, leafless spikes.

*Habitat.*—This species of chenopodium is found in most parts of the United States. It grows in old fields, along roadsides, in moist and sandy situations. It flowers in June and July, and from August until cold weather the seeds may be collected.

The Chenopodium anthelminticum has sometimes been confounded with the C. ambrosioides, which is a smaller plant, and distinguished by the leafy spikes of flowers. The sensible properties are similar.

**Chenopodium**, *Wormseed.* Mat. Med. List, U. S. P.

The fruit of Chenopodium anthelminticum.

The seeds are small, not larger than the head of a common-sized pin, irregularly spherical, very light, of a dull greenish-yellow color, approaching to brown, and having a bitterish, somewhat aromatic, pungent taste. The odor and taste are due to the volatile oil that they contain; this is found in other parts: in fact, the whole plant contains it.

*Therapeutics.*—Chenopodium is a powerful vermifuge, especially fatal to the round worm. It is also affirmed by some authorities to be antispasmodic and has been given with asserted success in chorea.

The seeds are given in the form of an electuary, pulverized and mixed with molasses or syrup; but the quantity required to be taken is liable to produce nausea and sickness. Dose ℈j to ℈ij given twice or thrice daily.

The expressed juice of the plant is sometimes administered; the dose is f℥ss; or a decoction of the leaves may be employed; this is best prepared with milk, in the proportion of ℥j leaves to Oj of milk or water. It may be flavored with aromatics.

**Oleum Chenopodii**, U. S., *Oil of Wormseed.*

Prepare this oil from wormseed by the general formula, see page 399.

This oil is of a light yellow color when distilled, but its color deepens by age and exposure. It has in a high degree the flavor of the plant. Its specific gravity is 0.908. Sometimes it is adulterated with spirit of turpentine, or other inferior volatile oils; this must be determined by the odor. From the readiness with which it may be given, it is the best for exhibition, as it possesses the vermifuge properties in the smallest possible compass. The dose is from ten to twenty drops on a lump of sugar, or in emulsion. After several doses have been given, a purgative, as castor oil, may be interposed.—W.]

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## [PHYTOLACCACEÆ, *R. Brown.* The Poke Weed Order.

## PHYTOLACCA DECANDRA, *L.* Poke.

*Generic Characters.*—Calyx of five rounded and petal-like sepals. Stamens 5–30. Ovary of 5–12 carpels, united in a ring, with as many short, separate styles, in fruit forming a depressed globose 5–12-celled berry with a single vertical seed in each cell.

*Specific Characters.*—Stamens ten; styles ten.

This is a tall coarse weed, which grows in clearings, borders of wood, along fences, &c. Its berries are, when ripe, of a blackish-purple color, and filled with a deep red juice.

*Habitat.*—United States.

**Phytolaccæ Bacca**, *Poke Berry.* Secondary List, U. S. P.

The berries of Phytolacca decandra.

**Phytolaccæ Radix**, *Poke Root.* Secondary List, U. S. P.

The root of P. decandra.

Poke is an emeto-cathartic, with some narcotic properties. As an emetic it operates very slowly and persistently, often not causing vomiting until the lapse of one or more hours. In very large doses it causes excessive vomiting and purging, with great prostration, spasm, vertigo, and other symptoms of nervous disturbance. It has caused death It

Fig. 108.

*Phytolacca decandra.*

is said also, in small doses, to be an alterative, and has been highly spoken of in chronic rheumatism, cutaneous affections, &c. The berries may be exhibited in saturated tincture. Dose, as an alterative, f℥j.

Dose of the root, as an emetic, gr. x to xxx; as an alterative, gr. j to v.—W.]

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## LAURACEÆ, *Lindley.* The Laurel Order.

## CINNAMOMUM ZEYLANICUM, *Nees.*

### The Ceylon Cinnamon.

Enneandria, Monogynia, *Linn. Syst.*

*Botanic Character.—Branches* somewhat 4-cornered, smooth. *Leaves* opposite, ovate or ovate-oblong, tapering into an obtuse point, 3-ribbed, reticulated on the under side, smooth. *Panicles* terminal and axillary, stalked. *Flowers* somewhat silky. *Calyx* 6-cleft, with the limb deciduous. *Stamens* 12, in 4 rows; the 9 external ones fertile; the 3 inner ones capitate, abortive; the three most internal of the fertile stamina having 2 sessile glands at the base. *Anthers* 4-celled, bursting by valves, the 3 inner opening outwards. *Ovary* 1-celled, with 1 ovule. *Fruit* (a berry) seated in the cup-like base of the calyx.—*Wight*, *Icon. Plant. Ind. Orient.* pl. 123.

### Cinnamomum, *Cinnamon.* [Mat. Med. List, U. S. P.]

The inner bark of shoots from the truncated stock; imported from Ceylon, and distinguished in commerce as Ceylon Cinnamon.

*Production.*—The cinnamon bark of Ceylon is obtained by the cultivation of the plant. The principal cinnamon gardens lie in the neighborhood of Columbo. Percival states that the bark-peelers having selected a tree of the best quality, lop off such branches as are three years old, and which appear proper for the purpose. But Simmonds says that, although the trees in their wild state will grow ordinarily to the height of thirty feet, when cultivated for their bark, they are not permitted to rise above ten feet. The general appearance of the plantation is that of a copse with laurel leaves and stems about the thickness of hazel, and when in full bloom the cinnamon bushes have a very beautiful appearance. The best cinnamon is obtained from the stalks or twigs which shoot up in a cluster of eight or ten together from the roots after the parent bush or tree has been cut down. The shoots are cut once in about three years, and those which are considered fit for cutting are usually about three-quarters of an inch in diameter, and five feet or more long. [This agrees with the information which Dr. Garrod informs me that he received from Mr. Rudd, of Ceylon, that the young cinnamon

Fig. 109.


*Cinnamomum Zeylanicum.*

are always cut down, that the part cut down forms coarse cinnamon, and the shoots from the stock the fine cinnamon. Mr. E. R. Power, who acted as Commissioner for Ceylon in the Exhibition of 1862, writes me nearly to the same effect. From each old root one or two sticks are cut, care being taken to cut the stick obliquely, in order to assist the young shoot which grows from this stem. It generally comes to perfection in the cultivated gardens in eighteen months.—Ed.] The peeling is effected by making two opposite, or, when the branch is thick, three or four longitudinal incisions, and then elevating the bark by introducing the peeling knife beneath it. In twenty-four hours the epidermis and greenish pulpy matter are carefully scraped off. "The bark is carefully sorted into firsts, seconds, and thirds; that near the middle and upper end of the sticks being used for firsts, a lower portion for seconds, and the lowest and coarser parts and old sticks for thirds." (*Power.*) In a few hours smaller, *i. e.* narrower quills are introduced into the larger ones, and in this way a congeries of quills formed, often measuring forty inches or more in length. The bark is then dried in the sun, and made up into bales. "Care is taken to fill up each pipe with the same kind of bark as that which is outside, and as few joints are placed in each pipe as possible. There is no fixed number of pieces for filling the pipes; sometimes as many as eight or ten are used, according to the fineness of the bark." (*Power.*) The finest pipes are usually well filled, as the preservation of the odor and flavor is greatly assisted by excluding the air.

*Officinal 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 odor, and warm, sweet, aromatic taste; breaks with a splintery fracture.

*Description.*—The bark is thin (the finest being scarcely thicker than drawing-paper), smooth, moderately pliable, breaking readily in the longitudinal direction, but transversely with a splintery fracture. Ceylon cinnamon is characterized by each single quill being cut obliquely at the bottom, whereas the other kinds are cut transversely. In the London market three qualities of Ceylon cinnamon are distinguished; viz, *firsts*, *seconds*, and *thirds*. Inferior kinds are thicker, darker, browner, and have a pungent, succeeded by a bitter taste. When cinnamon arrives in London, it is unpacked and examined; all the mouldy and broken pieces are removed from it; it is then remade into bales and cut. These bales are cylindrical, three feet six inches long, but of variable diameter, perhaps sixteen inches on the average. The cinnamon in boxes and chests is usually the small, inferior, and mouldy pieces.

*Ceylon cinnamon* is the most esteemed kind, and is alone officinal. *Tellicherry or Bombay cinnamon* in appearance is equal to the Ceylon kind, but the internal surface of the bark is more fibrous, and the flavor is inferior. *Madras or Malabar cinnamon* is coarser and inferior in flavor to both the other kinds. In thickness it approximates to Cassia bark. Both the Bombay and Malabar cinnamon resemble the Ceylon cinnamon in the composite character of their quills, though the latter, on account of its thickness, is frequently only double.

*Substitution.*—In commerce, Cassia bark (called on the continent Chinese cinnamon) is frequently substituted for cinnamon. It is distinguished by its greater thickness, its short resinous fracture, its less delicate and stronger flavor, its shorter and *single* quills, and its being packed in small bundles. Moreover it may be distinguished chemically by the action of iodine on its infusion (see *infra*). The difference of flavor is best distinguished when the barks are ground to powder.

*Composition.*—Cinnamon contains *volatile oil* and *tannin*. Perchloride of iron causes a greenish flocculent precipitate in infusion of cinnamon (*tannate of iron*). Solution of gelatin also occasions a precipitate in the infusion (*tannate of gelatin*). A decoction of cinnamon may be distinguished from a decoction of cassia bark by tincture of iodine, which gives a blue color (*iodide of starch*) with the latter, but not with the former. Both barks contain starch, but cinnamon appears to contain a larger proportion of some principle (tannic acid?) which destroys the blue color of iodide of starch; for if the decoction of cassia bark rendered blue by iodine be added to the decoction of cinnamon, the blue color disappears.

*Physiological Effects.*—Cinnamon, *in moderate doses*, stimulates the stomach, produces a sensation of warmth in the epigastric region, and promotes the assimilative functions. The repeated use of it disposes to costiveness. *In full doses*, it acts as a general stimulant to the vascular and nervous systems. Some writers regard it as acting specifically on the uterus.

*Therapeutics.*—Cinnamon is frequently added to other substances—as to the bitter infusions, to improve their flavor; and to purgatives to check their griping qualities. As a cordial, stimulant, and tonic, it is indicated in all cases characterized by feebleness and atony. As an astringent, it is employed in diarrhœa, usually in conjunction with chalk, the vegetable infusions, or opium. As a cordial and stimulant, it is exhibited in the latter stages of low fever. In flatulent and spasmodic affections of the alimentary canal it often proves a very efficient carminative and antispasmodic. It checks nausea and vomiting. It has also been used in uterine hemorrhage.

*Administration.*—The dose of it in substance is from ten to twenty grains.

*Pharmaceutic Uses.*—Cinnamon is an ingredient in aromatic sulphuric acid, decoction of logwood, infusion of catechu, aromatic powder, compound powder of catechu, powder of kino and opium, compound tincture of cardamoms, tincture of catechu, and compound tincture of lavender.

### *Officinal Preparation.*

Aqua Cinnamomi [U. S.], *Cinnamon Water.*—Take of cinnamon, bruised, twenty ounces; water, two gallons. Distil one gallon. This water is superior to the London and Dublin waters prepared from the oil. Cinnamon water is principally employed as a vehicle for other medicines. It is aromatic and carminative.

*Dose.*—Fl. oz. j to fl. oz. ij.

["Take of oil of cinnamon, half a fluidrachm; carbonate of magnesia, sixty grains; distilled water, two pints. Rub the oil first with the carbonate of magnesia, then with the water, gradually added, and filter through paper. Cinnamon water may also be prepared by mixing eighteen troyounces of cinnamon, in coarse powder, with sixteen pints of water, and distilling eight pints. Dose, from f℥ss to f℥j." U. S.]

Tinctura Cinnamomi [U. S.], *Tincture of Cinnamon.*—Take of cinnamon, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the cinnamon for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. This is about one-fourth stronger than the London and Edinburgh tinctures. ["Take of cinnamon, in fine powder, three troyounces; alcohol, water, each a sufficient quantity. Mix alcohol and water in the proportion of two measures of the former to one of the latter; then moisten the powder with a fluidounce of the mixture, pack it moderately in a conical percolator, and gradually pour the mixture upon it until two pints of filtered liquid are obtained." U. S.] It is commonly used as an adjuvant to cretaceous, astringent, tonic, or purgative mixtures. It has also been employed in uterine hemorrhage.

*Dose.*—Fl. drm. j to fl. drms. iij.

[SPIRITUS CINNAMOMI, *Spirit of Cinnamon.*—"Take of oil of cinnamon, a fluidounce; stronger alcohol, fifteen fluidounces. Dissolve the oil in the stronger alcohol." U. S. Dose, gtt. xv to xxx, in sweetened water.—W.]

PULVIS AROMATICUS [U. S.], *Aromatic Powder.*—Take of cinnamon, four ounces; nutmeg, three ounces; saffron, three ounces; cloves, one ounce and a half; cardamoms, freed from their capsules, one ounce; refined sugar, twenty-five ounces. Reduce the ingredients separately to fine powder, mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

This powder is nearly the same as the powder of the aromatic confection of London, without the chalk. The ingredients are the same, but the proportions are a little altered. It differs from the Edinburgh and Dublin aromatic powders in containing cloves, saffron, and sugar, and no ginger. ["Take of cinnamon, in fine powder, ginger, in fine powder, each two troyounces; cardamom, deprived of the capsules, and in fine powder, nutmeg, in fine powder, each, a troyounce. Rub them together until they are thoroughly mixed." U. S.] Aromatic and carminative.

*Dose.*—Gr. x to gr. xxx.

[CONFECTIO AROMATICA, U. S., *Aromatic Confection.*—"Take of aromatic powder, four troyounces; clarified honey, four troyounces or a sufficient quantity. Rub the aromatic powder with clarified honey until a uniform mass is obtained of the proper consistence." U. S. An agreeable aromatic stomachic, frequently used as a vehicle for the administration of other substances. Dose, gr. v to x.—W.]

**Oleum Cinnamomi**, *Oil of Cinnamon.* [Mat. Med. List, U. S. P.]

The oil distilled from cinnamon; imported from Ceylon.

*Officinal Characters.*—Yellowish when recent, gradually becoming red, having the odor and taste of cinnamon. Sinks in water.

*Preparation.*—Oil of Cinnamon is obtained in Ceylon by macerating the inferior pieces of the bark, reduced to a gross powder, in sea-water, for two days, when both are submitted to distillation.

*Description.*—As imported, the oil varies somewhat in its color, from yellow to cherry-red; the paler varieties are most esteemed, hence London druggists frequently submit red oil of cinnamon to distillation, by which they procure two pale yellow oils, one lighter (amounting to about a quarter of the whole), the other heavier than water. The loss on this process is considerable, being near ten per cent. Percival says that the oil obtained from the finer sorts of cinnamon is of a beautiful gold color, while that from the coarser bark is darker and brownish. The deeper color is due to the oxidation of the oil. Its odor is pleasant, and purely cinnamomic. Its taste is at first sweetish, afterwards cinnamomic, burning, and acrid.

*Composition.*—Oil of cinnamon of commerce consists of a mixture of two or more bodies. The principal constituent, and which is considered to be oil of cinnamon properly so called, is the *hydruret of cinnamyle*, whose formula, according to Mulder, is $C_{20}H_{11}O_2$; but, according to Dumas and Peligot, is $C_{18}H_8O_2$. Mulder supposes that the differences in these formulæ depend on the oil analyzed by Dumas and Peligot not having been quite fresh. By exposure to the air, oil of cinnamon absorbs oxygen, and forms cinnamic acid, two resins, and water.

*Adulteration.*—On account of their great difference in commercial value, and resemblance in physical and chemical properties, oil of cassia is sometimes substituted for, or mixed with, genuine oil of cinnamon. The finer and more delicate odor of the latter is the chief distinction between them.

*Therapeutics.*—Oil of cinnamon is sometimes employed as a powerful stimulant in paralysis of the tongue, in syncope, and in cramp of the stomach. But its principal use is as an adjuvant to other medicines.

*Dose.*—From one to three drops.

*Pharmaceutic Uses.*—It is an ingredient in bismuth lozenges.

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## CAMPHORA OFFICINARUM, *Nees.*

### The Camphor Laurel.

Enneandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—Young *branches* yellow and smooth. *Leaves* alternate, evergreen, oval, acuminate, attenuate at the base, bright green and shining above, paler beneath, triple-ribbed, glandular in the axils of the principal veins. *Petioles* from 1 to 1½ inch long. *Flowers* hermaphrodite, pannicled, small, yellowish-white. *Calyx* 6-cleft, papery, with a deciduous limb. *Fertile stamens* 9, in 3 rows; the inner with 2 stalked compressed glands at the base; *anthers* 4-celled, the outer turned inwards, the inner outwards, bursting by valves; 3 *sterile stamens*, shaped like the last, placed in a whorl, alternating with the stamens of the second row; 3 others stalked, with an ovate, glandular head. *Berry* round, blackish-red, size of a black currant. *Seed* solitary. Every part of the tree, but especially the flower, evinces by its smell and taste that it is strongly impregnated with camphor.—*Woodv.* page 419, plate 155 (*Laurus Camphora*).

*Habitat.*—China, Japan, and Cochin China. Introduced into Java from Japan.

**Camphora,** *Camphor.* [Mat. Med. List, U. S. P.] $C_{20}H_{16}O_2$.

A concrete volatile oil, obtained from the wood by sublimation, and resublimed in bell-shaped masses; imported (in its crude state) from China.

*Commerce.*—Two kinds of *unrefined* or *crude camphor* are known in commerce; one is the produce of China, the other of Japan.

*China Camphor, Formosa Camphor.*—This is the *ordinary crude camphor.* To obtain crude camphor in China the chopped branches are steeped in water, and afterwards boiled, until the camphor begins to adhere to the stick used in stirring. The liquid is then strained, and, by standing, the camphor concretes. Alternate layers of a dry earth, finely powdered, and of this camphor, are then placed in a copper basin to which another inverted one is luted, and sublimation effected. This kind of crude camphor is imported from Singapore and Bombay, in square chests lined with lead-foil, and containing from 1¼ to 1½ cwt. It is chiefly produced in the Island of Formosa, and is brought by the Chin-Chew junks in very large quantities to Canton, whence foreign markets are supplied. It consists of dirty-grayish grains, which are smaller than those of Dutch camphor. Its quality varies; sometimes it is wet and impure, but occasionally it is as fine as the Dutch kind. *Japan Camphor.*—Japan or Dutch camphor is brought to Europe by way of Batavia. It is imported in tubs (hence it is called *tub camphor*). It consists of pinkish grains, which, by their cohesion, form various-sized masses. It differs from the ordinary crude camphor in having larger grains, in being cleaner, and in subliming usually at a lower temperature. In consequence of these properties it fetches a higher price in the market. There is not much brought to England, and of that which does come the greater part is re-shipped for the Continent.

*Refinement.*—Crude camphor is refined by sublimation. The method at present adopted in this metropolis is, as I am informed, as follows: The vessels in which this sublimation is effected are called *bomboloes*. They are made of very thin flint glass, and weigh about 1 lb. each. Their shape is that of an oblate spheroid, whose shorter or vertical axis is about ten inches, and the longer or horizontal axis about twelve inches. They are furnished with a short neck. When filled with crude camphor, they are imbedded in the sand-bath, and heated. To the melted camphor lime is added, and the heat raised so as to make the liquid boil. The vapor condenses on the upper part of the vessel. As the sublimation proceeds, the height of the sand around the vessel is diminished. In about forty-eight hours the process is usually completed. The vessels are then removed, and their mouths closed with tow; water is sprinkled over them by watering-pots, by which they are cracked. When quite cold, the bowl of camphor, which weighs about eleven pounds, is removed and trimmed by paring and scraping. In this process the lime retains the impurities and a portion of the camphor; hence, to extract the latter the lime is submitted to a strong heat in an iron pot with a head to it, and the sublimed product refined by a second sublimation. Drs. Taylor and Rees witnessed this process at a large chemical factory in the neighborhood of London. The bombolo was not there used in the mode described by the author, but the short neck was fitted to the mouth of the subliming pot, which was imbedded in sand. The thin glass globe receives the pure sublimed camphor in a thick crust. The glass vessel is then broken, and a hollow hemisphere of camphor is removed from it.

*Officinal Characters.*—White, translucent, tough, and crystalline; has a powerful penetrating odor, and a pungent taste followed by a sensation of cold; floats on water; volatilizes slowly at ordinary temperatures; is slightly soluble in water, but readily soluble in rectified spirit and in ether.

*Properties.*—*Refined camphor* is met with in the form of large hemispherical bowls, perforated in the middle. It is solid at ordinary temperatures, soft and somewhat tough, but may be readily powdered by the addition of a few drops of rectified spirit. In closed vessels exposed to light it sublimes and crystallizes on the sides of the bottle. It burns in the air like the volatile oils generally. It fuses at 347° F., and forms a transparent liquid, which boils at 400 F., and in close vessels condenses unchanged. It is lighter than water, its specific gravity being usually stated as 0.9867. The density of camphor, however, varies considerably, according to the temperature. At 32° it is said to be denser than water. And when saturated with water, it sinks in this liquid at a temperature below 40°. By raising the temperature of the water, the camphor again rises to the surface. Small pieces, when thrown on this liquid, are violently agitated, and present a gyratory motion, which ceases directly a drop of oil is let fall on the water. Camphor is but very slightly soluble in water; 1,000 parts of the latter dissolving only one part of camphor at the ordinary pressure of the atmosphere. Alcohol readily dissolves camphor; but if water be added to the solution, the camphor is precipitated. Ether, chloroform, the oils (both fixed and volatile), and the acids, also dissolve it.

*Test.*—Sublimes entirely when heated.

*Physiological Effects.*—*Its local action* on the mucous surfaces, the denuded derm, and ulcers, is that of an *acrid*. A piece of camphor held in the mouth for half an hour caused the mucous lining of this cavity to become red, hot, swollen, and painful; and it is highly probable that, had the experiment been persevered in, ulceration would have followed. The pain and uneasiness which camphor, when swallowed in substance, sometimes produces in the stomach, is likewise imputed to its local action as an acrid. When applied to the denuded derm, or to ulcers, it produces pain, and appears to act as an irritant. Camphor has been charged with producing brittleness of the teeth when it has been used for a considerable time as a dentifrice, but without any valid foundation. *Camphor becomes absorbed*, and is thrown out of the system by the bronchial membrane principally, but also by the skin. Trousseau and Pidoux recognized its odor in every case in the pulmonary exhalation, but failed to detect it in the cutaneous perspiration. Cullen, however, says that camphor, though given very largely, never discovers its smell in the urine, whilst it frequently does in the perspiration and sweat. *Camphor specifically affects the nervous system.* Regarding the symptoms of this effect, but little difference of opinion prevails. In moderate doses it exhilarates, and acts as an anodyne. Its exhilarating effects are well seen in nervous and hypochondrical cases. In large doses it causes disorder of the mental faculties, the external senses, and volition; the symptoms being lassitude, giddiness, confusion of ideas and disordered vision, noise in the ears, drowsiness, delirium or stupor, and convulsions. 20 grains is the smallest quantity that appears to have been followed by serious symptoms; but half an ounce has been swallowed without fatal result; so that camphor, though certainly a narcotic irritant, cannot be regarded as a very active poison. In its power of causing stupor, camphor agrees with opium; but it differs from the latter in its more frequently causing delirium and convulsions. Epilepsy has been ascribed to the use of camphor. It is often a valuable addition to opium, preventing the headache which opium is apt to occasion. *The quality of the influence which camphor exercises over the vascular system* has been a subject of much controversy. From my own limited observations of its use *in small* or *medium doses* (from five to ten grains), I am disposed to regard its leading effect as that of a vascular excitant, though I am not prepared to deny slight depression may not have preceded this effect. Combined with diaphoretic regimen, as warm clothing and tepid diluents, I have seen camphor increase the fulness of the pulse, raise the temperature of the surface, and operate as a sudorific. If opium be conjoined, these effects are more manifest. In some well-reported cases, camphor, in large doses, caused depression of the vascular system, manifested by a languid, small, and slower pulse, coldness of the surface, and pallid countenance; in some cases with cold sweat. In some of these instances reaction followed the depression. The ancients and the moderns have alike regarded camphor as an anaphrodisiac.

*Therapeutics. In fever.*—Camphor has been employed in those forms of fever which are of a typhoid type. It is chiefly valuable by causing determination to the surface, and giving rise to diaphoresis. It does this more effectually when combined with other diaphoretics, as acetate of ammonia. Opium greatly contributes to the sudorific effects of camphor; and, when it is admissible, benefit is sometimes obtained by the administration of one grain of opium with five or eight of camphor. From its specific influence over the cerebral functions, camphor has been frequently used in fever to allay the nervous symptoms—such as the delirium, the watchings, and the *subsultus tendinum;* but it frequently fails to give relief. Dr. Home did not find any advantage from its use in low nervous fever; and Dr. Heberden has seen twenty grains of camphor given every six hours without any perceptible effect in abating the convulsive catchings, or composing the patient to rest. Professor Huss highly commends it in typhoid fever, but considers it objectionable when there is redness of the tongue, tenderness of the abdomen, and diarrhœa.

*In inflammatory diseases.*—In the latter stages of acute inflammation of internal important parts (as the serous and mucous membranes), after proper evacuations have been made in the earlier periods of the disease, when great exhaustion is manifested by a small, feeble pulse, and a cold flaccid skin, small but repeated doses of camphor have been employed to determine to the skin, and to promote diaphoresis. It is particularly serviceable in rheumatic inflammation, especially, when combined with opium. *In mania, melancholia, and other forms of mental disorder.*—Camphor is occasionally taken to cause exhilaration. I was acquainted with two females, both of nervous temperament, who used it for this purpose. To relieve despondency I have often found it serviceable. In mania and melancholia it has now and then proved useful by its narcotic effects: it induces mental quiet and causes sleep. It was used in these affections by Kinneir and Avenbrugger. *In puerperal mania*, Dr. Copland employs it with hyoscyamus, and Dr. Pritchard with carbonate of ammonia. *In spasmodic affections.*—The narcotic influence of camphor has occasionally proved serviceable in some spasmodic or convulsive affections, as whooping-cough, asthma, angina pectoris, hysteric and puerperal convulsions. *In palpitation.*—Dr. Lombard, of Geneva, states that, in doses of from three to twelve grains, it quiets the tumultuous palpitation which often arises from hypertrophy of the heart with dilatation. [I have long been in the habit of using it in these cases, combined with hyoscyamus.—Ed.] *In diseases of the uterus.*—Dr. Dewees bears testimony to the value of camphor, in doses of ten grains, in irritable uterus, in inflammation of its lining membrane, and in uterine cancer. *In irritation of the sexual organs.*—In satyriasis and nymphomania, it is said to have proved advantageous by its anaphrodisiac properties. Esquirol and Alibert used it successfully in the latter disease. *In chronic rheumatism and gout.*—A mixture of camphor and opium is useful in chronic rheumatism, by its sudorific and anodyne properties. Warm clothing and diluents should be conjoined. In chronic gout, also, camphor is said to have proved beneficial.

*Externally*, camphor is employed in the form of vapor, in solution, or, more rarely, in the solid state. The *vapor* is occasionally inhaled in spasmodic cough, and is applied to the skin to alleviate pain and promote sweat. Dupasquier recommended camphor fumigation in chronic rheumatism. The patient may be in bed, or seated in a chair; and, in either case, is to be enveloped in a blanket tied round the neck. About half an ounce of camphor is then to be placed on a heated metallic plate, and introduced within the blanket (under the chair if the patient be seated): in a few minutes it produces a copious perspiration. In *solution*, camphor is used either as an anodyne or a local stimulant. The oily and alcoholic solutions of camphor are mostly employed as stimulants. In *substance*, camphor is not frequently used. Twenty or thirty grains, added to a poultice, and applied to the perineum, allay the chordee, which is a painful attendant upon gonorrhœa. It has been employed successfully, for the prevention of pitting from smallpox, by Mr. Henry George, of Kensington. On the second day of a confluent case of smallpox, he covered one half of the face with wadding well sprinkled with powdered camphor, over which he placed oil-silk. The remainder of the face and the whole of the body were covered with powdered calamine. The side of the face which had been covered with camphor was free from pitting, while on the opposite, a month afterwards, the areolæ and indentations of the pustules still remained.

*Administration.*—The medium dose of it is from five to ten grains; but it is frequently exhibited in much smaller doses, as one grain; and occasionally twenty grains have been employed. It is given in the form of a pill or emulsion. That of *pill* is said to be objectionable, and in this state the camphor is with difficulty dissolved in the gastric fluids, and, floating on the top, is apt to excite nausea, or pain or uneasiness at the upper orifice of the stomach. It has even been charged with causing ulceration of the stomach when given in the solid form. The *emulsion* is made by rubbing up the camphor with loaf sugar, gum-arabic, and water; and the suspension will be rendered more complete by the addition of a little myrrh.

*Antidote.*—In a case of poisoning by camphor, first evacuate the contents of the stomach. Hufeland recommends the use of opium to relieve the effects of camphor. Phœbus directs solution of chlorine to be administered as the antidote, and afterwards purgatives and clysters. Vinegar and coffee, he states, promote the poisonous operation. Wine assists the patient's recovery.

*Pharmaceutic Use.*—Camphor is an ingredient of liniment of aconite, liniment of belladonna, liniment of soap, and ointment of subacetate of lead.

### *Officinal Preparations.*

AQUA CAMPHORÆ [U. S.], *Camphor Water.* (*Mistura Camphoræ, Lond., Ed., Dub.*)—Take of camphor, broken into pieces, half an ounce; distilled water, one gallon. Inclose the camphor in a muslin bag, and attach this to the stopper of a jar containing the distilled water. Invert the jar; allow it to stand for at least two days, and pour off the solution when required.

The quantity of camphor dissolved is exceedingly small, so that the liquid can scarcely be said to possess more than the flavor and odor of camphor. Hence its principal value is as a vehicle for the exhibition of other medicines. Its usual dose is from fl. oz. j to fl. oz. ij. ["Take of camphor, one hundred and twenty grains; alcohol, forty minims; carbonate of magnesia, half a troyounce; distilled water, two pints. Rub the camphor first with the alcohol, then with the carbonate of magnesia, and lastly with the water, gradually added; then filter through paper." U. S. This preparation contains nearly four grains of camphor to the ounce, and in this country is largely given internally.

*Dose.*—f℥ss—f℥j.—W.].

LINIMENTUM CAMPHORÆ [U. S.], *Liniment of Camphor.*—Take of camphor, one ounce; olive oil, four fluidounces. Dissolve the camphor in the oil. ["Take of camphor, three troyounces; olive oil, twelve troyounces. Dissolve the camphor in the oil." U. S.]

A stimulant and anodyne embrocation in sprains, bruises, and rheumatic and other local pains. In glandular enlargement it is used as a resolvent.

LINIMENTUM CAMPHORÆ COMPOSITUM, *Compound Liniment of Camphor.*—Take of Camphor, two ounces and a half; English oil of lavender, one fluidrachm; strong solution of ammonia, five fluidounces; rectified spirit, fifteen fluidounces. Dissolve the camphor and oil of lavender in the spirit; then add the solution of ammonia gradually with agitation until the whole is dissolved.

This is the Dublin preparation, which contains nearly twice as much ammonia as the Londom liniment. A powerful stimulant and rubefacient, producing, when freely used, considerable irritation and inflammation. It is applicable in the same cases as the simple *liniment of camphor* and the *liniment of ammonia.* From both of these compounds it differs in not being greasy.

Spiritus Camphoræ [U. S.], *Spirit of Camphor.* (*Tinctura Camphoræ, Ed. Dub.*, U. S. P. 1850.)—Take of camphor, one ounce; rectified spirit, nine fluidounces. Dissolve. ["Take of camphor, four troyounces; alcohol, two pints. Dissolve the camphor in the alcohol, and filter through paper." U. S.]

The principal use of this preparation is as a stimulant and anodyne liniment in sprains and bruises, chilblains, chronic rheumatism, and paralysis. Water immediately decomposes it, separating the greater part of the camphor, but holding in solution a minute portion; thereby forming an extemporaneous camphor mixture. By the aid of sugar or mucilage, the greater part of the camphor may be suspended in water. Employed in this form, we may give spirit of camphor internally in doses of from min. x to fl. drm. j. Spirit of camphor is miscible with solution of subacetate of lead in the proportion of two parts of the former to one of the latter, and in this form it is a convenient preparation, sometimes ordered as a concentrated lotion, to which water is to be added by the patient. But if a larger proportion of solution of lead be added, the camphor is partially precipitated.

Tincturæ Camphoræ cum Opio, *Camphorated Tincture of Opium.* [Tinctura Opii Camphorata, U. S.] (*Tinctura camphoræ composita, Lond., Tinctura opii camphorata, Ed., Dub.*)—Take of opium, in coarse powder, forty grains; benzoic acid, forty grains; camphor, thirty grains; oil of anise, half a fluidrachm; proof spirit, one pint. Macerate for seven days, strain, express, and filter; then add sufficient proof spirit to make one pint. ["Take of opium, dried and in moderately fine powder, benzoic acid, each, sixty grains; camphor, forty grains; oil of anise, a fluidrachm; clarified honey, two troyounces; diluted alcohol, two pints. Macerate for seven days and filter through paper." U. S.]

This is a very valuable preparation, and is extensively employed both by the profession and the public. By the latter it is familiarly known as *paregoric*. Its active ingredient is opium; but the camphor, which is combined with the opium, diminishes or prevents some of its ordinary ill effects, as headache and subsequent depression, and assists it as an antispasmodic. The principal use of it is to allay troublesome cough unconnected with any active inflammatory symptoms. It diminishes the sensibility of the bronchial membrane to the influence of cold air, checks profuse secretion, and allays spasmodic cough. A fluidounce contains two grains of opium. It is therefore of the same strength as the Edinburgh and Dublin tinctures, and a little ($\frac{1}{8}$) stronger than the London tincture. The British Pharmacopœia follows Edinburgh and Dublin in mentioning opium in the name, instead of suppressing it as London did; but it employs a safer name, and one less likely to be confounded by an ignorant dispenser, with tinctura opii. An example of this error, which proved fatal, is mentioned by Dr. M. Good. [Often very useful in doses of f℥ss—f℥j in bad chronic diarrhœa. such as is seen in armies.—W.]

*Dose.*—Fl. drm. j to fl. drs. iij.

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## SASSAFRAS OFFICINALE, *Nees.*

**The Sassafras Tree.** Enneandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A small diœcious *tree. Leaves* alternate, thin, varying in form, some being oblong and entire, or lobed on one side, but the greater part 3-lobed, all wedge-shaped at the base. *Flowers* in racemes, yellowish-green, before the leaves. *Calyx* 6-parted, membranous, with equal segments, permanent at the base. *Males: Fertile stamens* 9, in 3 rows, the 3 inner with 2 stalked glands at the base. *Anthers* linear, 4-celled, all opening inwards by valves. *Females* with 6 or more sterile stamens. *Fruit* succulent, oval, about the size of a large pea, deep blue, placed on the thick fleshy apex of the peduncle, and seated in the cup-shaped base of the calyx.— *Woodv.* page 91, pl. 31 (*Laurus Sassafras*).

*Habitat.*—Woods of North America, from Canada to Florida.

### **Sassafras**, *Sassafras.*

The dried root, from North America.

*Officinal Characters.*—In branched pieces sometimes eight inches in diameter at the crown; bark externally grayish-brown, internally rusty-brown, of an agreeable odor, and a peculiar aromatic warm taste; wood light, porous, grayish-yellow, more feeble in odor and taste than the bark. Also in chips.

### [**Sassafras Radicis Cortex**, *Bark of Sassafras Root.* Mat. Med. List, U. S. P.

The bark of the root of Sassafras officinale (Nees, *Laurin.*).

As the volatile oil is the active ingredient of sassafras and exists in the *bark* of the root, the U. S. Ph. very properly recognizes only the bark.—W.]

*Description.*—The root is used in medicine. It occurs in the form of large branches, frequently more or less covered with the bark. The wood is soft, light, of a grayish-red or grayish-yellow tint, and has a fragrant aromatic odor. It is usually sold cut up into chips (*sassafras chips*). The bark, though not officinal in its separated state, occurs in commerce in rather small pieces, which are light, odorless, and spongy or corky. The epidermis is brownish-gray; the cortical layers and inner surface reddish cinnamon-brown, or almost rust-red, becoming darker by age. It is more odorous, and probably more active than the wood.

*Composition.*—The root contains *volatile oil*, *resin*, *tannin*, and *extractive matter.*

*Physiological Effects.*—The wood and the bark are stimulant and sudorific. Taken in the form of infusion, and assisted by warm clothing and tepid drinks, they excite the vascular system, and prove sudorific. They owe their activity to the volatile oil, which possesses acrid properties.

*Therapeutics.*—Sassafras is employed as a sudorific and alterative in cutaneous, rheumatic, and venereal diseases. On account of its stimulant properties, it is inadmissible in febrile or inflammatory conditions of the system. It is rarely or never used alone, but generally in combination with sarsaparilla and guaiacum.

*Administration.*—Sassafras may be administered in the form of *infusion.*

*Pharmaceutic Uses.*—Sassafras is a constituent of the compound decoction of sarsaparilla; but the volatile oil is in great measure dissipated by boiling.

[Oleum Sassafras, U. S., *Oil of Sassafras.*—"Prepare this oil from bark of sassafras root, bruised, by the general formula," given at page 399.

This oil has the odor of the bark and a very warm aromatic pungent taste. It is remarkable for its great sp. gr., which is said to be from 1.087—1.094. It may be used instead of the bark or simply as a carminative and stomachic. Dose, gtt. ii—x.—W.]

[**Sassafras Medulla**, *Sassafras Pith.* Mat. Med. List, U. S. P.

The pith of the stems of Sassafras officinale.

Sassafras pith occurs in little, white, very light cylinders, resembling the pith of the elder, or any plant with a similar growth. It contains a large quantity of a mucilaginous substance, which dissolves in water, affording a very elegant, thick, translucent mucilage. This is not sticky and adhesive, like a solution of gum arabic, nor will it serve to suspend substances in water, but is a very elegant protective application in cases of conjunctivitis.

Mucilago Sassafras, U. S., *Mucilage of Sassafras.* Infusum Sassafras Medullæ, *Pharm.* 1850.—"Take of sassafras pith, one hundred and twenty grains; water, a pint. Macerate for three hours, and strain."—W.]

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## NECTANDRA RODIÆI, *Schomburgk.*

**The Bebeeru or Greenheart Tree.** Dodecandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A large forest *tree*, 60 or more feet high, with a trunk undivided by branches until near the top, and covered by an ash-gray smooth bark. *Leaves* opposite, oblong, acute, entire shining, undulated, 5 or 6 inches long, and 2 or 3 inches broad, with reflexed margins, on short petioles. *Inflorescence* cymose, axillary. *Flowers* hermaphrodite, each about 2 lines in diameter, on short pedicels, yellowish-white, thickly studded with minute glands, having a strong jessamine odor. *Calyx* 6-parted, rotate; segments deciduous. *Stamens* 12, in 4 series; the 9 outer fertile, the 3 inner sterile, without glands; the anthers in the two outer series turned inwards, those of the 3d series turned outwards, all thick, oblong, nearly sessile, 4-celled, and dehiscing by four valves. *Ovary* 1-celled, with 1 ovule. *Style* very short; *stigma* short and truncated. *Fruit* somewhat obovate, slightly compressed; the pericarp grayish-brown, hard, about a line in thickness. *Seed* 1 in each fruit, about the size and shape of a walnut, and containing 2 large plano-convex cotyledons.

*Habitat.*—British Guiana: on rocky hill-sides on the borders of rivers (the Essequibo, Demerara, Pomeroon, and Berbice).

### **Nectandra**, *Bebeeru Bark.* [Mat. Med. List, U. S. P.]

The bark imported from British Guiana.

*Officinal 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 color grayish-brown, internal dark cinnamon-brown. Taste strongly and persistently bitter, with considerable astringency.

*Description.*—*Bebeeru* or *bibiru bark* is derived from the trunk. To the characters given in the Pharmacopœia may be added: bark very hard, fracture tough and rather fibrous; taste somewhat aromatic and pungent, or acrid. Its infusion, like that of the cinchonas, reddens litmus paper. When long subjected to a boiling temperature (212°), or long contact with alkaline or caustic earthy substances, its bitterness is destroyed.

*Composition.*—In 1834, Dr. Rodie discovered that the bark contained an alkaloid, which he used with great success in intermittents. He terms the tree the *Bebeeru*, and the alkaloid *Bebeerine.* Dr. Maclagan found in bebeeru bark about 2.5 per cent. of *beberia*, and the same quantity of *tannic acid* and *resin.* Beberia is obtained by decomposing

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sulphate of beberia by ammonia; the precipitate is washed with cold water, triturated, while still moist, with moist hydrated oxide of lead, and the magma dried on a water-bath, and exhausted by rectified spirit. In this way is obtained an alcoholic solution of beberia, while the oxide of lead, tannic acid, and other impurities, are left behind. The alcohol is to be distilled off, and the resinous-looking residue treated with pure ether, which dissolves the beberia. It is uncrystallizable, and when obtained by evaporation from its ethereal solution, it is a yellow, amorphous, resinous-looking substance; but in the form of powder it is white. It is very soluble in alcohol, less so in ether, and very sparingly in water. Its alcoholic solution has an alkaline reaction on reddened litmus paper. It dissolves in acids, and neutralizes them, forming amorphous yellow salts. Colorless or crystallized salts have not yet been procured.

*Physiological Effects.*—Bebeeru bark appears to possess the tonic, antiperiodic, febrifuge, and astringent properties of cinchona barks. Like the latter its bitter tonic and antiperiodic powers reside in a vegetable alkaloid; and its astringent property in that kind of tannic acid which strikes a green color with the salts of iron.

*Therapeutics.*—See **Beberiæ Sulphas**, page 467.

There is no officinal preparation of the bark.

## **Beberiæ Sulphas**, *Sulphate of Beberia.*

$C_{38}H_{21}NO_6HO,SO_3$.

*Preparation.*—Take of bebeeru bark, in coarse powder, one pound; sulphuric acid, half a fluidounce; slaked lime, three quarters of an ounce, or a sufficiency; solution of ammonia, a sufficiency; rectified spirit, sixteen fluidounces, or a sufficiency; dilute sulphuric acid, a sufficiency; water, a gallon; distilled water, a sufficiency. Add the sulphuric acid to the water; pour upon the bebeeru bark enough of this mixture to moisten it thoroughly; let it macerate for twenty-four hours; place it in a percolator; and pass through it the remainder of the acidulated water. Concentrate the acid liquor to the bulk of one pint, cool, and add gradually the lime in the form of milk of lime, agitating well, and taking care that the fluid still retains a distinct acid reaction. Let it rest for two hours; filter through calico; wash the precipitate with a little cold distilled water, and add to the filtrate solution of ammonia until the fluid has a faint ammoniacal odor. Collect the precipitate on a cloth, wash it twice with ten ounces of cold water, squeeze it gently with the hand, and dry it on the vapor bath. Pulverize the dry precipitate, put it into a flask with six ounces of the rectified spirit, boil, let it rest for a few minutes, and pour off the spirit. Treat the undissolved portion in a similar manner with fresh spirit until it is exhausted. Unite the spirituous solutions, add to them four ounces of distilled water, and distil so as to recover the greater part of the spirit. To the residue of the distillation add, by degrees and with constant stirring, dilute sulphuric acid, till the fluid has a slight acid reaction. Evaporate the whole to complete dryness on the water-bath, pulverize the dry product, pour on it gradually a pint of cold distilled water, stirring diligently, filter through paper, evaporate the filtrate to the consistence of syrup, spread it in thin layers on flat porcelain or glass plates, and dry it at a heat not exceeding 140°. Preserve the product in stoppered bottles.

In this process the acidulated aqueous solution of the bark, after being concentrated by evaporation, and nearly neutralized by milk of lime, is filtered and precipitated by ammonia in slight excess. The impure beberia thus obtained is boiled with rectified spirit until all the alkaloid is dissolved; water is then added, and the greater part of the spirit having been recovered, the residue is treated with dilute sulphuric acid, until it exhibits a faint acid reaction, and is then evaporated to dryness. Finally, it is digested in cold water, which dissolves the sulphate of beberia; and the solution is filtered, evaporated, and scaled.

*Officinal Characters.*—In dark-brown thin translucent scales, yellow when in powder, with a strong bitter taste, soluble in water and alcohol. Its watery solution gives a white precipitate with chloride of barium (*sulphate of baryta*); 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 (*beberia*).

*Tests.*—Entirely destructible by heat. Water forms with it a clear brown solution.

*Therapeutics.*—Bebeeru bark and sulphate of beberia have been used as peptics in anorexia and dyspepsia; as general tonics in debility, protracted phthisis, and strumous affections; as febrifuges in intermittent and remittent diseases; and as antiperiodics in periodical headache and intermittent neuralgias. Sufficient experience has not yet been obtained of bebeeru bark, and its alkaloid, to enable us to form an accurate opinion of their therapeutical power in comparison with cinchona bark and quinia. In some cases beberia has appeared to produce its peptic and tonic effects with less tendency to cause headache, giddiness, ringing in the ears, and feverishness, than quinia; and it can in consequence be administered to some patients with whom quinia disagrees. On the other hand. it appears inferior to the latter in febrifuge and antiperiodic power. Beberia, when properly administered, according to Mr. Rodie, generally cures intermittents when quinine has failed.

It has been recommended as an economical substitute for sulphate of quinia; but the larger dose required would probably neutralize any advantage afforded by the difference in price.

*Administration.*—Sulphate of beberia may be administered in doses of from one to three grains as a tonic, and from five to twenty grains as a febrifuge. In substance it is given in the form of pill, made with conserve of roses; and in solution with dilute sulphuric acid. The following is given as a convenient form for its exhibition as a tonic: Sulphate of beberia, gr. xxx; dilute sulphuric acid, min. xxv; syrup, fl. oz. j; tincture of orange-peel, fl. oz. j; water fl. oz. iv. One tablespoonful to be taken three times a day.

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## MYRISTICACEÆ, *Lindl.* The Nutmeg Order.

### MYRISTICA OFFICINALIS, *Linn.* The Nutmeg Tree.

Diœcia, Monodelphia, *Linn. Syst.*

*Botanic Character.*—A *tree* from twenty to twenty-five feet high, similar in appearance to a pear tree. *Bark* dark grayish-green, smooth with a yellowish juice. *Leaves* oblong, subacute at the base, smooth, aromatic. *Racemes* axillary, few-flowered. *Flowers* usually diœcious, sometimes monœcious. *Males:* three to five on a peduncle. *Calyx* urceolate, trifid, fleshy, pale yellow, with a reddish pubescence. *Anthers* united throughout their whole length into a cylindrical column. *Females:* Scarcely different from the males, except that the pedicle is frequently solitary. *Stigma* sessile, emarginate, somewhat 2-lobed. *Fruit* globose, smooth, about the size of a peach, marked by a longitudinal groove. *Pericarp* fleshy, dehiscing by two nearly equal longitudinal valves. *Arillus*, commonly called *mace*, large, fleshy, branching, scarlet; when dry, yellow, brittle, and somewhat horny. *Seed* (*nutmeg in the shell*) oval or ovate; its outer coat or *shell* is dark brown, hard, glossy; its inner coat closely invests the seed, and dips down into the substance of the albumen, giving it a marbled or *ruminated* appearance. The *nucleus* (the *round* or *true nutmeg* of the shops) consists chiefly of

Fig. 110.


*Myristica moschata.*

the oleaginous *albumen*, the so-called veins of which are processes of the inner coat, which have a reddish-brown color, and abound in oil.—*Steph.* and *Church*. pl. 104.

*Habitat.*—Molucca Islands, especially the group called the Banda or Nutmeg Isles. Cultivated in Java, Sumatra, Penang, Singapore, Bengal, Bourbon Islands, Madagascar, and some parts of the West Indies.

**Myristica**, *Nutmeg*. [Mat. Med. List, U. S. P.]

The kernel of the seed imported from Sumatra and the Molucca Islands.

*Curing.*—Nutmegs require care in curing, on account of their liability to the attacks of an insect. It is necessary to have them well and carefully dried in their shell, as in this state they are secure from the attack of this insect. To prevent the attacks of the insect, the nuts are frequently limed. For the English market, however, the brown or unlimed nutmegs are preferred. The Dutch lime them by dipping them into a thick mixture of lime and water; but this process is considered to injure their flavor. Others lime them by rubbing them with recently-prepared well-sifted lime. This process is sometimes practised in London.

*Officinal Characters.*—Egg-shaped or nearly round, about an inch in length, marked externally with reticulated furrows, internally grayish-red with dark-brownish veins. It has a strong peculiar odor, and a bitter aromatic taste.

*Description.*—The shape of the nutmeg is roundish or elliptical, like that of the French olive. The color of the *unlimed* or *brown* nutmeg is ashy-brown; that of *limed* nutmegs is brown on the projecting parts, and white (from the presence of lime) in the depressions. Internally, nutmegs are pale reddish-gray, with red veins. The odor is pleasant and aromatic. The taste is agreeable.

Fig. 111.

*Nutmeg in the shell surround-d by its mace* (from a specimen preserved wet).

In the London market the following are the sorts of nutmegs distinguished by the dealers: *Penang nutmegs.*—These are unlimed or brown nutmegs, and fetch the highest price. They are sometimes limed here for exportation, as on the Continent the limed sort is preferred. *Dutch or Batavian nutmegs.*—These are limed nutmegs. In London they scarcely fetch so high a price as the Penang sort. *Singapore nutmegs.*—These are a rougher, unlimed, narrow sort, of somewhat less value than the Dutch kind.

*Composition.*—Nutmegs yield, by distillation with water, *a volatile oil*, characterized by its peculiar odor; and by expression a *fixed butyraceous oil*, which are described below.

*Physiological Effects.*—The activity of nutmeg depends on the volatile oil which it contains. Swallowed *in moderate quantities*, it produces the stimulant effect of the spices. *In large doses* it proves narcotic, and causes giddiness, delirium, precordial anxiety, sleepiness, or actual stupor. Instances of this kind are mentioned by Cullen and others. In the case related by Cullen, 120 grains of powdered nutmeg produced drowsiness, which gradually increased to complete stupor and insensibility. The patient continued for several hours alternately delirious and sleeping, but ultimately recovered. Purkinje has confirmed these statements by experiments made on himself. I am acquainted with a case in which the narcotic effects of a whole nutmeg have been several times experienced.

*Therapeutics.*—Nutmeg is used, like other spices, as a stimulant, carminative, and flavoring ingredient. In mild cases of diarrhœa I have frequently employed nutmeg as a substitute for opium. It may be taken in warm brandy and water, unless the use of spirit be contraindicated.

*Administration.*—It may be taken to the extent of twenty or thirty grains, having been reduced to powder by grating.

*Pharmaceutic Uses.*—Nutmeg is a constituent of aromatic powder, compound catechu powder, compound spirit of horseradish, and compound tincture of lavender.

## **Myristicæ Adeps,** *Concrete Oil of Nutmeg.*

*Synonym.*—Myristicæ Oleum, *Lond.*

A concrete oil obtained by means of expression and heat from nutmegs.

*Officinal Characters.*—Of an orange color, firm consistence, and fragrant odor like that of nutmeg; soluble in four times its weight of boiling alcohol, or half that quantity of ether.

*Description.*—In the shops it is usually denominated *expressed oil of mace.*—It is prepared by beating the nutmegs to a paste, which is to be inclosed in a bag, and then exposed to the vapor of water, and afterwards expressing by heated plates. It is imported in oblong cakes, covered by some monocotyledonous leaves commonly called *flag leaves.* The cakes have the shape of common bricks, but their size is sometimes smaller. They are unctuous to the touch, but not adhesive.

*Composition.*—Schrader found that 16 parts of concrete oil, expressed by himself, consisted of 1 part of volatile oil, 6 parts of brownish-yellow fat, and 9 parts of white fat. In 48 parts of the commercial concrete oil he found 2 of volatile oil, 25 yellow fat, and 21 parts of white fat. The volatile oil and yellow fat are soluble in both cold alcohol and cold ether. The white fat is soluble in boiling alcohol and boiling ether, but is insoluble in cold alcohol and ether. Dr. Playfair calls it *myristin.* By saponification it yields glycerine and myristic acid ($C_{28}H_{27}O_3$,HO).

*Therapeutics.*—Expressed oil of nutmegs is occasionally employed externally in chronic rheumatism and palsy.

*Pharmaceutic Uses.*—It is a constituent of warm plaster and pitch plaster.

**Oleum Myristicæ,** *Volatile Oil of Nutmeg.* [Mat. Med. List, U. S. P.]

The oil distilled in England from nutmeg.

*Officinal Characters.*—Colorless or straw yellow, having the odor and taste of nutmegs.

*Description.*—This is procured by submitting nutmegs and water to distillation. The usual produce of volatile oil in the distillations at Apothecaries' Hall, London, is about 4.5 per cent.; but the oil is generally imported. It is colorless or pale yellow, and of a pale consistence. By agitation with water it separates into two oils, one lighter, the other heavier than water. By keeping it deposits crystals of steroptene (*myristicine*), which are fusible at 212° F., volatile, soluble in alcohol, in ether, and in boiling water. From the latter liquid myristicine separates in a crystalline form as the liquid cools. According to Mulder, the stearoptene consists of $C_{16}H_{16}O_5$.

*Physiological Effects and Therapeutics.*—Volatile oil of nutmeg in small doses is cordial and carminative; but according to Mitscherlich, it is capable of acting as a strong poison, fatally affecting the heart and lungs.

*Administration.*—*Dose*, one or two drops, taken on sugar or dissolved in spirit as in spirit of nutmeg.

*Pharmaceutic Use.*—Volatile oil of nutmeg is a constituent of pill of Socotrine aloes, and aromatic spirit of ammonia.

*Officinal Preparation.*

Spiritus Myristicæ [U. S.], *Spirit of Nutmeg* (*Essentia Myristicæ Moschatæ. Dub.*).—Take of volatile oil of nutmeg, one fluidounce; rectified spirit, nine fluidounces. Dissolve.

The Dublin essence, now called spirit, turns out the far weaker spirits of London and Edinburgh, of which (if nutmegs yield, as above stated, about 4.5 per cent. of volatile oil) two fluidounces and a half may have contained about one minim of oil. The same quantity now contains 120 minims. The relative strength of the two spirits is therefore about 120 to 1, and one minim of the present spirit is equal to two fluidrachms of the former. [" Take of nutmeg, bruised, two troyounces; diluted alcohol, eight pints; water, a pint. Mix them, and with a regulated heat distil eight pints." U. S. The U. S. spirit is not nearly so strong as the British. Dose, f℥i—ij.—W.] It is cordial and carminative, and is employed as a pleasant addition to stimulant narcotic or purgative draughts. It is a constituent of compound mixture of iron—[not of that of the U. S. P.—W.]

*Dose.*—Min. x to min. xx.

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## THYMELACEÆ, *Lindl.* The Mezereon Order.

### DAPHNE, *Linn.* Octandria, Monogynia, *Linn. Syst.*

*Generic Character.*—Calyx funnel-shaped; limb in four segments; throat without scales. *Stamens* eight, inclosed within the tube, inserted in two rows near the throat. *Ovary* one-celled; *style* terminal, very short; *stigma* capitate. *Drupe* baccate, one-seeded.

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### DAPHNE MEZEREUM, *Linn.*

### Mezereon.

*Specific Character.*—*Stem* brown, bushy, three to five feet high, with upright smooth, tough, and pliant branches; leafy while young. *Leaves* deciduous, scattered, stalked, lanceolate, smooth, two inches long, appearing after the flowers. *Flowers* fragrant, sessile, about three together, with several brown smooth ovate bracts underneath. *Calyx* crimson, the tube externally hairy. *Berries* scarlet.—*Steph.* and *Church.* pl. 65.

*Habitat.*—Indigenous, but rare in England, perhaps truly wild near Andover. Cultivated in gardens.

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### DAPHNE LAUREOLA, *Linn.*

### Spurge Laurel.

*Specific Character.*—*Stem* very smooth, green, rather stout, erect, one to three feet high, little branched, leafy above, naked below. *Leaves* lanceolate, attenuated at the base, glabrous, evergreen. *Racemes* axillary, of about five glabrous, drooping bracteated flowers. *Flowers* green. *Berry* oval, bluish-black.—*Eng. Bot.*, vol. ii. pl. 119.

*Habitat.*—Indigenous, in woods, thickets, and hedges throughout England, rare in Scotland.

### Mezereum, *Mezereon.* [Mat. Med. List, U. S. P.]

The bark (of either of the above species) dried. ["The bark of Daphne Mezereum, and of Daphne Gnidium." U. S.]

[Mezereon has always hitherto been defined in the London, Edinburgh, and Dublin Pharmacopœias *the root-bark of Daphne Mezereum.* But the true mezereum is far too rare a plant in England in its wild state, and too valuable as a garden plant when cultivated, to supply the medicinal demand. Moreover, I am told, the cultivated mezereon is frequently grafted on the stock of the spurge laurel. Mr. McCulloch, of Covent Garden, informs me that his men invariably bring him for mezereon the spurge laurel. The bark of either species is recognized by the British Pharmacopœia as mezereon.—Ed.] The *stem-bark* of mezereon is usually considered to be somewhat less active than the root-bark; but in the United States, and most of the continental Pharmacopœias, the bark of both root and stem is included under the general name of *mezereon bark.* The stem-bark of true mezereon, in the fresh state, is externally brown and rougher than the root-bark, which is nearly white; but it is most readily recognized, in the fresh state, by the green color of the cellular integument beneath the epidermis. The fresh bark of the spurge laurel is green. The bark of both root and stem is now officinal.

*Officinal Characters.*—In strips or quilled pieces of various lengths, tough and pliable, olive-brown on the surface, white within, fibrous, odor faintly nauseous, taste hot and acrid.

*Description.*—It is tough, pliable, and fibrous; externally brown or olive-brown and corrugated; internally white, tough, and cottony. It occurs in strips several inches long. When chewed, the taste is at first sweetish, afterwards an acrid burning sensation is felt in the mouth and fauces, and extends to the gullet and stomach if the bark and saliva be swallowed. This sensation continues for several hours. Mezereon bark is also imported from Hamburg. I have been informed that the root-bark commands nearly three times the price of the stem-bark. Sometimes the entire root (bark and wood) of mezereon is used instead of the root-bark; but this proceeding is highly objectionable, as the wood possesses only a feeble acridity.

*Composition.*—Mezereon contains an *acrid resin* and an *acrid volatile oil? Daphnin*, a bitter, slightly astringent crystalline body, possessing neither basic nor acid properties, is not the active principle of mezereon. *Acrid Resin.*—Obtained by boiling the bark in alcohol. When the solution cools, some wax is deposited. The supernatant liquid is to be evaporated, and the residual extract washed with water. The resin then left behind is dark green, and soluble in both alcohol and ether. To this substance mezereon owes its acridity. There is, however, some reason to suspect that this resin is itself a compound of two principles, viz., an acrid vesicating fixed oil, and another substance. The resin is rendered soluble in water by means of the other constituents of the bark. Mr. Squire could not obtain any blistering effect from the resin extracted by alcohol. *Acrid Volatile Oil.*—According to Mr. Squire, mezereon contains a volatile acrid substance which is carried off by the vapor of water, but not by the vapor of alcohol. He says: "The pungent odor given off by boiling mezereon root in water over a lamp is so powerful, that, after holding my head over it for a short time, great irritation was produced, and it was difficult to carry on respiration."

*Physiological Effects.*—All parts of the plant, but more especially the bark, are endowed with excessive acridity; in virtue of which they cause irritation and inflammation in tissues to which they are applied. When swallowed, therefore, in large quantities, they prove poisonous. The topical action of mezereon bark is that of an irritant, and, when the bark has been applied to the skin, vesicant. A decoction of mezereon bark, taken in moderate quantities, sometimes appears to promote the action of the secreting and exhaling organs (especially the kidneys and the skin). But Dr. Alex. Russell could not observe, upon the strictest inquiry, that it sensibly increased any of the secretions. In larger doses it causes irritation of the alimentary canal and kidneys.

*Therapeutics.*—In this country mezereon is scarcely ever employed alone. It is usually administered in conjunction with sarsaparilla, and is employed as a sudorific and alterative in venereal, rheumatic, scrofulous, and chronic cutaneous diseases. As a topical remedy, it is sometimes applied to relieve toothache. It is occasionally used as a masticatory. Dr. Withering cured a case of difficulty of swallowing, arising from a paralytic affection, by mezereon, which he directed to be chewed frequently. In France it is used as a vesicatory. The mode of using it is this: First soften the bark by soaking it in hot vinegar and water, and then apply it to the part by a compress and bandage. The application is to be renewed night and morning until vesication is produced.

*Administration.*—Mezereon is usually administered internally in the form of decoction, but there is no officinal preparation. It is a constituent of the compound decoction of sarsaparilla. As a masticatory, a few grains of the bark may be chewed.

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## POLYGONACEÆ, *Lind.* THE RHUBARB ORDER.

## RHEUM.

### Rhubarb.

Enneandria, Monogynia, *Linn. Syst.*

*Generic Characters.*—*Calyx* petaloid, 6-parted, withering. *Stamens* about 9, inserted into the base of the calyx. *Styles* 3, reflexed. *Stigmas* peltate, entire. *Nut* (*achenium*) 3-cornered, winged, with the withered calyx at the base. *Embryo* in the centre of mealy albumen. *Stipules* cohering into a sheath round the stem.

It is not yet ascertained what species of *Rheum* yields the officinal rhubarb. Notwithstanding the inquiries of Kauw Boerhaave, first physician to the Emperor of Russia, who was led to believe that *Rheum palmatum* was the true species, and of Sievers, who went to Siberia, under the auspices of Catherine II. of Russia, with a view of settling the question, the source of rhubarb is still unknown. Sievers, after four years of persevering attempts to reach the country where the true rhubarb grew, or to obtain the seeds, says: "My travels have satisfied me that as yet nobody—that is, no scientific person—has seen the true rhubarb plant. All the seeds procured under the name of true rhubarb are false; all the descriptions in all the Materia Medicas are incorrect." Calau, apothecary in the rhubarb factory at Kiachta, and who, from his appointment, might be expected to know the origin of the rhubarb he received from the Bucharians, says: "All that we know of the rhubarb plant or its origin is defective and wrong. A severe prohibition from the Chinese government prevents all possibility of eliciting the truth." Dr. Royle states that "all the information obtained of late years in Russia only confirms what was before known, that *R. palmatum* is not the species, but that the genuine plant is a small one with roundish denticulate leaves." Of thirteen species of *Rheum* grown in the Chelsea Botanic Garden, the root of *R. palmatum*, carefully dried by artificial heat, most nearly resembled Asiatic rhubarb in the combined qualities of odor, color, and marbling. In the absence, therefore, of any definite information, it will be sufficient to describe *Rheum palmatum*.

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## RHEUM PALMATUM, *Linn.*

### Palmate-leaved Rhubarb.

*Specific Character.*—A perennial, *herbaceous* plant. *Leaves* alternate, roundish-cordate, half palmate; the lobes pinnatifid, acuminate, deep dull green, not wavy, but uneven, and very much wrinkled on the upper side, hardly scabrous at the edge, minutely downy on the under side; *petiole* pale green, marked with short purple lines, terete, obscurely channelled quite at the upper end. *Flowering stems* tall. *Flowers* in panicles.

*Habitat.*—Chinese Tartary, Thibet.

## **Rheum,** *Rhubarb.* [Mat. Med. List, U. S. P.]

The root of one or more undetermined species of Rheum, *Linn.*, deprived of the bark and dried; from Chinese Thibet and Tartary.

*Production and Commerce.*—Rhubarb grows wild in Chinese Tartary, but it is also cultivated in various parts of China. In Kansuh it is generally gathered in summer, from plants of six years of age. When the root is dug up, it is washed, to free it from earthy particles, peeled, bored through the centre, strung on a thread, and dried in the sun. In autumn, all the dried rhubarb collected in the province is brought in horse-hair sacks, containing about 200 lbs., to Sinin, the residence of the dealers, loaded on camels, and sent over Mongolia to Kiachta, and partly to Peking. ["The Rules of the Drug Trade of China," a MS. work in the Chinese language, much used by the drug merchants of Shanghai, states that the rhubarb carried from Kiachta to St. Petersburg is collected in Western Kansuh, in Koko-nor, and along the slopes of the Kwanlun mountains which form the northern boundary of Thibet; while that which is sold in Canton is collected in the more southern and eastern provinces of Sz'chuen, Shensi, Shansi, and Honan.[1] "The Chinese Commercial Guide," published at Canton in 1856, by Dr. Williams, Secretary of Legation to the U. S. Embassy at Peking, after mentioning the native names of the rhubarb brought from Shansi, Shensi, and Honan, adds that the produce of Sz'chuen is called *chuen* rhubarb, and sometimes *horse-hoof* rhubarb (*Ma-ti*). Mr. Lockhart, who resided fifteen years at Shanghai, as medical missionary, and to whom I am indebted for the preceding information, also informs me that the rhubarb exported from Shanghai is *chuen* (pronounced *chaun*) rhubarb.—Ed.]

Fig. 112.

*Rheum palmatum.*

*Officinal Characters.*—Trapezoidal roundish cylindrical or flattish pieces, frequently bored with one hole, yellow externally, internally marbled with fine waving grayish and reddish lines, finely gritty under the teeth; taste bitter, faintly astringent and aromatic; odor strong and very peculiar.

*Varieties.*—The officinal varieties of rhubarb are the *Russian* and the *East Indian.*

*Russian Crown Rhubarb.*—This is Chinese rhubarb, which is taken in exchange, on behalf of the Russian crown, at Kiachta. In Russia it is known as *Chinese rhubarb*, and on the Continent it is called *Russian rhubarb.* In English commerce it is commonly called *Turkey rhubarb*, because formerly this description of rhubarb came into Europe by way of Asiatic Turkey. The barter of rhubarb is carried on by the Russian

[1] Shanghai is not mentioned in "The Rules" as a place of sale or exportation of rhubarb, as it was not made a port of foreign trade until 1843, after this work was written.

government under a contract made with Bucharians at Kiachta for ten years, and confirmed by the Chinese government. According to this contract, the Bucharians undertake to furnish a certain quantity of rhubarb annually to the Russian crown for a certain quantity of goods of a certain quality, and to deliver up all rhubarb not approved of, without remuneration, and permit it to be burnt by the Russian government. All the rhubarb brought to Kiachta undergoes an examination, prescribed by the Imperial Russian Medical Council, according to directions of the Russian government. The selection of the rhubarb bartered for by Russian merchants takes place in the custom-house at Kiachta, and of that for the crown in a house for that purpose on the Chinese borders. All pieces of inferior quality are destroyed. Russian rhubarb is imported in chests holding from 156 to 160 lbs. each. Each chest is pitched on the outside, and covered with a hempen cloth and a hide. On the outside of the chest is a printed paper, stating the year in which the rhubarb was imported into Russia, and the weight of the chest. The following is a literal translation of one of these papers:—

**RAD: RHEI PALMAT:**
CHINESE HOOF RHUBARB
*OF THE YEAR* 1840.

*No.* 6

*poods. lbs.*
*NET WEIGHT* 4.—26

The shapes of the pieces are various, being angular, rounded, or irregular. The flat surfaces and the angles which the pieces present show that the cortical portion of the root has been removed by slicing, and not by scraping, as in the East Indian rhubarb. Holes are observed, in some of the pieces, extending completely through: they have been made for the purpose of hanging the pieces to dry; but all traces of the cord have been carefully removed, and the holes scraped or filed to get rid of all decayed portions. The holes, which extend only partially through the pieces, are borings which have been made to examine the condition of the interior of the pieces. Externally the pieces are covered with a bright yellow-colored powder, usually said to be produced by the mutual friction of the pieces in the chests during their passage to this country; though many druggists believe it is derived from the process of *rouncing* (that is, shaking in a bag with powdered rhubarb) before its exportation. [The foregoing statement requires, at the present time, some correction. I have received from Messrs. Horner, the principal importers of Russian rhubarb, the following information: "The treaty between the Russian and Chinese governments as to the supply of rhubarb expired about two years since, and up to the present time has not been renewed, although we are informed that negotiations are going on for its renewal. The supply, at present, is obtained through mercantile houses at Moscow, and is imported in the untrimmed state, similar to Canton rhubarb, and trimmed here. We have imported it in this state in chests similar to Canton chests, but covered with a hide. The government are in no way responsible for its quality, nor have anything to do with it." On examining the contents of some chests recently imported, I found the bark very imperfectly removed, apparently by rasping, and the cord frequently left in the holes; or, if it had been removed, the holes not cleaned out. The pieces were not covered with powder; the chests, also, had no label on the outside.—Ed.] The odor of Russian rhubarb is strong and aromatic. It is considered by druggists to be so delicate that in all wholesale drug-houses a pair of gloves is kept in the Russian rhubarb drawer, with which only are the assistants permitted to handle the pieces. When chewed, it feels gritty under the teeth, from the presence of numerous crystals of oxalate of lime. It communicates a bright yellow color to the saliva, and has a bitter, slightly astringent taste. Beneath the dust with which the pieces are covered, the surface has a reddish-white tint, owing to the intermixture of white and red parts. The yellowish white parts have the form of lines or veins, which, by their union with each other, assume a reticular form. Irregularly scattered over the surface, we observe small star-like spots and depressions of a darker color. The transverse fracture is uneven, and presents numerous brownish-red or dark carmine-colored undulating veins. The longitudinal fracture is still more uneven, and shows the longitudinal direction of the veins, which are often interrupted with white. The surface obtained by cutting is more or less yellow, and frequently exposes the veins, disposed in groups. By boiling very thin slices of the root in water, and then submitting them to the microscope, we observe numerous *conglomerate raphides* (clumps of crystals of oxalate of lime). From 100 grs. of Russian rhubarb the late Mr. Edwin Quekett procured between 35 and 40 grs. of these raphides. Turpin considered the presence of these crystals sufficient to distinguish Asiatic rhubarb from that grown in Europe; but in some specimens of English rhubarb I have met with them in as great abundance as in foreign rhubarb. The powder of Russian rhubarb is of a bright yellow color, with a reddish tint; but, as met with in the shops, it is almost invariably mixed with the powder of English rhubarb.

Fig. 113.

*Crystals of Oxalate of Lime in Russian Rhubarb.*

*East Indian Rhubarb.*—This, like the Russian rhubarb, is the produce of China, but is exported from Canton and Shanghai; but chiefly from the latter port, which is nearer than Canton to the provinces in which it is produced. It is known in English commerce as *Chinese* or *East Indian rhubarb*, being imported either directly from China, or indirectly by Singapore and other parts of the East Indies. Two kinds of East Indian rhubarb are known in commerce: these are, the *untrimmed* or *half-trimmed*, and the *trimmed*, sometimes called the *Dutch trimmed*.

*Half-trimmed or untrimmed East Indian Rhubarb.*—This is the *Chinese* or *East Indian rhubarb* of the shops. It varies in quality much more than the Russian crown rhubarb, and is sometimes worm-eaten. The present importations from Canton are of very inferior quality. The best Chinese rhubarb is brought from Shanghai. It is called "untrimmed," or "half-trimmed," because the cortical portion of the root has been incompletely scraped, not sliced, off; and consequently the pieces have a rounded character, and are devoid of the flat surfaces and angles produced by slicing, as in the Russian and Dutch trimmed rhubarbs. The inferior pieces present the remains of the greenish-brown or blackish cortex. The pieces are frequently cylindrical or roundish, but sometimes flattened; in trade they are distinguished as *rounds* and *flats*. They are generally perforated with holes, in many of which we find portions of the cords by which they were suspended. These holes are smaller than those observed in Russian rhubarb, and that portion of the root forming their sides is usually dark-colored, decayed, and of inferior quality. The best pieces are heavier and more compact than that of the Russian kind, and are covered with an easily separable dust. When this is removed we observe that the surface is not so regularly reticulated, is of a more yellowish-brown than reddish-white color, and has coarser fibres than Russian rhubarb. On the finer pieces we notice numerous star-like spots or depressions. The fracture is uneven; the veins, especially towards the middle, have a less determinate direction, and are of a duller or reddish-brown color, and, in very bad pieces, of an amber-brown color, with a gray substance between the veins. The odor of this species is much less powerful than that of Russian rhubarb, and is somewhat less aromatic. The taste, grittiness when chewed, and microscopic appearances, are similar to those of Russian rhubarb. The color of the powder is of a more dull yellow or brownish cast.

*Trimmed East Indian* or *Dutch trimmed Rhubarb.*—This kind of rhubarb is closely allied to, if it be not identical with, the preceding in its texture. In commerce, however, it is always regarded as distinct. It is imported from Canton and Singapore. It has been dressed or trimmed to resemble the Russian crown rhubarb, which it does in shape, size, and general appearance; for the cortical portion of the root seems to have been separated by slicing, and hence the pieces have the same angular appearance on the surface that the Russian rhubarb has. The pieces are frequently perforated, and in the holes are found the remains of the cord by which the root has been suspended: in this it differs from the Russian crown rhubarb. In the drug trade this kind of rhubarb is said to be trimmed, and, according to the shape of the pieces, they are called *flats* or *rounds*. The color and weight of the pieces are variable.

*English Rhubarb.*—This is the produce of *Rheum Rhaponticum*, cultivated in the neighborhood of Banbury in Oxfordshire. It is not officinal, but is sometimes sold for Asiatic rhubarb in the piece, and still more frequently in powder. It occurs in pieces of various size and shape, which are trimmed and frequently perforated, so as to represent foreign rhubarb: some of the pieces are cylindrical in their form, and are evidently segments of cylinders; others are flat. This kind of rhubarb is very light, spongy (especially in the middle of the large flat pieces), attractive of moisture, pasty under the pestle, and has a purplish, reddish, or pinkish hue not observed in the Asiatic kinds. Internally it has usually a marbled appearance; the streaks are pinkish, parallel, and have a radiated disposition; and in the centre of some of the larger pieces the texture is soft and woolly, and may be easily indented by the nail. Its taste is astringent, and very mucilaginous; it is not at all, or only very slightly, gritty under the teeth; its odor is feeble, and more unpleasant than either the Russian or East Indian kinds. The microscope discovers in it, for the most part, very few crystals of oxalate of lime.

*Composition.*—Rhubarb contains odorous matter, chrysophanic acid, tannic and gallic acids, resins, bitter principle, starch, and oxalate of lime.—*Odorous matter.*—The odorous principle is probably a volatile oil, but it has not hitherto been isolated. *Chrysophanic acid* (so called from χρυσὸς, gold, and φαίνω, shine).—Yellow, crystalline, granular matter of rhubarb, $C_{10}H_8O_3$, found in Russian and East Indian rhubarb. In the pure, or more or less impure state, it has long been known under the names of *rheic acid* and *rhein.* It may be procured from rhubarb by means of ether in Robiquet's displacement apparatus. Pure chrysophanic acid is a beautiful clear yellow odorless and tasteless substance, which is separated in granular masses, and shows little disposition to crystallize. It is tolerably soluble in hot rectified spirit of wine, not very soluble in ether, even when boiling, and almost insoluble in cold water, but more soluble in boiling water. Heated, it evaporates, emits yellow fumes, which condense and form yellow flocculi, and at the same time a part becomes carbonized. It dissolves in alkalies, producing a beautiful red color; if the potash solution be evaporated to dryness, the red color changes to violet, and then to a beautiful blue. It dissolves in oil of vitriol, forming a beautiful red solution, from which water precipitates yellow flocculi. *Resins.*—Rhubarb contains three resins, black, brown, and red, soluble in alcohol and in the alkalies, insoluble in water. *Bitter principle.*—The nature of this is not well determined. *Astringent matter, tannic and gallic acids.*—The red veins are the seat of the astringent matter. This is proved by brushing the cut surface of rhubarb with a weak solution of a ferruginous salt; the red veins, only, undergo a change of color. *Oxalate of Lime.*—The conglomerate raphides before noticed are crystals of oxalate of lime. They may be separated in great abundance by boiling Russian or East Indian Rhubarb in water until the cohesion of the tissue is completely destroyed. When the decomposed tissue is well shaken with water, the crystals fall to the bottom of the vessel. If the powder of rhubarb be heated in a glass capsule over a lamp, an odorous yellow vapor (*oil?* or *resin with chrysophanic acid*) is obtained, which communicates a red color to a solution of caustic potash. The aqueous infusion of rhubarb is rendered green by the perchloride of iron (*tanno-gallate of iron*); with a solution of gelatin it yields a copious yellow precipitate (*tannate of gelatin*), which is dissolved on the application of heat, or by the addition of an excess of gelatin; with a solution of sulphate of quinia, a yellowish precipitate (*tannate of quinia*); with the alkalies (potash, soda, and ammonia), a red-colored solution (*soluble alkaline chrysophanates*); with lime-water, a reddish precipitate (*chrysophanate of lime*); with the acids (the acetic excepted), precipitates; and with various metallic solutions (as of acetate of lead, chloride of tin, protonitrate of mercury, and the nitrate of silver), precipitates (principally *metallic chrysophanates* and *tannates*).

*Tests.*—Free from brown specks externally and internally, without cavities. Boracic acid does not turn the yellow exterior brown. In the powder, adulterations are detected with difficulty.

*Adulterations.*—Dr. R. D. Thompson stated before the Committee on the Adulteration of Drugs, in July, 1855, that samples of powdered rhubarb frequently contained as much as fourteen pounds of flour and eight ounces of turmeric in a hundred weight. Paper stained by a strong decoction of tincture of rhubarb is not affected by boracic acid, or by the borates rendered acid, whereas turmeric paper is reddened by these agents. Hence the presence of turmeric in powdered rhubarb may be detected by this means. Flour is not so easily detected in the powder. The production of an intensely blue color by the addition of iodine to a cold decoction of the powder would not necessarily indicate the presence of flour. In general, a decoction of Russian or of East Indian rhubarb becomes, with a solution of iodine, greenish-blue (*iodide of starch*): after a few minutes the color disappears, and no iodine can be detected in the liquor by starch, unless nitric acid be previously added. A decoction of English rhubarb, however, is rendered, by a solution of iodine, intensely blue (*iodide of starch*), the color not entirely disappearing by standing.

These peculiarities, however, are not constant. Some specimens of Russian rhubarb contain so much starch that they react on iodine, like those of English rhubarb.

*Physiological Effects.*—*In small doses*, as from four to eight grains, it acts as an astringent tonic, its operation being principally or wholly confined to the digestive organs. In relaxed conditions of these parts it promotes the appetite, assists the digestive process, improves the quality of the alvine secretions, and often restrains diarrhœa. *In large doses*, as from twenty to sixty grains, it operates slowly and mildly as a purgative, sometimes causing slight griping. It never inflames the mucous membrane of the alimentary canal, as jalap, scammony, colocynth, and some other drastic purgatives are capable of doing. The constipation which follows its cathartic effect has been ascribed to the operation of its astringent matter. In febrile complaints and inflammatory diseases, it sometimes accelerates the pulse and raises the temperature of the body; whence the impropriety of its use in these cases. Under the use of rhubarb, the secretions, especially the urine, become colored by it. According to Heller, the color which the urine acquires under the employment of this medicine depends on the acid or alkaline condition of this secretion; if acid, it is yellow; if alkaline, it becomes reddish-yellow or blood-red. From Schlössberger's experiments it appears that the color is communicated to the urine by the resins, and not by the crysophanic acid, which, when pure, neither operates on the bowels nor colors the urine. Urine colored by rhubarb stains the linen, and is reddened by caustic potash. The cutaneous secretion, especially of the armpits, also becomes colored under the use of rhubarb. The milk of nurses who have taken it is said to acquire a purgative property. Considered in relation to other medicinal agents, rhubarb holds an intermediate rank between the bitter tonics on the one hand, and the drastics on the other. From the first, it is distinguished by its purgative qualities; from the latter, by its tonic operation and the mildness of its evacuant effects. As a purgative, it is perhaps more closely allied to aloes than to any other cathartic in ordinary use; but it is distinguished by its much milder operation and its want of any specific action on the large intestines. Russian, East Indian, and Dutch trimmed rhubarb appear to be about equal in power.

*History.*—The later Greek writers are supposed to have been acquainted with our rhubarb. Alexander of Tralles used it in weakness of the liver and dysentery. Paulus Ægineta, in noticing the practice of the ancients, says, "Alvine discharges they promoted by giving turpentine to the extent of an olive, when going to rest; or, when they wished to *purge* more effectually, by adding a little *rhubarb*" (rheon). This is the first notice of the purgative properties of rhubarb.

*Therapeutics.*—The remedial value of rhubarb depends on the mildness and safety of its operation, and on its tonic and astringent influence over the alimentary canal. *As a purgative.*—There are many cases in which the above-mentioned qualities render rhubarb peculiarly valuable as a purgative. In mild cases of *diarrhœa* it sometimes proves peculiarly efficacious, by first evacuating any irritating matter contained in the bowels, and afterwards acting as an astringent. Given at the commencement of the disease, it is a very popular remedy; and though doubtless it is often employed unnecessarily (since, as Dr. Cullen has justly observed, in many cases no further evacuation is necessary or proper than what is occasioned by the disease), yet it rarely, if ever, does harm. Sulphate of potash is a very useful adjunct to it, and promotes its purgative operation. Antacids, as chalk or magnesia, are frequently conjoined with it. It is not fitted for inflammatory or febrile cases. As an infant's purgative it is deservedly celebrated. It is well adapted for a variety of children's complaints; but it is peculiarly adapted to scrofulous subjects, and those afflicted with enlargement of the mesenteric glands, accompanied with tumid belly and atrophy. Magnesia, sulphate of potash, mercury and chalk, or calomel may be associated with it, according to circumstances. For an ordinary purgative in habitual costiveness it is scarcely adapted, on account of the constipation which follows its purgative effect. *As a stomachic and tonic.*—In dyspepsia, accompanied with a debilitated condition of the digestive organs, small doses of rhubarb sometimes prove beneficial by promoting the appetite and assisting the digestive process.

*Administration.*—The powder may be exhibited as a stomachic and tonic, in doses of from five to ten grains; as a purgative from twenty to forty grains

### *Officinal Preparations.*

Extractum Rhei, *Extract of Rhubarb* [Extractum Rhei Alcoholicum, U. S., *Alcoholic Extract of Rhubarb. Extractum Rhei, Pharm.* 1850].—Take of rhubarb, sliced or bruised, one pound, rectified spirit, ten fluidounces; distilled water, five pints. Mix the spirit and the water, and macerate the rhubarb in the mixture for four days; then decant, press, and set by, that the undissolved matter may subside; pour off the clear liquor, filter the remainder, mix the liquors, and evaporate by a water bath at a temperature not exceeding 160° to a proper consistence. ["Take of rhubarb in moderately fine powder, twelve troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Moisten the powder with four fluidounces of the alcohol, pack it in a conical percolator, and gradually pour upon it, first the remainder of the alcohol, and afterwards diluted alcohol until twelve fluidounces of tincture have been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to six fluidounces. Continue the percolation with diluted alcohol until the tincture passes nearly tasteless. Evaporate this in a porcelain vessel by means of a water bath, at a temperature not exceeding 160°, to the consistence of syrup. With this mix the tincture first obtained, and continue the evaporation until the mixture is reduced to the proper consistence." U. S.]

The British Pharmacopœia follows the London in employing spirit as well as water; but the evaporation being conducted at a temperature not exceeding 160° will produce a better result. Great care is required in the preparation of this extract, as both the purgative and tonic properties of rhubarb are very apt to become deteriorated by the process. Some extract, prepared *in vacuo* more than twenty years ago, has retained the proper odor and flavor of rhubarb.

*Dose.*—As a purgative, gr. x to gr. xx.

Infusum Rhei [U. S.], *Infusion of Rhubarb.*—Take of rhubarb, in thin slices, a quarter of an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain.

This is nearly the Dublin infusion; it is stronger than the London infusion, but only half as strong as that of Edinburgh. The spirit of cinnamon (*Ed.*) is omitted, and the long maceration (*Ed.*) reduced to one hour. ["Take of rhubarb, bruised, one hundred and twenty grains; boiling water, half a pint. Macerate for two hours in a covered vessel, and strain." U. S.] Boiling water extracts from rhubarb chrysophanic acid, resin, tannic and gallic acids, extractive, and starch. As the liquor cools, it becomes turbid. Infusion of rhubarb is stomachic and gently purgative; it is usually employed as an adjunct to or vehicle for other mild purgatives or tonics. The alkalies or magnesia are sometimes conjoined. The stronger acids, and most metallic solutions are incompatible with it.

*Dose.*—Fl. oz. j to fl. oz. ij.

Pilula Rhei Composita, *Compound Rhubarb Pill* [Pilulæ Rhei Compositæ, U. S., *Compound Pills of Rhubarb*].—Take of rhubarb, in fine powder, three ounces; Socotrine aloes, in fine powder, two ounces and a quarter; myrrh, in fine powder, one ounce and a half; hard soap, one ounce and a half; English oil of peppermint, one fluidrachm and a half; treacle, by weight, four ounces. Reduce the soap to a fine powder, and triturate it with the rhubarb, aloes, and myrrh, then add the treacle and oil of peppermint, and beat the whole into a uniform mass. In this pill hard soap and oil of peppermint (*Ed.*, *Dub.*) are ordered instead of soft soap and oil of caraway (*Lond.*), and treacle (*Lond.*, *Dub.*) instead of conserve of roses (*Ed.*). The proportions of the other ingredients remain unaltered. It should be observed that pill of Barbadoes aloes, pill of Socotrine aloes, compound pill of colocynth, and compound rhubarb pill are each prepared with a different volatile oil, in order that the odor may assist in distinguishing them.

["Take of rhubarb, in fine powder, a troyounce; Socotrine aloes, in fine powder, three hundred and sixty grains; myrrh, in fine powder, a troyounce; oil of peppermint, half a fluidrachm. Beat them together with water so as to form a pilular mass, to be divided into two hundred and forty pills." U. S.]

Compound rhubarb pill is tonic and mildly purgative. It is often used as a dinner pill.

*Dose.*—Gr. x to gr. xx; [one to four pills, U. S.]

Pulvis Rhei Compositus [U. S.], *Compound Powder of Rhubarb.*—Take of rhubarb, in powder, two ounces; light magnesia, six ounces; ginger, in powder, one ounce. Mix them thoroughly, and pass the powder through a fine sieve. ["Take of rhubarb, in fine powder, four troyounces; magnesia, twelve troyounces; ginger, in fine powder, two troyounces. Rub them together until they are thoroughly mixed." U. S.]

A very useful antacid and mild stomachic purgative, especially adapted for children, commonly known as Gregory's Powder.

*Dose.*—For adults, gr. xx to gr. xl; for children, gr. v to gr. x.

Tinctura Rhei [U. S.], *Tincture of Rhubarb.*—Take of rhubarb, bruised, two ounces; cardamoms, bruised, a quarter of an ounce; coriander, bruised, a quarter of an ounce; saffron, a quarter of an ounce; proof spirit, one pint. Macerate the rhubarb, cardamoms, coriander, and saffron for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.

Stronger than any of the former tinctures of rhubarb, and nearly twice as strong as that of London. The liquorice root (*Lond.*, *Ed.*) and ginger (*Lond.*) are omitted, and coriander introduced, in addition to cardamoms (*Ed.*, *Dub.*). ["Take of rhubarb, in moderately coarse powder, three troyounces; cardamom, in moderately coarse powder, half a troyounce; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with a fluidounce of diluted alcohol,

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pack it moderately in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.] Tincture of rhubarb contains crysophanic acid, tannic acid, and resin. Cordial, stomachic, and mildly purgative. A popular remedy in various disordered conditions of the alimentary canal, especially at the commencement of diarrhœa and in flatulent colic. A useful adjunct to purgative mixtures when a cordial cathartic is required.

*Dose.*—As a stomachic, fl. drm. j to fl. drms. ij; as a purgative, fl. oz. ss.

[Pilulæ Rhei, U. S., *Pills of Rhubarb.*—"Take of rhubarb, in fine powder, three hundred and sixty grains; soap, in fine powder, one hundred and twenty grains. Beat them together with water, so as to form a pilular mass, to be divided into one hundred and twenty pills." U. S.

Each pill contains three grains of rhubarb.

Vinum Rhei, U. S., *Wine of Rhubarb.*—"Take of rhubarb, in moderately coarse powder, two troyounces; canella, in moderately fine powder, sixty grains; sherry wine, fourteen fluidounces; diluted alcohol, a sufficient quantity. Mix two fluidounces of diluted alcohol with the sherry wine, and moisten the powders, previously rubbed together, with half a fluidounce of the mixture; then transfer them to a conical percolator, and gradually pour upon them the remainder of the mixture, and afterwards diluted alcohol, until a pint of filtered liquid is obtained." U.S.

Dose, as a cordial laxative, fʒj to f℥ss, in water.

Tinctura Rhei et Sennæ, U. S., *Tincture of Rhubarb and Senna.*—"Take of rhubarb, in moderately coarse powder, a troyounce; senna, in moderately coarse powder, red saunders, in moderately coarse powder, each, one hundred and twenty grains; coriander, in moderately coarse powder, fennel, in moderately coarse powder, each, sixty grains; saffron, in moderately coarse powder, liquorice, in moderately coarse powder, each, thirty grains; raisins, deprived of their seeds, six troyounces; diluted alcohol, three pints. Macerate for fourteen days, express, and filter through paper." U. S.

This preparation is widely known as Warner's Gout Cordial. The aromatics and the alcohol which it contains make it very stomachic and stimulating, and while they unfit it for exhibition as a purgative, render it very useful in cases of habitual costiveness, associated with atony of the alimentary canal, in feeble subjects. Dose, as a stomachic and laxative, fʒj—iij.

Syrupus Rhei, U. S., *Syrup of Rhubarb.*—"Take of fluid extract of rhubarb, three fluidounces; syrup, twenty-nine fluidounces. Mix them thoroughly." U. S.

This is a very mild purgative preparation suitable for exhibition in the case of infants and very young children, to whom it may be given in doses of fʒss to fʒij according to age.

Syrupus Rhei Aromaticus, U. S., *Aromatic Syrup of Rhubarb.*—"Take of rhubarb in moderately fine powder, two troyounces and a half; cloves, in moderately fine powder, cinnamon, in fine powder, each, half a troyounce; nutmeg, in moderately fine powder, one hundred and twenty grains; syrup, six pints; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with two fluidounces of diluted alcohol, introduce it into a conical percolator, and pour diluted alcohol upon it until a pint of tincture has passed. Add this to the syrup, previously heated, and mix them thoroughly." U. S.

An elegant stimulant laxative suitable for administration in the summer bowel disorders of children. Dose, fʒss—f℥ss.

Extractum Rhei Fluidum, U. S., *Fluid Extract of Rhubarb.*—"Take of rhubarb, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, eight troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Moisten the rhubarb with four fluidounces of the alcohol, introduce it into a conical percolator, press it gently, and pour upon it the remainder of the alcohol. When the liquid has disappeared from the surface, gradually pour on diluted alcohol until a pint of tincture has passed. Set this aside in a warm place until reduced by spontaneous evaporation to six fluidounces, and continue the percolation until two pints more of tincture have been obtained. Evaporate this by a gentle heat to six fluidounces; then add the sugar, and, when this is dissolved, the reserved tincture, and continue the heat until the whole is reduced to the measure of a pint." U. S.

A fluidrachm of this fluid extract represents a drachm of the root. It is an excellent purgative preparation. Dose, gtt. xx to xxx.—W.]

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## [RUMEX CRISPUS, *Large Curled Dock.*

*Generic Character.*—Sepals six. Styles three. Fruit three-angled, wingless, inclosed in the large inner sepals.

*Specific Character.*—Leaves with strongly wavy curled margins, lanceolate: whorls crowded in prolonged wand-like racemes, leafless above; valves round, heart-shaped, obscurely denticulate, or entire. height three to four feet.

*Habitat.*—Europe. Naturalized in the United States.

### Rumex, *Yellow Dock.* Secondary List, U. S. P.

The root of Rumex crispus.

This root is large, long, spindle-shaped, and of a yellow color. It is said to be an alterative, and has been used with asserted advantage in chronic skin diseases. It must be taken for a long time before any effects are to be looked for. It may be exhibited in decoction (℥ij to Oj), a pint to be taken in twenty-four hours. A fluid extract is for sale in the market.—W.]

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## [PEDALIACEÆ, *Lindley.*

## SESAMUM INDICUM.

*Generic Character.*—Calyx five-parted. Corolla bell-shaped, five-cleft, with the lower lobe largest. Stamens five, the fifth a rudiment. Stigma lanceolate. Capsule four-celled.—*Willd.*

*Specific Character.*—Leaves ovate, lanceolate; the inferior three-lobed, the superior undivided.

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## SESAMUM ORIENTALE.

*Specific Character.*—Leaves ovate, oblong, entire.—*Willd.*

*Habitat.*—East Indies. Cultivated in Asia, Africa, West Indies, and Southern United States.

### Sesami Folium, *Benne Leaf.* Secondary List, U. S. P.

The leaves of Sesămum Indicum, and of Sesamum orientale.

These leaves should be used in a fresh state. They abound in a rich bland mucilage, which they readily yield to cold water. Their mucilage is a favorite demulcent drink with many, in the treatment of cases of dysentery, genito-urinary irritation, catarrh, &c. Five or six full-sized leaves are sufficient to make a pint of the mucilage.

**Oleum Sesami,** *Benne Oil.* Secondary List, U. S. P.

The oil of the seed of Sesamum Indicum, and Sesamum orientale.

In the countries where the Benne plant flourishes, these seeds are much used for food. The oil is very bland and has a peculiar sweetish taste. Its physical and medical properties resemble olive oil.—W.]

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## LABIATÆ, *Jussieu.* The Labiate Order.

## LAVANDULA VERA, *DC.*

**Lavender.** Didynamia, Gymnospermia, *Linn. Syst.*

*Botanic Character.*—An *undershrub* one to three feet high. *Leaves* opposite, linear-lanceolate or oblong-linear, quite entire, glaucous, when young hoary and revolute at the edges. *Spikes* interrupted. *Whorls* of six to ten flowers. *Floral leaves* ovate, acuminate, membranous, all fertile, the uppermost shorter than the calyx. *Flowers* purplish-gray. *Calyx* ovate-tubular, thirteen-ribbed, shortly five-toothed, with the four lower teeth nearly equal, the upper broader and longer. *Corolla* with the tube exserted, throat somewhat dilated, the limb oblique and bilabiate; upper lip two-lobed, lower three-lobed; all the divisions nearly equal. *Stamens* four, didynamous, inclosed in the tube of the corolla, bent downwards. *Style* shortly bifid at the apex. *Nuts* (*achenia*) four, smooth.—*Woodv.* page 150, pl. 55 (*L. spica*).

*Habitat.*—South of Europe. Extensively cultivated at Mitcham in Surry, and at Hitchin in Hertfordshire.

[**Lavandula,** *Lavender.* Mat. Med. List, U. S. P.

The flowers of Lavandula vera. (*De Candolle.*)]

**Oleum Lavandulæ** [U. S.], *English Oil of Lavender.*

The oil distilled in England from the flowers. [Prepare this oil from lavender by the general formula given at page 399.—W.]

*Preparation.*—*English* oil of lavender is alone officinal, as it was in the London Pharmacopœia. Foreign oil of lavender is very inferior, and is frequently obtained from *Lavandula spica, DC.* English oil of lavender should be prepared by submitting lavender *flowers* to distillation with water. $69\frac{1}{5}$ lbs. of the flowers, carefully separated from the stalks, yielded Mr. Bell 1 lb. of oil, or 1.44 per cent. At Hitchin 60 lbs. of good flowers yield on an average 16 fluidounces of oil. When the stalks and leaves are distilled with the flowers, the odor of the oil is considerably deteriorated, and becomes somewhat rank. At Mitcham the flowers are put into the still with the stalks, as cut from the ground. The finest oil is drawn for two and a half hours, and is considered to come from the flowers. That which comes afterwards is second or third quality. The oil from the stalks is less volatile than the other, and comes last.

*Officinal Characters.*—Colorless or pale-yellow, with the odor of lavender, and a hot bitter aromatic taste.

*Description.*—English oil of lavender has a hot taste, and a very fragrant odor. Its specific gravity varies from 0.877 to 0.905; the lightest oil being the purest. It boils at 397° F., and is composed, according to Dr. Kane, of $C_{15}H_{14}O_2$.

*Therapeutics and Pharmaceutic Uses.*—It is a stimulant and stomachic, and is given in hysteria and headache, chiefly, however, in the form of the compound tincture and spirit. It is also commonly employed as a perfume for scenting evaporating lotions, ointment, or liniments, and is thus used in the preparation of the compound liniment of camphor.

*Dose.*—Two to five drops.

*Officinal Preparations.*

Spiritus Lavandulæ [U. S.], *Spirit of Lavender.*—Take of English oil of lavender, one fluidounce; rectified spirit, nine fluidounces. Dissolve.

This spirit is probably from twenty-five times to one hundred times as strong as the Edinburgh spirit: ten minims contain one minum of oil.

*Dose.*—Min. xx to min. xxx.

["Take of lavender, fresh, twenty-four troyounces; alcohol, eight pints; water, two pints. Mix them, and with a regulated heat distil eight pints." U. S. An ingredient in Mistura Ferri Composita, U. S.—W.]

*Lavender Water.*—The fragrant perfume sold in the shops under the name of *lavender water* is a solution of the oil of lavender and of other odoriferous substances in spirit. There are various formulæ for its preparation, scarcely two manufacturers adopting precisely the same one. The following yields a most excellent product: oil of lavender, oil of bergamot, āā fl. drs. iij; otto of roses, oil of cloves, āā gtt. vj; oil of rosemary, fl. drm. j; musk, gr. ij; honey, oz. j; benzoic acid, gr. xl; rectified spirit, Oj; distilled water, fl. oz. iij. Mix, and after standing a sufficient time (the longer the better), filter. This agreeable perfume may be employed for scenting spirit washes, but it is principally consumed for the toilet.

Tinctura Lavandulæ Composita, *Compound Tincture of Lavender.* (*Spiritus Lavandulæ compositus, Ed.*) [Spiritus Lavandulæ Compositus, U. S., *Compound Spirit of Lavender.*]—Take of English oil of lavender, one fluidrachm and a half; English oil of rosemary, ten minims; cinnamon, bruised, one hundred and fifty grains; nutmeg, bruised, one hundred and fifty grains; red sandal-wood, three hundred grains; rectified spirit, two pints. Macerate the cinnamon, nutmeg, and red sandal-wood in the spirit for seven days; then press out and strain; dissolve the oils in the strained tincture, and add sufficient rectified spirit to make two pints.

This is the London tincture. The Edinburgh contained about the same quantity of oils but more spices. The Dublin was twice as strong, and was colored with cochineal. The red sandal-wood is merely a coloring ingredient. Stimulant, cordial, and stomachic. Employed to relieve gastric uneasiness, flatulence, low spirits, languor, and faintness. A favorite remedy with hysterical and hypochondriacal persons.

["Take of oil of lavender, a fluidounce; oil of rosemary, two fluidrachms; cinnamon, in moderately fine powder, two troyounces; cloves, in moderately fine powder, half a troyounce; nutmeg, in moderately fine powder, a troyounce; red saunders, in moderately fine powder, three hundred and sixty grains; alcohol, six pints; water, two pints; diluted alcohol, a sufficient quantity. Dissolve the oils in the alcohol, and add the water. Then mix the powders, and, having moistened the mixture with a fluidounce of the alcoholic solution of the oils, pack it firmly in a conical percolator, and gradually pour upon it the remainder of the alcoholic solution, and afterwards diluted alcohol, until the filtered liquid measures eight pints." U. S.]

*Dose.*—From fl. drm. ss to fl. drms. ij, administered in water or on sugar.

## MENTHA.

Didynamia, Gymnospermia, *Linn. Syst.*

*Generic Character.*—*Calyx* campanulate or tubular, five-toothed, equal or somewhat two-lipped, with the throat naked inside or villous. *Corolla* with the tube inclosed, the limb campanulate, nearly equal, four-cleft; the upper segment broader, nearly entire or emarginate. *Stamens* four, equal, erect, distinct; *filaments* smooth, naked; *anthers* with two parallel cells. *Style* shortly bifid, with the lobes bearing stigmas at the points. *Nuts* (*achenia*) four, smooth. *Stem* square. *Leaves* opposite. —*Woodv.* pl. 170, page 463.

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## MENTHA VIRIDIS, *Linn.*

### Spearmint.

*Specific Character.*—A perennial creeping-rooted *herb.* *Stem* erect, smooth. *Leaves* subsessile, ovate-lanceolate, unequally serrated, smooth; those under the flowers all bract-like, rather longer than the whorls. *Spikes* cylindrical, acute, loose. *Whorls* approximated, or the lowest or all of them distant; teeth of the *calyx* linear subulate.

*Habitat.*—Marshy places. Indigenous. A native of the milder parts of Europe; also of Africa and America. Flowers in August. Selected for medicinal use when in flower.

### Oleum Menthæ Viridis [U. S.], *English Oil of Spearmint.*

The oil distilled in England from the fresh herb when in flower.

["Prepare this oil from fresh spearmint by the general formula," given at page 399.—U. S.]

*Officinal Characters.*—Colorless or pale yellow, with the odor and taste of spearmint.

*Description.*—It is of a pale yellowish color, but becomes reddish by age. It has the odor and taste of the plant, and is lighter than water; sp. gr. 0.914. It boils at 320° F., and is composed, according to Dr. Kane, of $C_{35}H_{28}O$. The average produce of the essential oil is not more than 1–500th of the fresh herb. (*Brande.*) It is carminative and stimulant.

*Dose.*—Two to five drops rubbed with sugar and a little water.

*Officinal Preparation.*

Aqua Menthæ Viridis [U. S.], *Spearmint Water.*—Take of English oil of spearmint, one fluidrachm and a half; water, one gallon and a half. Distil one gallon.

The distillation of the oil with the water is an improvement on the London and Dublin processes of admixture by trituration and agitation. Mr. Squire finds by experience that the medicated waters are better prepared from the part of the plant which contains the oil, than from the oil itself; but when so prepared they are liable to vary in strength. The omission of the spirit (*Ed.*, *Dub.*) is another improvement, as the water keeps better without it. Spearmint water is carminative and stomachic. It is commonly used as a vehicle for other medicines.

*Dose.*—Fl. oz. j to fl. oz. iij.

["Take of oil of spearmint, half a fluidrachm; carbonate of magnesia, sixty grains; distilled water, two pints. Rub the oil, first with the carbonate of magnesia, then with the water, gradually added, and filter through paper. Spearmint water may also be prepared by mixing eighteen troyounces of spearmint with sixteen pints of water, and distilling eight pints." U. S. Dose f℥ss to f℥iss.

SPIRITUS MENTHÆ VIRIDIS, U. S., *Spirit of Spearmint.* Tinctura Olei Menthæ Viridis, *Pharm.* 1850. *Essence of Spearmint.*—"Take of oil of spearmint, a fluidounce; spearmint, in coarse powder, one hundred and twenty grains; stronger alcohol, fifteen fluidounces. Dissolve the oil in the stronger alcohol, add the spearmint, macerate for twenty-four hours, and filter through paper." U. S. Dose, fℨss to fℨij.—W.]

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## MENTHA PIPERITA, *Linn.*

### Peppermint.

*Specific Character.*—A perennial creeping-rooted *herb.* *Stem* erect, smooth. *Leaves* petiolated, ovate-oblong, acute, serrate, rounded-crenate at the base, smooth. *Spikes* lax, obtuse, short, interrupted at the base. *Calyx* at the base, smooth; teeth hispid.—*Woodv.* pl. 169, page 461.

*Habitat.*—Watery places. Indigenous. Extensively cultivated at Mitcham, Hitchin, and Market Deeping. Found in various parts of Europe; also in Asia, Africa, and America.

### Oleum Menthæ Piperitæ [U. S.], *English Oil of Peppermint.*

The oil distilled in England from the fresh herb when in flower.

*Preparation.*—In a warm, dry, and favorable season, the produce of oil from a given quantity of the fresh herb, is double, or more than double, that which it yields in a wet and cold season. The largest produce is three drachms and a half of oil from two pounds of fresh peppermint (or 1.4 per cent.), and the smallest about a drachm and a half from the same quantity (or 0.6 per cent.) (*Brande*); but I was informed by a distiller at Mitcham, that twenty mats of the herb (each mat containing about 1 cwt.) yield about seven pounds of oil (or 0.3 per cent. ["Prepare this oil from fresh peppermint by the general formula," given at page 399.—U. S.]

*Officinal Characters.*—Colorless or pale yellow, with the odor of peppermint; taste warm, aromatic, succeeded by a sensation of coldness in the mouth.

*Description.*—English oil of peppermint has a specific gravity of 0.902. It sometimes has a greenish tint, and it becomes deeper yellow by age. It has a penetrating odor, like that of the plant, and a burning aromatic taste, followed by a sensation of cold. The vapor of it applied to the eye, causes a feeling of coldness. Oil of peppermint consists of two isomeric oils—one liquid, the other solid; the latter is called *peppermint camphor*, or the stearoptene of oil of peppermint. Its composition is $C_{20}H_{20}O_2$. It is in colorless prisms, which have the odor and taste of peppermint, are almost insoluble in water, but readily soluble in alcohol and ether, and are fusible at 92° F.

*Adulteration.*—Oil of peppermint is said to be adulterated with foreign oil of rosemary; the odor would probably serve to distinguish the fraud. *American Oil of Peppermint* is inferior in odor and flavor to the English sort. It has, however, much improved of late. It is said to be prepared from the dried plant gathered when in flower. It yields a considerable quantity of camphor. The American oil is often adulterated with oil of turpentine, which is perceptible to the smell. The adulterated oil gives a black smoky flame in burning.

*Physiological Effects.*—Oil of peppermint is carminative, stimulant, stomachic and antispasmodic.

*Therapeutics.*—It is employed in medicine for several purposes, but principally to expel flatus, to cover the unpleasant taste of other medicines, to relieve nausea, griping pain, and the flatulent colic of children.

*Administration.*—It is taken on sugar in doses of from 2 to 5 drops.

*Pharmaceutic Use.*—It is an ingredient of compound rhubarb pill.

### *Officinal Preparations.*

Spiritus Menthæ Piperitæ, *Spirit of Peppermint* (*Essentia Menthæ piperitæ, Dub.*).—Take of English oil of peppermint, one fluidounce; rectified spirit, nine fluidounces. Dissolve. This spirit contains about forty-seven (*forty-three*) times as much oil of peppermint as spiritus menthæ piperitæ, *Lond.*

*Dose.*—Min. x to min. xxx, on sugar or in water.

[Spiritus Menthæ Piperitæ, U. S., *Spirit of Peppermint.* Tinctura Olei Menthæ Piperitæ, *Pharm.* 1850; *Essence of Peppermint.*—"Take of oil of peppermint, a fluidounce; peppermint, in coarse powder, one hundred and twenty grains; stronger alcohol, fifteen fluidounces. Dissolve the oil in the stronger alcohol, add the peppermint, macerate for twenty-four hours, and filter through paper." U. S. *Dose*, fʒss to fʒij.—W.]

Aqua Menthæ Piperitæ, *Peppermint Water.*—Take of English oil of peppermint, one fluidrachm and a half; water, one gallon and a half. Distil one gallon.

Equal in strength to the Dublin peppermint water. Carminative and stimulant. Used to relieve flatulence, and as a vehicle for other medicines. *Dose.*—Fl. oz. j to fl. oz. iij.

[Aqua Menthæ Piperitæ, *Peppermint Water.*—"Take of peppermint, half a fluidrachm; carbonate of magnesia, sixty grains; distilled water, two pints. Rub the oil first with the carbonate of magnesia, then with the water, gradually added, and filter through paper.

"Peppermint water may also be prepared by mixing eighteen troyounces of peppermint with sixteen pints of water, and distilling eight pints." U. S. *Dose*, f℥ss to f℥iss.

Trochisci Menthæ Piperitæ, U. S., *Troches of Peppermint.*—"Take of oil of peppermint, a fluidrachm; sugar, in fine powder, twelve troyounces; mucilage of tragacanth, a sufficient quantity. Rub the oil of peppermint with the sugar until they are thoroughly mixed; then with mucilage of tragacanth form a mass, to be divided into troches, each weighing ten grains." U. S. Used for flatulent, colicky pains.—W.]

## ROSMARINUS OFFICINALIS, *Linn.*

**Rosemary.** Diandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—An *undershrub* 3–5 feet high, densely leafy. *Leaves* opposite, sessile, linear, entire, revolute at the edge, hoary beneath. *Flowers* few, in short axillary racemes. *Calyx* purplish, 2-lipped; the upper lip entire, the lower bifid. *Corolla* white or pale purplish-blue, with a protruding tube, not ringed in the inside, somewhat inflated in the throat; limb with 2 equal lips; the upper of which is erect and emarginate, the lower trifid, with the middle lobe very large, concave and hanging down. *Stamens* 2, protruding; *filaments*, shortly-toothed near the base; *anthers* linear, with 2 straggling, confluent cells. Upper lobe of the *style* very short. *Nuts* (*achenia*), 4, smooth.—*Steph.* and *Church.* pl. 24.

*Habitat.*—South of Europe; also Asia Minor. Cultivated in England.

### [**Rosmarinus**, *Rosemary.* Mat. Med. List, U. S. P.

The tops of Rosmarinus officinalis.—W.]

### **Oleum Rosmarini** [U. S.], *English Oil of Rosemary.*

The oil distilled in England from the flowering tops. ["Prepare this oil from rosemary by the general formula." U. S. See page 399.]

*Officinal Characters.*—Colorless, with the odor of rosemary, and a warm aromatic taste.

*Description.*—Its specific gravity is 0.897, and it boils at 365° F. It consists, according to Dr. Kane, of $C_{45}H_{38}H_2$. One pound of the fresh herb yields about one drachm of oil.

*Therapeutics.*—Carminative and stimulant, but rarely taken *internally* except in the compound tincture of lavender. It is frequently used *externally*, in conjunction with other substances, as a stimulating liniment; for example, in alopecia or baldness.

*Dose.*—Two to five drops.

*Pharmaceutic Use.*—It is a constituent of liniment of soap and compound tincture of lavender.

*Officinal Preparation.*

Spiritus Rosmarini, *Spirit of Rosemary.* (*Essentia Rosmarini, Dub.*)—Take of English oil of rosemary, one fluidounce; rectified spirit, nine fluidounces. Dissolve.

This spirit contains about thirty-one (*sixty-four*) times as much oil of rosemary as spiritus rosmarini, *Lond.*

*Dose.*—Min. x to xxx, but seldom used internally.

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## [**LYCOPUS VIRGINICUS**, *Michaux.*

*Generic Character.*—*Corolla* not evidently 2-lipped, but almost equally 4-lobed. Fertile *stamens* 2; and often 2 sterile filaments without anthers.

*Specific Character.*—*Stems* obtusely 4-angled, 6 to 18 inches high, producing long and slender runners from the base. *Leaves* oblong or ovate, lanceolate, toothed, entire towards the base, short-petioled. *Calyx*, teeth 4, ovate, bluntish and pointless.

*Habitat.*—United States.

### **Lycopus**, *Bugle Weed.* Secondary List, U. S. P.

The herb of Lycopus virginicus.

Bugle weed is said to be somewhat astringent and narcotic. It has been recommended in incipient phthisis and hæmoptysis. It is best exhibited in infusion.—W.]

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## [**THYMUS VULGARE**, *Garden Thyme.*

*Generic Character.*—*Calyx* ovate, 10–13-nerved, 2-lipped; upper lip 3-toothed, spreading; lower lip 2-cleft, with ciliate, subulate segments; throat villous inside. *Corolla* naked inside; limb sub-bilabiate; upper lip straight, emarginate, flattish; lower lip spreading, 3-cleft, with equal lobes, or the middle one largest. *Stamens* 4, straight, distant, nearly equal or didynamous, the lower 2 being the longest. *Anthers* with 2 parallel or at length diverging cells. *Leaves* very small.

*Specific Character.*—Erect or procumbent at the base. *Leaves* sessile, linear, or ovate-lanceolate, acute, with revolute edges, fascicled in the axils. *Bracts* (floral leaves) lanceolate, obtuse. *Whorls* loose, rather distant. Teeth of the upper lip of the *calyx* lanceolate ; the segments of the lower lip subulate ciliated.—Shrub much branched, ½ to 1 foot high, rather hoary with a short down. Flowers purplish.

*Habitat.*—Southwest of Europe, in dry, arid, uncultivated places. Cultivated as a sweet herb in England and America.

### **Oleum Thymi,** *Oil of Thyme.* Mat. Med. List, U. S. P.

The volatile oil obtained from Thymus vulgaris.

At Milhaud, Aujargues, Souvignargues, and near the village of Fontanes, as well as at several other places in the neighborhood of Nismes, in the department of Gard in the South of France, this oil is largely distilled, and is imported into England and sold as *oleum origani.* Mr. Daniel Hanbury, who visited this district in the summer of 1849, says that the plant grows spontaneously in abundance on the arid, rocky, waste hills of that neighborhood. The entire plants, whether in flower or not, are collected, and, either in the fresh or dried state, submitted to distillation with water. The oil, which is of a reddish-brown color, is called *red oil of thyme* (*huile rouge de thym*), becomes much paler by redistillation, and is then called *white oil of thyme* (*huile blanche de thym*).

*Therapeutics.*—Oil of thyme is used almost exclusively as a rubefacient. It was an ingredient, under the name of the oil of origanum, in the Linimentum Saponis Camphoratum (opodeldoc) of the former editions of the U. S. Ph. It may be combined with any spirituous liniment. —W.]

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## [MELISSA OFFICINALIS, *Linn.*

## Common Balm.

*Generic Character.*—*Calyx* tubular, bell-shaped, 2-lipped, flattish on the upper side. Tube of the *corolla* curved upwards. *Stamens* 4, curved above, connivent under the erect upper lip. *Anthers* 4, perfect, usually approximate in pairs.

*Specific Character.*—Upright and branching. *Leaves* broadly ovate, crenate-toothed. *Corolla* longer by half than the calyx, whitish or cream color. *Bracts* similar to but smaller than the leaves.

*Habitat.*—South of France. Sparingly naturalized in the United States.

### **Melissa,** *Balm.* Secondary List, U. S. P.

The herb of Melissa officinalis.

When fresh this herb exhales the odor of lemons, but this is lost in drying. It contains some tannic acid and a very small proportion of a peculiar volatile oil.

*Therapeutics.*—The remedial powers of balm are very feeble, since it contains so little of its oil. It is somewhat stimulant, stomachic, and diaphoretic. A hot infusion of it is sometimes used to aid in producing diaphoresis.—W.]

## [HEDEOMA PULEGIOIDES, *Pers.*

### American Pennyroyal.

*Generic Character.*—*Calyx* gibbous on the lower side, hairy in the throat. *Stamens* 2, with anthers ascending, and a pair of sterile abortive filaments. *Flowers* in loose axillary clusters, often forming terminal racemes.

*Specific Character.*—*Leaves* petioled, oblong, ovate, obscurely serrate.

This is an erect little labiate, from 6–10 inches in height, with bluish inconspicuous flowers, small leaves and a more or less hairy stem. The whole plant has a very strong odor, closely resembling that of the European pennyroyal. It grows in dryish, barren hillsides, fields, and open copses. It is very common in the Middle States, flowering during the later summer and early autumn months.

Fig. 114.

*Hedeoma pulegioides.*

**Hedeoma**, *Hedeoma.* Mat. Med. List, U. S. P.

The herb of Hedeoma pulegioides.

The peculiar odor of this herb is owing to a volatile oil which may be separated by distillation. The odor and taste are retained in the dried herb.

*Therapeutics.*—An aromatic stimulant. The hot infusion is popularly used as a carminative in cases of flatulent colic; as a diaphoretic in cases of suppressed perspiration, "break-bone fever," &c.; as a stimulant emmenagogue, in cases of recent suppressed menstruation from exposure to cold, or other cause. In the latter affections, the feet should be soaked in hot mustard water, the patient put to bed, and as much of the hot infusion taken as the stomach will bear.

Oleum Hedeomæ, U. S., *Oil of Hedeoma.*—Prepare this oil from hedeoma by the general formula, see page 399. This oil may be used instead of the herb, especially as a carminative. Dose, gtt. iij to x.—W.]

## [SALVIA OFFICINALIS, *L.*

### Garden Sage.

*Generic Character.*—Calyx and corolla two-lipped. Stamens two. Anthers with a long connective astride the filament bearing a linear cell at the upper end, and none, or an imperfect one at the lower.

*Specific Character.*—Leaves ovate lanceolate, crenulate, rugose; whorls few flowered; calyx mucronate; upper lip of the corolla as long as the lower, and somewhat vaulted.

This is a perennial plant, which is everywhere cultivated as a potherb, and is too well known to require further description.

### **Salvia**, *Sage*. Mat. Med. List, U. S. P.

The leaves of Salvia officinalis.

The leaves of sage contain a considerable amount of volatile oil and tannic acid, to which two principles they owe their stimulant and astringent properties. They are rarely administered internally, although said to have a controlling influence over the colliquative sweats of phthisis and debility.

Infusum Salviæ, U. S., *Infusion of Sage.*—"Take of sage, half a troy-ounce; boiling water, a pint. Macerate for half an hour in a covered vessel, and strain." U. S. Used as a gargle, combined with alum and honey, in inflammation of the fauces and relaxation of the uvula.—W.]

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## [MONARDA PUNCTATA, *Linn.*

### Horsemint.

*Generic Character.*—Stamens 2. Calyx tubular, elongated, equally 5-toothed. Corolla 2-lipped. Anthers of 2 cells confluent into one; connective inconspicuous.

*Specific Character.*—Minutely downy; leaves petioled, lanceolate, narrowed at the base; bracts lanceolate, yellowish and purple; corolla nearly smooth, short, yellowish, the upper lip spotted with purple; stamens not exceeding the notched upper lip.

This monarda is a tall labiate, growing in tufts in sunny sandy places, and attaining the height of three feet. The rather large yellow flowers are arranged in whorls around the distal portions of the stem, and, with their large bright-colored bracts, make the plant very conspicuous. It flowers from the latter part of July until late in the autumn.

*Habitat.*—Middle and Southern States.

### **Monarda**. Mat. Med. List, U. S. P.

The herb of Monarda punctata.

The whole herb has a strong, rather disagreeable odor, and a hot, pungent taste. It is very seldom or never administered, and has been introduced into the Pharmacopœia on account of its volatile oil.

Oleum Monardæ, U. S., *Oil of Horsemint.*—Prepare this oil from fresh horsemint by the general formula, see page 399.

This oil is of a reddish amber color, and has the odor and taste of the herb in a very high degree. When long exposed to the air at a rather low temperature, it is oxidized, and converted into a crystalline camphor.

Oil of horsemint, applied externally, is a powerful rubefacient and even vesicant. It is much used in domestic practice as an embrocation in chronic rheumatism, sprains, also in cases of intestinal irritation. Internally it is sometimes given as a stimulant carminative in doses of two or three drops. Its strong, penetrating odor appears to be very repulsive to the ants which infest houses, and it is therefore used to protect closets against them.—W.]

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## [SCUTELLARIA LATERIFLORA, *L.*

### Mad Dog Scullcap.

*Generic Character.*—Calyx 2-lipped, with a helmet-like projection on its upper side; the lips entire, closed in fruit. Stamens 4, ascending, parallel, inferior (outer) pair longer than the superior. Anthers approximate in pairs, ciliated or bearded.

*Specific Character.*—Flowers small, blue, in axillary and often also in terminal one-sided racemes; the lower floral leaves like the others, the upper small and bract-like. Leaves lanceolate-ovate or ovate-oblong, pointed, coarsely serrate, petioled.

A rather weak, odorless, perennial herb, with a diffusely much-branched, upright stem. It grows in wet shaded places, and attains a height of from 1–2 feet. It blossoms in August and September.

*Habitat.*—United States.

### Scutellaria, *Scullcap.* Secondary List, U. S. P.

The herb of Scutellaria lateriflora.

Scullcap formerly was highly esteemed in the United States as a remedy in hydrophobia, whence the common name, Mad Dog Scullcap. It is, of course, utterly powerless in that disease, and passed into entire disrepute. More recently it has been strongly recommended as a nervine and antispasmodic in cases of nervous exhaustion, chorea, hysteria, and allied diseases. Its action is said not to be immediate, but to follow its persistent use. It may be given in infusion, which should be made of the strength of two ounces to the pint, and drank *ad libitum.* A fluid extract is sold in the shops, of which one to three teaspoonfuls may be taken three or four times a day.—W.]

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## [MARRUBIUM VULGARE, *L.*

### Horehound.

*Generic Character.*—*Calyx* tubular, 5–10-nerved; teeth 5–10, spiny-pointed, nearly equal, spreading at maturity. *Corolla* with an inclosed tube and a 2-lipped limb; the upper lip erect, flattish or concave, entire or shortly bifid; the lower lip trifid, spreading, the middle lobe the broadest, often emarginate. *Stamens* 4, inclosed within the tube of the corolla. *Nucules* obtuse, not truncate at the apex.

*Specific Character.*—*Branches* white-woolly. *Leaves* ovate or rounded, softly villous, greenish or white-woolly beneath, crenate. *Whorls* many-flowered. *Calyx* villose, woolly, with 10 subulate, recurved-spreading or woolly teeth. *Corolla* with an oblong helmet, bifid at the point (Bentham). *Flowers* white.

*Habitat.*—Dry waste grounds. Grows in most parts of Europe; also in Asia and America. Flowers in July.

**Marrubium,** *Horehound.* Mat. Med. List, U. S. P.

The herb of Marrubium vulgare.

This herb has an aromatic odor and a bitter taste. It contains bitter extractive, resin, tannic acid, and a volatile oil upon which its virtues depend.

*Therapeutics.*—Horehound is tonic, mildly stimulant, expectorant, and, in large doses, laxative. Taken in the form of infusion, it promotes the secretions of the skin and kidneys. It was formerly supposed to possess emmenagogue properties.

It is rarely employed by medical practitioners. As a domestic remedy it is used in chronic pulmonary complaints, especially catarrh. It was formerly given in uterine and hepatic affections.

*Administration.*—*Horehound tea* (prepared by infusing an ounce of the herb in a pint of boiling water) is taken in the dose of a wineglassful. *Syrup of horehound* (prepared with the infusion and sugar) is a popular remedy. *Candied horehound* ought to be made of the same ingredients. —W.]

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## SCROPHULARIACEÆ, *Lindley.* The Figwort Order.

### DIGITALIS PURPUREA, *Linn.*

**Purple Foxglove.** Didynamia, Angiospermia, *Linn. Syst.*

*Botanic Character.*—*Herbaceous*, biennial. *Stem* erect, 3–5 feet high, roundish, with several slight angles, downy. *Leaves* alternate, ovate-lanceolate or oblong, the lower ones tapering at the base into winged foot-stalks, crenate or crenato-dentate, veiny, of a dull green above, the under surface paler, downy. *Raceme* terminal, erect, one-sided, simple, of numerous large pendulous odorless flowers. *Calyx* 5-partite, segments ovate or oblong. *Corolla* somewhat campanulate, with an oblique 4–5 fid. limb, the lowermost segment being the largest, purplish pink, elegantly marked with eye-like spots, as well as hairy, within. *Stamens* 4, didynamous, ascending. *Anthers* approximated in pairs, their cells diverging and confluent. *Style* briefly bilobed at the apex; the lobes stigmatic within. *Capsule* ovate, 2-valved, with septicidal dehiscence; the valves entire, curved inwards at the margins. *Seeds* numerous, minute, oblong, somewhat angular. *Flor. Lond.* Fasc. 1. pl. 48.

Fig. 115.

*Digitalis purpurea.*

*Habitat.*—Indigenous; in pastures and about hedges or banks, on a gravelly or sandy soil.

**Digitalis**, *Digitalis*. [Mat. Med. List, U. S. P.]

The dried leaf; from wild indigenous plants, gathered when about two thirds of the flowers are expanded.

*Collection and Drying.*—The leaves are directed to be gathered when about two thirds of the flowers are expanded, *i. e.* before the seeds have begun to ripen; the plant being at this time considered to be in the greatest perfection. The superiority of leaves gathered after flowering has commenced is founded rather on theory than on clinical observation. Dr. Christison says "he has observed that their bitterness, which probably measures their activity, is very intense both in February and September, and that their extract is highly energetic as a poison in the middle of April before any appearance of the flowering stem." Although the leaves should be gathered, as directed, at the period of inflorescence, yet not unfrequently first year's leaves, which are considered to be of inferior activity, are substituted for them. The first year's leaves are frequently more tapering than those of the second year's growth; but this character is not much to be relied on; the character of *shortly petiolate* is another distinction, the radical or first year's leaves having longer petioles; but as these may be cut off, the best and safest plan, to avoid the substitution, is to purchase the fresh leaves at the proper season (namely, at the period of inflorescence, which is during the month of July), or to purchase the entire plants when in flower. The leaves are usually dried in baskets in a dark place, in a drying-stove. Both dried leaves and powder should be preserved in well-stoppered bottles, covered externally by dark-colored paper, and kept in a dark cupboard. As both undergo changes by keeping, whereby their medicinal activity is considerably diminished, they ought to be renewed annually.

*Officinal Characters.*—Ovate-lanceolate, shortly petiolate, rugose, downy, paler on the under surface, crenate.

*Description.*—Dried foxglove leaves have a faint odor, and a bitter nauseous taste.

*Adulteration.*—The leaves of *Inula conyza*, *DC.*, or *Ploughman's Spikenard*, closely resemble those of foxglove; but, when rubbed, are readily distinguished by their odor, which by some is called aromatic, by others fetid. Moreover, they are rougher to the touch, and are less divided on the edge.

*Composition.*—Digitalis contains an active principle, *digitalin*, to which its properties appear to be due, and which will be described presently. From the experiments of Englehardt, however, the active principle appears to be a volatile alkaloid like conia or nicotia, and is obtained by a similar process. He calls it *digitalium fluidum.*

*Physiological Effects.*—We may, for convenience, establish three degrees of the operation of foxglove.

*In the first degree*, or that produced by *small and repeated doses*, foxglove sometimes affects what are termed the organic functions, without disordering the animal or cerebro-spinal functions. Thus we sometimes have the stomach disordered, the pulse altered in frequency, and sometimes also in fulness and regularity; and the secretion of urine increased, without any other marked symptoms. The order in which the symptoms just mentioned occur is not uniform; sometimes the diuresis, at others nausea, and occasionally the affection of the circulation, being the first obvious effect.

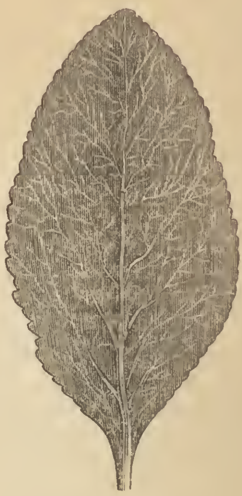
The influence of digitalis over the *circulation* is not at all constant.

In some cases the frequency of the pulse is augmented, in others, decreased, while in some it is unaffected. Lastly, in a considerable number of instances the pulse becomes irregular or intermittent under its use. A few drops of the tincture will, in some cases, reduce the frequency of the pulse, and render it irregular and intermittent, while in other instances much larger doses may be taken without any obvious

Fig. 116.

First year's leaf.

Fig. 117.



Second year's leaf.

*Foxglove leaves.*

effect on it. Dr. Withering mentions one case in which the pulse fell to forty; and I have several times seen it reduced to fifty. In some cases the slowness of the pulse is preceded by an increased activity of the vascular system. From Sandras's reports this would appear to occur more frequently after small than larger doses of digitalis. Dr. Sanders, indeed, asserts that it invariably excites the pulse, and refers to an experience of two thousand cases in proof. He says that he has seen the pulse rise from seventy to one hundred and twenty under its use, and at the end of twenty-four hours, or sooner, fall with greater or less rapidity to forty, or even below this. But an experience of the use of this remedy in only twenty cases will, I believe, convince most persons that Dr. Sanders has fallen into an error in the sweeping assertion he has made. A great deal, however, depends on the position of the patients. If it be desired to reduce the frequency of the pulse, the patient should be kept in a recumbent posture. The important influence of posture was first pointed out, I believe, by Dr. Baildon. His own pulse, which had been reduced by this plant from one hundred and ten to forty beats per minute while he was in the recumbent position, rose to seventy when he sat up, and to one hundred when he stood. The sudden change of position in those who are much under the influence of this medicine is attended with great danger, and in several instances has proved fatal; for the power of the heart being enfeebled by digitalis, when a demand is made on this viscus for an increase in the force of its contractions by the change from the recumbent to the standing attitude, it endeavors to make up for its diminished force by an increase in the frequency of its contractions; and not having sufficient power to propel the blood to the head, fatal syncope has been the result. The influence of digitalis over the pulse is more marked in some individuals or cases than in others; thus the reduction of the frequency of the pulse is in general more readily induced in weak and debilitated constitutions than in robust and plethoric ones. Occasionally no obvious effect on the number, force, or regularity of the pulse is produced, though the medicine may have been given to an extent sufficient to excite vomiting and cerebral disorder. Dr. Bence Jones says, "It may safely be assumed that digitalis acts on the nerves that regulate the heart's action, first as a stimulant, and in large doses as a sedative."

Dr. Howship Dickenson has shown (*Med.-Chir. Trans.* vol. 39) that digitalis has an immediate special action on the uterus, producing its forcible contraction, which is often even attended with pain.

The *diuretic* operation for which we employ digitalis is very inconstant. Dr. Withering stated that this medicine more frequently succeeds as a diuretic than any other, and that if it fail, there is but little chance of any other remedy succeeding. My experience, however, is not in accordance with Dr. Withering's. I have frequently seen digitalis fail in exciting diuresis, and have often found the infusion of broom subsequently succeed. It has been asserted by some that its diuretic effect was only observed in dropsical cases, and that it, therefore, depended on the stimulus given to the absorbent vessels, and not to any direct influence exerted over the kidneys; but the statement is not true, since digitalis is sometimes found acting as a diuretic even in health. In some cases the bladder has appeared more irritable than usual, the patient having a frequent desire to pass his urine.

The *second degree of operation* of digitalis, or that resulting from the use of too large or too long-continued doses, is manifested by the disordered condition of the alimentary canal, of the circulating organs, and of the cerebro-spinal system. The more ordinary symptoms are nausea or actual vomiting, slow and often irregular pulse, coldness of the extremities, syncope, or tendency to it, giddiness and confusion of vision. Sometimes the sickness is attended with purging, or even with diuresis; at other times the patient is neither vomited nor purged, and the principal disorder of system is observed in the altered condition of the nervous and vascular organs. Disordered vision, and a sensation of weight, pain, or throbbing of the head, especially in the frontal region, are experienced; giddiness, weakness of the limbs, loss of sleep, occasionally stupor or delirium, and even convulsions, may also be present. The pulse becomes feeble, sometimes frequent, sometimes slow; there may be actual syncope, and profuse cold sweats.

A most important fact connected with the repeated use of small doses of digitalis, is the *cumulative effect* sometimes observed. It has not unfrequently happened that, in consequence of the continued use of small doses of this medicine, very dangerous symptoms, in some cases terminating in death, have occurred. The most prominent of these were great depression of the vascular system, giddiness, want of sleep, convulsions, and sometimes nausea and vomiting. A knowledge of its occasional occurrence impresses us with the necessity of exercising great caution in the use of this remedy, particularly with respect to the continuance of its administration and increase of dose; and it shows that after the constitutional effect has become obvious, it is prudent to suspend from time to time the exhibition of the remedy, in order to guard against the effects of this alarming accumulation. I may add, however, that I have used it, and seen others employ it, most extensively, and in full doses, and have rarely seen any dangerous consequences; and I believe, therefore, the effects of accumulation to be much less frequent than the statements of authors of repute would lead us to expect. The experience of Sir Henry Holland is to the same effect. "Though employing the medicine somewhat largely in practice," he observes, "I do not recollect a case in which I have seen any injurious consequences from this cause." [Dr. A. Fleming believes that the cumulative effect of digitalis consists in the gradual depression of the circulation until it passes beyond the degree which the heart can bear without embarrassment, when the symptoms of cumulation suddenly occur. The tolerance of a depressed circulation is very different in different individuals, and it is probable that the so-called cumulative effects are sometimes occasioned by some sudden exertion or change of posture in the patient, the consequences of which have been already mentioned.—Ed.]

The quantity of digitalis that may be given to a patient without destroying life, is much greater than is ordinarily imagined. In one instance I saw twenty drops of the tincture given to an infant laboring under hydrocephalus, three times daily for a fortnight, at the end of which time the little patient had completely recovered, without one untoward symptom. I have frequently given a drachm of the tincture (of the best quality) three times daily to an adult, for a fortnight without observing any marked effect. I know that some practitioners employ it in much larger doses (as an ounce or half an ounce of the tincture) with much less effect than might be imagined. Mr. King, of Saxmundham, in Suffolk, assured me that he had been for many years in the habit of administering the tincture of digitalis to the extent of from half an ounce to an ounce at a time, not only with safety, but with the most decided advantage, as a remedy for acute inflammation—not, however, to the exclusion of blood-letting, which, on the contrary, he previously uses with considerable freedom. To adults he often gives an ounce of the tincture (seldom less than half an ounce), and waits the result of twenty-four hours, when, if he does not find the pulse subdued, or rendered irregular by it, he repeats the dose; and this, he says, seldom fails to lower the pulse in the degree wished for; and when this is the case, the disease rarely fails to give way, provided it has not gone the length of producing disorganization of the part. He has given as much as two drachms to a child of nine months. Sometimes vomiting quickly follows these large doses of the digitalis, but never any dangerous symptom, so far as his observation has gone, which has been very extensive. In less acute cases he sometimes gives smaller doses, as thirty drops several times in a day. Dr. Clutterbuck says: "I have myself exhibited the tincture to the extent of half an ounce (never more), in not more than two or three instances (cases of fever and pneumonia.) To my surprise, there was no striking effect produced by it, but I did not venture to repeat the dose. In numerous instances I have given two drachms; still more frequently one drachm; but not oftener than once in twenty-four hours, and not beyond a second or third time. Two or three exhibitions of this kind I have generally observed to be followed by slowness and irregularity of pulse, when I have immediately desisted." Dr. T. Williams states that a man in a state of intoxication took two ounces of the tincture in two doses, in quick succession, without the slightest inconvenience. The experience of Mr. Jones, of Jersey (see *Therapeutics*), is to the same effect.

The *third degree* of the operation of digitalis, or that resulting from the use of *fatal doses*, is characterized usually by vomiting, purging, and griping pain in the bowels; slow, feeble, and irregular pulse, great faintness, and cold sweats; disordered vision; at first, giddiness, extreme debility; afterwards insensibility and convulsions, with dilated insensible pupils.

If we compare the effects of digitalis with those of other medicinal agents, we find that they approximate more closely to those of tobacco than of any other cerebro-spinant. These two agents specially agree in their power of enfeebling the action of the heart and arteries. Considered as a diuretic, it is, in some respects, comparable with squills.

*Therapeutics.*—We employ digitalis for various purposes, as—first, to reduce the frequency and force of the heart's action; secondly, to promote the action of the absorbents; thirdly, as a diuretic; and fourthly, sometimes on account of its specific influence over the cerebro-spinal system. In the following remarks on the uses of digitalis in particular diseases, I refer to the administration of this remedy in doses in which it is ordinarily employed. I have no experience of its therapeutical effects when given in excessive doses.

*In fever.*—Digitalis is occasionally useful in fever to reduce the frequency of the pulse when the excitement of the vascular system is out of proportion to the other symptoms of fever, such as the increased temperature and the cerebral or gastric disorder. It cannot, however, be regarded in the most remote way, as a curative means; on the other hand it is sometimes hurtful. Thus, not unfrequently it fails to reduce the circulation; nay, occasionally it has the reverse effect, accelerates the pulse, while it increases the cerebral disorder, and perhaps irritates the stomach. In estimating its value as a remedial agent for fever, we must not regard it merely as a sedative means (I refer now to the vascular system). It is an agent which exercises a specific influence over the brain; and, therefore, to be able to lay down correct indications and contraindications for its use in disordered conditions of this viscus, we ought to be acquainted, on the one hand, with the precise nature of the influence of the remedy, and, on the other, with the actual condition of brain in the disease which we wish to relieve. Now, as we possess neither of these data in reference to fever, our use of digitalis is, with the exception of the sedative influence over the circulation, empirical; and experience has fully shown us it is not generally beneficial. But, I repeat, where the frequency of pulse bears no relation to the local or constitutional symptoms of fever, digitalis may be serviceable.

*In inflammation.*—Digitalis has been employed in inflammatory diseases, principally on account of its power of reducing the frequency of the pulse, though some have referred part of its beneficial operation to its influence over the absorbent system. Inflammation, of a chronic kind may be going on in one part of the body to an extent sufficient to produce complete disorganization, and ultimately to cause the death of the patient, without the action of the larger arterial trunks (*i. e.* of the system generally) being remarkably increased. In such cases digitalis is, for the most part, of little use. Again, in violent and acute inflammation, accompanied with great excitement of the general circulation, especially in plethoric subjects, digitalis is, in some cases, hurtful; in others it is a trivial and unimportant remedy; and we therefore rely, in our treatment, on blood-letting and other powerful antiphlogistic measures; and digitalis, if serviceable at all, can only be used after the other means. As a remedy for inflammation, it is principally useful in less violent cases, particularly when accompanied with increased frequency of pulse, and occurring in subjects not able to support copious evacuations of blood. Moreover, it has more influence over inflammation of some parts of the body (as the arachnoid membrane, the pleura, the pericardium, and the lungs) than of others. In gastric and enteritic inflammation it would appear to be objectionable on account of its irritant properties; while its specific influence over the brain would make it doubtful in phrenitis. In arachnitis of children it is certainly a most valuable agent. In conclusion, then, it appears that digitalis, as a remedy for inflammation, is principally valuable where the disease has a tendency to terminate in serous effusion. But in no case can it be regarded as a substitute for blood-letting. Its powers as an antiphlogistic remedy have, I suspect, been greatly overrated.

*In dropsy.*—Of all remedies for dropsy, none have gained more, and few so much celebrity as digitalis. Whatever may be its *modus operandi*, its powerful and salutary influence in many dropsies cannot be a matter of doubt. Dr. Withering has observed that "it seldom succeeds in men of great natural strength, of tense fibre, of warm skin, of florid complexion, or in those of a tight and cordy pulse." "On the contrary, if the pulse be feeble and intermitting, the countenance pale, the lips livid, the skin cold, the swollen belly soft and fluctuating, or the anasarcous limbs readily pitting under the pressure of the finger, we may expect the diuretic effects to follow in a kindly manner." In those with a florid complexion, blood-letting and purgatives will often be found useful preparatives for digitalis. In some forms of dropsy digitalis is more serviceable than in others. Thus anasarca, ascites, hydrothorax, and phlegmasia dolens, are sometimes benefited by it. Its diuretic effect is greatly promoted by combining other diuretics with it, especially squill, calomel, or the saline diuretics (as the acetate of potash). A combination of vegetable bitters (as infusion of gentian, or calumbo) with digitalis forms, I think, a valuable form of exhibition in many old dropsical cases. Decoction of broom might probably be advantageously conjoined with it where a powerful diuretic is required. In old cases of general dropsy, in œdematous swellings from debility, and in anasarca following scarlet fever, where, together with weakness, there is still left an excited and irritable state of the arterial system, chalybeates, as the tincture of perchloride of iron, may be conjoined with digitalis with the happiest effects.

*In hemorrhages.*—In active hemorrhages from internal organs, accompanied with a quick, hard, and throbbing pulse, digitalis as a sedative is oftentimes serviceable. Epistaxis, hæmoptysis, and menorrhagia. are the forms of hemorrhage more frequently benefited by its use. Dr. Dickenson maintains that digitalis cures more immediately, and with more certainty, than any remedy hitherto employed, in cases of menorrhagia not connected with organic disease, and that when organic disease gives rise to the symptoms, the action of the medicine is scarcely less manifest, although the advantage may be temporary. He found that this effect was independent of the state of the circulation. The digitalis was given in the form of infusion sometimes to the extent of an ounce and a half.

*In diseases of the heart and great vessels.*—An important indication in the treatment of many diseases of the heart and great vessels, is to reduce the force and velocity of the circulation. The most effectual means of fulfilling this indication are, the adoption of a low diet, repeated blood-letting, and the employment of digitalis. In *aneurism of the aorta* our only hope of cure is by the coagulation of the blood in the aneurismal sac, and the consequent removal of the distensive pressure of the circulation. To promote this, we endeavor to retard the movement of the blood within the sac by diminishing the quantity of blood in the system generally, and by reducing the force and velocity with which it circulates. Blood-letting and digitalis are, in these cases, very important agents; and under their use cases now and then recover. Again, in *simple dilatation* of the cavities of the heart our objects are to remove, if possible, the cause (usually obstruction in the pulmonic or aortic system), to strengthen the muscular fibres of the heart, and to repress any preternatural excitement of the vascular system. Digitalis is useful to us in attaining the latter object. In *simple hypertrophy* or *hypertrophy with dilatation*, we have to reduce the preternatural thickness of the heart's parietes; and this we do by removing, when it can be done, any obstruction to the circulation, by using a low diet, by repeated blood-letting, and by the employment of digitalis. No means, says the late Dr. Davies, excepting the abstraction of blood diminishes the impulsion of the heart so completely and so certainly as digitalis. "I have been," adds he, "in the habit of using it for several years for these affections, and have rarely seen it fail in producing at least temporary relief." "The enlarged and flaccid heart," observes Dr. Holland, "though, on first view, it might seem the least favorable for the use of the medicine, is, perhaps, not so. At least, we have reason to believe that in dropsical affections, so often connected with this organic change, the action of digitalis as a diuretic is peculiarly of avail." *In some disordered conditions of innervation of the heart and great vessels*, as in angina pectoris, nervous palpitation of the heart, and augmented arterial impulsion, it is also at times beneficial. In patients affected with an intermittent or otherwise irregular pulse, I have several times observed this medicine produce regularity of pulsation, a circumstance also noticed by Sir Henry Holland. Besides the preceding, there are *various other affections of the heart* in which digitalis may be found serviceable, either by its sedative influence over the circulation, or by its power of relieving dropsical effusion through its diuretic property.

[I cannot omit the use of this remedy by the late Mr. Jones, of Jersey, in delirium tremens. Mr. Jones was in the habit of giving half a fluidounce of tincture of digitalis in this disease, and of repeating the same dose once, if not twice, at intervals of twenty-four hours. After this, if necessary, he gave a smaller dose, as two fluidrachms. Smaller quantities than this, he says, were of no service. With these large doses he states that he cured, with very few exceptions, all the cases of delirium tremens (and they were many), that came under his care; several of these having been previously treated unsuccessfully with opium. He describes some, who were apparently at the point of death, who were restored by it, and whose pulse, previously irregular and intermittent, became steady and regular under its use. Mr. Jones's treatment, however, has not, I am informed, been adopted in Jersey; and it requires further trial in this country before an opinion can be passed on its merits. I have employed it in a few cases; but though the half-ounce doses were well borne, their effect on the disease was not very marked. Several successful cases have, however, been recorded, in some of which half-ounce doses were given three and four times in twenty-four hours.—ED.]

*Administration.*—The ordinary dose of digitalis, in *powder*, is from half a grain to a grain and a half.

*Antidotes.*—In a case of poisoning by digitalis, or its preparations, expel the poison from the stomach by the stomach-pump, or by emetics if vomiting should not have already commenced; assist the vomiting, when it is established, by the use of diluents; and counteract the depressing influence of the poison on the circulation, by the use of ammonia and brandy; and keep the patient in a recumbent posture, to guard against syncope. I am unacquainted with any chemical antidote for digitalis; perhaps infusion of galls might prove serviceable, by the tannic acid which it contains.

*Officinal Preparations.*

Infusum Digitalis [U. S.], *Infusion of Digitalis.*—Take of digitalis, dried, thirty grains; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain.

This infusion has half the strength of Infusum Digitalis, *Ed. Dub.* The spirit of cinnamon (*Lond.*, *Ed.*) is omitted. I believe this to be the most effectual of the preparations of digitalis.

*Dose.*—Fl. oz. ss to fl. oz. j.

["Take of digitalis, in coarse powder, sixty grains; tincture of cinnamon a fluidounce; boiling water half a pint. Macerate the digitalis with the water for two hours in a covered vessel, and strain; then add the tincture of cinnamon, and mix." U. S. This preparation is more than double the strength of the British infusion, and must therefore not be confounded with it. *Dose*, f℥ij—f℥ss.—W.]

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

["Take of digitalis, recently dried, and in fine powder, four troyounces; diluted alcohol a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

*Dose.*—The usual dose of the tincture for an adult is ten minims, cautiously increased to forty minims. I usually begin with twenty minims; but, as I have already stated, it has been given to the extent of one ounce.[1]

[Extractum Digitalis Alcoholicum, U. S., *Alcoholic Extract of Digitalis.*—"Take of digitalis, recently dried, and in fine powder, twelve troyounces; alcohol, a pint; diluted alcohol a sufficient quantity. Introduce the powder, previously mixed with one-third of the alcohol, into a percolator, and pour upon it the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour diluted alcohol upon it until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol, until two pints more of tincture have passed, or until the powder is exhausted; then evaporate this liquid, by means of a water-bath, at a temperature not exceeding 160°, to the consistence of syrup. To this add the three

[1] It would remove all doubts about the real intention of the prescriber, and would relieve any scruples of the dispenser, if the prescriber, when ordering *unusually large* doses of this or any other medicine, would *write his initials* above the dose, or above the quantity of the active ingredient.—Ed.

fluidounces of tincture first obtained, and continue the evaporation, at a temperature not exceeding 120°, until the whole is reduced to the proper consistence." U. S.

*Dose.*—Gr. $\frac{1}{4}$ in pill.—W.]

## **Digitalinum**, *Digitalin.*

The active principle obtained from digitalis.

*Preparation.*—Take of digitalis, in powder, forty ounces; rectified spirit, two gallons and five fluidounces; distilled water, one pint; acetic acid, half a fluidounce; purified animal charcoal, half an ounce; solution of ammonia, a sufficiency; tannic acid, one hundred and sixty grains; litharge, in fine powder, a quarter of an ounce; pure ether, a sufficiency. Pour on the digitalis two gallons of the spirit; digest at a heat of 120 for six hours, and separate the tincture by filtration and subsequent expression. Distil off the spirit, and treat the extract with five ounces of the water, acidulated with the acetic acid. Digest with a quarter of an ounce of the animal charcoal, filter, and dilute the filtrate with the water, so that it shall have the bulk of a pint. Now add the ammonia nearly to neutralization, and afterwards the tannic acid dissolved in three ounces of the water. Wash the precipitate thus obtained with a little of the water; mix it with a small quantity of the spirit, and carefully rub it in a mortar with the litharge. Place the mixture in a flask, and add to it four ounces of the spirit; raise the temperature to 160°, and maintain it for about an hour. Then add the rest of the animal charcoal, filter and remove the spirit by distillation. Lastly, wash the residue repeatedly with the ether.

This is the process of O. Henry. On treating the alcoholic extract with water and acetic acid, the greater part of the extractive matter, with some coloring and resinous matters, are left undissolved, while the digitalin is taken up by the acid. The solution, after partial decolorization, is nearly neutralized by ammonia, and the digitalin precipitated by the tannic acid. This precipitate is then slightly washed, and carefully rubbed with oxide of lead, which unites with the tannic acid. The digitalin is next dissolved in spirit, the solution decolorized, filtered, the spirit dissolved off, and the residual digitalin washed with ether to remove any fatty matter. Great care must be taken in these operations to use as little heat as possible, as digitalin is very liable to change from this cause. This is the *digitalin* of Homolle. It was afterwards called *la digitaline* by Homolle and Quevenne, and shown not to be a pure proximate principle, but to contain other compounds. 100 parts of dried leaves yield about 1.25 of digitalin.

*Officinal Characters.*—In porous, mammillated masses, or small scales; white, inodorous, and intensely bitter; readily soluble in spirit, but almost insoluble in water and ether; dissolves in acids, but does not form with them neutral compounds; its solution in hydrochloric acid is of a faint yellow color, but rapidly becomes green. It powerfully irritates the nostrils, and is an active poison.

*Description.*—Digitalin is difficultly crystallizable, and does not contain nitrogen. Concentrated sulphuric acid blackens it, and then dissolves it, forming a blackish-brown solution, which in a few days becomes successively reddish-brown, smoky amethyst, pure amethyst, and ultimately a beautiful crimson. If during this time a small quantity of water be added, a limpid, beautiful green solution is obtained. M. Grandeau exposes the digitalin moistened by sulphuric acid to the vapor of bromine, when it immediately assumes a violet color. This test will indicate the smallest trace of this substance.

*Physiological Effects and Therapeutics.*—The effects of digitalin have been examined by Homolle, and by Bourchardat and Sandras. From their experiments it appears that its effects are similar to those of the plant; but that it is at least one hundred times as powerful as the powder of the dried plant. In the human subject, doses of from two to six milligrammes (from about 1-32d to 1-11th of an English grain) diminished the frequency of the pulse, and caused nausea, vomiting, griping, purging, and increased secretion of urine. M. Bouillaud states that during four or five years not a day has passed without his employing digitalin on many patients affected with diseases of the heart or vessels. He has given it to from 150 to 200 patients of all ages. In all excepting three the pulse was reduced. Two of these had endocarditis and pericarditis. If the pulse was irregular previous to the taking of digitalin, it became regular as the medicine took effect. In fifteen cases, taken at hazard, in La Charité, the maximum pulse before the action of the digitalin was 96; after the medicine, 41 pulsations less. In three cases, the pulse was reduced 80, 102, and 106 beats. The minimum reduction in three other cases was 12, 14, 16. As soon as pain in the head, vertigo, or nausea came on, the medicine was stopped.

*Administration.*—Digitalin has been employed in medicine in doses of from 1-60th to 1-30th of a grain. It may be administered in substance in the form of pills, or dissolved in alcohol and given in the form of mixture or syrup. But the difficulty of adjusting these small doses, as well as the uncertainty of the purity and activity of the remedy, are great drawbacks to its use. Dr. Bence Jones considers that "the best form for keeping and giving digitalin as medicine is in granules, and not in tincture. Thus it keeps best, and is more certain in composition. It is thus most easily given, as its bitter taste is concealed. Each granule is made to contain one milligramme (= .015 grain) of digitalin."

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## [**VERONICA VIRGINICA**, *Linn.* *Culver's Root*, *Culver's Physic.*

*Generic Character.*—Calyx 4 (rarely 3–5) parted. Corolla wheel or salver shaped, somewhat irregular; stamens 2, not approaching one another.

*Specific Character.*—Leaves whorled in fours or sevens, short petioles, lanceolate, finely serrate; flowers in panicled spikes, with very small bracts; stamens much exserted. A tall perennial 3 to 6 feet high, growing in rich woods, with a simple straight stem and small whitish flowers.

*Habitat.*—Northern United States.

### **Leptandra**, *Leptandra.* Mat. Med. List, U. S. P.

The root of Veronica Virginica (*Linn.*), Leptandra Virginica (*Nuttall*).

This root has a bitter, slightly acrid, nauseous taste. It contains a volatile oil, resin, and, according to Mr. Wayne, a peculiar crystalline bitter substance, which is the active principle, and has received the name of leptandrin. This is not the leptandrin of the shops, which is the impure resin obtained by precipitating from the tincture of the root by water.

*Therapeutics.*—The fresh root is a very active cathartic and in large doses emetic. The dried root is not so energetic in its action. It is much esteemed by the so called "eclectic physicians" as a cholagogue. They use it as a substitute for calomel in cases of hepatic derangement.

*Dose.*—Of the powder gr. xx to xxx—of leptandrin (the impure resin) gr. ij to iv.—W.]

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## [GELSEMIUM SEMPERVIRENS, *Ait.* *Yellow Jessamine.*

*Generic Character.*—Corolla equally 5-lobed; stamens 5; stigmas 2, two parted.

*Specific Character.*—Leaves opposite, entire, ovate or lanceolate, on very short petioles. A twining shrubby vine, which ascends lofty trees and hangs from them in masses, or passes from tree to tree. Its flowers are axillary, large, yellow, very showy, and have a delightful perfume.

*Habitat.*—Rich woods near the coast from Virginia southwards.

### Gelsemium, *Yellow Jessamine.* Secondary List, U. S. P.

The root of Gelsemium sempervirens.

This root contains gum, starch, an acrid resin, a peculiar alkaloid (gelsemina), gallic acid, volatile oil, and other unimportant ingredients. It yields its virtues to water and alcohol.

*Therapeutics.*—Gelsemium "appears to be a nervous and arterial sedative without nauseating or purgative properties, but sometimes causing diaphoresis, especially in febrile diseases. When largely taken, it produces dizziness, dimness of vision, dilated pupils, general muscular debility, and universal prostration, reducing the frequency and force of the pulse and the frequency of respiration, and producing insensibility to pain, but without stupor or delirium." U. S. D. It has been recommended in the early stages of pneumonia, pleurisy, and other acute inflammations, as well as neuralgia, chorea and allied nervous diseases, and also in remittent, intermittent, and yellow fever. Judging from the amount of testimony in its favor, it must be a very valuable remedy, but I have had no experience with it. An overdose is said to have caused death. It is best administered in the form of a tincture, which may be made by macerating four ounces of the fresh root in a pint of diluted alcohol. The dose of a tincture of that strength is from twenty to forty drops.—W.]

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## SOLANACEÆ, *Lindley.* THE NIGHTSHADE ORDER.

## HYOSCYAMUS NIGER, *Linn.*

### Henbane. Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Stem* 1 to 3 feet high, little branched. *Leaves* alternate, sessile, lower ones stalked, stem-clasping, oblong, acute, sharply and unequally lobed, pale dull green. Whole herbage downy, glandular, and clammy, exhaling a powerful, fetid, and oppressive odor. *Flowers* numerous, unilateral, drooping from the bosoms of the crowded upper leaves, nearly sessile. *Calyx* urceolate, 5-lobed. *Corolla* of an elegant straw color, usually pencilled with dark purple veins, funnel-shaped; the limb 5-lobed, the lobes obtuse, unequal. *Stamens* 5, declinate; the 3 lower longer than the two others. *Ovary* superior, 2-celled; ovules

Fig. 118.


*Hyoscyamus niger.*

numerous, *style* simple; *stigmas* capitate. *Capsule* membranous, 2-celled, opening transversely by a convex lid. *Seeds* many, kidney-shaped, finely dotted yellowish-gray.—*Steph.* and *Church.* pl. 9.

There are two varieties, an annual and a biennial, of henbane. The latter only is officinal. It is larger, stronger, more branched, and more clammy than the annual variety. During the first year of its growth the plant has no stem, all the leaves being radical and stalked. It is less odorous and clammy than the mature plant; and Dr. Houlton states that it yields less extract. In the autumn the leaves die, but the root survives during the winter, and in the following spring sends up a stem, which grows to the height of from two to four feet. The leaves of the second year are large, deeply sinuate, or pinnatifid.

*Habitat.*—Indigenous; waste ground, banks, and commons. Flowers in July. Cultivated at Mitcham, Hitchan, Ampthill, Market Deeping, and about Cambridge.

## Hyoscyamus, *Hyoscyamus.*

### [Hyoscyami Folium, *Henbane Leaf.* Mat. Med. List, U. S. P.]

The leaves (*fresh and dried*) and (*the fresh young*) branches of the indigenous biennial plant; collected when about two thirds of the flowers are expanded.

*Collection and Drying.*—For the advantage of collecting the herb "*when about two thirds of the flowers are expanded*," see Digitalis (p. 494). One hundred pounds of the fresh herb yield about fourteen pounds when dried.

*Officinal Characters.*—Leaves sinuated, clammy (when fresh) and hairy. The fresh herb has a strong, unpleasant odor, and a slightly acrid taste, which nearly disappear on drying.

### [Hyoscyami Semen, *Henbane Seed.* Mat. Med. List, U. S. P.

The seed of Hyoscyamus niger.

Henbane seed are very minute, grayish, wrinkled, and somewhat kidney-shaped; they have the narcotic odor of the plant and an oily bitterish taste.—W.]

*Composition.*—Brandes procured from the herb of *hyoscyamus niger* a vegetable alkaloid, *hyoscyamia*, and his statements have been confirmed by Geiger and Hesse, as well as by Mein. However, Chevalier, as well as Brault and Poggiale, have failed to procure it. The properties assigned to it are almost identical with those of atropia, from which it differs in being more soluble in water. It is crystallizable, has an acrid taste, and, when volatilized, yields ammonia. Reisinger says that a drop of a solution of one grain of this substance in ten grains of water caused dilatation of the pupil, but did not give rise to irritation of the eye. A solution of double this strength acted as an irritant.

*Physiological Effects.—In small and repeated doses* the henbane has a calming, soothing, and tranquillizing effect. This is especially observed in persons suffering from great nervous irritability, and from a too active condition of the sensorial functions. In such it frequently causes quietude, with a tendency to sleep. It frequently allays irritation and preternatural sensibility existing in any organ. It does not quicken the pulse, check secretion, or cause constipation. Mr. Travers thus accurately describes its effects: "In the ruffled states of the system generally, but especially in the over-active state of the vascular system, there is a charm in the operation of henbane altogether peculiar. It is feeble as an anodyne, feebler as a soporific; but not "poppy nor mandragora" soothes like henbane." *Large doses* sometimes induce sleep. Fouquier, however, denies this. He says henbane causes headache, giddiness, dimness of sight, dilatation of pupil, a greater or less tendency to sleep, and painful delirium. But I have frequently seen sleep follow its use, although its hypnotic properties are neither constant nor powerful. It more frequently fails to occasion sleep in those accustomed to the use of opium. Very large doses are apt to be followed by delirium rather than by sleep. *In poisonous doses* it causes loss of speech, dilatation of pupil, disturbance of vision (presbyopia), distortion of face, coma, and delirium, generally of the unmanageable, sometimes of the furious kind, and phantasms; and paralysis, occasionally with convulsive movements. Irritation of the stomach and bowels (manifested by nausea, vomiting, pain, and purging) is occasionally induced. In its operation on the body henbane presents several peculiarities. From opium it is distinguished by the sedative rather than stimulant effects of small doses; by its not confining the bowels; by the obscurity of vision (presbyopia); and, when swallowed in large doses, by its producing dilatation of the pupil, and by its being more apt to occasion delirium with phantasms. Furthermore, in some individuals opium causes headache and other distressing symptoms which henbane is not so apt to produce. Its power of alleviating pain and allaying spasm and of inducing sleep is greatly inferior to that of opium. From belladonna and stramonium, to which it is in several respects closely allied, it is distinguished by the very rare occurrence of any symptoms of gastro-intestinal irritation after the ingestion of large doses of it.

*Therapeutics.—As an anodyne*, where opium disagrees, or is from any circumstance objectionable, it may be used in neuralgia, rheumatism, gout, periostitis, milk abscess, painful affections of the urino-genital organs, scirrhus, and carcinoma. *As a calmer* and *soporific*, it is available in sleeplessness, accompanied with great restlessness and mental irritability, when opium, from its stimulant or other properties, proves injurious. Sometimes, where it fails to cause actual sleep, it proves highly serviceable, by producing a calm and tranquil state, conducive to the well-doing and comfort of the patient. *As an antispasmodic*, it occasionally proves serviceable in spasmodic affections of the organs of respiration (*e. g.* spasmodic asthma) and of the urino-genital apparatus (*e. g.* spasmodic stricture, and spasm of the sphincter vesicæ). *As a sedative*, to allay irritation and preternatural sensibility. In troublesome cough it sometimes proves useful, by diminishing the sensibility of the bronchial membrane to the influence of the cold air. In nephritic and vesical irritation, and in gonorrhœa, it is sometimes a useful substitute for opium. In the irritation of teething, it is valuable from its power of relieving pain and convulsion. It is equally so in strumous ophthalmia, a few minims taken at bedtime greatly diminishing the irritability on the following morning. It has great advantages over opium in the diseases of children. Combined with camphor and ether it generally relieves palpitation of the heart.

*Officinal Preparations.*

Extractum Hyoscyami [U. S.], *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 coloring 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 consistency of a thin syrup; then add to it the green coloring matter previously separated, and, stirring the whole assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence. [" Take of henbane leaf, fresh, twelve troyounces. Bruise the leaf in a stone mortar, sprinkling on it a little water, and express the juice; then, having heated this to the boiling point, strain, and evaporate to the proper consistence." U. S.]

Mr. Squire finds that one hundred pounds of the leaves and young branches yield fifty pounds of juice and five pounds of extract. The quality of the extract met with in the shops is extremely variable. This arises principally from the unequal care with which it has been prepared, but probably also from its having been hitherto directed to be prepared from the leaves only (see Extractum Belladonnæ). It is a valuable addition to the compound extract of colocynth, whose operation it renders milder, though not less efficacious. It is sometimes used as a topical application to inflamed or tender parts; thus, alone, or in the form of ointment, it is applied to painful hemorrhoids; spread on linen it forms a plaster which has been used in neuralgia, rheumatic pains, and painful glandular swellings.

The *Dose* is from gr. v to gr. xx. Occasionally very much larger doses have been taken without any injurious effects.

[Extractum Hyoscyami Alcoholicum, *Alcoholic Extract of Henbane.*—" Take of henbane leaf, recently dried and in moderately fine powder, twenty-four troyounces; alcohol, four pints; water, two pints; diluted alcohol, a sufficient quantity. Mix the alcohol and water, and moisten the powder with a portion of the mixture; then pack it firmly in a conical percolator, and gradually pour upon it the remainder of the mixture. Continue the percolation with diluted alcohol until the tincture measures six pints. Lastly, evaporate this, by means of a water-bath, to the proper consistence." U. S. Dose, gr. ij to iij, in pill.—W.]

Tinctura Hyoscyami [U. S.], *Tincture of Hyoscyamus.*—Take of hyoscyamus leaves, dried and bruised, two ounces and a half; proof spirit, one pint. Macerate the hyoscyamus for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. [" Take of henbane leaf, in fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

*Dose.*—Fl. drm. ss to fl. drms. ij.

[Extractum Hyoscyami Fluidum, *Fluid Extract of Henbane.*—"Take of henbane leaf, in fine powder, sixteen troyounces; alcohol, water, each, a sufficient quantity. Mix two measures of alcohol with one of water, moisten the powder with six fluidounces of the mixture, pack it firmly in a conical percolator, and gradually pour the mixture upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation with the same mixture until two pints and a half more of tincture have been obtained. Evaporate this, by means of a water-bath, at a temperature not exceeding 150°, to four fluidounces, mix it with the reserved tincture, and filter through paper." U. S. This preparation is really a very concentrated tincture. Dose, gtt. v to xv, increased carefully.—W.]

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## ATROPA BELLADONNA, *Linn.*

### Deadly Nightshade.

Pentandria, Monogynia, *Linn. Syst.*

*Root* fleshy, perennial. *Stems* herbaceous, three to five feet high, round, branched, leafy, slightly downy. *Leaves* alternate, shortly petiolate, broadly ovate, acute, entire, smooth, mostly two together of unequal size. *Flowers* imperfectly axillary, solitary, stalked, drooping. *Calyx* persistent, five-parted. *Corolla* campanulate, about an inch long, dull purple in the border, paler downwards, the limb with five short equal segments. *Stamens* five; anthers cordate. *Ovary* superior, two-celled; *style* simple; *stigma* capitate. *Berry* of a shining violet black, globose, the size of a small cherry, two-celled. *Seeds* many, subreniform. Whole plant fetid when bruised, and of a dark and lurid aspect.—*Flor. Lond.* Fasc. 5, plate 16.

Fig. 119.

*Atropa belladonna.*

*Habitat.*—Indigenous; hedge and waste ground, on a calcareous soil. Flowers in June.

**Belladonna,** *Belladonna.* [Mat. Med. List, U. S. P.]

The leaves, fresh and dried, and the fresh branches, gathered when the fruit has begun to form, from wild or cultivated plants in Britain.

*Collection.*—The leaves, when fresh, have a feeble, bitterish, sub-acid taste. They are supposed to be in the greatest perfection when the fruit has *begun* to form, and before the *ripening* fruits and seeds have robbed them of their active principle; but the preference for this period is, as before observed, founded rather on theory than on clinical observation. As the wild plant is rare, the cultivated plant is allowed to be used, but the former should be preferred.

*Officinal Characters.*—Leaves alternate, three to six inches long, ovate, acute, entire, smooth, the uppermost in pairs and unequal. The expressed juice, or infusion, dropped into the eye, dilates the pupil.

*Composition.*—The herb of belladonna contains an alkaloid atropia in the state of bimalate.

*Physiological Effects.*—*In the first degree* of its operation belladonna diminishes sensibility and irritability, when these are morbidly increased; and very frequently causes dryness of the mouth and throat, attended with thirst. *In the second degree* of its operation, belladonna manifests, both in healthy and morbid conditions, its remarkable influence over the cerebro-spinal system. It causes dilatation of the pupils (mydriasis), presbyopia, or long-sightedness, with obscurity of vision, or absolute blindness, visual illusions (phantasms), suffused eyes, occasionally disturbance of hearing (as singing in the ears), numbness of the face, confusion of head, giddiness, and delirium, which at times resembles intoxication, and may be either combined with or followed by sopor. These symptoms are usually preceded by a febrile condition, attended with a remarkable affection of the mouth, throat, and adjacent parts. Besides dryness of these parts, it causes difficulty of deglutition and of articulation, a feeling of constriction about the throat, nausea, and sometimes actual vomiting, with now and then swelling and redness of the face. The pulse is usually hurried and small. The cutaneous, renal, and mucous secretions are frequently augmented; and an exanthematous eruption, like that of scarlet fever, has sometimes occurred. In some cases very severe effects have been induced by the application of the extract to abraded surfaces. The continued application of it to the sound skin has also been attended with similar effects. *In the third degree* of its operation belladonna produces effects similar to the preceding, but in a more violent form; also injection of the conjunctiva with a bluish blood; protrusion of the eye; feeling of weakness, lipothymia, syncope; difficulty or impossibility of standing, frequent bending forward of the trunk; continual motion of the hands and fingers; gay delirium and a vacant smile; aphonia, or confused sounds, uttered with pain, followed, in case of recovery, by gradual restoration to health and reason, without any recollection of the preceding state. Seven cases (two of which proved fatal) of poisoning by belladonna berries have occurred under my notice in the London Hospital. The phenomena were tolerably uniform. The following symptoms especially attracted my attention: *Dryness of the fauces*, *scarlet eruption*, in several, *mydriasis and presbyopia.* Mydriasis or dilatation of the pupil was present in every case; and was accompanied, in all the cases in which the patient was in a fit state for observation, with presbyopia, or long-sightedness. These two symptoms depend on the paralyzing influence of belladonna on the muscular fibres of the iris, by which mydriasis is produced, and on the ciliary muscle, by which the adjusting power of the eye is impaired. I strongly suspect that the impaired vision which has been ascribed to belladonna is chiefly or entirely presbyopia. In one of the patients (a woman) above alluded to, the vision was so much impaired that she could not distinguish letters or words. But magnifying spectacles enabled her to read with ease. *Delirium, Phantasms.*—The delirium was of the cheerful or wild sort, amounting in some cases to actual frenzy. In some of the patients it subsided into a kind of sleep, attended with pleasant dreams which provoked laughter. The delirium was attended with phantasms; and in this respect resembled that caused by alcohol (*delirium e potu*); but the mind did not run on cats, rats, and mice, as in the case of drunkards. Sometimes the phantasms appeared to be in the air, and various attempts were made to catch them with the hands; at other times they were supposed to be on the bed. *Paralysis, Sopor, or Coma.*—In most of the cases the power of the will over the muscles was so far disordered that the muscular movements were somewhat irregular, causing a kind of staggering or jerking, but actual convulsions were not general. There was sopor which terminated in coma, with a weakened or paralytic condition of the muscles.

In comparing the operation of belladonna with that of other cerebro-spinals, the most remarkable symptoms which attract our attention are dilatation of the pupil, with insensibility of the iris to light, disturbance of vision (presbyopia), giddiness, staggering, delirium (extravagant, pleasing, or furious), with phantasms, followed by sopor, dryness of the throat, and difficulty of deglutition and of articulation. Convulsions are rare, and, when they occur, are slight. Lethargy or sopor occurs subsequently to the delirium. These characters distinguish the effects of belladonna from those of any other medical substance, except henbane and stramonium. When applied to the eyebrow, belladonna causes dilatation of the pupil, without necessarily affecting the other eye, or disturbing vision. The action on the iris depends, according to Müller, not on the operation of the belladonna on the central organs of the nervous system, but on its topical paralyzing influence on the ciliary nerves. When, however, belladonna is swallowed, it is obvious that the iris can only become affected through the general system; and in this case the dilatation of the pupil is accompanied with disturbance of vision. The pneumogastric nerve is obviously concerned in producing the affection of the mouth, and the difficulty of deglutition and articulation. The disorder of the intellect and of the external senses caused by belladonna proves that the influence of this agent is not limited to the excito-motory system, but is extended to those portions of the nervous centres which are the seat of the intellect and of sensibility. The active principle of belladonna becomes absorbed, and is thrown out of the urine, in which secretion both Runge and Dr. Letheby have detected it.

*Therapeutics.*—Belladonna has been employed to allay pain and nervous irritation, to produce dilatation of the pupil, to counteract that condition of brain which is accompanied with contraction of the pupil, and to lessen rigidity and spasmodic contraction of muscular fibres. These uses obviously arise out of the ascertained physiological effects of the remedy. *To allay pain and nervous irritation.*—As an anodyne in most internal pains, no remedy hitherto proposed is equal to opium; but this agent totally fails us in many of those external pains known as neuralgia and tic douloureux. In such, belladonna occasionally succeeds in abating, sometimes in completely removing, pain; while it totally fails to give relief in the internal pains for which experience has found opium so efficacious. It is remarkable, therefore, that while both these cerebro-spinals (narcotics, *auctor.*) agree in lessening pain, they totally disagree as to the cases in which they succeed, and for which they are individually applicable. In the treatment of neuralgia, belladonna is employed both internally and externally. I believe that, to be successful, it requires, in many cases, to be persevered in until dryness of the throat, dilatation of pupil, and some disorder of vision are produced.

Just as, in many diseases for which mercury has been found a most efficient remedy, it is necessary to continue the use of this mineral until the mouth be affected, and often to use it for some time afterwards. My own experience of the use of this remedy leads me to regard it as very much inferior to aconite as a local remedy for this disease. Besides neuralgia there are many other painful affections against which belladonna is used as a local anodyne. Such are arthritic pains, painful ulcers, and glandular enlargements which are painful to the touch. "In cancer of the uterus, one grain of the extract should be used as a suppository" (*Brodie*).

*As an antispasmodic.*—To relieve rigidity and spasmodic contraction of muscular fibres, belladonna sometimes proves serviceable as a topical remedy. In rigidity of the os uteri, during lingering labors or puerperal convulsions, the extract or ointment of belladonna has been applied to the part by way of friction. Though the practice has been lauded by Chaussier, and adopted by Velpeau, Conquest, and others, yet it has not found much favor with British practitioners, and its use is not devoid of danger. In spasmodic stricture of the urethra, and of the sphincters of the bladder and rectum, as well as in spasmodic contraction of the uterus, the topical use of the extract (smeared on a bougie, applied to the perineum or other parts, or employed by way of a clyster) has in some cases appeared to give relief. In strangulated hernia it has been employed to produce relaxation of the abdominal muscles. Dr. A. P. Stewart recommends it in intestinal obstruction [in which I have seen it very serviceable.—Ed.]. Considerable relief has been gained in several cases of whooping-cough by the use of belladonna. Its occasional efficacy depends in part, probably, on its lessening the necessity of respiration, as well also on its power of obviating spasm of the bronchial tubes, and of decreasing the susceptibility of the bronchial membrane to the influence of the exciting causes of the paroxysms. But it frequently fails to give the least relief. [I generally employ the dried leaf in this disease, considering it more certain than the extract or tincture. I give it in quarter or half grain doses, and continue it, notwithstanding the dilatation of the pupil, until the spasm is relieved, a result which, in most cases, soon follows the dilatation.—Ed.] Belladonna is also useful in spasmodic asthma, and in angina pectoris.

*In maladies of the eyes.*—Belladonna is applied to the eye for two purposes: the first, and the most common, is to dilate the pupil; the other is to diminish the preternatural sensibility of the retina to the impression of light. *Dilatation of the pupil* is sometimes produced, in certain diseases of the eye, in order to enable us to examine the condition of the refractive humors, and thereby to ascertain the nature and extent of the malady, as in cases of incipient cataract, especially the marginal cataract of old persons, which might otherwise be occasionally confounded with glaucoma or amaurosis; or, in advanced cataract, to ascertain the existence of adhesions between the iris and the lens prior to the operation of extraction. In the operation by solution or absorption, the full dilatation of the pupil by belladonna is essential; and in central congenital cataract, frequently nothing more is necessary in order to remedy the defect. The daily use of belladonna in the latter case, perhaps for many years, produces no injurious or permanently paralyzing effect on the iris, the natural motory power of which remains unimpaired. In iritis, dilatation of the pupil is important, in order to prevent, or in recent cases to rupture, adhesions of the uvea to the capsule of the crystalline lens. Dilatation is usually effected by applying the extract, diluted with water to the consistence of cream, to the parts round the eye. The dilatation usually takes place within a quarter or half an hour, and sometimes continues for twenty-four hours. Belladonna is sometimes employed in inflammatory and other affections of the eye, to diminish the morbid sensibility of this organ to the influence of light. Thirty grains of the extract in eight fluidounces of water, filtered through linen and used warm, forms an excellent fomentation in ophthalmia with great intolerance of light, especially in scrofulous ophthalmia.

*In fever, with contraction of the pupil.*—Dr. Graves has proposed the use of belladonna in those cases of fever with cerebral disease which are attended with contraction of the pupil. It is not unreasonable, he observes, "to suppose that the state of the brain which accompanies dilatation of the pupil is different from that which accompanies contraction; and if belladonna has an effect in producing that cerebral state which is attended with dilatation, it is not going too far to infer that its administration may do much towards counteracting the opposite condition; neither is it unphysiological to conclude that if a remedy be capable of counteracting or preventing one very remarkable effect of a certain morbid state of the brain, it may also counteract other symptoms connected with the same condition." This line of argument, it must be admitted, is ingenious and plausible, and is supported by reference to several apparently successful cases treated on the principles here laid down. But I would observe, if the above reasoning were valid, opium should be serviceable in cerebral diseases attended with dilatation of pupil, since it causes contraction of this aperture. Now this is in direct opposition to our everyday experience of the uses of this important narcotic. [Dilatation, however, frequently arises from serous effusion and not from the condition or state of the brain itself. The favorable opinion expressed by Dr. Graves of the use of belladonna in fever with contracted pupil is supported by its action in some other cerebral diseases when attended with the same condition of pupil. In the "Lancet" (April 1, 1843) is recorded the case of a man suffering from *delirium tremens*, who had not slept for twelve days, and was in a state of furious delirium *with contracted pupils*. The undiluted extract of belladonna having been applied to a portion of skin, three inches by two, which had been blistered and deprived of its cuticle, the pupils became fully dilated in nine minutes, and the man fell into a profound sleep, which lasted seven hours, and awoke quite rational.—Ed.]

*As a prophylactic against scarlatina.*—The introduction of belladonna into practice as a preventive of scarlet fever, is owing to the absurd homœopathic axiom of "*similia similibus curantur;*" for as this plant gives rise to an affection of the throat, and sometimes to a scarlet rash on the skin, its power of guarding the system against the reception of scarlet fever has been assumed; and endeavors have been made to establish it by an appeal to experience. Bayle has collected from various publications 2,027 cases of persons who took this medicine, and were exposed to the contagion; of these, 1,948 escaped. Oppenheim gave it to 1,203 soldiers, and only twelve became affected. Hufeland also admits, from his own observation, the efficacy of the remedy. On the other hand, Lehman, Barth, Wendt, Muhrbeck, Hoffman, Bock, and many others that I could refer to, declare it has failed in their hands to evince its prophylactic powers. The experience also of Mr. Benjamin Bell, at George Watson's Hospital, in Edinburgh, is decidedly against the efficacy of the remedy. Scarlet fever having appeared in the hospital in 1851, belladonna was given to 54 healthy boys for a month, to the extent of dilating their pupils. 23 of the 54, notwithstanding, took the disease; and a still more remarkable failure is mentioned by Dr. Sigmond of a family of eleven persons who took the supposed specific, yet every individual contracted the disease.

*In profuse salivation.*—In this condition it is stated to have been found highly beneficial. A woman who had been treated profusely with mercury for the cure of enteritis, had violent salivation from the use of the drug. Extract of belladonna was ordered by Espenbeck, in doses of two and a half grains in an emulsion; and the following day the salivation was found to be completely arrested, and the mouth dry. When the administration of the belladonna was suspended, the ptyalism returned, and again it disappeared when the use of the drug was resumed. This result accords with the known physiological effects of belladonna.

*Administration.*—The dose of the *powder* for an adult is one grain, which should be gradually increased until dryness of the throat, dilatation of the pupil, or some head symptoms are produced. For children, the dose at the commencement should be a quarter of a grain. The *extract* or *tincture* is, however, commonly employed for internal as well as external use. Belladonna and its preparations act far more quickly and effectually when taken on an empty than on a full stomach. For external use an *infusion* of the leaves is sometimes used as a fomentation, or is made into a poultice with bread or linseed meal; and the *liniment* is now added.

*Antidotes.*—After the use of evacuants, the vegetable acids have appeared to give great relief. Decoction of galls or green tea might probably prove serviceable. Recent experiments appear to indicate that opium, which taken internally produces an opposite state of pupil, is also a direct antidote to the action of belladonna.

## *Officinal Preparations.*

EXTRACTUM BELLADONNÆ [U. S.], *Extract of Belladonna.*—Take of the fresh leaves and young branches of belladonna, one hundred and twelve pounds. Bruise the belladonna in a stone mortar, press out the juice, heat it gradually to 130°, and separate the green coloring 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 it to the green coloring matter previously separated, and stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.

The *young branches* are now, for the first time, directed to be employed as well as the leaves, for the following reasons: At a meeting of the Pharmaceutical Society, called to consider the advantage of using other parts of herbaceous plants in addition to the leaves in the preparation of extracts from the expressed juice, it appeared that, according to the experience of the manufacturers present, there was a decided advantage in pressing the soft young herbaceous stems or branches as well as the leaves, and that extracts so prepared kept much longer unchanged than those prepared from the leaves only, the latter being very liable to become mouldy. The results of the trials, made by Dr. Garrod, Mr. Dixon, Mr. W. Cooper, and others, of the comparative efficacy of the two extracts, were also decidedly favorable to the employment of the branches. (See *Pharm. Journ.*, 2d Series, vol. iii. pp. 300, 368.)

Mr. Squire obtained from 64½ lbs. of the leaves of 100 lbs. of the trimmed herb (*i.e.*, deprived of its stem and larger branches) 5 lbs. 3 oz.

of extract; and from the remaining 35½ lbs. of soft parts (branches, flowers, and young fruit), 1 lb. 11 oz., in all 6 lbs. 14 oz. The first of these extracts became mouldy in ten days; the second, as well as an extract made from all the soft parts, kept well.

["Take of belladonna leaf, fresh, twelve troyounces. Bruise the leaf in a stone mortar, sprinkling on it a little water, and express the juice; then, having heated this to the boiling point, strain, and evaporate to the proper consistence." U. S.

*Dose.*—Gr. j to gr. iij, cautiously increased.

Extractum Belladonnæ Alcoholicum, U. S., *Alcoholic Extract of Belladonna.*—"Take of belladonna leaf, in fine powder, twenty-four troyounces; alcohol, four pints; water, two pints; diluted alcohol, a sufficient quantity. Mix the alcohol and water, and moisten the powder with a pint of the mixture; then pack it firmly in a conical percolator, and gradually pour upon it the remainder of the mixture. Continue the percolation with diluted alcohol until six pints of tincture have passed. Lastly, evaporate this, by means of a water bath, to the proper consistence." U. S. *Dose.*—Gr. j to gr. iij, cautiously increased.—W.]

Emplastrum Belladonnæ [U. S.], *Belladonna Plaster.*—Take of extract of belladonna, three ounces; soap plaster, one ounce and a half; resin plaster, one ounce and a half. Melt the plasters by the heat of a steam or water bath; then add the extract of belladonna, and mix intimately. ["Take of alcoholic extract of belladonna, a troyounce; resin plaster, two troyounces. Add the extract to the plaster, previously melted by means of a water bath, and mix them." U. S.]

Anodyne and antispasmodic. Applied for the relief of neuralgic, rheumatic, and other pains. It is said to relieve the pain of dysmenorrhœa when applied to the sacrum; and it certainly affords relief in angina and in palpitation of the heart when applied to the chest. In spreading it, care must be taken not to employ a very hot spatula, or the properties of the extract will be injured.

Tinctura Belladonnæ [U. S.], *Tincture of Belladonna.*—Take of belladonna leaves, in coarse powder, one ounce; proof spirit, one pint. Macerate the leaves for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. This tincture has about half the strength of tinctura belladonnæ, *Lond.*, *Dub.*

["Take of belladonna leaf, recently dried and in fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

*Dose.*—Min. x to xxx.

Unguentum Belladonnæ [U. S.], *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. This ointment contains nearly one-half more extract than the London ointment.

["Take of extract of belladonna, sixty grains; water, half a fluiddrachm; lard, a troyounce. Rub the extract first with the water until rendered uniformly soft, then with the lard, and thoroughly mix them." U. S.]

It is a very useful preparation, and may be used as an anodyne and antispasmodic in some of the before mentioned cases. Mr. Squire says that this is not a clean ointment, and that half a drachm or a drachm of liniment of belladonna, mixed with an ounce of lard, answers better, and is clean.

**Belladonnæ Radix,** *Belladonna Root.* [Mat. Med. List, U. S. P.]

The root, dried; imported from Germany.

*Officinal Characters.*—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.

*Description.*—The root when fresh is fleshy, internally white, externally grayish or brownish-white. Its taste is slight, sweetish; its odor feeble. It is cultivated at Market Deeping in Lincolnshire, and should be collected in the autumn or early in the spring.

Linimentum Belladonnæ, *Liniment of Belladonna.*—Take of belladonna root, in powder, twenty ounces; camphor, one ounce; rectified spirit, thirty fluidounces, or a sufficiency. Moisten the belladonna root with a portion of the spirit, and macerate for seven days; then percolate into a receiver containing the camphor, until the product amounts to one pint.

This is a strong tincture (four times the strength of the extract—*Squire*) prepared from the root, which contains more atropia than the leaf. Being intended only for external use, it is termed a *liniment*, for which purpose it is adapted by the addition of camphor. It may be diluted with an equal quantity of soap liniment.

**Atropia** [U. S.], *Atropia.*

An alkaloid, $C_{34}H_{23}NO_6=289$, obtained from Belladonna root.

*Preparation.*—Take of belladonna root recently dried, and in coarse powder, two pounds; rectified spirit, ten pints; slaked lime, one ounce; water, half a fluidounce; dilute sulphuric acid, a sufficiency; carbonate of potash, a sufficiency; chloroform, three fluidounces; purified animal charcoal, a sufficiency; distilled water, ten fluidounces. Macerate the root, in two quarts of the spirit, for twenty-four hours, with frequent stirring. Transfer to a displacement apparatus, and exhaust with the remainder of the spirit by slow percolation. Add the lime to the tincture placed in a bottle, and shake occasionally several times. Filter, add the dilute sulphuric acid in very feeble excess, and filter again. Distil off three-fourths of the spirit, add to the residue the distilled water, evaporate at a gentle heat, but as rapidly as possible, until the liquid is reduced to one-third of its volume and no longer smells of alcohol, and let it cool. Add very cautiously, with constant stirring, a solution of the carbonate of potash so as nearly to neutralize the acid, care, however, being taken that an excess is not used. Set to rest for six hours, then filter, and add carbonate of potash in such quantity that the liquid shall acquire a decided alkaline reaction. Place it in a bottle with the chloroform; mix well by frequently repeated brisk agitation, and pour the mixed liquids into a funnel furnished with a glass stopcock. When the chloroform has subsided, draw it off by the stopcock, 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 colorless crystals are obtained.

In this process the alcohol extracts, from the belladonna root, a salt of atropia: this is decomposed by the lime, which removes the organic acid and coloring extractive matter. Sulphuric acid is then added to the filtered solution, to unite with the disengaged atropia; for this alkaloid, when free, and especially when in contact with alkalies, readily undergoes decomposition by heat. The filtered solution of sulphate of atropia is then evaporated by a very gentle heat, as the atropia salts, especially in the impure state, easily undergo decomposition. A small quantity of carbonate of potash is next added, to separate a resinous substance which impedes the crystallization of the atropia. After the separation of this, an excess of a concentrated solution of carbonate of potash is used to precipitate, as speedily as possible the atropia, which is then removed from the mixture by solution in the chloroform. When the chloroform has been removed by distillation, the residual impure alkaloid is dissolved in spirit, decolorized, filtered, and the atropia crystallized. "2 lbs. of the root should yield about 40 grains of atropia." (*Brandes.*) ["Take of belladonna root, in fine powder, forty-eight troyounces; purified chloroform, four troyounces and a half; diluted sulphuric acid, solution of potassa, alcohol, water, each, a sufficient quantity. Mix the powder with a pint of alcohol, and, having introduced the mixture into a cylindrical percolator, pour alcohol gradually upon it until sixteen pints have passed. From the liquid, thus obtained, distil off twelve pints of alcohol. To the residue add sufficient diluted sulphuric acid to give it an acid reaction, and, having evaporated the liquid to half a pint, add an equal bulk of water, and filter through paper. To the filtered liquid add, first a troyounce and a half of the chloroform, and then solution of potassa in slight excess, and shake the whole, together, at intervals, for half an hour. When the heavier liquid has subsided, separate it, and, having added a troyounce and a half of the chloroform to the lighter liquid, again shake them together, and separate the heavier from the lighter liquid as before. Add to this lighter liquid the remainder of the chloroform, and, after agitation, separate the heavier liquid for the third time. Mix the heavier liquids in a capsule, and set the mixture aside until, by spontaneous evaporation, the atropia is left dry." U. S. In the first step of this process the alcohol dissolves out the salt of atropia existing in the belladonna root. When the sulphuric acid is added this salt is converted into the sulphate which is soluble in water. When the water is added to the concentrated alcoholic solution, the resin and oily matters contained in the latter are precipitated. These are afterwards separated by filtration. In the next steps the potassa decomposes the sulphate of atropia, setting the alkaloid free. The latter is insoluble in the water but is greedily taken up by the chloroform, which on standing separates with it from the water. The second addition of the chloroform is to insure the obtaining of all the atropia.

The atropia as thus obtained is not entirely pure, as it contains considerable coloring matter; yet it is sufficiently so to crystallize, although the sub-prismatic crystals have a decidedly yellowish tint.—W.]

*Officinal Characters.*—In colorless acicular crystals, sparingly soluble in water, more readily in alcohol and in ether. Its solution in water has an alkaline reaction, gives a citron-yellow precipitate with terchloride of gold, has a bitter taste, and powerfully dilates the pupil. It is an active poison.

*Tests.*—Dissolves entirely in pure ether; leaves no ash when burned with free access of air.

*Description.*—Atropia crystallizes from its concentrated hot, watery, or spirituous solution in white, transparent, silky prisms: from its solution in dilute spirit, in needles like those of sulphate of quinia. It is odorless, and has an acrid, somewhat metallic taste. Impure atropia is not crystalline, is more or less colored, and has an unpleasant odor. One part of atropia requires 200 parts of cold water, or 54 parts of hot water, to dissolve it. It is soluble in $1\frac{1}{2}$ times its weight in cold alcohol, but requires, at ordinary temperatures, 25 parts of ether to dissolve it, or 6 parts of boiling ether. It reacts on vegetable colors as an alkali, fuses by heat, and at a higher temperature is partly volatilized and partly decomposed. Nitric acid dissolves it, forming a yellow solution. Cold oil of vitriol dissolves it without color; but if heat be applied, the mixture acquires a red color. When heated with a solution of potash or soda, atropia undergoes decomposition, and gives out ammonia. A watery solution of a salt of atropia is reddened by tincture of iodine; yields a whitish, flocculent precipitate with tincture of galls; and a yellowish-white with chloride of platinum. [When heated it first melts, and afterwards, on increasing the heat, is partly volatilized unchanged. Atropia and its salts are decomposed and rendered inert by prolonged contact with caustic potassa. U. S.] The *sulphate*, *hydrochlorate*, and *acetate of atropia*, are crystalline salts.

*Physiological Effects.*—Atropia is a most energetic poison. Its effects are similar to, but more powerful than, those of belladonna. One centigramme (about 1-6th of a grain) produces the following symptoms: The first and most constant symptom is dry throat, with difficulty of swallowing, and acceleration of the pulse by eight to twenty strokes. The second is dilatation of pupils, with dimness of sight, also giddiness, noise in the ears, hallucination, phantasms, lively delirium with unconsciousness of all surrounding objects, incoherence, numbness of the limbs, a sensation of formication in the arms, rigidity of the thighs, depression of the pulse, and occasionally strangury. The voice is sometimes weakened; or there may be complete aphonia. The unfavorable symptoms disappear after from twelve to twenty hours. A very minute (imponderable) quantity applied to the eye is sufficient to dilate the pupil. The action of atropia is thus described and explained by Dr. A. Fleming: Atropia applied to the smaller arteries (*e. g.* in the web of a frog's foot) constricts them. A solution of one grain of atropia in ten fluidrachms of water, painted on the mucous surface of the mouth and throat, dries it, and consequently impairs its feeling and movement, and renders deglutition difficult. These symptoms are much relieved by drinking water. The same solution rubbed into the skin does not alter its sensibility. Hence atropia produces a contractile and astringent effect, but does not paralyze, as it has been supposed to do, from the relief it affords in spasmodic diseases. The obvious effects it produces on the eye are dilated pupil and impaired vision. The impaired sight is greatly improved by looking through a small hole in a black card. It is therefore partly due to the enlargement of the pupil, and the consequent admission of too many and too diverging rays, which confuse the image on the retina. The sight is also more defective with near than with distant objects, and objects appear smaller to the atropized than to the other eye. A telescope, if adapted to the unaffected eye, requires to be lengthened to suit the atropized eye; and an object clearly seen with a microscope by the unaffected eye requires to be further removed in order to become visible to the atropized eye. Hence it follows that the lens has retroceded from the cornea, and the eye is no longer capable of near vision. Again, a strongly atropized eye, *i. e.* with dilated pupil, bears the sun's light *better* that an unatropized eye; hence the retina was supposed to be paralyzed or rendered less sensitive to the light; but when the telescope is properly adapted to an atropized eye, vision is as perfect, and in the opinion of some more perfect, than with the unaffected eye; even though without the telescope the atropized eye was absolutely blind. These facts, in the opinion of Dr. Fleming, indicate that atropia does not paralyze the retina, but merely deranges the visual apparatus.

*Therapeutics.*—Atropia is employed medicinally (chiefly as an external agent) as a substitute for belladonna; to which it is considered superior, on account chiefly of the uncertainty of the latter. It is, of course, much more energetic, and, for external use especially, is much cleaner than the extract. As a topical agent, it is employed as a mydriatic or dilator of the pupil, in cataract, &c. The local pain which atropia produces when used endermically is of very short duration, and is unattended with any ill consequences. Internally atropia has been employed in hooping-cough, chorea, and some other nervous diseases. [The experience of atropia as a dilator of the pupil has hitherto been chiefly derived from the use of a solution of the sulphate; and it is found at the London Ophthalmic Hospital, that the solution of the uncombined alkaloid is not nearly so well borne by the eye, as a solution of the sulphate. The following remarks will therefore apply to this salt, which was in the last London Pharmacopœia, and which, though omitted in the British Pharmacopœia, will probably still continue to be employed, at least for this purpose.—Ed.] The following formula was given for its preparation. *Atropiæ sulphas.*—Take of dilute sulphuric acid, two fluidrachms; atropia, twenty-seven grains and a half, or a sufficiency; distilled water, half a fluidounce. To the acid and water mixed, add by degrees the atropia until the acid is saturated. Let the solution be strained and evaporated at a gentle heat in order that crystals may be formed. The sulphate of atropia may be regarded as one of the preparations of belladonna. In a weak solution it has no irritant effect (which appears not to be the case with the solution of atropia), and is free from that mechanical action which may be objected to in the extract of belladonna, while owing to its uniform composition, it can be applied of a precisely regulated strength. Two grains of this salt are usually dissolved in one fluidounce of distilled water. A single drop of this, retained in contact with the cornea and conjunctiva for only a few instants, produces, in twenty to twenty-five minutes, *complete dilatation with immovability of the pupil.* A solution of this strength has been chiefly used for the purpose of diagnosis, to prevent threatening adhesion of the iris, and to increase the capacity of sight in central cataract, or in central opacity of the cornea, &c. But it is liable to disturb vision for three or four days. and to make reading almost impossible in cases where this could be accomplished readily in the ordinary state of the pupil. Hence a weaker solution is often preferred, and a solution of one-fourth of a grain in an ounce of water, has been found to induce full dilatation, with transient immovability of the pupil, and to enable a full examination to be made of the internal parts, in all directions. The dilatation ensues after thirty to forty-five minutes; and ordinarily, in twenty-four hours, it ceases to disturb the vision. A still weaker solution of one-eighth of a grain in an ounce of water, is kept at the London Ophthalmic Hospital, for the use of patients suffering from cataract in its early stage. Mr. Luxton found a strong solution of the nitrate, prepared by mixing two grains of atropia with one minim of nitric acid (sp. gr. 1.5) and adding to these one drachm of water, a most useful preparation for the relief of the severe paroxysms of facial neuralgia. The affected portion of the face is to be painted with the above solution, and the pain is frequently subdued in from three to five minutes. Sometimes a second, third, or fourth application may be required. Its chief efficacy is witnessed in those cases in which the neuralgia has arisen from exposure to vicissitudes of temperature or other external causes.

*Administration.*—The *dose* of atropia for internal use is from about one-thirtieth to one-tenth of a grain. Its employment requires great caution. the safest mode of administration is in solution, on account of the facility with which the dose may be adjusted; but it has also been given, mixed with sugar, in the form of powder; and, mixed with the powder of liquorice root and honey, in the form of pills. It may be employed endermically in doses of about one-thirtieth of a grain gradually increased to one-fifteenth of a grain.

### *Officinal Preparations.*

Liquor Atropiæ, *Solution of Atropia.*—Take of atropia, in crystals, four grains; rectified spirit, one fluidrachm; distilled water, seven fluidrachms. Mix the spirit and the water, and dissolve the atropia in the mixture.

*Dose.*—For internal use from four minims (= gr. $\frac{1}{30}$ of atropia) to twelve minims, or when used endermically from four to eight minims. It may also be employed, diluted with distilled water, to dilate the pupil.

Unguentum Atropiæ, *Ointment of Atropia.*—Take of atropia, eight grains; rectified spirit, half a fluidrachm; prepared lard, one ounce. Dissolve the atropia in the spirit, add the lard, and mix thoroughly.

Employed to relieve neuralgia and to dilate the pupil.

### [**Atropiæ Sulphas**, U. S., *Sulphate of Atropia.*

"Take of atropia, sixty grains; stronger ether, four fluidounces and a half; sulphuric acid, six grains; stronger alcohol, a fluidrachm. Dissolve the atropia in the ether; then mix the acid and alcohol, and add the mixture, drop by drop, to the ethereal solution until the atropia is saturated. Allow the liquid to stand until the precipitate formed is deposited. Then decant the ether, and expose the residue to spontaneous evaporation until the salt is left dry." U. S.

*Officinal Characters.*—Sulphate of atropia is a white, slightly crystalline powder, very soluble in water and in alcohol, insoluble in ether, and wholly dissipated by heat. It is neutral to litmus, and gives a white precipitate with chloride of barium.

*Therapeutics.*—The action and dose of the sulphate are precisely those of the alkaloid. It is preferred by oculists, because it is less irritant to the eye (see Atropia, p. 519). Its solubility in water makes it more suitable for hypodermic use. *Dose*, gr. one-thirtieth in water.—W.]

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## DATURA STRAMONIUM, Thorn-apple.

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A bushy, smooth, fetid annual *herb.* *Stem* about two feet high, much branched, forked, spreading, leafy. *Leaves* alternate, large, ovate, wedge-shaped at the base, irregularly sinuated, with large acute teeth, smooth. *Flowers* solitary, erect, on short peduncles, at the junction of the branches. *Calyx* tubular, pentagonal, 5-cleft at the apex, falling off by a circular horizontal incision above the peltate base. *Corolla* funnel-shaped, about three inches long, with a large spreading plaited regular 5-toothed limb, white, sweet-scented, especially at night. *Stamens* five, inserted into the tube of the corolla, included; anthers dehiscing longitudinally. *Ovary* incompletely 4-celled, the alternate

Fig. 120.

*Datura stramonium.*

dissepiment being lost above the middle, the other one complete; *style* simple, filiform, terminated by a thick blunt *stigma*. *Fruit* ovate, as big as a walnut, in its outer coat very prickly, 4-valved, half 4-celled. *Seeds* numerous, black reniform.—*Woodv.*, plate 124, page 338.

*Habitat.*—Indigenous; in waste grounds and on dunghills. Flowers in July.

### **Stramonii Folia**, *Stramonium Leaves.* [**Stramonii Folium**, Mat. Med. List, U. S. P.]

The leaves dried; collected from plants cultivated in Britain, when they are in flower.

*Officinal Characters.*—Large, ovate, sinuous, deeply cut; of a heavy odor, strongest while they are drying, and a mawkish faintly bitter nauseous taste.

### **Stramonii Semina**, *Stramonium Seeds.* [**Stramonii Semen**, Mat. Med. List, U. S. P.]

The Ripe Seeds.

*Officinal Characters.*—Brownish-black, reniform, flat, rough, in taste feebly bitter and mawkish; inodorous unless bruised, when they emit a peculiar heavy odor.

*Composition.*—The herb and seeds of stramonium contain a vegetable alkaloid, daturia, combined according to Brandes with malic acid. *Daturia* has been minutely examined by Dr. Planta, and he finds that it not only possesses the properties of atropia, but that it is isomeric with that alkaloid; its formula, according to him, being $C_{34}H_{23}NO_6$, which precisely corresponds to the formula for atropia, based on Liebig's analysis. Dr. Planta finds that atropia and daturia both crystallize in colorless needles, are permanent in the air, inodorous, heavier than water, and not very soluble in that liquid, daturia requiring 288 parts of cold and 72 of boiling water to dissolve it. They are very soluble in alcohol, but less soluble in ether. Both alkaloids melt at about 190°, without losing weight or undergoing decomposition. At a higher temperature they are decomposed. The aqueous solution of each has a strong alkaline reaction. Both alkaloids form neutral uncrystalline salts with sulphuric and hydrochloric acids, very soluble in water and alcohol, but not easily dissolved by ether. Chemical reagents produce similar results with the solutions. The two alkaloids resemble each other physiologically in their power of causing dilatations of the pupil.

*Physiological Effects.*—The symptoms produced by it closely resemble those caused by belladonna. *In small but gradually increased doses* it diminishes sensibility, and thereby frequently alleviates pain. It does not usually affect the pulse; it slightly and temporarily affects the pupil, and has no tendency to cause constipation, but rather relaxation. *In larger doses* it causes thirst, dryness of the throat, nausea, giddiness, nervous agitation, dilatation of the pupil, obscurity of vision, headache, disturbance of the cerebral functions, perspiration, occasionally relaxation of bowels, and in some cases diuresis. It has no direct tendency to induce sleep, and hence it cannot be called *soporific*. But indirectly, by alleviating pain, and thereby producing serenity and ease, it often disposes to sleep. *In fatal doses* the leading symptoms are flushed countenance, delirium (usually maniacal), dilatation of the pupil, dryness of the throat, loss of voice, difficulty of deglutition, convulsions, and, in some cases, palsy.

*Therapeutics.*—A more extended experience of this plant is requisite to enable us to speak with much confidence of its employment. The similarity of its effects with those of belladonna would lead us to expect a similarity of uses. Like the last-mentioned plant, it has been successfully employed to diminish sensibility, and thereby to relieve external pain. In *neuralgia* (*tic douloureux*, *sciatica*, &c.) it has been employed with considerable success by Lentin, Marcet, and Begbie. It was given internally in the form of extract. Its external application has scarcely been tried. In *rheumatism* it has frequently proved serviceable from its anodyne qualities. In *enterodynia* (that is, spasmodic pain of the bowels unconnected with inflammatory action or the presence of irritating substances), Dr. Elliotson found it most successful. The diseases in which stramonium has been principally used are *mania* and *epilepsy*. Without denying the occasional benefit of stramonium in these diseases, I believe the cases in which it is serviceable to be very rare, while those in which it is calculated to be injurious are very common. Dr. Cullen observes, that he has no doubt that narcotics may be a remedy for certain cases of mania and epilepsy; but he very justly adds, "I have not, and I doubt if any other person has, learned to distinguish the cases to which such remedies are properly adapted." In some cases of *spasmodic asthma*, smoking the herb has given at least temporary relief; but the practice requires very great caution, as it has proved highly injurious, and in some instances fatal. Dr. Bree tried it in eighty-two asthmatic cases; in fifty-eight of these it had no permanent effect, and in the remaining twenty-four it acted injuriously. General Gent, who was instrumental in introducing the practice, fell a victim to it. Aggravation of the dyspnœa, paralytic tremblings, epilepsy, headache, and apoplexy, are some of the evils said to have been induced in the cases above referred to. In persons disposed to head affections, and in aged persons, it is, therefore, a highly dangerous practice. As no preparation is given of the leaf, it is probably introduced into the Pharmacopœia to be smoked. It will be prudent, therefore, to remember the foregoing caution.

*Officinal Preparations.*

Extractum Stramonii, *Extract of Stramonium.*—Take of stramonium seeds, in coarse powder, one pound; proof spirit, a sufficiency. Pack the powder in a percolator, and add the spirit, until the powder is exhausted. Distil off the spirit, and evaporate the residue by a water bath to a proper consistence.

The Edinburgh mode of preparation with proof spirit is here adopted, as it yields an extract less liable to spoil, and more efficient than the London extract prepared with water.

*Dose.*—At the commencement about a quarter of a grain, which should be gradually increased until some obvious effect is produced.

Tinctura Stramonii [U. S.], *Tincture of Stramonium.*—Take of stramonium seeds, bruised, two ounces and a half; proof spirit, one pint. Macerate the stramonium for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.

["Take of stramonium seed, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

*Dose.*—Min. x to min. xx, gradually increased until it occasions some obvious effect on the system. This preparation is applicable to all the cases for which stramonium is used.

[Unguentum Stramonii, U. S., *Ointment of Stramonium.*—"Take of extract of stramonium, sixty grains; water, half a fluidrachm; lard, a troyounce. Rub the extract first with the water until rendered uniformly soft, then with the lard, and thoroughly mix them." U. S. Used as an anodyne application in hemorrhoids, irritable ulcers, &c.

Extractum Stramonii, U. S., *Extract of Stramonium.* Extractum Stramonii Foliorum, *Pharm.* 1850.—"Take of stramonium leaf, twelve troyounces. Bruise it in a stone mortar, sprinkling on it a little water, and express the juice; then, having heated this to the boiling point, strain, and evaporate, at a temperature not exceeding 160°, to the proper consistence." U. S. Dose, one grain, in pill.

Extractum Stramonii Alcoholicum, U. S., *Alcoholic Extract of Stramonium.*—"Take of stramonium leaf, recently dried and in fine powder, twelve troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Introduce the powder, previously mixed with one-third of the alcohol, into a conical percolator, and gradually pour upon it the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour on diluted alcohol until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol until two pints more of tincture have passed, or until the powder is exhausted; then evaporate, by means of a water bath, at a temperature not exceeding 160°, to the consistence of syrup. With this mix the three fluidounces of tincture first obtained, and continue the evaporation, at a temperature not exceeding 120°, until the mixture is reduced to the proper consistence." U. S. Dose, one grain, in pill.—W.]

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## NICOTIANA TABACUM, *Linn.*

### Virginian Tobacco. Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A viscid *herb.* *Stem* three to six feet high, erect, round, hairy, branching at the top. *Leaves* sessile (the lower ones decurrent), oblong-lanceolate, acuminate, very large, pale green, with glandular short hairs. *Flowers* in terminal panicles. *Calyx* tubular-campanulate, five-cleft, hairy. *Corolla* rose-colored, funnel-shaped; throat inflated-ventricose; limb plaited, five-lobed; the segments of the limb acuminate. *Stamens* five, inserted on the tube of the corolla, included, of equal length; *anthers* dehiscing longitudinally. *Ovary* superior ovate; *style* simple; *stigma* emarginate. *Capsule* covered by the persistent calyx, bilocular. *Seeds* many, small, somewhat reniform, brown.—*Steph.* and *Church.*, plate 37.

*Habitat.*—America. Extensively cultivated in most parts of the world, especially in the United States of America. Virginia is the most celebrated for its culture. North of Maryland the plant is rarely seen. [This is a mistake. The plant grows freely in the Middle States, and is very extensively cultivated in the valley of the Connecticut.—W.]

This is the only species employed in medicine; but the tobacco used for smoking, chewing, and snuff, is derived from several species. The generic appellation, Nicotiana, is obviously derived from Nicot, the name of an individual who sent the seeds of the plant to France, about 1560. The origin of the specific name, Tabacum, is less satisfactorily ascertained. It is probable, however, that the word is derived from *tabac*, an instrument used by the natives of America in smoking this herb; though some derive it from *Tobago.*

### Tabacum, *Leaf Tobacco.* [Mat. Med. List, U. S. P.]

The dried leaves; cultivated in America.

*Officinal Characters.*—Large mottled-brown ovate or lanceolate acuminate leaves, bearing numerous short glandular hairs; having a peculiar heavy odor and nauseous-bitter acrid taste; yielding, when distilled with solution of potash, an alkaline fluid, which has the peculiar odor of nicotine (*nicotia*), and precipitates with bichloride of platinum and tincture of galls.

*Test.*—Not manufactured.

*Description.*—In commerce two states of tobacco are distinguished: in the one it is called *unmanufactured* or *leaf tobacco*, in the other it is termed *manufactured tobacco.* For medicinal purposes, Virginian leaf tobacco is directed to be employed.

*Composition.*—Tobacco contains an alkaloid *nicotia*, $C_{20}H_{14}N_2$. It exists in the leaves (fresh and dried), root, seeds, and smoke. Nicotia is a colorless volatile liquid alkaloid, with an acrid odor and an acrid burning taste. The vapor has an irritating and peculiar odor of tobacco in a most powerful degree. It restores the blue color of reddened litmus, and renders turmeric brown. It does not solidify at 14° F.; it boils at 482° F., and at the same time undergoes decomposition. By exposure to the air it becomes brown and thick. It is readily combustible with the aid of a wick. It is soluble in water, ether, alcohol, and the oils (fixed and volatile). Ether readily separates it from its aqueous solution. It combines with acids, and forms very deliquescent salts. The *sulphate*, *phosphate*, *oxalate*, and *tartrate* are crystallizable; the *acetate* is not. The compound salts with metallic oxides are more readily crystallized. A dilute aqueous solution of nicotia yields a white flocculent precipitate (double chloride) with a solution of chloride of mercury, and a yellow granular precipitate with chloride of platinum. In addition to the above properties it may be observed that nicotia, like hydrocyanic acid, is a compound of nitrogen, carbon, and hydrogen. The fact that this alkaloid is soluble in water and ether is a peculiarity, since an alkaloid which is easily dissolved by one of these liquids is not readily dissolved by the other. Concentrated sulphuric acid strikes a wine red color with nicotia in the cold. If heated, it darkens, becomes black, and sulphurous acid is evolved. It gives white fumes with hydrochloric acid, precisely like ammonia. Heated with the acid it acquires a deep violet color. Nitric acid colors it orange yellow, and vapors of deutoxide of nitrogen are given off when the mixture is heated. It forms a soluble soap with stearic acid. In many of its reactions nicotia resembles ammonia. Among other differences it may be mentioned that the solution of iodine in water which is decolorized by ammonia produces a yellow precipitate with a solution of nicotia; and pure tannic acid, which gives a reddish color with ammonia, throws down a copious white precipitate in a solution of nicotia. It is an energetic poison, almost equalling in activity hydrocyanic acid.

*Physiological Effects.*—When taken into the stomach in a liquid form in small doses, it usually operates as a diuretic, and, as dropsical swellings sometimes disappear under the use of these doses, it has been inferred that the remedy promotes the operation of the absorbents. *In larger doses* it provokes nausea, vomiting, and purging; but its most remarkable effects are languor, feebleness, relaxation of muscles, trembling of the limbs, great anxiety, and tendency to faint. Vision is frequently enfeebled, the ideas are confused, the pulse small and weak, the respiration somewhat laborious, the surface cold and clammy, or bathed in a cold sweat, and, in extreme cases, convulsive movements are observed. Sir B. Brodie found that the infusion of tobacco, thrown into the rectum, often paralyzed the heart, and caused death in a few minutes. But if the head of the animal was previously removed, and artificial respiration kept up, the heart remained unaffected; proving that tobacco disorders this organ through the medium of the nervous system. In the form of *clyster* tobacco has frequently proved fatal, sometimes from the use of inordinate doses by ignorant persons, and occasionally in the hands of the well-informed practitioner. Sir A. Cooper has seen 120 grains, and even 60 grains, destroy life. In a case related by Sir Charles Bell death probably occurred from the same cause. Dr. Copland saw thirty grains in infusion prove fatal.

The *smoking* of tobacco by those unaccustomed to it gives rise to all the before-described effects of large doses. In habitual smokers, the practice, when employed moderately, provokes thirst, increases the secretion of saliva and buccal mucus, and produces a remarkably soothing and tranquillizing effect on the mind, which has made it so much admired and adopted by all classes of society, and by all nations, civilized and barbarous. I am not acquainted with any well-ascertained ill effects resulting from the habitual practice of smoking. A similar observation is made by Dr. Christison. Yet Dr. Prout says it "disorders the assimilating functions in general, but particularly, as I believe, the assimilation of the saccharine principle. *The application of tobacco to abraded surfaces* is a very dangerous practice, and has in some instances been attended with violent or even fatal results. Mr. Weston has related a case in which the expressed juice of tobacco was applied to the head of a boy, aged eight years, for the cure of tinea capitis. Death took place three hours and a half after the application. The operation of tobacco resembles that of *Lobelia*. With digitalis tobacco agrees in several circumstances, especially in that of enfeebling the action of the vascular system, although its power in this respect is inferior to that of digitalis. In its capability of causing relaxation and depression of the muscular system, and trembling, tobacco surpasses it; as it does, also, in its power of promoting the secretions. From belladonna, stramonium, and hyoscyamus, it is distinguished by causing contraction of the pupil, both when applied to the eye and when taken internally in poisonous doses; and also by the absence of delirium and of any affection of the parts about the throat.

*Therapeutics.*—The principal remedial value of tobacco consists in its power of relaxing muscular fibres, whereby it becomes a valuable antispasmodic. As a purgative, but especially as an antispasmodic and purgative conjoined, it is exceedingly serviceable in alvine obstructions. It is used in the following diseases: *colic*, *ileus*, *strangulated hernia*, *and constipation*. The efficacy of tobacco in these diseases depends principally on its power of relaxing muscular fibres and on its purgative properties. These effects are usually accompanied by nausea and giddiness. The remedy is applied in the form of clyster, consisting either of the infusion or of the smoke. The latter was at one time supposed to be more efficacious. Heberden says it causes less giddiness than the infusion. It probably extends further up the intestines than the liquid enema, and, therefore, acts on a larger surface; but the difficulties and inconvenience of applying it, and the uncertainty of its effects, have led, for the most part, to the discontinuance of its use. In *ileus* the tobacco clyster has been recommended by Sydenham, by Heberden, by Abercrombie, and by several other distinguished authorities. The earlier it is resorted to the more successful it is likely to prove. Indeed, when employed in the last stage of the disease, it sometimes hastens the fatal termination by exhausting the already depressed vital powers. As it is occasionally necessary to repeat the injection, it is of importance to begin cautiously. Dr. Abercrombie uses only fifteen grains of tobacco infused in six ounces of boiling water for ten minutes, and he repeats this in an hour if no effect have been produced. I have generally employed a scruple, and have not experienced any dangerous effects from its application; and it is possible that, in persons long accustomed to the use of tobacco, a somewhat larger dose might be required; but I have never met with any cases in which a scruple did not produce the full effect on the system that was desired. In *strangulated hernia* the tobacco clyster has frequently effected the return of the protruded parts when the operation appeared almost inevitable; and every surgical writer speaks in the highest terms of its use. A tense hernial tumor sometimes becomes soft and relaxed by the diminished force of circulation produced by tobacco. Notwithstanding these facts, this remedy is much less resorted to than formerly. Several circumstances have, I suspect, led to the infrequency of its use: first, the dangerous, if not fatal, consequences which have sometimes resulted from its employment; secondly, the frequency of its failure and the consequent loss of time, by which the chance of recovery is diminished; thirdly, the operation for hernia being much less dreaded now than formerly, for experience has fully proved that death rarely (Mr. Pott says only once in fifty times) results from it; but chiefly the greater advantage and smaller risk attending the use of chloroform. In *colic* from lead, and in *obstinate constipation* from spasmodic constriction, the tobacco clyster has sometimes proved most beneficial. *In ischuria and dysuria.*—When retention of urine arises from spasm of the neck of the bladder or from spasmodic stricture, tobacco, by its powerfully relaxing properties, is an agent well calculated to give relief. Mr. Earle has published several cases illustrative of its efficacy. In dysuria, also, tobacco proves serviceable; it abates pain, relaxes the urinary passages, promotes the secretion of urine, and, by diminishing the sensibility of the parts, facilitates the expulsion of calcareous matter. *In tetanus.*—The relaxing influence over the muscular system possessed by tobacco, suggested the employment of this remedy in tetanus. Its effects have been, like those of most other medicines in this disease, unequal. Mr. Curling has collected accounts of nineteen cases treated by tobacco: of these, nine recovered; and in seven of the fatal cases the remedy had not a fair trial; while in the eighth, organic disease of the brain was found. Mr. Curling observes that "more has now been advanced in proof of the efficacy of tobacco than can be adduced in favor of any other remedy yet resorted to. I have not," he adds, "succeeded in finding a single case in which, being fully and fairly tried before the constitution had given way, it has been known to fail" (*Treatise on Tetanus*). *In spasmodic asthma.*—In this disease, tobacco, either smoked, or taken internally, in nauseating doses, has been found occasionally to give relief. My own observation is unfavorable to the use of tobacco smoke, which I have repeatedly found to bring on convulsive cough and spasmodic difficulty of breathing in persons afflicted with chronic catarrh.

### *Officinal Preparations.*

Enema Tabaci, *Enema of Tobacco.*—Take of leaf tobacco, twenty grains; boiling water, eight fluidounces. Infuse in a covered vessel for half an hour, and strain.

Used, as I have already stated, in ileus, strangulated hernia, obstinate constipation, and retention of urine. Twenty grains is the largest quantity of tobacco that can be administered at one time without danger, as even thirty grains have proved fatal.

[Infusum Tabaci, U. S., *Infusion of Tobacco.*—"Take of tobacco, sixty grains; boiling water, a pint. Macerate for an hour in a covered vessel, and strain." U. S. This preparation corresponds to the Enema Tabaci, Br. Ph., and is used for the same purpose, with the same dangers and precautions.

Unguentum Tabaci, U. S., *Ointment of Tobacco.*—"Take of tobacco, in fine powder, half a troyounce; lard, eight troyounces; water, a sufficient quantity. Moisten the tobacco with a little water, introduce it into a conical glass percolator, and, having pressed it firmly, pour water upon it until four fluidounces of filtered liquid have passed. Evaporate this to the consistence of a soft extract, and mix it thoroughly with the lard." U. S. A very small amount of this ointment may be used, combined with other appropriate unguents, in painful piles. Its power of producing serious constitutional symptoms should always be borne in mind.

Vinum Tabaci, U. S., *Wine of Tobacco.*—"Take of tobacco, in moderately fine powder, a troyounce; sherry wine, a pint. Macerate for seven days, with occasional agitation; then express, and filter through paper." U. S. *Dose*, gtt. x—xxx.

Oleum Tabaci, U. S., *Oil of Tobacco.*—"Take of tobacco, in coarse powder, twelve troyounces. Put it into a retort of green glass, connected with a refrigerated receiver, to which a tube is attached for the escape of the incondensible products. Then, by means of a sand-bath, heat the retort gradually to dull redness, and maintain it at that temperature until empyreumatic oil ceases to come over. Lastly, separate the dark oily liquid in the receiver from the watery portion, and keep it in a well-stopped bottle." U. S. This is a thickish, black, oily liquid, having the characteristic odor of old tobacco-pipes. It is a virulent poison, entirely unfit for internal use. It has been applied, in the form of an ointment, to obstinate skin affections, indolent buboes, &c., but even its external application is attended with danger. The strength of the ointment should never exceed twenty drops to the ounce.—W.]

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## SOLANUM DULCAMARA, *Linn.*

### Bittersweet.

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.—Root* woody. *Stem* shrubby, with climbing or straggling branches, rising (when supported) to the height of many feet. *Leaves* acute, entire at the margin, generally smooth; the lower ones cordate, ovate; the upper auriculo-hastate. *Flowers* in lateral or terminal cymes. *Calyx* persistent, 5-cleft. *Corolla* hypogynous, rotate, limb 5-cleft, purple, with two round green spots at the base of each segment. *Stamens* 5, arising from the throat of the corolla, exserted; filaments very short; anthers converging into a cone, and dehiscing by two pores at the apex. *Style* simple. *Stigma* obtuse. *Berries* oval, scarlet, juicy, 2-celled, with numerous subreniform *seeds.—Flor. Lond.*, Fasc. 1, plate 14.

*Habitat.*—Indigenous. In hedges and thickets. Flowers in June and July.

### Dulcamara, *Dulcamara.* [Mat. Med. List, U. S. P.]

The young branches, dried; from indigenous plants which have shed their leaves.

*Officinal Characters.*—Light, hollow, cylindrical, about the thickness of a goose-quill, bitter and subsequently sweetish to the taste.

*Description.*—The annual stems are collected in the autumn, after the leaves have fallen. When fresh, they have an unpleasant odor, which they lose by drying. The epidermis is greenish gray, the wood light, and the pith very light and spongy.

*Composition.*—Dulcamara contains an alkaloid *solania*, $C_{84}H_{68}NO_{28}$, which resembles sulphate of quinia, but its needle-like crystals are finer and shorter. If Blanchet's analysis be correct, solania differs from the other vegetable alkaloids in the small quantity of nitrogen which it contains, and in its very high atomic weight, 810? It is said to be poisonous (Otto), but it does not dilate the pupil like atropia.

*Physiological Effects.*—Not very obvious. Its decoction operates as a diaphoretic and diuretic; but Frank gave the decoction, and others have given the extract and fruit, in very large doses, without any obvious effects.

*Therapeutics.*—Dulcamara has been thought serviceable in chronic pulmonary catarrhs, in rheumatic and gouty complaints, in chronic skin diseases, and in various cachectic conditions of the system, in which sarsaparilla has been found beneficial. As a remedy for lepra, it was introduced to the notice of British practitioners by Dr. Crichton. For this disease it has been declared a most effectual remedy by Bateman;

while Rayer speaks of its good effects in eczema and psoriasis. In the few cases in which I have tried it, it proved useless.

Fig. 121.

*Solanum dulcamara.*

*Officinal Preparation.*

INFUSUM DULCAMARÆ, *Infusion of Dulcamara.*—Take of dulcamara, bruised, one ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain. Diuretic and diaphoretic.

*Dose.*—Fl. oz. j—iv.

[DECOCTUM DULCAMARÆ, U. S., *Decoction of Bittersweet.*—" Take of bittersweet, bruised, a troyounce ; water, a sufficient quantity. Boil the bittersweet in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint." U. S. Dose, fʒj to f℥iv, t. d.

Extractum Dulcamaræ, U. S., *Extract of Bittersweet.*—"Take of bittersweet, in moderately fine powder, twelve troyounces; diluted alcohol, a sufficient quantity. Moisten the bittersweet with four fluidounces of diluted alcohol, pack it in a conical percolator, and pour diluted alcohol gradually upon it until the tincture passes but slightly impregnated with the properties of the bittersweet. Distil off the alcohol from the tincture until reduced to one half; then strain, and, by means of a water-bath, evaporate to the proper consistence." U. S. Dose, gr. v to xx in pill.

Extractum Dulcamaræ Fluidum, U. S., *Fluid Extract of Bittersweet.*—"Take of bittersweet, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, ten troyounces; diluted alcohol, a sufficient quantity. Moisten the bittersweet with half a pint of diluted alcohol, pack it in a conical percolator, and pour upon it diluted alcohol until three pints of tincture have passed. Evaporate this by means of a water-bath, to a pint, add the sugar, evaporate again to a pint, and strain the liquid while hot." U. S.

A thickish liquid, with the sensible properties of dulcamara in a high degree. One fluidounce of it represents a troyounce of the powder. Dose, gtt. xx to fʒj, in water.—W.]

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## CAPSICUM FASTIGIATUM, *Blume.*

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A small branched *shrub* 1–2 feet high. *Branches* 4-sided, fastigiate, scabrous. *Leaves* ovate or lanceolate, acuminate, ciliated. *Calyx* persistent, subcylindrical, truncated. *Corolla* hypogynous, rotate, white; tube very short; limb plaited, 5-cleft. *Stamens* 5 arising from the throat of the corolla, exserted; filaments very short; anthers connivent, dehiscing longitudinally. *Ovary* 2-celled; *style* simple, subclavate; *stigma* obtuse. Fructiferous *peduncles* subgeminate, erect. *Capsule* oblong, cylindrical, straight, when ripe deep red, very pungent. *Seeds* numerous, reniform.—*Wight, Icones Plant. Ind. Orient.*, vol. iv., plate 1617.

*Habitat.*—Sierra Leone.

[The common chilly pepper, the fruit of *capsicum annuum*, had always been officinal until the London Pharmacopœia in 1851 made the Guinea pepper officinal, and named *capsicum fastigiatum* as its source. Dr. Pereira, after comparing the commercial Guinea pepper with the East Indian *Solanaceæ* in the museum of the Linnæan Society, satisfied himself that it was yielded by *C. frutescens*, Linn. I have carefully examined the capsicums in the collections both of the Linnæan Society and of the British Museum, and am satisfied that Guinea pepper is the produce of *C. fastigiatum*, *Blume.* This species is indeed *C. frutescens*, *Linn. Sp. Plant*, but not *C. frutescens*, *Linn. Hort. Cliff.* which latter species is usually understood by this name. I cannot indeed find in either museum a specimen bearing the name of *C. fastigiatum*, but there is in the British Museum a capsicum consisting of four pieces attached to one paper. They are all in fruit. On the paper is written "Capsicum," and on the back "Tranquebar Soc. Unit. Fratr. (1) 1775, (2) 1778." The fruit, calyx, and peduncle correspond exactly with the officinal capsicum of Guinea pepper. The specimens also correspond with Dr. Wight's plate and description of *C. fastigiatum*.—Ed.]

### Capsicum, *Capsicum.*

The ripe fruit, dried; imported from the coast of Guinea and from the East and West Indies, and distinguished in commerce as Guinea pepper and pod pepper.

*Commerce.*—Mr. Horner informs me that Guinea or pod pepper comes exclusively from Sierra Leone, and that none is imported from the East or West Indies, as stated in the Pharmacopœia.

*Officinal 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.

*Composition.*—Capsicum contains an *acrid soft Resin*, and an *acrid Oil*, which Bucholz terms *Capsicin*. *Capsicin* is obtained by digesting the alcoholic extract in ether, and evaporating the ethereal solution. It is a thick liquid, of a yellowish-red or reddish-brown color, which becomes very fluid when heated, and, at a higher temperature, is dissipated in fumes. Half a grain of it, volatilized in a large room, causes all who respire the air of the room to cough and sneeze. By exposure to air and light it solidifies. It is decolorized by chlorine. It is slightly soluble in water and in vinegar; but very much so in alcohol, ether, oil of turpentine, and the caustic alkalies.

*Physiological Effects.*—Capsicum belongs to the spices, and is more closely allied, by its effects, to the peppers, than to any other article of the Materia Medica. Its active principle is more fixed, and its operation is more permanent and violent, than mustard or horseradish. Its hot and fiery taste is familiar to every one. Applied to the skin, capsicum acts as a rubefacient and vesicant. Swallowed *in small doses*, it creates a sensation of warmth in the stomach; and in torpid and languid habits proves a valuable stimulant, and a promoter of the digestive functions. *In excessive doses*, it may produce abdominal pain, and gastric inflammation.

*Therapeutics.*—Capsicum is more employed as a *condiment* than as a medicine. It is added to various articles of food, either to improve their flavor, or, if difficult of digestion, to promote their assimilation, and to prevent flatulence. The properties of Guinea pepper are similar to those of chillies, than which it is much hotter and more fiery. Its powder is *Cayenne pepper*, extensively employed as a condiment. The inhabitants of tropical climates employ this and other species to stimulate the digestive organs, and thereby to counteract the relaxing and enervating influence of external heat. As a *medicine*, it is principally valuable as a local stimulant to the mouth, throat, and stomach. Its constitutional not being in proportion to its topical effects, it is of little value as a general or diffusible stimulant. Administered internally, capsicum has long been esteemed in cases of *cynanche maligna*. As a gargle, in relaxed conditions of the throat, its efficacy is undoubted. The powder or tincture may be applied, by means of a camel's hair pencil, to a relaxed uvula. It is a very useful gastric stimulant in enfeebled, languid, and torpid conditions of the stomach. Thus, in the dyspepsia of drunkards, as well as of gouty subjects, it has been found useful. In various diseases attended with diminished susceptibility of stomach, capsicum is an exceedingly useful adjunct to other powerful remedies, the operation of which it promotes by raising the dormant susceptibility of this viscus; as in cholera, intermittents, low forms of fever, and dropsies. Dr. Wright speaks in high terms of it as a remedy for obviating the black vomit—a symptom of the fever of tropical climates, at one time considered fatal.

*Administration.*—The *powder* of capsicum is usually given in doses of from gr. v to gr. x, made into pills with crumbs of bread.

*Officinal Preparation.*

Tinctura Capsici, *Tincture of Capsicum.*—Take of capsicum, bruised, three quarters of an ounce; rectified spirit, one pint. Macerate the capsicum for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.

It is slightly stronger than the London tincture in the proportion of 11 to 10, but only half as strong as the Dublin tincture, unless the use of the somewhat less pungent capsicum annuum, by the Dublin College, may be supposed to diminish the difference.

*Dose.*—Min. xv to min. xxx.

Employed in the low stage of typhus and scarlet fevers, and in gangrenous sore-throat, and to prevent the nausea which oil of turpentine is apt to occasion. The *capsicum gargle* is prepared by adding one fluidrachm of the tincture to eight fluidounces of the acid infusion of roses. The tincture is also an ingredient in the *catechu lozenge.*

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## [**CAPSICUM ANNUUM,** *Willd. Chilly Pepper.*

*Specific Characters.*—Fruit oblong, pendulous, and erect. Petioles glabrous. Stem herbaceous. Calyx obsoletely 5-toothed.

*Herbaceous* annual, 1 to 2 feet high. *Leaves* ovate or oblong, acuminate, long-stalked, almost entire, sometimes hairy on the veins underneath. *Flowers* white; *Berry* scarlet, yellow, variegated with red and yellow, or dark green; variable in shape, being oblong, round, or cordate.

*Habitat.*—America. A doubtful native of the East Indies. Cultivated in England.

### **Capsicum.** Mat. Med. List, U. S. P.

The fruit of Capsicum annuum and of other species of Capsicum.

It will be seen that the U. S. P. recognizes especially the fruit of the C. annuum, differing in this from the British Ph.

*Description.*—1. The dried fruit is flat, more or less shrivelled, oblong, blunt or pointed at one end, while the calyx or stalk is usually attached at the other end. The length of the berry (independent of the stalk) is two or three inches, the breadth one-half to three-quarters of an inch, the color yellowish or reddish-brown, the taste hot and pungent, the odor none. The epidermis is tough and leathery; the seeds are flattened and whitish. The recent fruit, called *capsicum* or *chillies*, grown in this country, and sold for pickling, is, when ripe, yellow or red, but it is frequently gathered green; its size and shape are variable, and it is distinguished as long-podded, short-podded, and heart-shaped.

*Therapeutics.*—The medical properties of this pepper are similar to those of the Guinea pepper, from which it differs only in being less powerful.

Infusum Capsici, U. S., *Infusion of Capsicum.*—" Take of capsicum, in coarse powder, half a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S. This preparation is chiefly used as a gargle, but may be given internally.

Dose, f℥j to f℥iv, diluted with water.

Tinctura Capsici, U. S.—" Take of capsicum, in fine powder, a troyounce; diluted alcohol, a sufficient quantity. Moisten the powder with half a fluidounce of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.

This preparation is not so strong as the British tincture. It may be used for the same purposes in double the quantity.

Dose, f℥ss to f℥iss in water.

Oleoresina Capsici, U. S., *Oleoresin of Capsicum.*—" Take of capsicum, in fine powder, twelve troyounces; ether a sufficient quantity. Put the capsicum into a cylindrical percolator, press it firmly, and gradually pour ether upon it until twenty-four fluidounces of filtered liquid have passed. Recover from this, by distillation on a water-bath, eighteen fluidounces of ether, and expose the residue, in a capsule, until the remaining ether has evaporated. Lastly, remove, by straining, the fatty matter which separates on standing, and keep the oleoresin in a well-stopped bottle." U. S.

This preparation is a dark, very thick, excessively pungent and acrid liquid, possessing in a high degree all the properties of capsicum. It may be added to other substances in pill, when a powerful, arousing, stimulating stomachic is desired. Dose, gtt. ss to j.—W.]

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## CONVOLVULACEÆ, *R. Brown.* The Convolvulus Order.

## CONVOLVULUS SCAMMONIA, *Linn.*

### The Scammony Plant.

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, tapering, 3 or 4 feet long, with an acrid milky juice. *Stems* numerous, twining, herbaceous, smooth, 15 or 20 feet long. *Leaves* alternate, on long petioles, arrow-shaped, smooth. *Peduncles* solitary, axillary, 2 or 3-flowered, scarcely twice so long as the leaves. *Bracts* awl-shaped. *Sepals* 5, obovate, truncated, and reflexed at the point, colored at the edge. *Corolla* hypogynous, funnel-shaped, an inch long, pale-yellow, with purple stripes or white, the limb 5-lobed, plaited. *Stamens* shorter than the corolla; *anthers* erect, sagittate. *Style* as long as the stamens; *stigmas* 2, linear. *Capsules* 2-celled, 4-seeded.—*Woodv.* pl. 5, page 13.

*Habitat.*—The scammony plant grows wild in all parts of Anatolia, as well as in Syria, and in some of the Greek and Turkish Islands of the Archipelago. Sochia, or the district of the River Meander, produces a large quantity; but Kirkagatch and Demirgik, in the plain of Mysia, furnish the largest quantity of all. It is found in mountainous districts, in the plains, and in the open ground, flourishing most luxuriantly among the Juniper, Arbutus, and wild Valonia bushes, which afford shelter and support to its branches. The yellow-flowered variety is the most abundant.

### **Scammoniæ Radix,** *Scammony Root.*

The dried root; from Syria.

*Officinal 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.

*Description.*—The *root* is succulent, and shaped like a carrot; when about four years old, it is generally one or two inches in diameter at the crown, whence it tapers gradually to the extremity, with occasional fibres, its length varying from ten inches to two or three feet, according to the depth of the soil. In some instances it is found to have four or even five inches diameter at the crown. It is from the milky juice of the living root that the officinal scammony is obtained in Asia; but the dried root is now placed in the Pharmacopœia that we may ourselves procure from it the pure purgative resin. Mr. Ransom, of Hitchin, informs me that his collectors gather the roots in Syria just before the plants flower, as the roots are at that time richest in resin.

*Composition of the Root.*—Marquart found in 100 parts of the dried root, resin, 4.12; gum, 5.8; sugar, starch, and extractive, 24.48; besides salts and woody fibre.

*Pharmaceutic Use.*—Scammony root is used in the preparation of resin of scammony.

### **Scammonium,** *Scammony.* [Mat. Med. List, U. S. P.]

A gum-resin, obtained by incision from the living root in (*Asia Minor and*) Syria.

*Collection and Preparation.*—Scammony is collected from the roots, without any regard to the color of the flower. The only perceptible difference in quality is to be ascribed to the soil. The scammony which has the strongest odor is that produced in mountainous districts, and on a poor soil; rich soils and marshy ground produce a scammony-juice containing a larger proportion of water, which, when dry, forms a scammony of a grayish-black color, and of less specific gravity. The method of procuring scammony is, according to Mr. Maltass (*Pharm. Journ.* vol. 13, p. 264), as follows: During the summer months, when the plant is in flower, the Greek and Turkish peasants, having cleared away the bushes which shelter it, remove the earth from the root to the depth of three or four inches. The root is then cut through in a slanting direction, with a sickle-shaped knife, at the distance of about one inch to one inch and a half below the crown: a mussel-shell is immediately stuck into the root under the lower part, and the sap or milk runs into it. A stone is then placed to windward of the root, to protect the shell from the loose earth and dust which might be otherwise blown into it by the high winds prevalent during summer. The sap flows freely early in the morning and late in the evening, but ceases during the hottest part of the day. One plant will not generally fill a shell; but it sometimes happens that a good root will fill two or three shells. The quantity afforded by one root varies according to size, position, and age. In some districts one hundred roots produce but 600 grains of scammony; in others the average of each root is 60 grains; and in a good soil a four-year plant will produce 120 grains. A root four inches in diameter has been known to produce as much as 720 grains; but those cut by Mr. Maltass himself did not produce above 60 grains, and some afforded none at all. The shells are usually left till the evening, when they are collected, and the cut part of the root is scraped with a knife to remove the dry, or partially dry, drops of scammony which adhere to it. The peasants then empty the shells (from which they carefully blow the dust) into copper vessels, and work up the drops scraped from the roots together with the contents of the shells. This is done with a knife, and continued until the whole is so well mixed that it forms a string when run off the knife. This is the *pure Lachryma scammony*. The scammony brought to market by the Greek peasants is almost the only pure sort that can be obtained. It does not exceed seven hundredweight yearly. When purchased, it is placed in a room having the windows open, to allow the wind to blow over it; care being taken to prevent the rays of the sun from striking upon it. Here it is spread upon sheep-skins, and turned occasionally to prevent it becoming mouldy underneath. When nearly dry, it is broken into irregular pieces, and allowed to remain a few days longer, until quite dry; it is then shipped in small cases containing about thirty pounds each.

Dioscorides describes the mode of procuring it in very similar terms: The head being separated, the root is to be excavated in the form of a cup, so that the juice may flow into the cavity, from which it is to be taken out in shells. Others excavate the earth, and having incised the root, let the juice run into the cavity, which has been previously lined with walnut leaves; when the scammony is dry it is removed.

*Officinal Characters.*—Ash-gray and rough externally; fresh fracture resinous, splintery, shining, black when dry; odor and flavor cheesy; causes, when chewed, a slight prickly sensation in the back of the throat; easily triturated into a dirty-gray powder, and converted with water into a smooth emulsion.

*Tests.*—It does not effervesce with hydrochloric acid. Boiling water agitated with the powder, cooled and filtered, does not strike a blue color 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.

*Description.*—Scammony is usually imported from Smyrna. Occasionally it comes by way of Trieste. Still more rarely it is brought from Alexandretta, the port of Aleppo. *Pure scammony*, *Virgin scammony* (*Lachryma scammony*), usually occurs in amorphous pieces; is friable, easily reduced to small fragments between the fingers, or by the pressure of the nail, and has, according to my experiments, a specific gravity of 1.210. Its fractured surface is resinous, shining, reddish or greenish-black, and presents small air cavities. When rubbed with the finger moistened with either water or saliva, it readily forms a milky liquid. If we examine thin fragments by transmitted light, we observe them to be semi-transparent at the edges, and of a gray-brown color. In the same pieces we sometimes find some portions shining, and blackish, as above described; while others are dull-grayish. Virgin scammony readily takes fire, and burns with a yellowish flame. Its odor is peculiar, somewhat analogous to old cheese; its taste is slight at first, afterwards acrid. The decoction of its powder, when filtered and cold, is not rendered blue by tincture of iodine. Paper moistened with an alcoholic or ethereal tincture of scammony should undergo no change of color when exposed to brown nitrous fumes. 100 grains, incinerated with nitrate of ammonia, yield, according to my experiments, about three grains of ashes; ether separates at least 78 per cent., dried at 280° F., principally resin. This sort of scammony is usually imported from Smyrna. Pure scammony, according to Maltass, is easily recognized, when dry, by the following characters: It is light, and breaks easily with a glossy fracture, If no water has been added by the peasants, the color of the fracture is reddish-black. If water has been added, or the scammony has been collected in shady places, the fracture is black and very glossy. If the dry drops scraped from the roots have not been worked up with the milk, pieces will be found of a light red color resembling resin. One of the best characters of genuine scammony is its golden-reddish color when reduced to small fragments.

Mr. D. Hanbury, in some useful practical remarks on scammony, describes the characters of pure natural scammony, *i. e.* the unmixed inspissated juice of the root, as follows: It has a pale yellowish-brown color; it is transparent, very brittle, readily affords a white emulsion when rubbed with water, and leaves but a small quantity of white residue when treated with ether (*Pharm. Journ.*, 1853, p. 270). Scammony of *this* quality is never met with in commerce. Mr. Hanbury's description appears to be taken from the pure scammony as it exists in the shells in which it is collected. In these thin layers it is certainly translucent, and near the edge even transparent. This pale-brown translucent scammony has no cheesy odor, and is free from the cavities found in the lumps; whence Mr. Hanbury concludes that the cavities, the cheesy odor, the dark color, and the opacity of the lumps, which have dried more slowly, are caused by saccharine fermentation.

*Composition.*—Dr. Christison analyzed "pure" scammony, both old and moist, and obtained from 77 to 83 per cent. of resin, and from 6 to 8 of gum.

*Adulteration.*—Mr. Maltass states that most of the peasants adulterate scammony before it is brought to the market. One process is as follows: The scammony is brought to a liquid state by admixture with water, and a quantity of white chalky or magnesian earth is added. The quantity added varies from 10 to 150 per cent.! The color of soft moist scammony is not affected by the addition, unless the proportion exceeds 20 per cent.; when dry, it is then apparent to any one acquainted with the drug. I have been informed by a Turkey merchant, who formerly resided at Smyrna, that scammony is brought into Smyrna in the soft state, on camels. Here it is mixed with various impurities by persons (Jews) who are denominated scammony makers, and who adulterate it, and thereby lower its value to suit the market. The quantity of scammony annually sold in Smyrna amounts to about 7,500 pounds weight. Out of this quantity about seven hundred weight of pure can be obtained, the remainder being of different qualities, the quantity of resin that they contain varying from one ounce to fifteen ounces in every pound. If the whole crop were brought to market *unadulterated*, it is doubtful whether the annual quantity would exceed 3,000 pounds weight. (Maltass.)

The various sorts of scammony commonly found in the shops are distinguished by English dealers as *seconds*, *thirds*, &c. These occur in round, flat cakes, or in irregular lumps, and for the most part contain carbonate of lime, dextrine, and the starch or flower of wheat or barley. When they contain *carbonate of lime*, hydrochloric acid applied to a fractured surface causes effervescence. When they contain *starch* or *dextrine*, iodine produces a blue or a reddish-purple tint, when added to the filtered decoction after it has become cold.

*Calcareous scammony* is more ponderous than the virgin sort, and usually breaks with a dull, earthy, ash-gray fracture. *Calcareo-amylaceous scammony* is heavy, dense, and difficult to fracture. The fractured surface, in some samples, is resinous and shining, like that of pure scammony; but usually it has a dull, waxy lustre; it has air-cavities, and numerous small white specks (chalk); and its color is grayish or grayish-black. *Amylaceous scammony* is of less frequent occurrence than the calcareo-amylaceous kind. It sometimes has a resinous fracture and a dark color, like pure scammony, but more commonly a waxy lustre and a grayish color. It is light in weight, but tenacious. Scammony is also said to be adulterated with guaiacum, wood-ashes, gypsum, and gum arabic, or gum tragacanth; and occasionally pounded scammony roots are added. This adulterated scammony is put into drums, and scammony nearly pure, and about as liquid as honey, is poured on the top to give it a good appearance. Without this precaution, detection would not be difficult, the surface of the adulterated drug being always dry. The presence of guaiacum may be detected by nitrous fumes, which give a blue color to paper which has been moistened with a tincture containing guaiacum. Incineration will detect an abnormal amount of inorganic matter, as chalk, gypsum, or sand.

[In short, scammony used to be adulterated to the extent of thirty, fifty, and even seventy-five per cent. to enable it to be sold in the market at a corresponding price. But the efforts and example of the leading pharmaceutical chemists, and the liberal and enlightened feeling that has been fostered by the institution and publications of the *Pharmaceutical Society* have led pharmaceutists generally, in this and other cases, to prefer pure to adulterated drugs; and for several years those who were willing to pay the price of pure scammony have had little difficulty in obtaining it.—Ed.]

*Physiological Effects.*—The effects of pure scammony are those of a powerful and drastic purgative. As the evacuant properties of scammony depend on its local irritation, it operates more energetically when there is a deficiency of intestinal mucus, and is then very apt to gripe; and, *vice versâ*, when the intestines are well lined with secretion, it passes through with much less effect. In its operation scammony is closely allied to jalap, than which it is more active, while its odor and taste are less nauseous. It is less irritant than gamboge.

*Therapeutics.*—Scammony is, of course, inadmissible in inflammatory conditions of the alimentary canal, on account of its irritant qualities.

It is well adapted for torpid and inactive conditions of the abdominal organs, accompanied with much slimy mucus in the intestines. It is principally valuable as a smart purgative for children, on account of the smallness of the dose necessary to produce the effect, the slight taste, and the energy yet safety of its operation. When used for them, it is generally associated with calomel. Where a milder purgative is required, it may be conjoined with rhubarb, sulphate of potash, and an aromatic. It may be employed to open the bowels in constipation; to expel worms, especially in children; to act as a hydragogue purgative, on the principle of counter-irritation, as in affections of the head and dropsies; and for any other purpose for which an active cathartic may be required.

*Administration.*—For an adult, the usual *dose* of virgin scammony is from ten to fifteen grains. In order to diminish its irritant and griping qualities, it should be finely divided. For this purpose it may be intimately mixed with some bland powder (as gum, starch, or sugar) or made into an emulsion with milk, as in the scammony mixture.

*Pharmaceutic Uses.*—Scammony is an ingredient in compound extract of colocynth, compound pill of colocynth, compound powder of scammony, confection of scammony, and pill of colocynth and hyoscyamus.

## Scammoniæ Resina, *Resin of Scammony.*

### [Resina Scamonii, U. S.]

A resin, obtained by means of rectified spirit from scammony root or scammony.

*Preparation.*—Take of scammony root, in coarse powder, eight ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Macerate the scammony root with sixteen fluidounces of the spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and, when the tincture ceases to pass, pour into the percolator successive portions of spirit until the root is exhausted. Add to the tincture four fluidounces of the water, and distil off the spirit by a water-bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this two or three times with hot water, and dry it on a porcelain plate by a stove or water-bath. ["Take of scammony, in fine powder, six troyounces; alcohol, water, each, a sufficient quantity. Digest the scammony with successive portions of boiling alcohol until exhausted. Mix the tinctures, and reduce the mixture to a syrupy consistence by distilling off the alcohol. Then add the residue to a pint of water, separate the precipitate formed, wash it thoroughly with water, and dry it with a gentle heat." U. S.]

*Officinal Characters.*—In brownish translucent pieces, resinous in fracture, brittle, of a sweet, fragrant odor, if prepared from the root.

The resin prepared from the root is more translucent, and has a more saccharine odor than that prepared from the gum resin; and much resembles in its odor the resin of jalap; but the resin prepared from scammony is by no means destitute of sweetness. Scammony resin is fusible and combustible, and soluble in alcohol and ether. The alcoholic solution of the resin is feebly acid; the addition of water causes a white precipitate (*hydrate of resin*). Precipitates (*metallic scammoniates?*) are also produced by alcoholic solutions of the acetate of lead and the acetate of copper. Caustic potash deepens the color of the solution. Scammony resin may be decolorized by animal charcoal without having its purgative qualities affected. Its composition, according to Johnston, is $C_{40}H_{33}O_{20}$. It is remarkable for containing the largest quantity of oxygen of any resin hitherto analyzed.

*Tests.*—It cannot form singly (alone) an emulsion with water. Its tincture does not render the fresh-cut surface of a potato blue. Ether dissolves it entirely.

*Adulteration.*—According to M. Thorel, resin of jalap, owing to its comparative cheapness, has been used for adulterating resin of scammony. This fraud may be detected by digesting the suspected substance in rectified ether. Jalap resin is quite insoluble in this menstruum, while the resin of scammony is soluble in it in all proportions. Resin of scammony is sometimes adulterated with resin of guaiacum; this may be detected by nitrous gas or by the pharmacopœia test of the fresh-cut surface of a raw potato, as nitrous gas and the albumen of the potato both turn tincture of guaiacum blue. If the adulteration be caused by common resin, this may be dissolved out and separated from scammony resin by oil of turpentine. Sulphuric acid gives with resin immediately on contact an intense red color; with scammony resin only a wine red, slowly produced.

*Effects and Administration.*—Scammony resin is a drastic cathartic. When pure or virgin scammony can be obtained, the extract or resin is an unnecessary preparation. [I have repeatedly given to the same patient ten grains of pure scammony, and at another time ten grains of scammony resin, and have been unable to perceive any difference in their effect.—Ed.]

*Dose.*—Gr. viij to gr. xij. When administered, it should be intimately divided, either by some bland powder, or still better by an emulsion.

*Pharmaceutic Uses.*—Resin of scammony is an ingredient in compound extract of colocynth, confection of scammony, and scammony mixture.

### *Officinal Preparations.*

Confectio Scammonii, *Confection of Scammony.*—Take of scammony or resin of scammony, in fine powder, three ounces; ginger, in fine powder, one ounce and a half; oil of caraway one fluidrachm; oil of cloves, half a fluidrachm; syrup, three fluidounces; 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.

This is the Dublin confection, which is a more definite preparation than the London confection. The scammony constitutes about one-third. A warm or aromatic cathartic.

*Dose.*—For an adult, gr. xxx to gr. lx; for children, gr. iij to gr. x.

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.

It is one of the most agreeable purgative draughts that can be taken, and being tasteless is well adapted for children, for whom the quantity ordered is a suitable dose.

Pulvis Scammonii Compositus, *Compound Powder of Scammony.*—Take of scammony, four ounces; jalap, three ounces; ginger, one ounce. Reduce them separately to fine powder; mix them thoroughly, and pass the powder through a fine sieve.

This is the London powder with the substitution of three ounces of jalap for four ounces of hard extract of jalap. It is rather stronger than the Edinburgh and Dublin preparations. The effects of scammony and of jalap being very similar, little or no advantage can be obtained by the intermixture of these substances. The ginger is intended to correct the griping of the other ingredients. Compound powder of scammony is cathartic, and is used as a smart purge for children, especially where much mucous slime is contained in the bowels, and in worm cases.

*Dose* for an adult from ten to twenty grains; for children under a twelvemonth old, from three to five grains.

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## EXOGONIUM PURGA, *Bentham.*

**The Jalap Plant.** Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, with irregularly ovate-conical, tuberous branches, covered with a very thin dirty blackish epidermis, and internally white and fleshy. *Stems* annual, herbaceous, twining, branched, smooth. *Leaves* alternate, cordate, ovate, acuminate, quite entire, and smooth on both sides. *Peduncles* 1–3-flowered. *Sepals* five, unequal, obtuse, smooth. *Corolla* salver-shaped, with a subclavate, cylindrical tube, and a subpentagonal, horizontally-expanded limb, red-lake. *Stamens* 5, exserted. *Style* one. *Stigma* capitate, two-lobed. *Ovary* two-celled; the cells two-seeded.—*Bot. Mag.*, vol. lxxv., pl. 4280.

*Habitat.*—In woods near Chicanquiaco, at an elevation of nearly 6,000 feet above the level of the sea, and in other parts of Mexico. Xalapa or Jalapa used to be the only market for the root, and Vera Cruz the only place of its exportation to Europe; but it is now brought from several towns on the Mexican coast of the Gulf of Mexico, and a considerable part of the present supply is imported under the name of *Tampico Jalap*, Tampico being a port in the Gulf situated north of Vera Cruz.

### **Jalapa,** *Jalap.* [Mat. Med. List, U. S. P.]

The Tubers dried; imported from Mexico.

*Officinal Characters.*—Varying from the size of a nut to that of an orange, ovoid, the larger tubers frequently incised, covered with a thin brown wrinkled cuticle; presenting when cut a yellowish-gray color, with dark-brown concentric circles.

*Description.*—The dried tubers, or more properly tubercules, of true jalep found in commerce, average less than an ounce in weight. When entire, they are usually more or less oval, and pointed at the two opposite extremities. The larger tubercles are frequently incised, apparently to facilitate desiccation. They should be heavy, hard, and difficult to powder. Jalap is more active as a cathartic in proportion to the quantity of resin which it contains: plump, firm, heavy, resinous pieces, therefore, are preferable. Light, whitish, amylaceous, shrivelled, or woody pieces, are objectionable. Tampico jalap scarcely corresponds to the officinal characters of jalap. It is lighter, more wrinkled, more elongated, and tapering at each end; and though many pieces which closely resemble it may be found among Vera Cruz jalap, they are not such pieces as are described in the Pharmacopœia. It contains, however, according to Mr. Haselden, as much resin as the ordinary kind. Jalap is very apt to become worm-eaten; and such *jalap* has been recommended as well adapted for the preparation of the resin; but Mr. Haselden finds that it yields less resin than sound jalap.

Fig. 122.

*Exogonium purga.*

*Adulteration.*—The roots of *Ipomæa orizabensis* are sometimes found intermixed with genuine jalap, or are imported separately, and are termed in commerce *jalap stalk* or *jalap wood;* but they differ from true jalap so much in their angular shape, their paler color, their lighter weight, and their fibrous texture, that they cannot easily be mistaken for it.

*Composition.*—According to Guibourt's analyses, jalap contains:—

| | |
|---|---|
| Resin | 17.65 |
| Saccharine matter by alcohol | 19.00 |
| Saccharine matter by water | 9.05 |
| Gum | 10.12 |
| Starch | 18.78 |

*Physiological Effects.*—Jalap acts as a powerful and drastic purgative, producing copious liquid stools; and, when judiciously exhibited, is both safe and efficacious. Its objectionable effects are, that while in the stomach it frequently causes nausea, and sometimes vomiting; while, after it has passed into the intestines, it often gripes. It is tolerably certain in its operation—more so, indeed, than many other purgatives. In the proper dose it may be given without the least hesitation to children, in any case requiring an active purge. It has an advantage over some other evacuants, that it does not stimulate or heat the system, its effect being confined principally to the alimentary canal, the peristaltic motion, secretions, and exhalations of which, it promotes; and it is said that constipation less frequently succeeds its use than of some other purgatives. It is a more dastric purgative than senna. To scammony it is closely allied, not only by its effects, but also by botanical affinities and chemical properties. It is much less irritant to the intestinal mucous membrane than gamboge; and, therefore, is a much safer purgative; but inferior to aloes, in its stimulant influence over the abdominal and pelvic bloodvessels.

*Therapeutics.*—Daily experience proves the value of jalap as an active purgative, in various diseases both of children and adults. Of course its irritant properties unfit it for exhibition in inflammatory affections of the alimentary canal, as well as after surgical operations about the abdomen and pelvis. Moreover it is not an appropriate purgative in irritation of or hemorrhage from the uterus; or in piles, stricture, and prolapsus of the rectum. The following are some of the cases in which it is employed; *In constipation*, when this condition is not dependent on or connected with irritation or inflammation of the alimentary canal or pelvic organs, jalap is admissible. Its efficiency is much increased by association with calomel. It may be employed in febrile and inflammatory diseases (those above-mentioned excepted), as well as in chronic maladies. *As a vermifuge*, the compound of jalap and calomel is most efficacious, and may be used with the most happy effects in children, especially where there is an excessive secretion of mucus. *In cerebral affections*, jalap, in combination with calomel, is used with the best effect, on the principle of counter-irritation, to relieve cerebral congestion. In inflammatory affections of the brain or its membranes, or in hydrocephalus, it is a valuable purgative. *In dropsies*, it is frequently desirable to promote watery stools. Jalap, especially, in combination with cream of tartar, as in compound powder of jalap, may be used for this purpose with the best effects.

*Administration.*—The dose of jalap, *in powder*, is, for an adult, from ten to thirty grains—a scruple usually acts smartly and safely—for children under twelve months old the dose is from two to five grains. Fifteen grains of jalap, and two or three grains of calomel, form an efficient, yet safe, purgative for an adult; but this combination very readily produces salivation by repetition. From two to five grains of ipecacuanha are sometimes substituted for the calomel. To children, jalap is sometimes exhibited in gingerbread cakes. *Purgative cakes* of this kind are kept in the shops, composed of jalap, oz. ijss; flour, oz. ij; 24 eggs; and sugar, lb. j. This quantity is sufficient for sixty cakes.

## *Officinal Preparations.*

Extractum Jalapæ [U.S.], *Extract of Jalap.*—Take of jalap, in coarse powder, one pound; rectified spirit, four pints; distilled water, one gallon. Macerate the jalap in the spirit for seven days; press out the tincture, then filter, and distil off the spirit, leaving a soft extract. Again, macerate the residual jalap in the water for four hours, express, strain through flannel, and evaporate by a water-bath to a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140° to a proper consistence. [" Take of jalap, in moderately fine powder, twelve troyounces; alcohol, four pints; water, a sufficient quantity. Introduce the powder, previously mixed with three fluidounces of alcohol, into a conical percolator, and gradually pour upon it the remainder of the alcohol. When the liquid ceases to pass, pour upon the residue sufficient water to keep its surface covered, until four pints of tincture have passed. Set this aside, and continue the percolation until six pints of infusion have been obtained. Distil off the alcohol from the tincture, and evaporate the infusion until the liquids respectively have been brought to the consistence of thin honey; then mix them, and evacuate to the proper consistence." U. S.]

In this process the alcohol extracts the resin, and the water subsequently takes up the gummy extractive; the alcoholic tincture is distilled to save the spirit, while the aqueous decoction is evaporated. The extract is therefore a mixture of resin with the gummy extractive. It was formerly, and, indeed, is now, by many persons, supposed that the combination of these ingredients was necessary for the full cathartic effects of jalap. It is, however, well known that the watery extract is inert as a purgative, though it is said to be diuretic; the only advantage, therefore, that can attend the mixture of the two extracts (the watery and the alcoholic) is, that the resin is intimately divided, and thereby prevented from causing violent irritation and griping in any one part of the intestinal tube. The extract is only directed to be kept in the usual *soft* state; the *hard* extract (*Lond.*) being omitted. Mr. Brande says that jalap yields about 66 per cent. of extract—that is, 16 of alcoholic. and 50 of watery extract. Mr. Squire found that the London process, which scarcely differed from the British, gave 50 per cent, of mixed extract. According to this statement, therefore, the extract of the British Pharmacopœia has about one-fourth of the strength of the Edinburgh extract, which was the impure resin of jalap.

*Dose.*—Gr. x to gr. xx.

Pulvis Jalapæ Compositus [U. S.], *Compound Powder of Jalap.*—Take of jalap, in powder, five ounces; acid tartrate of potash, nine ounces; ginger in powder, one ounce. Rub them well together, and pass the powder through a fine sieve. [" Take of jalap, in fine powder, a troyounce; bitartrate of potassa, in fine powder, two troyounces. Rub them together until they are thoroughly mixed." U. S.]

A hydragogue purgative. Used in habitual costiveness, verminal diseases, and dropsies.

*Dose.*—For an adult, gr. xx to gr. lx.

Tinctura Jalapæ [U. S.], *Tincture of Jalap.*—Take of jalap, in coarse powder, two ounces and a half; proof spirit, one pint. Macerate the jalap for forty-eight hours, with fifteen ounces of the spirit in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.

The British tincture is rather weaker than the London and Edinburgh tinctures, and only two-thirds of the strength of the Dublin tincture. [" Take of jalap, in fine powder, six troyounces; alcohol, water, each a sufficient quantity. Mix two measures of alcohol, with one of water. Then moisten the powder with two fluidounces of the mixture, pack it moderately in a cylindrical percolator, and gradually pour the mixture upon it until two pints of tincture are obtained." U. S.] An active cathartic. Rarely used alone; generally employed as an adjunct to purgative draughts, the activity of which it promotes.

*Dose.*—Fl. drm. j to fl. drs. iv. As an adjuvant to a cathartic draught, the dose rarely exceeds fl. drs. ij.

### Jalapæ Resina [Resina Jalapæ, U. S.], *Resin of Jalap.*

A resin obtained from the jalap by means of rectified spirit.

*Preparation.*—Take of jalap, in coarse powder, eight ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Macerate the jalap with sixteen fluidounces of the spirit, in a covered vessel, at a gentle heat for twenty-four hours; then transfer to a percolator, and when the tincture ceases to pass, pour into the percolator successive portions of spirit until the jalap is exhausted. Add to the tincture, four fluidounces of the water, and distil off the spirit by a water bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin; wash this two or three times with hot water, and dry it on a porcelain plate by a stove or water bath. ["Take of jalap, in fine powder, sixteen troyounces; alcohol, water, each, a sufficient quantity. Moisten the jalap with four fluidounces of alcohol, pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it until four pints have passed, or until the filtered liquid ceases to occasion turbidness when dropped into water. Reduce the tincture to half a pint by distilling off the alcohol, mix the residue with four pints of water, separate the precipitate formed, wash it thoroughly with water, and dry it with a gentle heat." U. S.]

*Officinal Characters.*—In dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale brown powder, sweetish in odor, acrid in the throat; easily soluble in rectified spirit, but only partially so in ether, and insoluble in oil of turpentine.

*Properties.*—Resin of jalap is insoluble in water; it has acid properties and dissolves in alkaline solutions. It fuses at a moderate heat, giving off its peculiar odor, and when more strongly heated, inflames, leaving no residue.

*Administration.*—To prevent irritation and griping, the resin should be well mixed by trituration with some mild agent, as almonds, sugar, or sulphate of potash. *Dose.*—Gr. iv to gr. viij.

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## GENTIANACEÆ, *Lindley.* The Gentian Order.

## GENTIANA LUTEA, *Linn.*

### Yellow Gentian. Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, cylindrical, forked, ringed, wrinkled, externally brown, internally yellow and fleshy. *Stem* simple, erect, two to three feet high, hollow. *Leaves* pale green, opposite, ovate or oval, pointed, entire, smooth, 5–7-ribbed, plaited; lower ones on short, sheathing petioles; upper ones amplexicaul, concave. *Flowers* whorled, crowded, pedunculate. *Calyx* inferior, yellow, 4–5-parted, with unequal segments, persistent. *Corolla* twisted in æstivation, monopetalous, yellow, withering, the limb regular 5–7-parted, the segments oblong-linear, acuminate. *Stamens* 4–5, as long as the corolla, and inserted upon its tube. *Ovary* conical, with five greenish glands at the base; the ovules in rows next the suture; *stigmas* two, terminal, revolute; *style* none. *Capsule* one-celled, septicidal, two-valved. *Seeds* numerous, roundish, compressed, with a membranous margin.—*Steph.* and *Church*, pl. 132.

*Habitat.*—Subalpine and mountainous meadows (3000–6500 feet above the level of the sea) of Central and Southern Europe.

### Gentiana, *Gentian.* [Mat. Med. List, U. S. P.]

The root dried; collected in the Alps, Apennines, and other mountainous districts of Europe.

*Collection.*—The roots are collected and dried by the peasants of Switzerland, the Tyrol, Burgundy, and Auvergne. They are imported into this country in bales from Havre, Marseilles, and other ports.

Fig. 123.

*Gentiana lutea.*

*Officinal 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.

*Description.* — Gentian root is imported in cylindrical, usually more or less branched pieces, varying in length from a few inches to a foot or more, and in thickness from half an inch to one or two inches. These pieces are marked by transverse annular wrinkles and longitudinal furrows. The odor of the root in the fresh state is peculiar and disagreeable; its taste is intensely bitter. The roots of other species of gentiana are said to be frequently mixed with those of the officinal species; their effects, however, are analogous.

*Composition.*—Gentian root consists for the most part of a volatile odorous and butyraceous oily matter, a bitter crystalline body consisting of an acid (gentisic acid) and a bitter principle (gentianite), with gum, sugar, pectin, wax, caoutchouc, a yellow coloring matter, and woody fibre. *Gentisic Acid*, *Gentisin.*—Procured by washing the alcoholic extract of the root with water, and then treating it with alcohol. The tincture obtained is evaporated, and the extract treated with ether: the residue, by successive solutions and evaporations, yields gentisin. It is pale yellow, crystallizes in needles, and has a peculiar but weak smell. When cautiously heated, it gives out some yellow vapors, which are condensed on the upper part of the tube. It is scarcely soluble in water, but dissolves in alcohol. With alkalies it unites to form salts. Trommsdorff states that a solution of gentisic acid is unaffected by acetate of lead, nitrate of silver, and most other tests. Chloride of iron and the salts of copper produced in the alcoholic solution the most characteristic changes. *Bitter Principle of Gentian, Gentianite.*—This has not hitherto been isolated. By digesting the alcoholic extract of gentian in water, an acidulous intensely bitter solution is obtained. The acid may be thrown down by solution of subacetate of lead. When the excess of lead has been removed from the solution by sulphuretted hydrogen, a liquid is obtained, which, by evaporation, yields a sweet and very bitter extract, from which ether removes an aromatic fat, an odorous resin, and wax. The bitter matter has not been separated from the sugar. *Pectin.*—The existence of pectic acid (pectin) in gentian was ascertained in 1835 by Denis. To this substance is to be in part, perhaps, ascribed the gelatinization of infusion of gentian, which under certain circumstances is not unfrequently observed. *Sugar.*—To the presence of this matter in gentian is to be ascribed the capability of the infusion of gentian to undergo the vinous fermentation, and to form an alcoholic liquor (*gentian spirit*) much admired by the Swiss.

*Physiological Effects.*—Gentian is very properly regarded as a *pure* or *simple bitter;* that is, as being bitter, but without possessing much astringency or aroma. It has, therefore, the usual tonic properties of medicines of this class. Given in full doses, it appears more disposed to relax the bowels than the other simple bitters. It is somewhat less bitter, and therefore, I presume, somewhat less powerful, than quassia. Like some other vegetable bitter tonics (for example, quassia and calumba), gentian has been found to possess some deleterious properties, and, as Haller conceived, is not quite so innocuous as is generally supposed. The bitter extractive of gentian possesses no narcotic properties. Planche has shown that the distilled water of gentian causes violent nausea, and, within three minutes, a kind of intoxication. Moreover, Buchner tells us that some years ago a narcotic effect was produced in Prussia by the medicinal use of gentian root, although the presence of any foreign matter could not be detected. The same effect had been previously observed in 1748, but was attributed at the time to some foreign admixture.

*Therapeutics.*—Gentian is adapted to most of the cases requiring the use of the pure or simple bitters. It agrees best with phlegmatic, torpid individuals, and is apt to disagree with irritable or susceptible persons. It is contraindicated in febrile disorders and inflammatory conditions of the gastro-intestinal membrane. It is employed principally in dyspepsia and other gastric disorders attended with debility or torpidity, and unaccompanied by any marks of inflammation or irritation, or great susceptibility of the digestive organs, and in other diseases principally marked by weakness and debility.

### *Officinal Preparations.*

EXTRACTUM GENTIANÆ [U. S.], *Extract of Gentian.*—Take of gentian, sliced, one pound; boiling distilled water, one gallon. Macerate the gentian in the water for two hours; boil for fifteen minutes; pour off, press, and strain. Then evaporate by a water bath to a proper consistence.

The cold water ordered by the three colleges in the last editions of their Pharmacopœias, extracted the bitter principle, and acted but little on the pectin. Hence the extract was very bitter, but wanted the cohesion requisite in a pill mass. Boiling water is now again ordered, and an excellent bitter extract is obtained, and one that is at the same time well adapted for the formation of pills. Extract of gentian is tonic. It is usually employed as a vehicle for the exhibition of the metallic substances (especially chalybeates) in the form of pill.

[" Take of gentian, in moderately coarse powder, twelve troyounces; water, a sufficient quantity. Moisten the gentian with four fluidounces of water, pack it in a conical percolator, and gradually pour water upon it until the infusion passes but slightly impregnated with the properties of the gentian. Boil the liquid to three-fourths of its bulk; then strain, and, by means of a water bath, evaporate to the proper consistence." U.S.]

*Dose.*—Gr. x to gr. xxx. [This dose seems to me too large, at least too large for the American extract. I have known much smaller quantities excite nausea by over stimulating weak stomachs. Gr. ij to vij would seem to be better.—W.]

INFUSUM GENTIANÆ COMPOSITUM [U. S.], *Compound Infusion of Gentian.*—Take of gentian, sliced, a quarter of an ounce; bitter-orange peel, bruised, thirty grains; coriander, thirty grains; proof spirit, two fluidounces; cold distilled water, eight fluidounces. Pour the spirit upon the dry ingredients in a covered vessel, in two hours add the water, and in two hours more strain through calico.

The infusions of the London and Dublin Pharmacopœias were very apt to spoil by keeping; but as an infusion can always be speedily procured, this was not a matter of much importance. However, to obviate this as much as possible, the British Pharmacopœia follows the Edinburgh College, and orders cold water to be used, by which less of the mucilaginous matter, or pectin, is dissolved, and employs spirit to promote the solution of the bitter principle, while the quantity of gentian is twice as great as in the London infusion; so that we have a weak tincture rather than an infusion; coriander seed has also been introduced, and the lemon peel of the London infusion omitted. The time of maceration has been advantageously reduced from fifteen to four hours. This preparation will hardly be considered in England a satisfactory substitute for the favorite, even if perishable, infusion which it has displaced. Infusion of gentian is stomachic and tonic.

[" Take of gentian, in moderately coarse powder, half a troyounce; bitter orange-peel, in moderately coarse powder, coriander, in moderately coarse powder, each, sixty grains; alcohol, two fluidounces; water, a sufficient quantity. Mix the alcohol with fourteen fluidounces of water, and, having moistened the mixed powders with three fluidrachms of the menstruum, pack them firmly in a conical percolator, and gradually pour upon them first the remainder of the menstruum, and afterwards water, until the filtered liquid measures a pint." U. S.]

*Dose.*—Fl. oz. ss to fl. oz. j.

TINCTURA GENTIANÆ COMPOSITA [U. S.], *Compound Tincture of Gentian.*—Take of gentian, bruised, one ounce and a half; bitter-orange peel, cut small and bruised, three-quarters of an ounce; cardamoms, bruised, a quarter of an ounce; proof spirit, one pint. Macerate the gentian and the other ingredients for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.

[" Take of gentian, in moderately fine powder, two troyounces; bitter orange peel, in moderately fine powder, a troyounce; cardamom, in moderately fine powder, half a troyounce; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with a fluidounce and a half of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

This tincture corresponds in its ingredients with the London and Dublin tinctures, but differs widely from the Edinburgh. Percolation is an improvement. The strength is not altered. A grateful cordial tonic and stomachic.

*Dose.*—Fl. drm. ss to fl. drs. ij.

[EXTRACTUM GENTIANÆ FLUIDUM, U. S., *Fluid Extract of Gentian.*—"Take of gentian, in moderately fine powder, sixteen troyounces; diluted alcohol, a sufficient quantity. Moisten the gentian with six fluidounces of diluted alcohol, introduce it into a conical percolator, pressing moderately, and pour upon it diluted alcohol until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation until two pints more of tincture have been obtained. Evaporate this, by means of a water bath, to four fluidounces, mix it with the reserved tincture, and filter through paper." U. S.

This is in reality a concentrated tincture, one fluidounce of which represents a troyounce of the gentian. Dose, gtt. x to f℥ss.—W.]

## [GENTIANA SAPONARIA, *L.*

*Synonym.*—G. Catesbæi, *Walt.*

*Specific Character.*—Leaves ovate-lanceolate, oblong or lanceolate-obovate; lobes of the club shaped, light blue corolla obtuse, erect, or converging, short and broad, but distinct, and more or less longer than the conspicuous, two-cleft and minutely-toothed appendages; seeds acute, narrowly winged.

*Habitat.*—Moist woods; Maryland and southwards.

**Gentiana Catesbæi,** *Blue Gentian.* Secondary List, U. S. P.

The root of Gentiana catesbæi.

The physical and medicinal properties of this root are very similar to those of the Yellow Gentian, for which it may be substituted in a little larger dose.—W.]

## [SABBATIA ANGULARIS, *Purth.*

### American Centaury.

*Generic Character.*—Corolla wheel-shaped, four to five-cleft. Stamens five to twelve, anthers recurved. Style two-parted, slender, deciduous.

*Specific Character.*—Stem somewhat four-winged, angled; leaves ovate, five-nerved, with a somewhat heart-shaped clasping stem.

A handsome plant, very distinctly marked by its peculiar wing-angled, much-branched stem, and its large, deep rose purple flowers ($1\frac{1}{2}$ inches wide), which frequently have a greenish star in the centre. It grows in damp meadows, on river banks, &c., attaining a height of from one to two and a half feet, and flowering from June to September.

*Habitat.*—Canada to South Carolina.

**Sabbatia,** *Sabbatia.* Secondary list, U. S. P.

The herb of Sabbatia angularis.

The herb should be gathered whilst flowering. It has a pure bitter taste, and yields to water and alcohol.

Fig. 124.

*Sabbatia angularis.*

It is a simple bitter tonic without astringency, and may be given with advantage during the convalescence from acute disease. It is best administered in infusion (℥j to Oj of boiling water), a wineglassful before meals.—W.]

## [FRASERA CAROLINENSIS, *Walter*.

### American Colombo.

*Synonym.*—Frasera Walteri, *Michaux*.

*Generic Character.*—Corolla 4-parted, wheel-shaped, spurless. Style persistent; stigma 2-lobed. Filaments awl-shaped; anthers straight, versatile. Pod flat, 4 to 14-seeded.

A tall showy plant, often growing seven or even eight feet high, with a smooth stem, and whorled leaves mostly in fours. The light greenish-yellow flowers are an inch in breadth, and spotted with purple. Each calyx lobe has a large round gland on its middle.

*Habitat.*—Rich dry soil. S. W. New York to Kentucky and southward.

Fig. 125.

*Frasera Carolinensis.*

**Frasera**, *American Colombo.* Secondary List, U. S. P.

The root of Frasera Walteri (*Michaux*).

This is a large fleshy root, which is sliced transversely, or sometimes longitudinally, before drying. It has a bitter somewhat peculiar taste. Its medicinal powers are those of a simple bitter. It may be given in infusion or in form of a tincture.—W.]

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## OPHELIA CHIRATA, *Grisebach*.

Tetrandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Annual.* *Stem* round, tall, smooth, branched. *Branches* elongated, semi-erect. *Leaves* opposite, amplexicaul, cordate-ovate, very acute, entire, smooth, 5–7-ribbed. *Cymes* umbelliform, lax, few-flowered. *Calyx* persistent, 4-parted; segments sublanceolate, acuminate, shorter than the corolla. *Corolla* yellow, twisted in æstivation, rotate, 4-parted, with glandular pits above the base, withering. *Stamens* four, inserted in the throat of the corolla. *Stigmas* two, terminal, short. *Capsule* 2-valved, septicidal, 1-celled. *Seeds* very numerous, small.—*Wallich*, *Plant. Asiat.* vol. iii. plate 252 (*Gentiana Chirata*).

*Habitat.*—Mountains of Nepal and the Morungs.

### Chirata, *Chiretta.*

The entire plant, collected in Northern India, when the fruit begins to form.

*Officinal 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.

*Description.*—The plant is pulled up by the root about the time that the flowers begin to decay, and the capsules are well formed. The dried plant with the root is met with in the shops. The root is fibrous, the stem is round, not jointed, marked with the cicatrices of leaves, and has a yellowish pith; the leaves are as above described. The plant is without odor.

*Composition.*—The *bitter matter* is the most important constituent. No vegetable alkaloid has been detected in it. The substance sold as *sulphate of chirayitine* is sulphate of quinia.

*Physiological Effects.*—Chiretta is an intensely bitter substance. In its operation, as well as by its botanical affinities, it is closely allied to gentian. It appears to possess rather a relaxing than a constipating effect.

*Therapeutics.*—It has long been employed by the natives of India in the same class of cases in which gentian has been used in Europe. As a stomachic it is especially serviceable in the dyspepsia of gouty subjects. It strengthens the stomach, obviates flatulency, and diminishes the tendency to acidity.

*Administration.*—It may be given in *powder* in the dose of twenty grains, or it may be employed in the form of infusion or tincture.

*Officinal Preparations.*

Infusum Chiratæ, *Infusion of Chiretta.*—Take of chiretta, bruised, a quarter of an ounce; distilled water, at 120°, ten fluidounces. Infuse in a covered vessel for half an hour, and strain.

*Dose.*—From fl. oz. j to fl. oz. ij.

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

*Dose.*—F. drm. ss to fl. drs. ij.

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## [AQUIFOLIACEÆ, *De Cand.* The Holly Family.

### ILEX VERTICILLATA.

*Synonym.*—Prinos verticillatus; Black Alder; Winterberry.

*Generic Character.*—Flowers more or less diœciously polygamous, but many of them perfect. Calyx 4 to 6-toothed; petals 4 to 6, separate, or united only at the base, oval or obovate, obtuse, spreading. Stamens 4 to 6. The berry-like drupe containing 4 to 8 little nutlets.

*Specific Character.*—Leaves downy on the veins beneath, deciduous; flowers all very short, peduncled; fruit scarlet.

It grows in wet places throughout the United States.

**Prinos**, *Black Alder.* Secondary List, U. S. P.

The bark of Prinos verticillatus.

This bark is tonic and astringent, and as a local application stimulant. It is used as a wash, or sometimes as poultice, to ill-conditioned ulcers. The decoction is the best preparation for external or internal use; it may be made by boiling three ounces of the bark in a quart of water to a pint. Dose, a wineglassful.—W.]

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## [APOCYNACEÆ, *R. Brown.* The Dog's-bane Family.

## APOCYNUM ANDROSÆMIFOLIUM, *Linn.*

*Spreading Dog's-bane.*

*Generic Character.*—Seeds comose; corolla bell-shaped, appendaged within. Filaments short, broad, and flat; calyx not glandular; leaves opposite.

Fig. 126.

*Apocynum androsæmifolium.*

*Specific Character.*—Branches divergently forking; leaves ovate, distinctly petioled; cymes loose, spreading, mostly longer than the leaves; corolla open-bell shaped with revolute lobes, the tube much longer than the ovate pointed divisions of the calyx.

A perennial herbaceous plant, with opposite mucronate leaves, and very pale rose-colored cymose flowers, one-third of an inch in diameter when open. When wounded, a milky juice exudes freely from it. Its fruit is a pair of linear pendent pods, 3 to 4 inches long, and filled with comose seeds, attached to the central placenta.

It grows in borders of thickets, along fences, &c., and attains the height of five or six feet. It flowers in June and July.

*Habitat.*—Northern United States.

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## APOCYNUM CANNABINUM, *Linn.* *Indian Hemp.*

*Specific Character.*—Stem and branches upright and ascending, terminated by erect and close many-flowered cymes, which are usually shorter than the leaves. Corolla with nearly erect lobes, the tube not longer than the lanceolate divisions of the calyx.

This plant is very similar to the preceding, but has a more upright, less diffuse habit, much smaller, greenish-white flowers, and rarely exceeds three feet in height. It flowers in July and August.

*Habitat.*—With the preceding.

**Apocynum Androsæmifolium,** *Dog's-bane.* Secondary List, U. S. P.

The root of Apocynum androsæmifolium.

This root is very bitter, and is said to contain a bitter extractive and volatile oil.

*Therapeutics.*—Its action on the system seems to be that of a gastro-intestinal stimulant, and in large doses irritant. In doses of thirty grains it is a stimulant emetic. In smaller doses (gr. x to xv) it is said to be useful as a stomachic and laxative in dyspepsia.

Its virtues are said to be impaired by keeping. The recently dried root may be administered in infusion or decoction.

Fig. 127.

*Apocynum cannabinum.*

**Apocynum Cannabinum,**

*Indian Hemp.*

Secondary List, U. S. P.

The root of Apocynum cannabinum.

This root is five or six feet in length, and nearly half an inch in diameter at the larger end, and has a strong peculiar odor and an acrid, persistent, bitter taste. It contains bitter extractive, gallo-tannic acid, resin, a peculiar principle to which the name of apocynin has been given, and various unimportant substances.

*Therapeutics.*—" Indian hemp is powerfully emetic and cathartic, sometimes diuretic, and, like other emetic substances, promotes diaphoresis and expectoration. It produces much nausea, diminishes the frequency of the pulse, and appears to induce drowsiness independently of the exhaustion consequent upon vomiting. The disease in which it has been found most useful is dropsy." U. S. D. In ascites, it sometimes causes the removal of the fluid, through its hydragogue cathartic action.

Dose, as an emetic, gr. xv to xxx. It is best given in decoction [℥j to Oij, boiled to one pint]; or a watery extract may be made, and given in pill form, gr. iii to v, t. d.—W.]

## [EBENACEÆ, *R. Brown.* THE EBONY FAMILY.

### DIOSPYROS VIRGINIANA, *Linn.*

*Generic Character.*—Calyx 4 to 6-lobed. Corolla 4 to 6-lobed, convolute in the bud. Stamens commonly 16 in the sterile, 8 imperfect in the fertile flower. Berry 4 to 8-celled, 4 to 8-seeded, surrounded at the base by the thickish calyx.

*Specific Characters.*—Leaves ovate-oblong, smooth or nearly so. Corolla between bell and urn-shaped. This is a small tree growing from 15 to 20 feet high, in old fields and woods. The flower opens in early summer and is greenish-yellow and leathery.

*Habitat.*—United States.

Fig. 128.

*Diospyros Virginiana.*

**Dyospyros,** *Persimmon.*

Secondary List, U. S. P.

The unripe fruit of Diospyros Virginiana.

This fruit resembles in appearance a small plum, about an inch in diameter. Before frost its taste is excessively astringent. After frost and perfect maturity, it is edible, yellowish, with a very pleasant, sweet pulp. Its active principle is a peculiar tannic acid. It is a pure astringent, and may be used whenever such a remedy is indicated. It is best exhibited in infusion.—W.]

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## LOGANIACEÆ, *DC.* THE STRYCHNOS ORDER.

### STRYCHNOS NUX-VOMICA, *Linn.*

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—Middle-sized *tree; trunk* short, often crooked; the *branches* irregular, without spines or tendrils. *Leaves* opposite, shortly-stalked, ovate, 3–5-ribbed, entire, shining, quite smooth. *Corymbs* terminal. *Calyx* with 5 short teeth. *Corolla* funnel-shaped, greenish-white. *Stamens* 5, inserted into the throat of the corolla; filaments very short; anthers subexserted. *Ovary* superior. *Style* the length of the corolla. *Stigma* capitate. *Fruit* 1-celled, round, smooth, size of a pretty large apple, covered with a smooth, somewhat hard *shell*, of a rich orange color when ripe, filled with a white, soft gelatinous *pulp*. *Seeds* several, immersed in the pulp of the fruit, and attached to a central placenta.—*Steph.* and *Church.* pl. 52.

*Habitat.*—Coromandel, and other parts of India.

## **Nux-vomica,** *Nux-vomica.* [Mat. Med. List, U. S. P.]

The seeds imported from the East Indies.

*Characters.*—Nearly circular and flat, about an inch in diameter, umbilicated and slightly convex on one side, externally of an ash-gray color, thickly covered with short satiny hairs, internally translucent, tough and horny; taste intensely bitter, inodorous.

Fig. 129.

*Strychnos nux-vomica.*

*Description.*—The *seeds* are round, peltate, scarcely an inch in diameter, nearly flat, or very slightly convex on the dorsal surface, and concave on the other or ventral surface, and are usually surrounded by a filiform annular stria. In the centre of the ventral surface of the seed is the orbicular hilum or umbilicus. At one part of their circumference or margin there is a slight prominence, which answers to the chalaza, and to the radicle of the embryo. From this prominence to the umbilicus is a more or less obvious line, forming the raphe. The testa or seed coat is described above. The *nucleus* is composed of two parts, namely, albumen and embryo. The albumen is bipartite, cartilaginous, or horny, of a dirty-white color, of an intensely bitter taste, and has in its interior a cavity. Unlike that of most seeds, the albumen of nux-vomica is of a poisonous nature. The embryo, which is milky-white, is seated in the circumference of the seed, and is furnished with two large heart-shaped, acuminated, triple-ribbed, very thin cotyledons. Powdered nux-vomica has a yellowish-gray color, a bitter taste, and a peculiar odor analogous to that of liquorice.

Fig. 130.


*Nux-vomica.*

*a.* The dorsal surface.
*b.* The ventral or concave surface.
*c.* Prominence indicating the chalaza and radicle.
*d.* Hilum or umbilicus.
*e.* Raphe.

Fig. 131.


*Sections of Nux-vomica.*

*f.* Transverse section of seed, showing the bipartite albumen, the cavity, and the embryo.
*g.* Vertical section, exposing the internal cavity, and showing the situation and figure of the embryo.

*Composition.*—The seeds contain the alkaloids strychnia and brucia, in combination with igasuric or strychnic acid.

*Strychnia.*—See page 560.

*Brucia:* ($C_{46}H_{26}N_2O_8$) when combined with water, is capable of crystallizing, in oblique four-sided prisms; or sometimes the crystals have a pearly laminated appearance, something like boracic acid. Its taste is very bitter, though less than that of strychnia. It is soluble in 850 parts of cold, or 500 parts of boiling water; but the presence of coloring matter, of which it is difficult to deprive it, promotes its solubility. It is very soluble in alcohol, but is insoluble in ether and the fixed oils, and is very slightly soluble in the volatile oils. Nitric acid communicates a fine red color to brucia; and the color changes to violet on the addition of chloride of tin; sulphuretted hydrogen and sulphurous acid destroy the color. Chlorine communicates a red color to brucia. Bromine communicates a violet tint to its alcoholic solution. Sulphuric acid first reddens brucia, and then turns it yellow and green, but does not produce the deep violet color on the addition of bichromate of potash. According to Dr. Fuss, brucia is not a peculiar alkaloid, but a compound of strychnia and resin (yellow coloring matter). He says that he has proved this both analytically and synthetically, and he ascribes the property of brucia to become reddened by nitric acid, and by chlorine, to the resin present. The *salts of brucia* are readily formed by saturating dilute acids with brucia. They are soluble, crystallizable, and have a bitter taste. They are decomposed by potash, soda, ammonia, the alkaline earths, morphia, and strychnia, which precipitate the brucia. They produce precipitates on the addition of tannic acid (*tannate of brucia*). Nitric acid colors them as it does free brucia. The effects of brucia on man and animals appear to be precisely similar to those of strychnia, though larger doses are required to produce them. Magendie considers it to possess only one-twelfth of the activity of strychnia; while Andral regards it as having one-twenty-fourth that of pure strychnia.

*Strychnic* or *Igasuric Acid* is crystallizable, and has an acid, rough taste. It is soluble in water and alcohol. The salts of iron, mercury and silver in solution are unaffected by it; but those of copper are rendered green; and after some time a light green precipitate is deposited.

Powdered nux vomica is blackened by concentrated sulphuric acid. Nitric acid communicates to it a deep orange-yellow color. If the powder be digested with boiling water acidulated with sulphuric acid, the filtered liquor is turbid and slightly yellow. Nitric acid, after some minutes, reddens it. If the sulphuric solution be digested with finely powdered marble (to saturate the excess of acid), then evaporated to dryness, and the residue treated with boiling alcohol, we obtain a spirituous solution of sulphates of strychnia and brucia, with coloring matter. This has a bitter taste, is reddened by nitric acid, and forms a flocculent colored precipitate on the addition of ammonia. Sometimes crystals of strychnia are deposited from the alcoholic liquor on standing for two or three days. Ammoniacal sulphate of copper added to the infusion or decoction of nux-vomica, produces an emerald-green color, and gradually a greenish-white precipitate (*igasurate of copper*); ammoniacal sulphate of strychnia remains in solution. Nitric acid communicates an orange-red color to the decoction, owing to its action on the brucia and yellow coloring matter. Tannic acid, or infusion of galls, produces in the decoction a copious precipitate (*tannates of strychnia*, *brucia*, and *some other vegetable matter*). Subacetate of lead causes an abundant precipitate (*gummate and igasurate of lead, with coloring and fatty matter*).

*Physiological Effects.*—1. *Local effects.* In medicinal doses it does not usually disorder the stomach, nor is it invariably irritant in its operation, even when swallowed as a poison. In some instances, however, the pain and heat in the stomach, the burning in the gullet, and the nausea and vomiting, are evidences of its local action; and in several cases marks of inflammation have been discovered in the stomach on examination of the body after death. Strychnia also is a local irritant. 2. *Effects after absorption of the active principle.*—Three degrees of the operation of nux-vomica may be admitted: *First degree: tonic and diuretic effects.*—In very small and repeated doses, nux-vomica usually promotes the appetite, assists the digestive process, increases the secretion of urine, and renders the excretion of the fluid more frequent. In some cases it acts slightly on the bowels, and occasionally produces a sudorific effect. The pulse is usually unaffected. *Second degree: rigidity and convulsive contraction of the muscles.*—In larger doses the effects of nux vomica manifest themselves by a disordered state of the muscular system. A feeling of weight and weakness in the limbs, and increased sensibility to external impressions of light, sound, touch, and variations of temperature, are usually the precursory symptoms. The limbs tremble, and a slight rigidity or stiffness is experienced when an attempt is made to put the muscles into action. The patient experiences a difficulty in keeping the erect posture, and, in walking, frequently staggers. If the use of the medicine be still persevered in, these effects increase in intensity, and the voluntary muscles are thrown into a convulsed state by very slight causes. Thus, when the patient inspires more deeply than usual, or attempts to walk, or even to turn in bed, a convulsive paroxysm is brought on. The sudden contact of external bodies also acts like an electric shock on him. The further employment of nux-vomica increases the severity of the symptoms. The paroxysms now occur without the agency of any evident exciting cause, and affect him even when lying perfectly quiet and still in bed. The muscular fibres of the pharynx, larynx, œsophagus and bladder also become affected; and Trousseau and Pidoux say those of the penis are likewise influenced, while the sexual feelings are also excited. The pulse does not appear to be uniformly affected; for the most part it is slightly increased in frequency between the convulsive attacks, but Trousseau says he has found it calm even when the dose of the medicine was sufficient to cause general muscular rigidity. Previously to the production of the affection of the muscles, various painful sensations are often experienced in the skin, which patients have compared to the creeping of insects (formication) or to the passage of an electric shock. It is remarkable that in paralysis the effects of nux-vomica are principally observed in the paralyzed parts. *Third degree: tetanus, asphyxia, and death.*—Death is frequently caused by the stoppage of the respiration (asphyxia) in consequence of the spasmodic condition of the respiratory muscles. In other cases death seems to arise from excessive exhaustion of the nervous power. As in other cases where death takes place from obstructed respiration, venous congestion, especially in the lungs, is found after death. Occasionally there is redness or inflammation of the alimentary canal, and now and then softening of the brain or spinal cord.

*Part of the body on which nux-vomica exercises a specific effect.*—Every part of the nervous system is probably specifically affected by nux-vomica, though the principal manifestations of its action are in the cerebro-spinal system. The tetanic symptoms and the absence of narcotism have led to the conclusion that the spinal cord was the part principally affected; a conclusion supported by the fact that the division of this cord—nay, even complete decollation—will not prevent the poisonous effects of nux vomica; whereas the destruction of the cord by the introduction of a piece of whalebone into the spinal canal causes the immediate cessation of the convulsions; and if only part of the cord be destroyed the convulsions cease in that part of the body only which is supplied with nerves from the portion of medulla destroyed. These facts, then, originally observed by Magendie, and which I have myself verified, lead to the conclusion that the abnormal influence, whatever it may be, which causes the convulsions to take place, is not derived from the contents of the cranium, but from the medulla spinalis itself. But nux-vomica affects the sensibility of the body, and heightens the sensations of touch, vision, and hearing. These effects are referable to its action on the cerebrum; though Dr. Stannius considers that this increased susceptibility to external impressions arises from the action of the poison on the spinal cord. Although the intellectual functions are not usually much disordered by this drug, yet the mental anxiety commonly experienced by persons under its use, the occasional appearance of stupor, and the observations of Andral and Lallemand on the injurious effects of it in apoplexies with cerebral softening, leave no doubt that the cerebrum is affected by this agent. Bally has observed an appearance of stupor, vertigo, tinnitus aurium, sleeplessness, and turgescence of the capillaries of the face, result from the use of strychnia. The ganglia also appear to be affected by nux vomica; and hence the influence which this agent exercises over the movements of the intestinal canal and heart.

*Therapeutics.*—The obvious indications for the use of nux vomica or strychnia are torpid or paralytic conditions of the motor or sensitive nerves, or of the muscular fibre; while these agents are contraindicated in spasmodic or convulsive diseases. Experience, however, has fully proved that when paralysis depends on inflammatory conditions of the nervous centres these agents prove injurious, and accelerate organic change.

*In paralysis.*—Of all the diseases for which nux-vomica has been employed, in none has it been so successful as in paralysis; and it is deserving of notice that this is one of the few remedies whose discovery is not the effect of mere chance, since Fouquier was led to its use by legitimate induction from observation of its physiological effects. That a remedy which stimulates so remarkably the muscular system to action should be serviceable when that system no longer receives its accustomed natural stimulus, is, *à priori*, not astonishing. Paralysis, however, is the common effect of various lesions of the nervous centres, in some of which nux-vomica may be injurious, in others useless, and in some beneficial. It is, therefore, necessary to point out under what circumstances this remedy is likely to be advantageous or hurtful. A very frequent and, indeed, the most common cause of paralysis, is hemorrhage of the nervous centres. It is almost superfluous to say that no radical cure of these cases can be effected until the effused blood is removed by absorption. But the effused blood and the ruptured brain may not be the only lesions. The part surrounding the sanguineous clot is usually much softened, and this softening, though it sometimes follows the effusion, more frequently precedes it, and is generally the result of acute or chronic inflammation or irritation. In these cases, especially while the clot is recent and itself acting as a source of irritation, experience confirms our theoretical anticipations that nux vomica can only do harm, and increase the evil it is intended to mitigate. But there are cases in which paralysis, arising from cerebral hemorrhage, may be advantageously treated by nux vomica. After a time, the effused blood gradually disappears. Now, it is well known that by long disuse of some of the voluntary muscles the power over them becomes gradually diminished; and it appears that occasionally in cerebral hemorrhage, after the absorption of the effused blood, the paralysis remains, as it were by habit. In these cases the cautious employment of nux-vomica, or of its active principle, may be attended with beneficial results, by favoring the return both of motion and sensation. But paralysis, like some other diseases of the nervous system, may exist without our being able to discover after death any lesion of the nervous centres; and it is then denominated a functional disorder, as if there were actually no organic lesion. To me, however, the fact of the lesion of action is a strong ground for suspecting that there must have been an organic lesion of some kind, though we see nothing. "It is highly probable," says Andral, "that some organic lesions do exist in such cases, although they escape our notice." Be this as it may, experience has fully established the fact that nux-vomica is more beneficial in those forms of paralysis usually unaccompanied by visible lesions of structure; such, for example, as paralysis resulting from exposure to the influence of lead and its various compounds. Thus, of ten cases of saturnine hemiplegia, treated by nux-vomica or its active principles, and which are mentioned by Bayle, three were cured, and three ameliorated. As hemiplegia more frequently depends on cerebral hemorrhage than some other forms of paralysis, so it is, for the most part, less amenable to remedial means. Thus, while out of twenty-six cases of paraplegia nineteen were cured by nux-vomica or its active constituents, yet in thirty instances of hemiplegia only thirteen were cured. In six cases of general paralysis (that is, paralysis of both sides at once) four were cured by this remedy. In the paralysis which sometimes affects the muscles of certain organs, nux vomica (or strychnia) has been employed with advantage. Thus a case of amaurosis, accompanied with paralysis of the eyelid, is said to have been cured by it; and several cases of incontinence of urine, depending on paralysis or diminished power of the muscular fibres of the bladder, have also been benefited by the same means. In some cases of local paralysis strychnia has been employed endermically with benefit.

*In paralysis of the sentient nerves.*—The good effects procured from the use of nux-vomica in paralysis of the motor nerves, have led to its employment in functional lesions of sentient nerves, characterized by torpor, inactivity, and paralysis. That benefit may be obtained in these cases is physiologically probable, from the circumstance that one of the effects of this agent is an exaltation of the susceptibility to external impressions as I have before mentioned. Hitherto, however, the trials have not been numerous, nor remarkably successful. In amaurosis benefit has been obtained in some few instances; and where no organic lesion is appreciable, this remedy deserves a trial. The endermic method of using it has been preferred. Small blisters, covered with powdered strychnia, have been applied to the temples and eyebrows. The remedy causes sparks to be perceived in both eyes, especially the affected one; and it is said, the more of these, the better should be the prognosis: moreover, the red-colored sparks are thought more favorable than sparks of other colors. When the malady is complicated with disease of the brain, the remedy must be employed with extreme caution.

*In other affections of the nervous system.*—I have seen nux-vomica very serviceable in shaking or *tremor of the muscles* produced by habitual intoxication. A gentleman thus affected, who had for several weeks lost the power of writing, re-acquired it under the use of this medicine. *Chorea* has been benefited by it. It has also been used in *neuralgia* with good effect.

*In affections of the alimentary canal.*—On account of its intense bitterness, nux-vomica has been resorted to as a tonic and stomachic in dyspepsia, especially when this affection depends on, or is connected with, an atonic condition of the muscular coat of the stomach. In pyrosis, arising from simple functional disorders of the stomach, even when symptomatic of organic disease of the stomach, it has been found very useful. In febrile states of the system its use is contraindicated. In dysentery, particularly when of an epidemic nature, nux-vomica has gained some reputation, from the experience of several practitioners. In *colica pictonum*, a combination of strychnia and hydrochlorate of morphia has been found highly successful. In *prolapsus of the rectum* Dr. Schwartz has recommended the use of this remedy, which he has employed for ten years, both in adults and children, with great benefit (in consequence of its stimulant action on the sphincter ani). One or two grains of the alcoholic extract are to be dissolved in two drachms of water; and of this solution he gives to infants at the breast two or three drops; to older children, from six to ten or fifteen drops, according to their age. [I have found the addition of extract of nux-vomica or of strychnia to purgatives, as aloes or compound extract of colocynth, greatly to assist their action in habitual constipation arising from a distended and atonic state of the bowels.—Ed.]

*In impotence.*—The excitement of the sexual feelings which Trousseau has seen produced by nux-vomica, led him to employ this remedy against impotence, and he has found it successful both in males and females. In some cases, however, its good effects were observed only while the patients were taking the medicine.

*Administration.*—Nux-vomica is used in the form of powder, tincture, or extract. The powder of nux-vomica is administered in doses of two or three grains gradually increased. Fouquier has sometimes increased the quantity to fifty grains.

*Officinal Preparation.*

Extractum Nucis Vomicæ, *Extract of Nux-Vomica.*—Take of nux-vomica, one pound; rectified spirit, a sufficiency. Apply steam to the nux-vomica until it is thoroughly softened, then dry rapidly, and reduce to fine powder. Exhaust the powder by boiling it with successive portions of the spirit, until the latter comes off nearly free from bitterness. Strain, distil off the spirit, and evaporate by a water bath to a proper consistence.

In the preparation of this alcoholic extract, the Edinburgh process is followed, and the softened and subsequently dried seed is directed to be reduced to powder, and boiled (not macerated, *Lond.*) in the spirit.

*Dose.*—Half a grain, gradually increased to two or three grains. The extract is given in the form of pill.

Tinctura Nucis Vomicæ [U. S.], *Tincture of Nux-Vomica.*—Take of nux-vomica, two ounces; rectified spirit, one pint. Apply steam to the nux-vomica until it is thoroughly softened, then dry rapidly, and reduce it to fine powder. Macerate the powder for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint.

["Take of nux-vomica, in fine powder, eight troyounces; alcohol, a sufficient quantity. Mix the powder with a pint of alcohol, and digest for twenty-four hours, in a close vessel, with a gentle heat; then transfer the mixture to a cylindrical percolator, and gradually pour alcohol upon it until two pints of tincture are obtained." U. S.]

It is sometimes used as an embrocation to paralyzed parts, and its good effects in this way seem to be increased by combining it with ammonia.

*Dose.*—Min. x to min. xx.

[Extractum Nucis Vomicæ Alcoholicum, *Alcoholic Extract of Nux-Vomica* (Extractum Nucis Vomicæ, *Pharm.* 1850.)—"Take of nux-vomica, in fine powder, twelve troyounces; alcohol a sufficient quantity. Mix the nux-vomica with four fluidounces of alcohol, and allow the mixture to stand for an hour. Then introduce it into a cylindrical percolator, and gradually pour alcohol upon it until the tincture passes without bitterness. Distil off the alcohol, by means of a water-bath, until the tincture is reduced to half a pint, and evaporate this to the proper consistence." U. S.

*Dose.*—Gr. $\frac{1}{4}$—gr. $\frac{1}{2}$.—W.]

### **Strychnia** [U. S.], *Strychnia.* $C_{42}H_{22}N_2O_4$.

An alkaloid obtained from nux-vomica.

*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 convenient vessel; chop or slice it; dry it by the vapor bath or hot-air chamber, and immediately grind it in a coffee mill. Digest the powder at a gentle heat for twelve hours with two pints of the spirit and one of the water, strain through linen, express strongly and repeat the process twice. Distil off the spirit from the mixed fluid, evaporate the watery residue to about sixteen ounces, and filter when cold. Add now the acetate of lead, previously dissolved in distilled water, so long as it occasions any precipitate; filter; wash the precipitate with ten ounces of cold water, adding the washings to the filtrate; evaporate the clear fluid to eight ounces, and when it has cooled add the ammonia in slight excess, stirring thoroughly. Let the mixture stand at the ordinary temperature for twelve hours; collect the precipitate on a filter, wash it once with a few ounces of cold distilled water, dry it on the vapor bath, and boil it with successive portions of rectified spirit, till the fluid scarcely tastes bitter. Distil off most of the spirit; evaporate the residue to the bulk of about half an ounce, and set it aside to cool. Cautiously pour off the yellowish mother-liquor (which contains the brucia of the seeds) from the white crust of strychnia which adheres to the vessel. Throw the crust on a paper filter, wash it with a mixture of two parts of rectified spirit and one of the water, till the washings cease to become red on the addition of nitric acid; finally, dissolve it by boiling it with an ounce of rectified spirit, and set it aside to crystallize. More crystals may be obtained by evaporating the mother-liquor.

Strychnia, as before stated, exists in the nux-vomica associated with brucia, in combination with igasuric acid. These are dissolved out by dilute spirit, and the spirit having been removed by distillation, solution of acetate of lead is added to the watery residue. This forms acetates of the alkaloids, and precipitates the igasuric acid together with resin, &c., which are separated by filtration. To the extract obtained by evaporating the filtrate, ammonia is added in slight excess to precipitate the alkaloids. These are collected, slightly washed, dried, and then re-dissolved in spirit, and the solution evaporated to half an ounce by measure. The strychnia separates as a crystalline crust, leaving the greater part of the brucia in solution. This is decanted off, and the strychnia is then washed with dilute alcohol, to remove the adhering brucia, and is lastly dissolved in rectified spirit and crystallized.

["Take of nux-vomica, rasped, forty-eight troyounces; lime, in fine powder, six troyounces; muriatic acid, three troyounces and a half; alcohol, diluted alcohol, diluted sulphuric acid, water of ammonia, purified animal charcoal, water, each, a sufficient quantity. Macerate the nux-vomica, for twenty-four hours, in sixteen pints of water, acidulated with one-third of the muriatic acid; then boil for two hours, and strain with expression through a strong muslin bag. Boil the residue twice successively in the same quantity of acidulated water, each time straining as before. Mix the decoctions, and evaporate to the consistence of thin syrup; then add the lime previously mixed with a pint of water, and boil for ten minutes, frequently stirring. Pour the whole into a double muslin bag, and, having thoroughly washed the precipitate, press, dry, and powder it. Treat the powder repeatedly with diluted alcohol, in order to remove the brucia, until the washings are but faintly reddened by nitric acid. Then boil it repeatedly with alcohol until deprived of bitterness, mix the several tinctures, and distil off the alcohol by means of a water-bath. Having washed the residue, mix it with a pint of water, and, applying a gentle heat, drop in sufficient diluted sulphuric acid to neutralize and dissolve the alkaloid. Then add purified animal charcoal, and, having boiled the mixture for a few minutes, filter, evaporate, and set aside to crystallize. Dissolve the crystals in water, and add sufficient water of ammonia to precipitate the strychnia. Lastly, dry this on bibulous paper, and keep it in a well-stopped bottle." U. S. In the first step of this process the dilute muriatic acid decomposes the igasurates of strychnia and brucia in the nux-vomica, forming instead, soluble hydrochlorates. The resin of the seed is not taken up since it is insoluble in water. The lime which is afterwards added decomposes these hydrochlorates, and a precipitate is obtained, which consists of the alkaloids mixed with the excess of lime and other impurities. The subsequent steps of the process have for their object the purifying of the alkaloid strychnia, and explain themselves. "Strychnia, thus prepared, is a white or grayish-white powder, of an intensely bitter taste, nearly insoluble in water, slightly soluble in cold alcohol, and readily soluble in boiling alcohol. When heated it melts, and by a strong heat is wholly dissipated." U. S. P.]

*Officinal Characters.*—In right square octahedrons or prisms, colorless and inodorous, sparingly soluble in water, but communicating to it its intensely bitter taste, soluble in boiling rectified spirit, in ether, and in chloroform. Pure sulphuric acid forms with it a colorless solution, which on the addition of bichromate of potash (black oxide of manganese, or ferridcyanide of potassium) acquires an intensely violet hue, speedily passing through red to yellow. A very active poison.

*Description.*—Pure strychnia, when rapidly crystallized, assumes the granular form. It is soluble in 6667 parts of water, at 50°; that is, one grain needs more than fifteen ounces of water to hold it in solution. It requires 2500 parts of boiling water to dissolve it, and it renders 40,000 parts of water sensibly bitter. Alcohol and pure ether dissolve it with difficulty. It acts on vegetable colors as an alkali, saturates acids forming salts, and separates most of the metallic oxides (the alkaline substances excepted) from their combinations with acids. In some cases part only of the metal is precipitated, a double salt being formed in solution. Thus, when strychnia is boiled with a solution of sulphate of copper, a green solution of cupreous sulphate of strychnia is obtained, while a portion only of the oxide of copper is precipitated. A solution of chloride of mercury added to a solution of strychnia in hydrochloric acid, causes a white clotty precipitate composed of chloride of mercury and hydrochlorate of strychnia. Tannic acid or tincture of galls occasions a whitish precipitate in a neutral solution of hydrochlorate of strychnia.

*Tests.*—Not colored by nitric or sulphuric acid; leaves no ash when burned with free access of air.

Commercial strychnia usually forms with strong nitric acid a red-colored liquid, which afterwards becomes yellow. This change does not occur with pure strychnia, but depends on the presence of one or both of two substances—viz., brucia and yellow coloring matter. As the red color is destroyed by deoxidizing agents (sulphurous acid and sulphuretted hydrogen), it appears to depend on the oxidizement of the substances referred to.

The *salts of strychnia*, when pure, are for the most part crystalline, white, and very bitter. They possess the following chemical characteristics: 1st, their solutions yield white precipitates with the alkalies and their carbonates; 2dly, they are precipitated by tannic, but not by gallic acid; 3dly, they are unchanged by the action of the persalts of iron.

*Physiological Effects.*—The effects of strychnia are of the same kind as those of nux vomica, but more violent in degree. As ordinarily met with in the shops, it may be regarded as about six times as active as the alcoholic extract of nux vomica. The salts of strychnia act in the same manner. Some individuals are more susceptible of the action of strychnia than others. Andral has seen a single pill, containing one-twelfth of a grain, cause slight trismus, and the commencement of tetanic stiffness of the muscles [I have seen this effect produced in a boy aged twelve, by one-*hundredth* of a grain taken three times a day, and on several occasions in adults by the continued use of one-sixteenth.—Ed.]; while in other cases the dose may be gradually increased beyond a grain, with comparatively little effect. The largest dose I have given is a grain and a half, and this was repeated several times before the usual symptoms indicative of the affection of the system came on. Smaller doses had been previously given without any obvious effect. Subsequent experience has satisfied me that so large a dose is dangerous. The dose here mentioned destroyed the life of a healthy young woman in an hour and a half (*Lancet*, Aug. 31, 1850, p. 259). Dr. Warner, U. S., died from the effects of *half a grain* of sulphate of strychnia in fourteen minutes. Several cases of poisoning by strychnia will be found reported in the *Medical Times and Gazette* for December 16, 1854, and April 28, 1855. In one of these a person recovered after taking a dose of four grains. A Swede on board the Dreadnought Hospital Ship, suffering from paralysis, took one-eighth of a grain of strychnia three times a day for several weeks, without apparent effect; but the dose having been increased first to one-third and afterwards to half a grain, died rather suddenly with the whole body (trunk and limbs) in a state of tetanic spasm. This case gives some color to the idea that strychnia, like digitalis and some other potent remedies, accumulates in the system. Dr. A. Fleming says that the cumulative action only occurs when the medicine is given in the form of pill, and in consequence of its slow solution accumulates in the bowels. It is never observed when strychnia is given in solution. The *local* action of strychnia is that of an irritant. Applied to the naked derm, it causes burning and pungent pain, lasting from half an hour to an hour; and where blisters have been applied, the raw surface inflames under the use of the remedy, and affords a copious suppuration.

*Therapeutics.*—The uses of strychnia are similar to those of nux vomica above stated. *In cholera.*—M. Abeille has employed this medicine in cholera, and states that it modifies advantageously and rapidly the phenomena of cholera, by its influence upon the sensitive nerves. In the algide state it excited reaction 19 times in 23 cases, and there were 10 recoveries. Ice should be taken after each dose, to prevent vomiting; if this take place, the dose may be repeated with safety. *In incontinence of urine.*—A man suffered from incontinence of urine for five months, in consequence of paralysis of the neck of the bladder, brought on by being disturbed in micturition. The urine passed from him in drops. After the fruitless administration of strychnine internally, a solution was injected into the bladder (0.50 centigramme of strychnine to 500 centigrammes of water). The patient is stated to have recovered in thirteen days. Dr. Girard, of the Asylum at Auxerre, has applied minute quantities of sulphate of strychnia locally to the surface of the rectum in involuntary evacuation of the feces. [I have found the application of the hydrochlorate to the anus useful in restraining the involuntary evacuations of paraplegia.—Ed.] M. Duchassay has employed this salt in the prolapsus ani of children. He removed a small portion of cuticle, applied one-eighteenth of a grain of the sulphate to the surface, and thereby stimulated the sphincter muscle.

*Administration.*—The *dose* of strychnia or of its hydrochlorate is, at the commencement, one-sixteenth or one-twentieth of a grain, which is to be very gradually increased until its effects on the muscular system are observed. Strychnia is usually given in the form of pill made with conserve of roses, or it may be dissolved in alcohol or dilute hydrochloric acid, as in solution of strychnia. The *endermic* dose of strychnia should not, at the commencement, exceed half a grain; and of its salts, one-fourth of a grain.

*Antidote.*—Evacuate the contents of the stomach as speedily as possible. No chemical antidotes are known. Probably astringents (as infusion of galls, or strong green tea freely administered) would be serviceable. To relieve the spasms, narcotics may be employed. Chloroform vapor has been successfully used for this purpose. As conia is the counterpart of strychnia, it deserves a trial. I applied it to a wound in a rabbit affected with tetanus from the use of strychnia; the convulsions ceased, but the animal died. In the absence of conia, the extract of hemlock should be employed. In the *British Medical Journal* of January 28, 1860, and in the *American Journal*, July 28, 1862, will be found some experiments on dogs poisoned by strychnia, the effects of which were counteracted and removed by the use of nicotia or tobacco. This antagonism is said to be not a chemical but a physiological one, strychnia powerfully contracting the muscles, and nicotia powerfully relaxing them. The antidotal property of nicotia was first suggested by the Rev. Samuel Haughton, F.R.S., in 1856; and the *Medical Times* of June 12, 1858, records the case of a man poisoned by six grains of strychnia, who, after vomiting, was saved by the rapid administration, in half-ounce doses, of an infusion of *an ounce and a quarter* of tobacco leaf. These statements accord with the observations of Mr. Curling, who considers tobacco the most efficacious remedy we possess in ordinary tetanus; but the experiment of Orfila should not be forgotten, that twelve drops of nicotia given to a middle-sized dog produced convulsions, rapidly followed by tetanus, opisthotonos, and death.

*Officinal Preparation.*

Liquor Strychniæ, *Solution of Strychnia.*—Take of strychnia, in crystals, four grains; dilute hydrochloric acid, six minims; rectified spirit, two fluidrachms; distilled water, six fluidrachms. 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.

[**Strychniæ Sulphas,** U. S., *Sulphate of Strychnia.*

"Take of strychnia, a troyounce; diluted sulphuric acid, nine fluidrachms, or a sufficient quantity; distilled water, a pint. Mix the strychnia with the distilled water, heat the mixture gently, and gradually add diluted sulphuric acid until the alkaloid is neutralized and dissolved. Filter the solution, and evaporate with a moderate heat, so that crystals may form on cooling. Lastly, having drained the crystals, dry them rapidly on bibulous paper, and keep them in a well-stopped bottle." U.S.

*Officinal Characters.*—A white salt, in colorless, prismatic crystals, which are without odor, exceedingly bitter, readily soluble in water, sparingly soluble in alcohol, and insoluble in ether. They effloresce on exposure to the air, and melt when heated, losing nearly fourteen per cent. of their weight of water of crystallization. By a strong heat they are wholly volatilized. In other respects they answer to the tests for strychnia.

*Therapeutics.*—The physiological, toxical, and therapeutic powers of this salt are precisely those of strychnia, for which it may be substituted in the same dose, and to which it is preferred by some, owing to its greater solubility in water.

*Administration.*—If given in pill, it should first be dissolved in a little water, and the pill mass be moistened with this, so as equally to diffuse the alkaloid salt. The solution in water is, however, generally a better mode of exhibiting it.

*Dose.*—Gr. $\frac{1}{20}$.—W.]

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## [IGNATIA AMARA.

*Description.*—A tree with long cylindrical, glabrous branches, with opposite, almost sessile, ovate, acuminate, entire leaves. The flowers are white, odorous, tubular, in axillary clusters. The fruit is about the size of an apple, ovoid and smooth, its rind dry, brittle, woody; the seeds, about twenty in number, are immersed in a soft pulp. The ovary is ovoid. The embryo is straight, in the axis of cartilaginous albumen. (*Griff. Med. Bot.*)

*Habitat.*—Philippine Islands.

**Ignatia.** Mat. Med. List, U. S. P.

The seeds of Strychnos ignatia, *Lind.*

The seeds, the *St. Ignatius's beans* of the shops, are about the size of olives, rounded and convex on one side, and somewhat angular on the other. Externally they are brownish, with a bluish-gray tint. Within the envelopes of the seed is a very hard, horny, or cartilaginous albumen, in whose cavity is contained the embryo. These seeds are without odor, but have an exceedingly bitter taste. They contain strychnia and brucia combined with igasuric acid. Owing to the large proportion of strychnia which they contain, they are very commonly used in the preparation of that alkaloid.

*Therapeutics.*—The action of ignatia on the system very closely resembles, if it be not identical with, that of nux vomica and strychnia. The extract has been especially recommended in atonic states of the alimentary canal.

Extractum Ignatiæ Alcoholicum, U. S., *Alcoholic Extract of Ignatia.*—"Take of ignatia, in fine powder, twelve troyounces; alcohol, a sufficient quantity. Mix the ignatia with four fluidounces of alcohol, and allow the mixture to stand for an hour. Then introduce it into a cylindrical percolator, press it firmly, and gradually pour alcohol upon it until three pints of tincture have slowly passed. Distil off the alcohol, by means of a water-bath, until the tincture is reduced to half a pint, and evaporate this to the proper consistence." U. S. *Dose*, $\frac{1}{4}$–$\frac{1}{2}$ gr. in pill.—W.]

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## ASCLEPIADACEÆ, *Lindley.* The Milkweed Order.

### HEMIDESMUS INDICUS, *DC.*

A twining glabrous *shrub. Leaves* opposite, varying from cordate-ovate to narrow-linear, usually oblong lanceolate, acute, entire, shining above. *Flowers* in cymes, small. *Calyx* 5-cleft. *Corolla* hypogynous, 5-lobed, rotate; throat furnished with 5 scales, alternate with the lobes. *Stamens* 5, inserted in the tube; *filaments* connected at the base, distinct at top; *anthers* cohering over the stigma, but unconnected with it. *Pollen-masses* 4 in each anther, adhering after dehiscence to the 5 processes of the stigma. *Ovaries* 2; *styles* 2; *stigma* common to both styles, flat, peltate, 5-cornered, with cartilaginous processes at the angles. *Follicles* 2, cylindrical, slender, divaricate, straight. *Seeds* comose.—*Wight, Icon. Plant. Ind. Orient.*, vol. iv. Plate 1320.

*Habitat.*—India.

### Hemidesmus, *Hemidesmus.*

The root dried; imported from India.

*Officinal Characters.*—Yellowish-brown, cylindrical, tortuous, furrowed, and with annular cracks, having a fragrant odor, and a very agreeable flavor.

*Description.*—The root is brownish externally, and has a peculiar aromatic odor, somewhat like that of sassafras or new hay, and a feeble bitter taste. It is long, rugous, furrowed longitudinally, and has its cortex divided, by transverse fissures, into moniliform rings. The cortical portion has a corky consistence, and surrounds a woody cordlike centre.

*Use.*—Employed on account of its agreeable flavor.

*Officinal Preparation.*

Syrupus Hemidesmi, *Syrup of Hemidesmus.*—Take of hemidesmus, bruised, four ounces; refined sugar, twenty-eight ounces; boiling distilled water, one pint. Infuse the hemidesmus in the water, in a covered vessel, for four hours, and strain. Set it by till the sediment subsides; then decant the clear liquor, add the sugar, and dissolve by means of a gentle heat. The product should weigh two pounds ten ounces, and should have the specific gravity 1.335.

*Dose.*—One or two fluidrachms as a flavoring syrup.

## [ASCLEPIAS TUBEROSA, *Linn.* Butterfly Weed.

*Generic Character.—Filaments* monadelphous. *Pollen-masses* 10, waxy, fixed to the stigma by pairs, pendulous and vertical. *Calyx* and *corolla* reflexed deeply, 5-parted, crown of 5-hooded fleshy bodies (nectaries, *L.*), with an incurved horn rising from the cavity of each.

*Specific Character.—Leaves* alternate, scattered, or the lowest opposite. *Pods* hoary.

The stem of this plant is erect, hairy, with spreading branches; leaves oblong-lanceolate, sessile, alternate, somewhat crowded; umbels numerous, forming terminate corymbs (Beck); flowers orange-yellow. This plant is found in all parts of the United States.

### **Asclepias,** *Pleurisy Root.* Secondary List, U. S. P.

The portion used in medicine is the root. It is large, and formed of irregular tubers or fusiform branches; externally of a yellow-brown color, internally white. When recent, it has a somewhat acrid, nauseous taste; in the dried state the taste is bitter, but not unpleasant. The powder is dirty white. It yields its properties to boiling water.

The effects of this root upon the system are those of a diaphoretic and expectorant; it does not produce, however, any stimulating action. In larger doses, especially if recent, it acts upon the bowels. With a view to the effects mentioned, it is employed at the commencement of pulmonary affections; and sometimes by its use in combination with antiphlogistics an attack may be cut short. In rheumatism it has also proved serviceable. Dr. Chapman (*Elem. of Therap.* vol. i. p. 351) speaks of its certainty and permanency of operation. Dr. Eberle employed it in dysentery. The dose of the powder is ℈j to ʒj. The form of administration best adapted to produce perspiration is decoction, made by boiling ℥j in a quart of water, and administering f℥ij every two hours. —W.]

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## OLEACEÆ, *Lindley.* The Olive Order.

## OLEA EUROPÆA, *Linn.*

### **The European Olive.** Diandria, Monogynia, *Linn. Syst.*

A small *tree*, about twenty feet in height, of dull aspect. *Leaves* opposite, oblong or lanceolate, entire, smooth, green above, hoary beneath. *Flowers* in axillary racemes, small, white. *Calyx* short, campanulate, 4-toothed. *Corolla* with a short tube, and a 4-parted plane spreading limb. *Stamens* 2. *Ovary* 2-celled. *Style* short. *Stigma* bifid. *Drupe* dark bluish-green, with oily flesh, and an osseous kernel; usually 1-seeded.—*Steph. and Church.* pl. 15. *Woodv.* pl. 136, page 369.

*Habitat.*—Native of Asia, naturalized and extensively cultivated. in the South of Europe and North of Africa.

### **Oleum Olivæ,** *Olive Oil.* [Mat. Med. List, U. S. P.]

The oil expressed from the fruit in the South of Europe.

*Officinal Characters.*—Pale yellow, with scarcely any odor, and a bland oleaginous taste; congeals partially at about 36°.

*Description.*—Olive oil (*sweet oil*) is an unctuous fluid, whose specific gravity varies from .9158 to .9176 at 59° F., the lightest being the best. It is soluble in about $1\frac{1}{2}$ times its weight of ether; but is only very slightly soluble in alcohol. Pure olive oil has less tendency to become rancid by exposure to the air than most other fixed oils, but the second qualities readily acquire rancidity. This seems to depend on the presence of some foreign matter. *Provence oil*, the produce of Aix, is the most esteemed. *Florence oil* is a very fine kind of olive oil, imported from Leghorn in flasks surrounded by a kind of network formed by the leaves of a monocotyledonous plant, and packed in half-chests. It is used at the table, under the name of *salad oil*. *Lucca oil* is imported in jars holding fifteen gallons each. *Genoa oil* is another fine kind. *Gallipoli oil* forms the largest portion of the olive oil brought to England; it is imported in casks. Apulia and Calabria are the provinces of Naples most celebrated for its production: the Apulian is the best. *Sicily oil* is of inferior quality; it is principally produced at Milazzo. *Spanish oil* is the worst.

Fig. 132.


*Olea europæa.*
3, Fruit.

*Adulteration.*—Olive oil is liable to adulteration with some of the cheaper fixed oils; as with poppy oil, lard oil, &c. Olive oil is completely solidified when cooled by ice; poppy oil, however, remains in part liquid. Even two parts of olive oil to one of poppy oil will not completely congeal.

*Composition.*—When olive oil is cooled to about 21°, a portion of it congeals. This is called *margarine*. The part which remains fluid at this temperature is *oleine* or *elaine*. *Oleine* is colorless, inodorous, and tasteless, insoluble in water, but soluble in cold alcohol and in ether. It is a compound of *oleic acid* with a sweet principle *glycerine*. *Oleic acid* ($HO,C_{36}H_{33}O_3$) is a colorless fluid, which reddens litmus and concretes at about 50°, is very soluble in alcohol, cold ether, and solution of potash, is insoluble in water, and combines with metallic oxides forming oleates. The oleate of lead is soluble in ether. *Margarine* is obtained from the congealed oil by pressing out the oleine and dissolving the residue in boiling alcohol, from which when cold the margarine separates in pearly crystals. Margarine is a compound of *margaric acid* with *glycerine*. *Margaric acid* ($HO,C_{34}H_{33}O_3$) is a white crystalline solid of a pearly lustre, without odor or taste, reddens litmus, fuses at 140°, and is carried over in distillation by superheated steam. It is soluble in alcohol, ether, and solution of potash, insoluble in water. Unites with bases forming margarates. The margarate of lead is not soluble in ether, which is therefore used for separating these acids in the lead plaster. Margaric acid is by some considered to be a mixture of stearic and palmitic acids.

*Physiological Effects.*—Swallowed in large doses, olive oil acts as a laxative, in general, without occasioning pain.

*Therapeutics.*—Medicinally it is not often administered by the mouth. As a *mild laxative* it may be used in irritation, inflammation, or spasm of the alimentary canal, or of the urino-genital organs. As an *antidote*, it has been used in mineral, animal, and vegetable poisoning; but its operation appears to be entirely mechanical. It envelopes the poison, sheathes the living surface, and mechanically obstructs absorption. At one time it was supposed to possess antidotal properties for arsenical poisons; and Dr. Paris tells us that the antidote on which the men employed in the copper-smelting works and tin burning-houses in Cornwall rely with confidence, "whenever they are infested with more than an ordinary portion of arsenical vapor, is sweet oil; and an annual sum is allowed by the proprietors, in order that it may be constantly supplied." There is no just ground for supposing that oil, applied externally or taken internally, has any particular influence in counteracting the operation or relieving the effects of the poison of venomous serpents, notwithstanding the high encomiums that have been passed on it, except the mechanical action mentioned above. [The obstruction, however, which it causes to the absorption of the poison is often very serviceable, and is sometimes sufficient to prevent any bad effects from following. I have often applied oil to the recent sting of a wasp or bee, even after the pain had extended from the wounded finger to the entire arm, and have always found the pain cease after a few minutes. It has sometimes returned in a day or two immediately after washing the hands, until oil was again applied to the wound.—Ed.] Olive oil is a frequent constituent of *laxative enemata*, especially in dysentery, or irritation of the bowels or of the neighboring viscera. *Externally* smeared over the body, it has been recommended by Berchtold and others as a safeguard against the plague. It can be beneficial only by mechanically impeding absorption. It may be employed also to relax the skin and sheathe irritable surfaces. Frictions of olive oil have been employed in ascites and anasarca.

*Pharmaceutic and Surgical Uses.*—Olive oil is a constituent of enema of sulphate of magnesia; it is employed in the preparation of liniments, ointments, plasters, and linseed poultice. It serves for making both hard and soft soap, and is one source of glycerine. In *surgery*, it is used for smearing surgical instruments, as bougies.

*Administration.*—The dose of olive oil, as a laxative, is from fl. oz. j to fl. oz. ij.

## **Glycerinum,** *Glycerine.* $C_6H_8O_6$.

## [**Glycerina,** Mat. Med. List, U. S. P.]

A sweet principle, obtained from fats and fixed oils.

*Preparation.*—Glycerine, from γλυκὺς, sweet, is liberated whenever fixed oils or fat are boiled with metallic oxides and water, as in the making of soaps and lead plaster; the glycerine, in union with the water, separates, and may be purified from the saline matters or oxide of lead, and concentrated by evaporation. But a far better mode of preparation consists in decomposing the fatty bodies by superheated steam alone, as is practised in the manufacture of stearic acid candles, in which process the glycerine passes over in distillation with the fat acids, from which it is easily separated. It is quite free from color and any impurity, and only requires to be concentrated by evaporation.

*Officinal Characters.*—A colorless thick fluid, oily to the touch, without odor, of a sweet taste; freely soluble in water or in alcohol. When decomposed by heat it evolves intensely irritating vapors (*acrolein.*)

*Description.*—Glycerine is a neutral, uncrystallizable fluid, of a treacly consistence. It is nearly insoluble in ether, does not dry by exposure to the air, and does not undergo alcoholic fermentation. It dissolves lime, oxide of lead, and other bases, and also gallic and tannic acids.

*Test.*—Sp. gr. 1.26 (1.25?).

It is not carbonized in the cold by sulphuric acid, as is the case with sucrose, and is not affected when heated with solution of potash as glucose; nor does the copper test produce any effect upon it.

*Therapeutics.*—Glycerine is a useful addition to lotions, which it preserves in a moist state. When heated with starch (from 30 to 80 grs. to 1 fl. oz.), it forms a "plasma," which may be employed as an ointment, or as a material for the formation of ointments. Glycerine diluted with water is frequently applied to chapped hands.

## FRAXINUS, *Linn.*

Diandria, Monogynia, *Linn. Syst.*

*Generic Character.*—*Flowers* polygamous or diœcious. *Calyx* four-cleft or none. *Petals* either none or four, usually in pairs, cohering at the base, oblong or linear. *Stamens* two. *Stigma* bifid. *Fruit* (samara) two-celled, compressed, winged at the apex, with two ovules in each cell, or by abortion one-seeded.

## FRAXINUS ORNUS, *Linn.*

### European Flowering or Manna Ash.

*Specific Character.*—A small *tree* 20–25 feet high. *Leaves* opposite, large, impari-pinnate; *leaflets* 7–9 large, sub-petiolate, lanceolate, serrated at the apex, entire at the base, bearded beneath near the nerve. *Panicles* large and many-flowered, crowded, shorter than the leaf. *Flowers* small and polygamous. *Calyx* four-cleft. *Corolla* yellowish or greenish-white. *Fruit* narrow, linear-lanceolate, obtuse.—*Steph. and Church.* Plate 53.

*Habitat.*—South of Europe, in mountainous situations, especially Calabria and Sicily. De Candolle says that it rarely produces manna in Calabria.

## FRAXINUS ROTUNDIFOLIA, *Lamarck.*

### Round-leaved Flowering or Manna Ash.

*Specific Character.*—A small *tree* sixteen to twenty feet high. *Leaves* opposite, pinnate; *leaflets* 4–9 smooth, ovate or roundish, obtusely serrate, subsessile, *petioles* channelled. By some botanists considered to be a variety of the preceding species.

*Habitat.*—Grows in Calabria and the East. De Candolle says that from this tree manna is chiefly obtained.

### Manna, *Manna.* [Mat. Med. List, U. S. P.]

A concrete exudation from the stem, obtained by incisions: imported from Sicily and the South of Europe.

*Extraction of Manna.*—Manna is obtained, both in Calabria and Sicily, by incision into the stem of the trees. In the manna districts of Capace, Cinesi, and Fabaretto, in Sicily, where the best manna is obtained, the *Fraxinus ornus* is cultivated in separate square plantations. The trees are not tapped till they cease to produce leaves, which happens about July or August. Cross or transverse incisions, about two inches long, are made in the stem by means of a hooked or curved knife, beginning at the lower part near the soil, and are repeated daily in warm weather, extending them perpendicularly upwards, so as to leave the stems uninjured on one side, which is cut next year. In this way is obtained *manna in sorts*. The *flake manna* is obtained during the height of the season, when the juice flows vigorously. It is procured from the upper incisions, the juice there being less fatty than that in the lower part; and, consequently, it more easily dries in tubes and flat pieces. The masses left adhering to the stems are scraped off, and constitute the *cannulated manna in fragments*. Although all three kinds of manna are got from the same stem, yet the younger stems yield more of the cannulated sort, and the older ones more of the fatty kind. Dry and warm weather are necessary for a good harvest.

*Officinal Characters.*—In stalactiform pieces from one to six inches in length, and one or two inches in width, uneven, porous, and friable, furrowed on one side, of a yellowish-white color, with a faintly nauseous odor, and a sweetish taste; soluble in water and rectified spirit.

*Description.*—Several kinds of manna are described by pharmacologists. The finest kind is called *flake manna* or *cannulated manna*. It is imported in deal boxes, having partitions, and frequently lined with tin-plate. This is the kind described in the Pharmacopœia. The pieces are from half an inch to an inch thick. Their form is irregular, but more or less stalactitic; most of the pieces being flattened or slightly hollowed out on one side, where they adhered to the tree or substance on which they have concreted, and on this side they are frequently soiled. Their color is white, or yellowish-white; they are light, porous, and friable; the fractured surface presents a very small number of capillary crystals. The odor is somewhat like that of honey, and is to me rather unpleasant; the taste is sweet, but afterwards rather acrid. This variety of manna is universally preferred, and fetches everywhere a much higher price than the other sorts. The fragments are worth from one-half to two-thirds the value of the flakes, the new and white being preferred to the old and yellow. Fresh and flaky manna has a less irritating and nauseous flavor, and a less purgative effect than old and common or fatty manna. The commonest kind in English commerce is called *Sicilian manna*. It appears to me to be the *common* or *fatty manna* of some writers. It consists of small, soft, viscid fragments, of a dirty yellowish-brown color, intermixed with some few dark-colored, small pieces of the flake variety. It contains many impurities intermixed. *Manna in sorts.* This and the last kind are of inferior quality.

*Commerce.*—Manna is imported into this country principally from Palermo and Messina. It is also brought from Naples, Leghorn, Trieste, Genoa, and Marseilles.

*Composition.*—Manna contains mannite, sugar, and extractive matter. *Mannite*, *Manna-sugar* ($C_6H_7O_6$), is obtained by boiling manna in alcohol, from which it crystallizes in acicular prisms. It forms from sixty to eighty per cent. of the best manna. Mannite is a white, crystalline, odorless substance, which has a sweet, agreeable taste. It is soluble in five parts of cold water, and in a smaller proportion of boiling water; it is readily soluble in boiling alcohol, but less so in cold alcohol. Its solution does not undergo the vinous fermentation when in contact with yeast. It differs essentially from sugar not only in this respect, but also in its elementary composition, containing a slight excess of hydrogen. It appears to possess little if any purgative quality. *Extractive matter.*—The aperient quality of manna appears to reside in this.

*Physiological Effects.*—In large doses it is mildly laxative. It acts on the bowels without exciting vascular irritation. It is apt, however, to produce flatulence and griping. The fresher and less changed the manna, the feebler are said to be its laxative powers. The commoner kinds of manna are more laxative and more apt to excite flatulence than the finer varieties. Manna approaches tamarinds as a laxative.

*Therapeutics.*—It is employed as a laxative partly on account of the mildness of its operation, partly for its sweet flavor, in delicate persons, as females and children. Dr. Burns recommends it for new-born infants if the meconium do not come away freely. On account of its sweetness it is frequently added to flavor purgative draughts, and is used as a common laxative for children, who readily eat it.

*Administration.*—It may be taken in substance, or dissolved in warm milk or water. The dose for an adult is from one to two ounces; for children, a quarter of an ounce.

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## STYRACEÆ, *Lindley.* THE BENZOIN ORDER.

## STYRAX BENZOIN, *Dryand.*

### The Benzoin Tree.

Decandria, Monogynia, *Linn. Syst.*

A large *tree* with a *stem* the thickness of a man's body. *Branchlets* whitish-rusty, tomentose. *Leaves* alternate, oblong, acuminate, smooth above, whitish and tomentose beneath. *Racemes* compound, axillary nearly the length of the leaves, and, as well as the flowers, tomentose. *Calyx* campanulate, obscurely 5-toothed. *Corolla* gray, of five petals, connate at the base, several times longer than the calyx. *Stamens* ten; *filaments* connate at the base into a short tube. *Ovary* superior, ovoid, pubescent, incompletely 3-celled; *style* filiform; *stigma* simple, *Ovules* indefinite. *Fruit* 1-seeded. —*Phil. Trans.* vol. lxxvii. pl. 12.

Fig. 133.


*Styrax officinale.*

*Habitat.*—Sumatra, Borneo, Siam, Java.

### Benzoinum, *Benzoin.*

[Mat. Med. List, U. S. P.]

A resinous exudation from the stem; imported from Siam and Sumatra.

*Extraction of the Resin*—Benzoin is obtained in Sumatra as follows: When the tree is six years old, longitudinal or somewhat oblique, incisions are made in the bark of the stem, at the origin of the lower branches. A liquid exudes, which, by exposure to the sun and air, soon concretes, and the solid mass is then separated by means of a knife or chisel. Each tree yields about three pounds of benzoin annually, for the space of ten or twelve years. That which exudes during the first three years is white. The benzoin which subsequently flows is of a brownish color, and is of inferior quality.

*Officinal Characters.*—In lumps, consisting of agglutinated tears, or a brownish mottled mass, with or without white tears imbedded in it; has little taste, but an agreeable odor; gives off, when heated, fumes of benzoic acid; and is soluble in rectified spirit and in solution of potash.

*Description.*—The several sorts of benzoin met with in commerce may be conveniently arranged under two heads; viz. *Siam benzoin* and *Sumatra benzoin.*

*Siam benzoin.*—Crawford says that the benzoin of Siam is procured from Lao. Siam benzoin is brought to England, either direct from Siam, or indirect by way of Singapore. It includes the best commercial sorts, or those known in commerce as *benzoin* of *the finest quality.* It occurs in tears, in irregular lumps, and in cubical blocks; but, unlike the Sumatra sort, it never comes over enveloped in calico. It is in general distinguished from the other sorts by its warmer or richer (yellow, reddish, or brown) tints. *Siam benzoin in tears* consists of irregular flattened pieces, some of which are angular, and the largest of them barely exceeding an inch in length. Externally these pieces are shiny, or dusty from their mutual friction, and are of an amber or reddish-yellow color; they are brittle, and may be easily rubbed to powder. Internally they are translucent or milky, and frequently striped; they have a pleasant odor, but little or no taste. *Siam or lump benzoin.*—The finest kind consists of agglutinated tears (*white or yellow lump benzoin*). More commonly we find the tears are connected by a brown resiniform mass, which, when broken, presents an amygdaloid appearance, from the white tears imbedded in the mass (*amygdaloid benzoin*). Inferior sorts of lump benzoin are reddish.

*Sumatra benzoin.*—Though placed second, this sort is the more important, being in many countries the only kind known. It is rarely imported directly from Sumatra, but in general indirectly by way of Singapore or Bombay, and now and then from Calcutta. It occurs in large rectangular blocks, marked with the impression of a mat, and covered with white cotton cloth. When broken, we observe but few large white tears in it. The mass is generally made up of a brown resiniform matter, with numerous white, small pieces or chips intermixed, which thereby give the broken surface a speckled appearance, somewhat like that of a fine-grained granite.

*Composition.*—Benzoin contains from fifteen to twenty per cent. of benzoic acid, and about eighty per cent. of resins. *Benzoic acid* is described below. The *resins* are two, one of which is soluble, the other insoluble in ether and in carbonate of potash.

*Physiological Effects.*—Benzoin produces the general effects of the balsams. Its power of producing local irritation renders it apt to disorder the stomach, especially in very susceptible individuals. Its constitutional effects are those of a heating and stimulating substance, whose influence is principally directed to the mucous surfaces, especially of the air-tubes. It is more acrid and stimulant, and less tonic, than myrrh, to which some pharmacologists have compared it. As it contains benzoic acid, it must increase the proportion of hippuric acid in the urine.

*Therapeutics.*—As an internal remedy, the employment of benzoin is almost wholly confined to chronic pulmonary affections, especially those of the bronchial membrane. Its stimulant properties render it improper in all acute inflammatory complaints, and its acridity prevents its employment where there is much gastric irritation. Its use, therefore, is better adapted for torpid constitutions.

*Administration.*—Benzoin is scarcely ever administered alone. The dose of it in powder is from ten to twenty grains.

*Officinal Preparation.*

TINCTURA BENZOINI COMPOSITA [U. S.], *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, filter, and add sufficient rectified spirit to make one pint.

["Take of benzoin, in coarse powder, three troyounces; Socotrine aloes, in coarse powder, half a troyounce; storax, two troyounces; balsam of tolu, a troyounce; alcohol, two pints. Macerate for fourteen days, and filter through paper." U. S.]

A stimulating expectorant, administered in chronic catarrhs.

*Dose.*—Fl. drm. j to fl. drs. ij.

It is decomposed by water. A very pleasant mode of exhibiting it is in the form of emulsion, prepared with mucilage and sugar, or yelk of egg. Compound tincture of benzoin is occasionally applied to foul and indolent ulcers, to excite the vascular action and to improve the quality of the secreted matter. If applied to cut surfaces it causes temporary pain, and cannot promote adhesion or union by the first intention, though, by exciting too much inflammation, it may sometimes prevent it. But when the edges of the wound have been brought together, the tincture may be carefully applied to the lint or adhesive plaster as a varnish or cement. Here it acts mechanically, excluding air, and keeping the parts in their proper position. In the same way, it may sometimes prove serviceable in contused wounds. *Court* or *black sticking plaster* is prepared by brushing first a solution of isinglass, and afterwards a spirituous solution of benzoin, over black sarcenet.

[UNGUENTUM BENZOINI, U. S., *Ointment of Benzoin.*—"Take of benzoin, in moderately coarse powder, a troyounce; lard, sixteen troyounces. Heat them together, by means of a water bath, for two hours, with occasional stirring; then strain without pressure, and stir the product constantly while cooling." U. S.

Benzoin has the property of hindering lard and other fatty substances from becoming rancid. This ointment is for this reason often used as a basis for various unguents, for which purpose its pleasant odor well fits it.—W.]

## **Acidum Benzoicum** [U. S.], *Benzoic Acid.*

$\overline{Bz}(HO,C_{14}H_5O_3)=122.$

An acid obtained from benzoin by sublimation.

*Preparation.*—Mohr's process is adopted in the Pharmacopœia.

Take of benzoin, four ounces. Place the benzoin in a cylindrical pot of sheet iron, furnished with a flange at its mouth; and, having fitted the pot into a circular hole in a sheet of pasteboard, interpose between the pasteboard and flange a collar of tow, so as to produce a nearly air-tight junction. Let a cylinder of stiff paper open at one end, eighteen inches high, and having a diameter of at least twice that of the pot, be now inverted on the pasteboard, and secured to it by slips of paper and flour paste. Pass two inches of the lower part of the pot through a hole in a plate of sheet tin, which is to be kept from contact with the pasteboard by the interposition of a few corks; and let a heat just sufficient to melt the benzoin (that of a gas lamp answers well) be applied, and continued for at least six hours, that benzoic acid may be sublimed. Let the product thus obtained, if not quite white, be pressed firmly between folds of filtering paper, and again sublimed.

["Take of benzoin, in coarse powder, twelve troyounces. Spread the benzoin evenly over the bottom of an iron dish eight inches in diameter, cover the dish with a piece of filtering paper, and, by means of paste, attach it closely to the rim. Then, having prepared a conical receiver or cap of thick, well-sized paper, of rather larger diameter than the dish, invert it over the latter, so as to fit closely around the rim. Next apply heat by means of a sand bath, or of the iron plate of a stove, until, without much empyreuma, vapors of benzoic acid cease to rise. Lastly, separate the receiver from time to time, and remove the benzoic acid from it and the paper diaphragm, as long as the acid continues to be deposited. Benzoic acid, thus obtained, is in white feathery crystals, of a peculiar, agreeable odor, and warm, acidulous taste." U. S. This odor is caused by the presence of a small portion of an oil, which is formed from the resin of the benzoin during distillation. This oil probably adds to rather than detracts from the medicinal powers of the acid.—W.]

*Officinal Characters.*—In light feathery crystalline plates, nearly white, and with a strong odor of benzoin; sparingly soluble in water, but readily dissolved by rectified spirit; soluble also in the caustic alkalies and lime, but separating from these on the addition of hydrochloric acid, unless the solution be very dilute.

*Description.*—As met with in the shops, benzoic acid occurs in flexible, transparent crystals, of a mother-of-pearl lustre, having a sour, warm taste, but no odor when pure. It readily fuses and volatilizes, its vapor being exceedingly irritating to the air-passages. It is combustible, burning with a bright yellow flame. It dissolves in about five hundred parts of cold water, and in about twenty-five parts of boiling water. Benzoic acid is also distinguished by its fusibility, volatility, odor of its vapor, and by the character of its soluble salts. Thus the benzoate of ammonia produces with the persalts of iron a pale red precipitate ($2Fe_2O_3,3\overline{B}z$); and with the nitrate of silver and acetate of lead white precipitates. From cinnamic acid (with which it has been confounded) it is distinguished by not yielding oil of bitter almonds when distilled with oxidizing agents, as chromic acid or a mixture of bichromate of potash and sulphuric acid.

*Test.*—When heated, it sublimes without any residue.

*Physiological Effects.*—The *local* action of benzoic acid is that of an acrid. When swallowed, it occasions a sensation of heat and acridity in the back part of the mouth and throat, with heat at the stomach. The inhalation of its vapor causes violent coughing. On the *general system* it acts as a stimulant, whose influence is, however, principally directed to the mucous surfaces, especially the bronchial membrane. In its passage through the system it abstracts the elements of glycocoll or gelatin sugar, and becomes converted into hippuric acid, which is thrown out of the system in the urine, in combination with a base. Benzoic acid, $HO,C_{14}H_5O_3 +$ Glycocoll $C_4H_5NO_4 =$ Hippuric acid, $C_{18}H_9NO_6 + 2HO$. Mr. Alexander Ure first pointed out the fact that the quantity of hippuric acid in the urine is increased by the use of benzoic acid. If, an hour after a meal, a scruple or half a drachm of benzoic acid be taken into the stomach, the urine subsequently voided, within three or four hours, will be found, on adding a small quantity (about one-twelfth part) of hydrochloric acid, to yield a copious precipitate of rose-pink acicular crystals of hippuric acid, which weigh, after being allowed to settle for a day, from fifteen to twenty-nine grains. Mr. Ure's observations were confirmed by the experiments of Dr. Garrod and Keller. It was also found by Keller that the urine which yielded hippuric acid contained the normal proportion of both uric acid and urea. The urine is rendered more acid by its use.

*Therapeutics.*—Benzoic acid is a constituent of the camphorated tincture of opium, but otherwise is but little employed in medicine. It is sometimes administered in chronic bronchial affections. I have repeatedly tried it, but have seldom seen benefit result from its use. I have more frequently seen it augment than relieve the cough. Its property of increasing the acidity of the urine makes it occasionally useful in diseases attended with alkaline urine and phosphate deposits. It may be given in the form of *benzoate of ammonia*, which is more soluble than the free acid, and has a similar action on the urine.

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## [SAPOTACEÆ, *Juss.* THE SOAPWORT ORDER.

## ISONANDRA GUTTA, *Hooker.*

A tall tree, a native of the Malayan Archipelago, especially of Singapore.

Its trunk is from three to six feet in diameter, and furnished with ascending branches. The leaves are petiolate, ovate, four of five inches long, and crowded at the end of the branches. The flowers are in axillary clusters.

### **Gutta-percha**, *Gutta-percha*, Mat. Med. List, U. S. P.

The concrete juice of Isonandra gutta.

*Preparation and Physical Properties.*—"A magnificent tree of fifty, or more probably one hundred years' growth, is cut down, the bark stripped off, and the milky juice collected and poured into a trough formed by the hollow stem of the plantain leaf; it quickly coagulates on exposure to the air; but from one tree I was told that not more than twenty pounds or thirty pounds are procured" (Montgomerie). It is extensively imported in blocks, and is puried by "devilling," or kneading in hot water. As imported, it is a white or dirty pinkish opaque solid. Its density is 0.79. Water, alcohol, alkaline solutions, muriatic and acetic acids have no action on it. Oil of vitriol slowly chars it; nitric acid converts it into a yellow resin; ether and coal naphtha soften it in the cold, and by the aid of heat effect an imperfect solution of it. Its best solvents are oil of turpentine and chloroform.

*Composition.*—Gutta-percha of commerce consists chiefly of a *peculiar substance* (gutta-percha, properly so called) mixed with a small quantity of *a vegetable acid*, *casein* (hence the cheesy odor which it sometimes possesses), a *resin* soluble in ether and in oil of turpentine, and a *resin* soluble in alcohol. The pure gutta-percha is a carbo-hydrogen analogous to caoutchouc.

*Therapeutics.*—Its most important quality, and which renders it so useful in surgery, is the facility with which it softens and becomes plastic in hot water. In this state it may be readily moulded into any required shape, and joined, by pressure, to other pieces which have also been rendered plastic by heat. When it cools, it resumes its original hard and tough nature. It is very much used in the formation of splints; a piece of sheet gutta-percha is cut into the required shape, softened in hot water, and then accurately moulded to the limb, to which, when it becomes cold and hard, it forms a very firm, unyielding support. It is also used in making bougies, pessaries, and various other surgical appliances. Its solution, when applied to a superficial wound, rapidly dries, leaving a perfectly impervious tenacious film over the surface, and is therefore used whenever it is desirable to exclude the air from a part; for instance, in hermetically sealing compound fracture; in various chronic skin diseases, especially the dry, scaly varieties (psoriasis, &c.); to abort variolous pustules.

Liquor Gutta-perchæ, U. S., *Solution of Gutta-percha.*—"Take of gutta-percha, in thin slices, a troyounce and a half; purified chloroform, seventeen troyounces; carbonate of lead, in fine powder, two troyounces. To twelve troyounces of the chloroform, contained in a bottle, add the gutta-percha, and shake occasionally until it is dissolved. Then add the carbonate of lead, previously mixed with the remainder of the chloroform, and, having several times shaken the whole together at intervals of half an hour, set the mixture aside, and let it stand for ten days, or until the insoluble matter has subsided, and the solution become liquid, and either colorless or of a pale straw color. Lastly, decant the liquid, and keep it in a well-stopped bottle."—W.]

## ERICACEÆ, *Lindley*. The Heath Order.

## ARCTOSTAPHYLOS UVA URSI, *Sprengel*.

### The Bearberry.

Decandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—Small evergreen shrub. *Stems* long, procumbent. *Leaves* alternate, shortly stalked, persistent, obovate, entire, smooth, shining, coriaceous; upper surface dark green, under surface paler and marked with reticulated veins, from half an inch to an inch long. *Flowers* in small terminal, racemose clusters; *pedicels* short, more or less reflexed; *bractlets* obtuse, small, colored. *Calyx* 5-parted, pale-reddish, persistent. *Corolla* smooth, pale rose-colored, with a small contracted 5-cleft reflexed limb, deciduous. *Stamens*, 10, included; *filaments* flattened; *anthers* compressed, with 2 pores at the apex, and with two lateral reflexed appendages. *Ovary* round, surrounded with three scales; *style* short; *stigma* obtuse. *Fruit* small, round, scarlet, mealy within, with generally *five* more or less cohering seeds.—*Woodv.* vol. 2, page 194, pl. 70. (*Arbutus Uva Ursi.*)

Fig. 134.


*Arctostaphylos uva ursi.*
1. Anthers. 2. Single anther, showing awns.

*Habitat.*—Indigenous. Native principally of the northern parts of Europe, Asia, and America. It occurs on dry, barren, stony, alpine heaths. The leaves should be collected in September or October.

**Uva Ursi,** *Bearberry Leaves.* [Mat. Med. List, U. S. P.]

The dried leaves from indigenous plants.

*Officinal 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 odor when powdered; the infusion giving a bluish-black precipitate with perchloride of iron.

*Adulteration.*—The leaves of *Vaccinium Vitis Idæa* (*Red Whortleberry*) are occasionally substituted for those of uva ursi. The fraud may be detected by the margins of the leaves being revolute and somewhat crenate, and the under surface dotted; whereas the margins are entire, and the under surface reticulated in the genuine leaves. Furthermore, the false leaves are but very slightly astringent, and their watery infusion is colored green by perchloride of iron; whereas the true ones are highly astringent, and their watery infusion forms a blackish-blue precipitate with perchloride of iron. Box leaves have some resemblance to those of uva ursi, but are at once distinguished by being devoid of astringency.

*Composition.*—Uva ursi leaves contain about 36 per cent. of *tannic acid;* and 1.5 of *gallic acid;* together with some *resin*, a little *volatile oil*, *extractive*, a crystallizable principle, named by its discoverer, Mr. Hughes, *ursin*, a substance called *arbutin*, and another crystallizable resinous principle, termed by Trommsdorf, who first isolated it, *urzone;* besides other unimportant matters. But little is known of either *ursin* or *urzone*, although the former is reputed to possess energetic diuretic properties. *Arbutin* was discovered by Kawalier. It is a neutral substance, crystallizing in long, thin, colorless acicular prisms, of a bitter taste, and soluble in water, alcohol, and ether. The active principles of uva ursi are extracted both by water and rectified spirit. Perchloride of iron produces a bluish-black precipitate in the watery infusion, and gelatin also causes a precipitate.

*Physiological Effects.*—The obvious effects of uva ursi are those of a vegetable astringent. Its activity as an astringent depends on tannic and gallic acids. The former of these acids, in its passage through the system, becomes oxidized and converted into gallic and pyrogallic acids, and humus-like substances, which communicate a dark color to the urine. Uva ursi slightly augments the quantity, and also somewhat modifies the quality, of the urine. Alexander found that thirty grains of the powder acted as a mild diuretic; and I have frequently seen lithic deposits in the urine lessened under its use. In large doses the powder readily nauseates.

*Therapeutics.*—As an astringent, it is applicable to all the purposes for which the vegetable astringents generally are used. It has been employed as an antidote in poisoning by ipecacuan. But the principal use of this remedy is in *chronic affections of the bladder*, attended with increased secretion of mucus, and unaccompanied with any marks of active inflammation. Thus, in the latter stages of catarrhus vesicæ, the continued use of uva ursi is frequently most beneficial. Combined with hyoscyamus, says Dr. Prout, and persevered in steadily *for a considerable time*, it seldom fails to diminish the irritation and quantity of mucus, and thus to mitigate the sufferings of the patients. "It undoubtedly possesses," he adds, "considerable powers in chronic affections of the bladder, *for which only it is adapted*, its operation being slow and requiring perseverance." Sir Benjamin Brodie, on the other hand, observes that "uva ursi has the reputation of being useful in some cases of chronic disease of the bladder, and in this (inflammation) among the rest. I must say, however, that I have been disappointed in the use of uva ursi, and that I have not seen those advantages produced by it which the general reputation of the medicine had led me to expect. I have seen much more good done by a very old medicine, Pareira." Such are the opposite statements of the effects of this remedy, made by two of the most eminent writers on diseases of the urinary organs. My own experience of it amounts to this: that in some cases the relief obtained by it was marked; whereas in other instances it was of no avail. It is to be remembered that its astringent operation unfits it for acute cases, and that the alteration which it produces in the condition of the urinary organs is effected very slowly; so that, to be beneficial, it requires to be exhibited for a considerable period. *In calculous affections* it has occasionally given relief. De Haen and Van Swieten speak of the good effects of it in these cases. It alleviated the pain, checked the purulent and mucous secretion, and restored the urine to its natural condition. These effects seem to have arisen from its influence over the kidneys and bladder, for it did not appear to affect the calculus. I have already stated that it has appeared to me to lessen lithic deposits in the urine.

*Administration.*—The dose of the *powder* is from twenty to sixty grains. But the powdered leaves of this plant are so bulky and disagreeable, that few stomachs will bear to persevere long enough in the use of the requisite quantity.

*Officinal Preparation.*

INFUSUM UVÆ URSI, *Infusion of Bearberry.*—Take of bearberry leaves, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for two hours, and strain through calico.

An infusion is now substituted for the decoction. (*Lond.*, *Dub.*)

*Dose.*—Fl. oz. j to fl. oz. iij.

[EXRACTUM UVÆ URSI FLUIDUM, U. S., *Fluid Extract of Uva Ursi.* "Take of uva ursi, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, eight troyounces; diluted alcohol, a sufficient quantity. Moisten the uva ursi with six fluidounces of diluted alcohol, introduce it in a conical glass percolator, press it firmly, and gradually pour upon it diluted alcohol until half a pint of tincture has passed. Set this aside, and continue the percolation until two pints and a half more of tincture have been obtained. Evaporate this, by means of a water-bath, to four fluidounces, and, having dissolved the sugar in it while hot, mix it with the reserved tincture and strain. Lastly, evaporate the whole by a gentle heat until it is reduced to a pint." U. S.

*Dose.*—fʒss to fʒi, t. d. in water.—W]

## [CHIMAPHILA UMBELLATA, *Nuttall.* *Pipsissewa.*

*Generic Character.*—Flowers corymbed or umbelled. Petals widely spreading. Filaments dilated in the middle. Style very short, and top shaped, covered by a broad orbicular stigma. Valves of the pod smooth on the edges.

*Specific Character.*—Leaves wedge, lanceolate, acute at the base, sharply serrate, not spotted.

A perennial *under-shrub.* *Rhizome* woody, creeping. *Stems* ascending, somewhat angular, marked with the scars of former leaves. *Leaves* in irregular whorls, evergreen, coriaceous, on short petioles, serrate,

Fig. 135.

*Chimaphila umbellata.*

smooth, shining. *Flowers* nodding in a small corymb. *Corolla* white, tinged with red, having an agreeable odor.

*Habitat.*—Woods of North America.

**Chimaphila**, *Pipsissewa.* Mat. Med. List, U. S. P.

The officinal parts are the leaves, or rather the leaves and the stems. The fresh leaves exhale a peculiar odor when bruised; their taste is bitter and astringent. The infusion of the dried herb is rendered green (*tannate of iron*) by sesquichloride of iron, and very slightly turbid by a solution of isinglass.

*Chimaphila maculata*, or *spotted winter-green*, probably possesses similar virtues to the *C. umbellata.* "The character of the leaves of the two plants will serve to distinguish them. Those of C. maculata are lanceolate, rounded at the base, where they are broader than near the summit, and of a deep olive green color, veined with greenish-white; those of the officinal species are broadest near the summit, gradually narrowing to the base, and of a uniform shining green. In drying with exposure to light, the color fades very much, though it still retains a greenish hue." (Wood.)

*Composition.*—The analysis of the leaves made by Mr. Fairbanks revealed the presence in them of gum, starch, sugar, pectic acid, lignin, extractives, chlorophyll, resin, yellow coloring matter, fatty matter, various inorganic substances, and a peculiar whitish substance, to which Mr. Fairbanks has given the name of chimaphilin. According to the United States Dispensatory the bitter extractive contains the active principle of the drug; the so called chimaphilin having no claims to be considered as such.

*Physiological Effects.*—The fresh leaves appear to possess considerable acridity, depending, probably, on some volatile constituent; for Dr. Barton says, that when bruised they produce rubefaction, vesication, and desquamation, if applied to the skin.

The infusion of the dried leaves when swallowed acts as a tonic, producing an agreeable sensation in the stomach, and assisting the appetite and digestive process. It promotes the action of the secreting organs, more especially the kidneys, over which, indeed, it has appeared to exercise a specific influence; increasing the quantity of urine; diminishing, as some have imagined, the quantity of lithic acid or lithates secreted; and beneficially influencing several forms of chronic nephritic disease. Indeed, this plant possesses, in its medicinal as well as its natural historical and chemical relations, qualities analogous to those belonging to uva ursi.

*Uses.*—The following are the principal diseases in which it has been employed:—

1. *In dropsies*, accompanied with great debility and loss of appetite, it is useful as a diuretic, as well as on account of its stomachic and tonic qualities. It was introduced to the notice of practitioners in this country as a remedy for this class of diseases, by Dr. W. Somerville. Dr. Beatty has also found it useful in this disease.

2. *In chronic affections of the urinary organs.*—Pyrola has been found serviceable in the various disorders of the urinary organs, in which the uva ursi frequently proves beneficial; such as cystirrhœa and calculous complaints. It has occasionally alleviated some cases of hæmaturia, ischuria, dysury, and gonorrhœa.

3. *In scrofula.*—We can readily believe that, as a tonic, this remedy may be useful in various forms of scrofula. But it has been supposed by some to possess almost specific powers; and in America its reputation is so high, that in the provinces it acquired the title of "King's Cure." Dr. Paris says that "an irregular practitioner, who has persuaded a number of persons in this metropolis that he possesses remedies obtained from the American Indians, by which he is enabled to *cure* scrofula in its worst forms," relies for success on chimaphila. In some ill-conditioned scrofulous ulcers pyrola is used in the form of a wash.

*Administration.*—Chimaphila is given in the form of *decoction* or *extract;* the latter has been employed in doses of ten or fifteen grains.

Decoctum Chimaphilæ, *Decoction of Pipsissewa.*—"Take of pipsissewa, bruised, a troyounce; water, a sufficient quantity. Boil the pipsissewa in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint. *Dose*, Oj to be taken in the course of the twenty-four hours." U. S.—W.]

[**GAULTHERIA PROCUMBENS**, *Linn. Winter Green.*

*Generic Character.*—Corolla monopetalous, urn-shaped, deciduous. Calyx 5-cleft, enlarged in fruit into a berry, inclosing the small many-seeded pod. Anthers 4-awned at the top where they open.

*Specific Character.*—Stem creeping for the most part. Leaves obovate or oval, coriaceous, obscurely serrulate. Flowers few, nodding.

A well-known creeping plant, growing in cool, damp, sandy, or rocky places, mostly in forests of evergreens. The bright green. thick leaves are collected in a sort of tuft at the end of the stem and branches, half hiding the bright red berries.

Fig. 136.

*Gaultheria procumbens.*

*Habitat.*—Canada, Eastern and Middle States, southward along the Alleghanies.

**Gaultheria**, *Gaultheria.* Mat. Med. List, U. S. P.

The leaves of Gaultheria procumbens.

All parts of the plant have the spicy taste of sweet birch, but it is strongest in the fleshy berry, which is much relished by many people. The leaves have in addition to this a marked astringency. The peculiar flavor is owing to the presence of volatile oil. It is commonly known as winter green, teaberry, mountain tea, and sometimes incorrectly as the partridge berry: the true partridge berry is a cinchonaceous plant, Mitchella repens.

*Therapeutics.*—An aromatic stimulant, and feeble astringent. It is, in infusion, sometimes administered in atonic diarrhœa. Its principal use is, however, in the preparation of the volatile oil, which is largely used for flavoring.

Oleum Gaultheriæ, U. S., *Oil of Gaultheria.*—Prepare this oil, from fresh gaultheria by the general formula, see page 399.

This oil is remarkable for being the heaviest of the known essential oils (sp. gr. 1.173), and for producing a purple color with the sesquisalts of iron. In large quantities it acts as a powerful gastric irritant. It is scarcely ever used except for flavoring. It enters into the composition of the compound syrup of sarsaparilla.—W.]

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## LOBELIACEÆ, *Jussieu.* The Lobelia Order.

## LOBELIA INFLATA, *Linn.*

### Indian Tobacco.

Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—Annual or biennial herb, a foot or more in height. *Root* fibrous. *Stem* solitary, erect, angular, very hairy below; the upper part branched and smooth. *Leaves* scattered, irregularly serrate-dentate, hairy; the lower ones oblong, obtuse, shortly petiolate; those towards the middle ovate, acute, sessile. *Flowers* small, racemose; *pedicels* short, with an acuminate bract. *Calyx* smooth, with an ovoid tube, 5-lobed; the lobes linear, acuminate. *Corolla* delicate blue, bilabiate, the upper lip 2-cleft, the lower 3-cleft. *Stamens* 5; *anthers* united into an oblong curved body, purple; *filaments* white. *Ovary* more or less inferior; *style* filiform; *stigma* curved and inclosed by the anthers. *Fruit* capsular, 2-celled, 10-angled, inflated, crowned with the calyx. (*Seeds* numerous, small, about $\frac{1}{33}$d of an inch long, and $\frac{1}{85}$th of an inch broad), brown, oval or almond-shaped, reticulated; the interspace irregular in shape, and yellow.—*Bigelow, Med. Bot.* pl. 19.

Fig. 137.

*Lobelia inflata.*

*Habitat.*—North America, from Canada to Carolina and the Mississippi. Begins to flower in July. The plant should be collected in August or September.

### Lobelia, *Lobelia.*

[Mat. Med. List, U. S. P.]

The herb in flower, dried, imported from North America.

*Officinal Characters.*—Stem angular; leaves alternate, ovate, toothed, somewhat hairy beneath; capsule ovoid, inflated, ten-ribbed; herb acrid. Usually in compressed rectangular parcels.

*Description.*—Lobelia is chiefly prepared by the Shaking Quakers of

New Lebanon, North America. It is generally compressed into rectangular or oblong cakes, weighing either half a pound or a pound each, and enveloped in blue paper. The accompanying figure is copied from a label attached to an imported package.

LOBELIA.
*Lobelia inflata.*
**D. M. & Co.,**
WATERVLIET, N. Y.

Lobelia is also found in commerce in an uncompressed state—that is, consisting of the flowering herb cut up into pieces of varying sizes, and possessing the botanic characters already noticed. The dried herb is pale, greenish-yellow; its smell is somewhat nauseous and irritating; its taste burning and acrid, very similar to that of tobacco. Its powder is greenish, and somewhat resembles powdered senna leaves.

*Composition.*—The principal constituents which have been indicated are a *volatile oil*, to which its peculiar odor is due; a *resin* with an exceedingly acrid taste; a peculiar acid called *lobelic acid;* and a peculiar alkaline principle named *lobelina*, to which the narcotic properties of lobelia are evidently due. The active properties of the plant are extracted by proof spirit and by ether. *Lobelina* is a liquid alkaloid, lighter than water, of a pale yellow color, and somewhat aromatic odor. It is soluble in water, but more so in alcohol and ether. It is also soluble in oil of turpentine and oil of sweet almonds. It has an alkaline reaction on reddened litmus paper, and unites with sulphuric, nitric, hydrochloric, oxalic, and lobelic acids, to form crystallizable salts, which are more soluble in water than the alkaloid itself. Tannic acid throws it down from its solution in the form of a white bitannate. Mr. Bastick says lobelina is volatile, but does not evaporate entirely unchanged. A quarter of a grain excited vomiting and much prostration in a cat. A grain caused immediate and total prostration, which for half an hour rendered the animal almost motionless, and caused dilatation of the pupils.

*Characteristics.*—As death is not unfrequently a consequence of the empirical use of lobelia, it is desirable that we should possess some means of detecting the poison. I am, however, unacquainted with any chemical characteristics by which it can be recognized. The tobacco-like flavor of the powder and decoction, and the remarkable acrid sensation, like that caused by tobacco, which these excite in the fauces, may sometimes aid in recognizing them. Mr. Frederick Curtis has drawn attention to the microscopic characters of the seeds as a means of detecting the herb of lobelia, or its powder; as these seeds, on account of their minuteness, escape complete destruction by the mill or mortar. I have, however, been unable to detect any seeds or fragments of seeds in the *pulvis lobeliæ* sold at a herb shop in London; the herb which is sent to the mill not being sufficiently ripe to contain seeds; but the *pulvis seminum lobeliæ* may be readily detected by the microscope. When the ordinary lobelia powder contains seeds or fragments of seeds, no difficulty will be found in recognizing them by the microscope. Mr. Curtis recommends the powder to be sifted in order to separate the coarser from the finer particles; and he says that the uninjured seeds will be left on a sieve whose apertures are $\frac{1}{75}$ of an inch. Mr. Curtis describes the seeds as having "oblong square" reticulations. Dr. Otto Berg has also depicted these spaces as being rectangular. I have, however, found them irregular in shape.

*Physiological Effects.*—An accurate account of the effects of this plant on man is yet wanting; but, from the observations hitherto made, its operation appears to be very similar to, but milder than, that of tobacco; and from this circumstance, indeed, it has been called *Indian Tobacco. In small doses* it operates as a *diaphoretic* and *expectorant.* Mr. Andrews, who speaks from its effects on himself, says it has "the peculiar soothing quality of exciting expectoration without the pain of coughing." *In full medicinal doses* (as 20 grains of the powder) it acts as a powerful nauseating *emetic.* Hence, it has been called the *emetic weed.* It causes severe and speedy vomiting, attended with continued and distressing nausea, sometimes purging, copious sweating, and great general relaxation. These symptoms are usually preceded by giddiness, headache, and general tremors. It sometimes gives almost instantaneous relief in an attack of spasmodic asthma. Intermittent pulse was caused by it in a case mentioned by Dr. Elliotson. Administered by the rectum, it produces the same distressing sickness of stomach, profuse perspiration, and universal relaxation, which result from a similar use of tobacco. *In excessive doses*, or *in full doses too frequently repeated*, its effects are those of a powerful *acro-narcotic poison.* Its effects, according to Dr. Wood, are "extreme prostration, great anxiety and distress, and ultimately death, preceded by convulsions." He also tells us that fatal results (in America) have been experienced from its empirical use. These are the more apt to occur when the poison, as is sometimes the case, is not rejected by vomiting. Several cases of poisoning by lobelia have also occurred in England, in consequence of the administration of this agent by ignorant and inexperienced persons.

*Therapeutics.*—Lobelia is probably applicable to all the purposes for which tobacco has been used. From my own observation of its effects, its principal value is as an antispasmodic. Given in full doses, so as to excite nausea and vomiting at the commencement of, or shortly before, an attack of *spasmodic asthma*, it sometimes succeeds in cutting short the paroxysm, or in greatly mitigating its violence; at other times, however, it completely fails. Occasionally it has proved serviceable in a few attacks, and, by repetition, has lost its influence over the disease. To obtain the beneficial influence in asthma, it is not necessary, however, to give it in doses sufficient to excite vomiting. Dr. Elliotson recommends the use of small doses at the commencement, and says that these should be gradually increased if neither headache nor vomiting occur; but immediately these symptoms come on, the use of the remedy is to be omitted. Given in this way, I can testify to its good effects in spasmodic asthma. It has also been used in *croup*, *whooping-cough*, and *catarrhal asthma*, but with no very encouraging effects.

*Administration.*—It may be given in powder or tincture (alcoholic or ethereal). The dose of the powder as an emetic, is from ten to twenty grains; as an expectorant, from one to five grains. It deserves especial notice that the effects of lobelia are very unequal on different persons, and that some are exceedingly susceptible of its influence.

*Antidotes.*—After the poison has been evacuated from the stomach, opium and demulcents may be used to allay the gastro-intestinal irritation.

*Officinal Preparations.*

TINCTURA LOBELIÆ [U. S.], *Tincture of Lobelia.*—Take of lobelia, dried and bruised, two ounces and a half; proof spirit, one pint. Macerate the lobelia for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. [" Take of lobelia, in fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

*Dose.*—As an emetic and antispasmodic, from fl. drm. j to fl. drms. ij, repeated every two or three hours, until vomiting occurs; as an expectorant, from min. x to fl. drm. j.

TINCTURA LOBELIÆ ÆTHEREA, *Ethereal Tincture of Lobelia.*—Take of lobelia, dried and bruised, two ounces and a half; spirit of ether, one pint. Macerate for seven days, then press and strain, and add sufficient spirit of ether to make one pint.

This may be given in the same doses as the alcoholic tincture.

[ACETUM LOBELIÆ, U. S., *Vinegar of Lobelia.*—" Take of lobelia, in moderately coarse powder, four troyounces; diluted acetic acid, a sufficient quantity. Moisten the powder with two fluidounces of diluted acetic acid, pack it firmly in a conical glass percolator, and gradually pour upon it diluted acetic acid until the filtered liquid measures two pints. Vinegar of lobelia may also be prepared by macerating the powder in two pints of diluted acetic acid for seven days, expressing the liquid, and filtering through paper." U. S. Dose, as an expectorant, f℥ss to f℈iss; as an emetic, f℥ss.—W.]

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## COMPOSITÆ, *DC.* THE COMPOSITE ORDER.

## [EUPATORIUM PERFOLIATUM, *Linn.*

### Boneset.

*Generic Character.*—Flowers all alike, tubular. Achenia five-angled. Pappus of slender, roughish bristles. Scales of the involucre many or several. Receptacle flat.

*Specific Character.*—Stem hairy, leaves lanceolate, opposite, united at the base, so as to appear as one leaf with the stem passing through the centre. Corymbs very large and compound.

A coarse weed, from three to four feet in height, with large heads of white flowers, and wrinkled, profusely veined, serrate leaves, which sometimes are eight inches in length. It prefers meadows and other moist, but not actually swampy, situations, with a heavy soil, and is very common in the Middle States, flowering during the latter summer and early autumn months.

**Eupatorium,** *Thoroughwort.* Mat. Med. List, U. S. P.

The tops and leaves of Eupatorium perfoliatum, gathered after flowering has commenced.

Boneset or thoroughwort has a bitterish disagreeable taste, and a peculiar odor. Its active principle has not been isolated. It yields best to boiling water. In large doses, eupatorium acts as an emetic; in smaller doses, when taken in hot infusion, it is a powerful diaphoretic;

Fig. 138.

*Eupatorium perfoliatum.*

when taken in still smaller quantity, before meals in cold infusion, it is a feeble tonic. Its principal use is as a diaphoretic; taken at the commencement of a "break-bone fever," "general cold," or an attack of subacute rheumatism, it will frequently entirely relieve the patient by producing a profuse perspiration. In such cases its action should be aided by putting the patient to bed.

Infusum Eupatorii, U. S., *Infusion of Thoroughwort.*—"Take of thoroughwort, a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S. Dose, as an emetic, *ad libitum;* as a diaphoretic (hot), Oss to Oj; as a tonic, f℥j to ij.—W.]

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## [ERIGERON HETEROPHYLLUM, *Muhl.*

### Common Fleabane.

*Generic Character.*—Head many-flowered. Involucre of nearly equal narrow scales, almost in one row. Anthers without tails. Achenia flattened. Pappus simple, or with an outer set of minute scales.

*Specific Character.*—Stem striate, beset with spreading hairs. Leaves coarsely and sharply toothed. Rays purplish-white, numerous, conspicuous. Pappus double.

A very common, roughish annual weed, which grows profusely in rather barren and waste places, old fields, &c., flowering during the last of June, July, and August. Its stem is rather thick, and terminates in a very large diffuse, corymbose panicle of flowers. It is the *E. annuum*, Pres, and the *E. strigosum*, Bigelow, but must not be confounded with the true *E. strigosum*, Muhl, in which the leaves are nearly entire.

*Habitat.*—A native of Europe, extensively naturalized in the United States.

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## ERIGERON PHILADELPHICUM, *Linn.*

### Philadelphia Fleabane.

*Specific Character.*—Rays elongated, conspicuous, innumerable, reddish-purple or flesh color, very narrow. Stem leafy. Pappus single.

A tall perennial weed, often attaining the height of three feet, with several small heads on peduncles, forming an imperfect corymb. It grows in old pastures and copses, flowering perhaps a little earlier than the previous species.

### Erigeron, *Fleabane.* Mat. Med. List, U. S. P.

The herb of Erigeron heterophyllum and of Erigeron Philadelphicum.

The herb should be gathered when in flower. It has a peculiar, slightly aromatic odor, and a bitter taste. It contains a peculiar volatile oil in small quantity, and probably owes whatever virtues it may possess to it.

*Therapeutics.*—A feeble diuretic and stomachic, which may be used as an adjuvant. It is best given in infusion, made with boiling water (two ounces to the pint). As much may be taken as the stomach will bear.—W.]

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## [ERIGERON CANADENSE, *Linn.*

### Horse Weed.

*Specific Character.*—Rays inconspicuous, numerous. Stem erect, wand-like, hairy. Heads small, very numerous, racemose on the branches, forming a large panicle.

A very tall, homely weed, with unattractive white flowers, which grows along the sides of roads and in waste places. Its height varies very much according to the soil in which it is; sometimes it is scarcely one foot, and sometimes eight or nine feet high. It flowers rather later in the season than the other species. It has spread over most of the civilized world.

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## ERIGERON CANADENSE.

### Canada Fleabane.

The herb of Erigeron Canadense.

This should be gathered while in flower. Its odor and taste are more marked than that of the last species. Its active principle is a volatile oil. It also contains some gallo-tannic acid.

*Therapeutics.*—The oil of Erigeron Canadense has been highly recommended by some practitioners as a remedy to arrest uterine hemorrhages, but in the hands of others it has failed. The diuretic action of Canada fleabane probably is greater than that of the common fleabane. It may be given in infusion.

Oleum Erigerontis Canadensis, U. S., *Oil of Canada Fleabane.*—Prepare this oil from Canada fleabane by the general formula, see page 399.

A light straw-colored oil, with the odor of the plant from which it is obtained.

*Dose*, gtt. v to xv, in emulsion, or dropped on a lump of sugar.—W.]

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## ANTHEMIS NOBILIS, *Linn.*

### Common Chamomile.

Syngenesia, Polygamia superflua, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, with long fibres. *Stems* herbaceous, in a wild state prostrate, when cultivated more or less erect, from about eight inches to a foot long, much branched, downy-villose, round, hollow. *Leaves* sessile, somewhat downy, bipinnate, leaflets linear-subulate, rather fleshy, acute. *Flower-heads* (capitula) terminal, solitary, with a yellow convex disk, and white ray; *involucre* hemispherical, with nearly equal imbricated bracts, which are broadly membranous at their margins; *receptacle* conical, solid, and covered with thin concave obtuse chaffy or membranous scales. *Florets* of the disk hermaphrodite, tubular, five-toothed, yellow. *Florets* of the ray female, ligulate, in one row, white. *Fruit* subtrigonous, smooth, without pappus, but crowned with an obsolete margin.—*Engl. Bot.* vol. 14, plate 980.

Fig. 139.


*Anthemis nobilis.*

*Habitat.*—Indigenous; on open gravelly pastures or commons. It is also found in a wild state in all the temperate part of Europe. Flowers from June to September. Cultivated at Mitcham, Derbyshire, and elsewhere, for the London market.

**Anthemis**, *Chamomile Flowers.* [Mat. Med. List, U. S. P.]

The flower-heads, single and double, dried; wild and cultivated in Britain.

*Officinal 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; and both varieties, but especially the single, are bitter and very aromatic.

*Description.*—The flower-heads have a strong and peculiar odor, and a bitter aromatic taste. When fresh, they exhibit a strong and peculiar fragrancy when rubbed. They should be dried in the shade. In France. Germany, and Italy, the officinal chamomiles of this country are known by the name of Roman chamomiles, to distinguish them from the flower-heads of *Matricaria chamomilla*, which are there called common chamomiles. Two kinds of chamomiles are distinguished in the shops—the one called *single* and the other *double*.

*Single Chamomile Flowers.*—Strictly speaking, *single* chamomiles are those which have one row only of white female ligulate florets; but few flowers are in this condition; in most of the so-called single flowers some of the yellow tubular florets have become converted into white ligulate florets. It is obvious, therefore, that the distinction between the so-called single and double flowers is to a certain extent arbitrary. Single chamomiles should be preferred for the preparation of the extract and infusion, on account of their having the largest yellow disks, in which the oil chiefly resides. They are, therefore, more powerfully odorous.

*Double Chamomile Flowers.*—These constitute the sort usually found in the shops. In these, all or most of the yellow tubular florets have become converted into the white ligulate ones. The flowers are consequently whiter, larger, and more showy, though less odorous, and containing less volatile oil.

*Adulterations.*—[No particular adulteration of chamomile flowers has been, as yet, noticed in works published in this country; but in France, M. Timbal-Lagrave has had supplied to him, under the name of Roman chamomiles, the flower-heads of two other plants, namely, those of the *Matricaria parthenium*, Linn., and *Matricaria parthenoides*, Desf. The latter adulteration is scarcely likely to occur in this country. Neither is it probable that the single flowers of the former, which are commonly called Feverfew flowers, would be supplied for, or mixed with, true chamomile flowers; but if such should be the case, the *latter* could be at once distinguished by their pleasantly aromatic odor, and their scaly conical receptacle, as the *former*, or feverfew flowers, have an unpleasant odor, and a nearly flat receptacle without scales. Double feverfew flowers have, however, recently occurred mixed with double chamomile flowers. In a paper published in the *Pharmaceutical Journal* (vol. 1, 2d series, p. 447), Professor Bentley has described these flowers, and given illustrative figures, from which it appears that the two may be readily distinguished by the different odors and forms of their receptacles, as noticed above, with respect to the single flowers; but double feverfew flowers differ from single feverfew flowers in having a scaly receptacle, in which character they resemble double chamomile flowers. The scales, however, of the latter are chaffy, and densely cover the receptacle, whilst those of the former are much fewer in number, and less membranous.—Ed.]

*Composition.*—Chamomile flowers have been found to contain a *volatile oil*, *bitter extractive*, a little *tannic* acid, *resin*, a *volatile acid*, resembling valerianic acid. Their active properties depend essentially upon the volatile oil and extractive. Both water and alcohol extract the bitterness and aroma of the flowers.

*Physiological Effects.*—Chamomiles produce the effects of an *aromatic bitter tonic:* their aromatic qualities depend on the volatile oil, their stomachic and tonic qualities on bitter extractive and tannic acid. In large doses they act as an emetic.

*Therapeutics.*—Chamomiles are an exceedingly useful stomachic and tonic in *dyspepsia*, with a languid and enfeebled state of stomach, and general debility. As a remedy for *intermittents*, though they have gained considerable celebrity, they are inferior to many other medicines. The oil is sometimes used to relieve *flatulence*, *griping*, and *eructation;* and the warm infusion is employed as an *emetic*.

*Administration.*—The powder is rarely employed, on account of the inconvenient bulk of the requisite quantity, and its tendency to excite nausea. It may be given in *doses* of from ten to thirty grains or more. The infusion is a more elegant preparation. *Fomentations of* chamomile flowers consist of the infusion or decoction, and are used quite hot; but they present no advantage over water of the same temperature. Flannel bags filled with chamomiles and soaked in hot water are useful topical agents for the application of moist warmth, on account of their retention of heat.

### *Officinal Preparations.*

Extractum Anthemidis, *Extract of Chamomile.*—Take of chamomile flowers, one pound; oil of chamomile, fifteen minims; distilled water, a sufficient quantity. Digest the chamomile in six pints of the water for twelve hours, pour off the clear liquid and press; again digest, and press as before. Evaporate the mixed liquors by a water bath to a proper consistence, adding the oil of chamomile at the end of the process.

The oil of chamomile is added at the end of the process to compensate for the oil dissipated from the flowers during the preparation. One hundred weight of the flowers yields about forty-eight pounds of extract. The extract is a bitter stomachic and tonic. It is generally used as a vehicle for the exhibition of other tonics, in the form of pills. Conjoined with the oil of chamomile, we obtain from it all the effects of the recent flowers.

*Dose.*—Gr. x to gr. xx.

Infusum Anthemidis [U. S.], *Infusion of Chamomile.*—Take of chamomile flowers, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for fifteen minutes, and strain.

This infusion agrees very nearly with the Dublin preparation, and is much stronger than the London and Edinburgh. It is taken warm to excite gentle vomiting, or to promote the operation of an emetic. The cold infusion is usefully employed as a domestic stomachic bitter and tonic in dyspepsia. ["Take of chamomile, half a troyounce; boiling water, a pint. Macerate for ten minutes in a covered vessel, and strain." U. S.]

*Dose.*—Of the cold infusion, fl. oz. j to fl. oz. ij; of the warm infusion, *ad libitum.*

## **Oleum Anthemidis**, *English Oil of Chamomile.*

The oil distilled in England from chamomile flowers.

*Officinal Characters.*—Pale blue or greenish-blue, but gradually becoming yellow; with the peculiar odor and aromatic taste of the flowers.

*Description.*—One hundred weight of flowers yields from one and a half to two fluidounces of oil. Lewis says that the yellow oil, with a cast of greenish or brown, has a sp. gr. of 0.908. When fresh, its odor is strong and peculiar, and its taste pungent and nauseous.

*Adulteration.*—The oil of the shops is frequently brought from abroad, and is probably the produce of another plant (*Matricaria chamomilla*): hence English oil is alone made officinal.

*Effects and Uses.*—It is stimulant and antispasmodic. It is a frequent addition to tonic and cathartic pills; it communicates stimulant qualities to the former, and is believed to check the griping caused by the latter. It is an ingredient in Extract of Chamomile.

*Dose.*—One to five drops.

## ARTEMISIA, *Linn.*

Syngenesia, Polygamia superflua. *Linn. Syst.*

*Generic Character.*—*Flower-heads* (capitula) discoidal, homogamous or heterogamous. *Florets* of the ray in one row, usually female and 3-toothed, with a long bifid protruding style; of the disk, 5-toothed, hermaphrodite, or, by the absorption of the ovary, sterile or male; *involucral* scales imbricated, dry, scarious at the edge; *receptacle* flattish or convex without scales, naked or fringed with hairs. *Fruit* obovate, with a minute epigynous disk.

### Santonica, *Santonica.* [Mat. Med. List, U. S. P.]

The unexpanded flower-heads of an undetermined species of Artemisia, *Linn.* Imported from Russia.

*Officinal 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, inclosing four or five tubular flowers; odor strong, taste bitter, camphoraceous.

*Description.*—Santonica flower-heads are commonly designated seeds: but they are correctly stated in the British Pharmacopœia to be the unexpanded flower-heads. With these flower-heads we commonly find in commercial santonica a variable proportion of stalks and minute linear leaves, or fragments of leaves, intermixed. Santonica has been known under several names, as *Wormseed*, *Semen santonici*, *Semen contra*, *Semen sanctum*, &c. Three sorts have been described by pharmacologists, under the respective names of Levant Wormseed, Barbary Wormseed, and Indian or East Indian Wormseed. The two latter much resemble each other, except in color, the Barbary sort being more greenish-yellow; and may be readily distinguished from the former by being covered with a whitish down, and by their globular form. The former, or Levant Wormseed, is the best kind, and that which is alone officinal. It is said to be the produce of Bucharia, Persia, &c.; it comes to England by way of Russia. Santonica, although new as compared with the last London, Edinburgh, and Dublin Pharmacopœias, was formerly officinal in the Dublin, but was omitted in 1850. The same kind of santonica has been made officinal in the last United States Pharmacopœia. Its botanical source, as stated in the British Pharmacopœia, is undetermined, but it is supposed by some writers to be principally derived from *Artemisia contra*, Linn. (*Artemisia Sieberi*, Besser). To distinguish Levant santonica from the other kinds, the following test is given in the British Pharmacopœia:—

*Test.*—Flower-heads not round or hairy.

*Composition.*—The most important constituents of santonica are, a *volatile oil*, and a *crystalline principle*, termed *santonin*. The latter is now commonly regarded as the active principle, and has been made officinal in the British and United States Pharmacopœias; but some of the medicinal activity of santonica is doubtless due to the volatile oil, and hence santonin will not in every case supply the place of santonica. These observations refer more especially to Levant santonica, for at present, as far as is known, no *santonin* has been obtained from the Barbary sort.

*Physiological Effects and Uses.*—An accurate account of the effects of santonica is yet wanting. It appears to act upon the general system as a mild stimulating tonic; and more especially as an energetic anthelmintic. It has been employed with success in cases of *round*, *tape*, and *thread-worm*.

*Administration.*—Santonica has been given in *substance* and *infusion*. The dose in substance is from ten to sixty grains, or more, repeated night and morning for about three days, and then followed by some active cathartic. (See **Santoninum.**)

**Santoninum** [U. S.], *Santonin.* $C_{30}H_{18}O_6$.

A crystalline neutral principle obtained from santonica.

*Preparation.*—Take of santonica, bruised, one pound; slaked lime, seven ounces; hydrochloric acid, a sufficiency; solution of ammonia, half a fluidounce; rectified spirit, fourteen fluidounces; 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 colorless and nearly free from acid reaction, then with the solution of ammonia previously diluted with five fluidounces of the water, and lastly with cold distilled water till the washings pass colorless. Press the filter containing the precipitate between folds of filtering paper, and dry it with a gentle heat. Scrape the dry precipitate from the filter, and mix it with the animal charcoal. Pour on them nine ounces of the rectified spirit, digest for half an hour, and boil for ten minutes. Filter while hot, wash the charcoal with an ounce of boiling spirit, and set the filtrate aside for two days in a cool dark place to crystallize. Separate the mother-liquor from the crystals, and concentrate to obtain a further product. Collect the crystals, let them drain, redissolve them in four ounces of boiling spirit, and let the solution crystallize as before. Lastly dry the crystals on filtering paper in the dark, and preserve them in a bottle protected from light. ["Take of santonica, in moderately coarse powder, forty-eight troyounces; lime, recently slaked and in fine powder, eighteen troyounces; animal charcoal, in fine powder, diluted alcohol, acetic acid, alcohol, each, a sufficient quantity. Digest the santonica and lime with twelve pints of diluted alcohol for twenty-four hours, and express. Repeat the digestion and expression twice with the residue, using the same quantity of diluted alcohol. Mix the tinctures, and reduce the mixture to eight pints by distilling off the alcohol. Then, having filtered, and evaporated to one-half, gradually add acetic acid until in slight excess, stirring during the addition, and set the whole aside for forty-eight hours. Place the resulting crystalline mass upon a funnel loosely stopped, wash it with water, and dry it. Next, boil the dry residue with ten times its weight of alcohol, and, having digested the tincture for several hours with animal charcoal, filter it while hot, and add sufficient hot alcohol, through the filter, to wash the charcoal thoroughly; then set it aside in a dark place to crystallize. Lastly, dry the crystals on bibulous paper in the dark, and keep them in a well-stopped bottle, protected from the light. By evaporating the mother-water, more crystals may be obtained." U. S. The lime is added in the first steps of the process in order to make the santonin more soluble by uniting with it. Afterwards the alcohol is driven off by evaporation and a watery solution of the santonate of lime, with coloring matter, &c. is left. The acetic acid takes the lime away from the santonin, and the latter being insoluble in the menstruum crystallizes out of it. The subsequent steps are to free the crystals from coloring matter.—W.]

*Officinal Characters.*—Colorless 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. ["It melts when heated, and forms, on cooling, a crystalline mass. When heated somewhat above its melting point, it rises unchanged in dense, white, irritating vapors. Nearly insoluble in cold water, it is dissolved by two hundred and fifty parts of boiling water. It is soluble in forty-three parts of cold and three parts of boiling alcohol, and in seventy-five parts of ether. Its alcoholic and ethereal solutions are intensely bitter." U. S. P.]

*Properties.*—Santonin is soluble in the fixed oils. It is decomposed by the sun's light, formic acid and resinous substances being produced. It is neutral in its action on test-papers, yet it behaves as an acid (*santonic acid*), forming crystallizable and soluble salts with the alkalies, and one of its salts, the *santonate of soda*, has been recommended for use in medicine. It possesses the advantage over santonin of being soluble in water. It contains 25 per cent. of santonin.

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

*Physiological Effects and Uses.*—Santonin is a most energetic anthelmintic. The experiments of Küchenmeister prove that an oily solution of santonin will kill the lumbricus, or round worm in a shorter space of time than any other anthelmintic. Hence, it has been found of great service in cases where that worm was present in the system, as also in cases of tape and thread-worm. In excessive doses it appears to act as an acrid poison, causing purging, vomiting, cold sweats, severe abdominal pains, and symptoms generally of great prostration. In some cases its use in excess has produced a singular effect upon those under its influence, in their perception of colors, red becoming orange, and blue green.

*Administration.*—As it is insoluble in water, it is best dissolved in some oily liquid, such as castor oil. The dose for a child is about half a grain twice a day; and for an adult from two to six grains. Santonin is commonly preferred as an anthelmintic, to santonica, more especially for children, from being tasteless and inodorous. Santonica, moreover, is too bulky for general administration.

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## ARNICA MONTANA, *Linn.*

**Mountain Arnica.** Syngenesia, Polygamia superflua, *Linn. Syst.*

*Botanic Character.*—Perennial *herb*. *Stem* striated, hairy, 1–3-headed, about 1 foot high. *Radical leaves* obovate or oblong, entire, 5-ribbed; *cauline leaves* in 1 or 2 pairs lanceolate, both more or less pubescent on their upper surface. *Heads* (*capitula*) many-flowered; *involucre* in 2 rows, campanulate, with linear-lanceolate equal scales, rough, glandular; *florets* of the ray in one row, pistillate or female, ligulate; *florets* of the disk hermaphrodite, tubular, 5-toothed, the tube of the corolla shaggy; both kinds of florets of an orange-yellow color; *receptacle* fringed, hairy. *Fruit* somewhat cylindrical, tapering to each end, and somewhat ribbed and hairy. *Pappus* in one row, composed of close rigid, rough hairs.—*Steph. and Church*, plate 123.

*Habitat.*—Meadows of the cooler parts of Europe, from the sea-shore to the limits of eternal snow. It is also found in the northern parts of America and Asia.

[**ARNICA**. Mat. Med. List, U. S. P.

The flowers of Arnica montana, U. S.]

## Arnica, *Arnica.*

The root dried; collected in Middle and Southern Europe.

Besides the root, the flowers have been employed in medicine, and are commonly preferred on the continent of Europe and in North America.

*Officinal Characters.*—Rootstock from one to three inches long, and two or three lines thick, cylindrical, contorted, rough from the scars of the coriaceous leaves, and furnished with numerous long slender fibres; has a peppery taste and peculiar odor.

*Description.*—The so-called arnica root is really the rhizome, to which small rootlets are attached. The latter are generally two or more inches in length, and about the thickness of a common knitting-needle. Both the rhizome and rootlets have a brownish color externally. Their odor is feebly aromatic, and disagreeable; and their taste somewhat peppery, bitterish and nauseous.

*Composition.*—The root has been found to contain volatile oil, acrid resin and extractive. Mr. Bastick has announced the existence of an alkaloid, which he calls *arnicina*, in the flowers. *Volatile Oil.*—The oil obtained from the root is yellowish, lighter than water (sp. gr. 0.98), and has a burning aromatic taste. Sixteen pounds of the dried root yield about an ounce of oil. *Resin.*—The acridity of the roots and flowers resides, according to Pfaff, in the resin, which is soluble in alcohol. *Extractive Matter.*—According to Chevallier and Lassaigne, this is nauseous, acrid, bitter, and soluble in both water and spirit. They consider it to be analogous to *cytisin*. *Arnicina.*—This is not volatile, feebly bitter, but not acrid, slightly soluble in water, but more so in alcohol and ether. Its hydrochlorate is crystallizable (Bastick). The properties of arnica appear to depend essentially upon the acrid resin, although these are doubtless modified to some extent by the volatile oil and extractive. The best solvent of the active principle is rectified spirit.

*Physiological Effects.*—Arnica appears to possess acrid properties. When swallowed, it causes burning in the throat, nausea, vomiting, gastric pains, and loss of appetite. The active principle becomes absorbed, quickens the pulse and respiration, and promotes diaphoresis and diuresis. Furthermore, it appears to exert a specific influence over the nervous system, causing headache, giddiness, and disturbed sleep. Sundelin considers it to be closely allied in operation to senega, from which, he says, it differs in its stimulating influence over the nervous system, and in its causing constipation.

*Therapeutics.*—Arnica is indicated in diseases characterized by debility, torpor, and inactivity. It is administered as a stimulant to the general system in various debilitated conditions, and in typhoid fevers: to the nervous system in deficient sensibility, as amaurosis; to the muscular system in paralysis; to the vascular system and secreting organs, when the action of these is languid and requires to have its energy increased, as in some forms of dropsy, chlorosis, amenorrhœa, and asthenic inflammation. It is rarely employed in this country *internally*, excepting by homœopathic practitioners. The trials which have been made in this country of its remedial virtues by regular practitioners, do not in any material degree confirm the extravagant encomiums which have been passed upon it on the Continent. As an *external* application in sprains, bruises, &c., the tincture of arnica has been much employed as a domestic remedy in this country and elsewhere. The experiments of Dr. Garrod, however, appear to indicate that its efficacy is entirely due to the rectified spirit employed in its preparation, as he found that about the same remedial effects were produced upon certain bruised surfaces by the application of either simple rectified spirit or tincture of arnica. Altogether, so far as present experience leads us in this country, we have reason to believe that the virtues of arnica, both as an external and internal remedy, have been much overrated.

*Administration.*—Arnica root has been administered in powder in doses of from five to twenty grains, frequently repeated. When thus given, it is conveniently mixed with syrup or honey to form an electuary. The tincture is a more convenient and eligible mode of administration.

## *Officinal Preparation.*

TINCTURA ARNICÆ [U. S.], *Tincture of Arnica.*—Take of arnica root, in fine powder, one ounce; rectified spirit, one pint. Macerate the arnica for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.

*Dose.*—Fl. dr. j to fl. drs. ij.

["Take of arnica, six troyounces; alcohol, a pint and a half; water, half a pint; diluted alcohol, a sufficient quantity. Mix the alcohol and water, and, having moistened the arnica slightly with the mixture, bruise it thoroughly in a mortar. Then pack it firmly in a cylindrical percolator, and pour upon it, first the remainder of the mixture, and afterwards sufficient diluted alcohol to make the tincture measure two pints." U. S. This preparation is stronger than the corresponding one of the British Pharmacopœia. *Dose*, f℥ss to f℥j in water.—W.]

As an external application to sprains, bruises, &c., it is commonly mixed with water in the proportion of one part of the former to from one to seven parts of the latter.

[EXTRACTUM ARNICÆ ALCOHOLICUM, U. S., *Alcoholic Extract of Arnica.*—"Take of arnica, in moderately coarse powder, twenty-four troyounces; alcohol, four pints; water, two pints; diluted alcohol, a sufficient quantity. Mix the alcohol and water, and moisten the powder with a pint of the mixture; then pack it firmly in a cylindrical percolator, and gradually pour on the remainder of the mixture. Continue the percolation with diluted alcohol until six pints of tincture have passed. Lastly, evaporate this by means of a water-bath to the proper consistency." U. S. This extract is about three times as strong as the powdered arnica. *Dose*, gr. v to x.

EMPLASTRUM ARNICÆ, U. S., *Plaster of Arnica.*—"Take of alcoholic extract of arnica, a troyounce and a half; resin plaster, three troyounces. Add the extract to the plaster, previously melted by means of a water-bath, and mix them." U. S. Used as an external application in sprains, bruises, chronic rheumatism, &c.—W.]

## TARAXACUM DENS LEONIS, *DC.*

### Common Dandelion.

Syngenesia, polygamia æqualis, *Linn. Syst.*

*Botanic Character.*—Herbaceous, perennial. *Leaves* radical, runcinate, with the divisions toothed, broad. *Scapes* simple, six inches or more in height, erect, smooth, hollow, single-headed. *Head* (*capitulum*) many-flowered; *involucre* double; inner bracts in one row, erect; external bracts imbricated, short, linear, reflexed; *receptacle* naked; *florets* yellow, ligulate, numerous. *Fruit* yellow, somewhat compressed, linear-obovate, blunt, its upper half muricated, with a long beak. *Pappus* hairy, stipitate, in many rows, very white.—*Woodv.* plate 3, page 7.

The above characters are liable to modification by locality and other circumstances, by which several varieties of this plant are formed. These

Fig. 140.

*Taraxacum dens leonis.*

have been described by De Candolle and some other botanists as distinct species, but as they are all connected by intermediate forms, they are but varieties of one. As these varieties vary in their medicinal activity, that one only which presents the above characters should be employed in medicine.

*Habitat.*—Indigenous; very common in meadows, pastures and waste places, and flowering from the early spring till the close of the summer. This species is also found throughout Europe, and in most other parts of the world.

**Taraxacum,** *Dandelion Root.* [Mat. Med. List, U. S. P.]

The fresh roots; gathered between September and February, from meadows and pastures in Britain.

Although the *fresh root* is thus alone ordered in the Materia Medica of the *British Pharmacopœia*, the *dried root* is afterwards directed to be employed in the preparation of *decoction of taraxacum.* Hence the dried root should be used as thus indicated in the decoction, and the fresh root in the other preparations of taraxacum ordered in the Pharmacopœia.

*Collection.*—There is much difference of opinion as to the best time of collecting dandelion root for use in medicine. The more general idea is that it should be obtained from about the middle of September to the middle or end of November; but according to Professor Bentley (*Pharm. Journ.* vol. i. 2d ser. p. 402), the root is most active at the end of February or beginning of March. According to the directions given in the *British Pharmacopœia*, dandelion roots may be collected any time between September and February. Care must be taken, however, not to gather them during, or even for some time after the prevalence of frost, as this materially lessens their activity.

*Officinal Characters.*—Tap-shaped roots, smooth and dark-brown externally, white within, easily broken, and giving out an inodorous bitter milky juice, which becomes pale-brown by exposure.

*Description.*—The *fresh root*, to which the officinal characters apply, is conical fleshy, and more or less branched. It breaks readily with a short fracture. Externally it is smooth, of a dull yellow, yellowish-brown, or brownish color, and presents a plump appearance. It has commonly a bitter taste, and more especially so in the spring and summer months, but in frosty weather it becomes sweet.

The *dried root* presents a contracted and shrivelled appearance, a dark brown and somewhat blackish color externally, and is marked with deep irregular longitudinal furrows. It breaks readily with a short fracture. Professor Bentley (*Pharm. Journ.* vol. xvi. p. 304) has thus described its internal appearance: "Upon making a transverse section we observe distinctly two portions, viz., a cortical or external layer, and an internal central axis. The cortical portion is of a whitish color, and of a corky or somewhat spongy texture. Its diameter is twice, thrice, or more, that of the axis. It presents a number of distinct irregularly concentric rings, resembling the rings of wood in a transverse section of an exogenous stem. The axis is of a decided yellow color, unless the roots have been kept for a very long time, in which case the color will be less manifest."

*Adulterations.*—Dandelion root, being collected by ignorant persons, is liable to be adulterated with the roots of other common indigenous plants, as those of *hawkbit*, *chickory*, various kinds of *dock*, &c. It may readily be distinguished from these by the foregoing description..

*Composition.*—The milky juice of the root contains a *bitter extractive*, *caoutchouc*, *gum*, *albumen*, *wax*, *sugar*, *&c.* The juice of the autumn root yields a considerable quantity of inulin. From the analysis of Frickhinger it appears that the root gathered in the autumn is richer in those ingredients which are extractible by water than the root collected in the spring; whereas the latter contains more albumen, wax, and mineral constituents (ashes). The bitter extractive has been called *taraxacin* or *dandelion bitter.* This, which is probably the active principle of the root, is obtained by receiving the milky juice in distilled water, heating the liquid to boiling, by which the resin and albumen are separated, filtering the liquid when cold, and slowly evaporating, so that crystals may be formed. These may be purified by washing, and by solution in either distilled water or alcohol. Pure taraxacin occurs in stellated and dendritic masses, has a bitter and somewhat acrid taste, and is readily soluble in ether, alcohol, and boiling water, but difficultly so in cold water. It is easily fusible and inflammable, burns without developing ammonia, dissolves in concentrated acids without producing any color, and is neutral to test papers. This principle was first obtained in a crystallized state by M. Pollex, who named it *taraxacin.* In a recent analysis Kramoyer did not succeed in obtaining this crystalline taraxacin, but he found a non-crystallizable bitter hydrocarbon, which he termed *taraxacerin*. Further analyses of the milky juice of dandelion roots are therefore desirable.

*Physiological Effects.*—Its obvious effects are those of a bitter stomachic and tonic. It appears also to act on the liver, and to increase the biliary secretion. Hence probably in large doses it acts as a mild aperient. Its diuretic operation is less obvious and constant. When the digestive organs are weak, and readily disordered, taraxacum is very apt to occasion dyspepsia, flatulency, pain, and diarrhœa.

*Therapeutics.*—It is employed as a resolvent, aperient, and tonic, in chronic diseases of the digestive organs, especially hepatic affections, as jaundice, chronic inflammation or enlargement of the liver, dropsy dependent on hepatic obstruction, and dyspepsia attended with deficient biliary secretion. It is extensively employed in England and in Germany; but in Scotland it is commonly but little esteemed.

*Administration.*—It is employed in the form of *decoction*, *extract*, and *juice*.

### *Officinal Preparations.*

Decoctum Taraxaci, *Decoction of Taraxacum.*—Take of dried dandelion root, sliced and bruised, one ounce; distilled water, one pint and a half. Boil for ten minutes, and strain. The product should measure one pint.

Aperient and tonic. To increase its aperient property, a saline purgative may be conjoined. *Dose*, from fl. oz. j to fl. oz. ij.

[Infusum Taraxaci, U. S., *Infusion of Dandelion.*—"Take of dandelion, bruised, two troyounces; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S. *Dose*, f℥j to f℥ij.—W.]

Extractum Taraxaci [U. S.], *Extract of Taraxacum.*—Take of fresh dandelion root, four pounds. Crush the root; press out the juice, and allow it to deposit; heat the clear liquor to 212°, and maintain the temperature for ten minutes; then strain, and evaporate by a water-bath at a temperature not exceeding 160° to a proper consistence. ["Take of dandelion, gathered in September, sixty troyounces. Slice the dandelion, and bruise it in a stone mortar, sprinkling on it a little water, until reduced to a pulp. Then express and strain the juice, and evaporate it in a vacuum, or in a shallow dish over a water-bath to the proper consistence." U. S.]

Dandelion root washed, crushed, and pressed, yields about half its weight of juice. Except in the months of April and May, when it is very aqueous, this juice spontaneously coagulates, and becomes of a fawn color. The quantity of extract obtained from the juice varies at different seasons, the yield being the greatest from about the end of September to the beginning of December. It is obvious, then, that the expressed juice is richest in solid constituents in the months of October, November, and December, but it is very doubtful whether its activity is in proportion to the amount of its solid constituents. (See *Collection.*) Mr. Holland, of Market Deeping, finds that if extract be made from the root taken up in the autumn it becomes opaque from deposition of inulin, and requires to be redissolved in cold water in order to form a clear extract. If the extract be made in the spring, before vegetation commences, the juice yields an extract not liable to this deposit. Extract of taraxacum should be brown, not blackish. Its taste is bitter and aromatic. It should be completely soluble in water. *Dose*, gr. x to gr. xxx.

Succus Taraxaci, *Juice of Taraxacum.*—Take of dandelion root, seven pounds; rectified spirit, a sufficiency. Bruise the dandelion root in a stone mortar; press out the juice; and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place.

*Dose.*—From fl. drm. j. to fl. drs. ij.

[EXTRACTUM TARAXACI FLUIDUM, U. S., *Fluid Extract of Dandelion.* "Take of dandelion, in moderately fine powder, sixteen troyounces; diluted alcohol, a sufficient quantity. Moisten the dandelion with four fluidounces of diluted alcohol, introduce it into a conical percolator, press it firmly, and gradually pour upon it diluted alcohol until half a pint of tincture has passed. Set this aside, and continue the percolation until two pints and a half more of tincture have been obtained. Evaporate this at a temperature not exceeding 120° until it is reduced to half a pint, mix it with the reserved tincture, and filter through paper." U. S. Dose, f℥j to ij, t. d. in water.—W.]

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## [INULA HELENIUM, *Linn.*

### Elecampane.

*Generic Character.*—Heads many-flowered. Rays many; anthers with tails at their bases. Pappus capillary.

*Specific Character.*—*Stem* erect. *Leaves* delicate, velvety, tomentose beneath, acute; the radical ones ovate, gradually attenuated into petioles; those of the stem semi-amplexicaul. *Peduncles* few, 1-headed, corymbose at the apex. (*De Cand.*)

*Root* perennial, thick, branching. *Stem* 3 to 5 feet high. *Leaves* large, serrated, veiny. *Heads* terminal. *Flowers* bright yellow.

*Habitat.*—Europe; sparingly naturalized in this country.

### Inula, *Elecampane.* Secondary List, U. S. P.

The root of Inula helenium.

The dried root of the shops consists of longitudinal or transverse slices, which are yellowish-gray, and have an aromatic or camphoraceous smell, and a warm, bitter taste. Iodine colors the root brown. It contains elecampane camphor, resin, bitter extractive, inulin, and various unimportant substances. Inulin is an amylaceous substance, which is very slightly soluble in cold water, but very soluble in boiling water, from which it is deposited as the solution cools. It is slightly soluble in boiling alcohol. Iodine gives it a yellow tint; this distinguishes it from ordinary starch. Its formula is $C_{12}H_{10}O_{10}$.

*Therapeutics.*—An aromatic tonic. It acts as a gentle stimulant to the organs of secretion, and is termed diaphoretic, diuretic, and expectorant. Large doses cause nausea and vomiting. It was formerly supposed to possess emmenagogue properties. In its operation it is allied to sweet-flag and senega.

*Uses.*—It is rarely employed now by the medical practitioner. It has been used in pulmonary affections (as catarrh) attended with profuse secretion and accumulation of mucus, but without febrile disorder or heat of skin. In dyspepsia, attended with relaxation and debility, it has been administered with benefit. It has also been employed in the exanthemata to promote the eruption.

*Administration.*—Dose of the *powder*, ℈j to ʒij; of the *decoction* (prepared by boiling ℥ss of the root in Oj of water), f℥j to f℥ij.—W.]

## [MARUTA COTULA.

### Mayweed.

*Generic Character.*—Rays neutral; achenia obovoid, ribbed. Receptacle chaffy. Pappus none.

*Specific Character.*—Scales of the involucre with whitish margins.

A very common roadside weed, with finely thrice-pinnately divided leaves, and single heads terminating the branches. It is naturalized in the United States from Europe.

**Cotula,** *Mayweed.* Secondary List, U. S. P.

The herb of Anthemis cotula, Maruta cotula.

Fig. 141.

*Maruta cotula.*

This herb has a strong, disagreeable odor and a bitter taste. It contains a volatile oil and bitter extractive. Its therapeutic powers are very similar to those of chamomile, for which it may be substituted. It is best given in infusion. The flowers have least of the taste, and are therefore the best part of the plant.—W.]

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## [ACHILLEA MILLEFOLIUM, *Linn.*

### Yarrow, *Milfoil.*

*Generic Character.*—Heads radiate; rays pistillate. Achenia flattened and margined; pappus wanting. Receptacle chaffy, flattish. Involucre imbricated.

*Specific Character.*—Leaves twice pinnately divided, the divisions linear, crowded, 3-cleft; rays 4–5, short.

An ill-favored weed, distinguished by its peculiar leaves, its large, flat corymb of small white heads, and disagreeable odor. It attains the height of one to two feet. A native of Europe, it is now very common along roadsides, waste places, and old fields in the Northern United States, where it flowers from June to September, during which period it should be gathered.

### Achillea.

The herb and flowers of Achillea millefolium.

This herb contains bitter extractive, tannic acid, and a volatile oil, which may be obtained by distillation, and is peculiar for its deep azure blue color. It yields to water and alcohol. The taste is peculiar, somewhat aromatic, bitter, and astringent.

*Therapeutics.*—A mild, astringent, aromatic tonic. It has been used, with asserted success, in cases of painful or suppressed menstruation, and probably exerts similar powers with a large number of other bitter, aromatic, stimulating herbs. For this purpose it should be exhibited in warm infusion at the menstrual period.—W.]

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## [TANACETUM VULGARE, *Linn.*

### Tansy.

*Generic Character.*—Heads nearly discoid, all fertile; scales of the involucre imbricated, dry. Receptacle convex, naked. Achenia angled or ribbed, with a flat top. Pappus a short crown. Flowers yellow.

*Specific Character.*—Stem erect, smooth; leaves twice pinnately parted, the leaflets and the margined petiole cut toothed; corymb dense; pistillate flowers terete; pappus 5-lobed.

*Habitat.*—Europe; cultivated and escaped from gardens in the United States.

### Tanacetum, *Tansy.* Secondary List, U. S. P.

The herb of Tanacetum vulgare.

The herb and flowers have a disagreeable aromatic odor and a nauseous, strong, aromatic, bitter taste. They contain a volatile oil, gallotannic acid, bitter extractive, and various unimportant substances.

*Therapeutics.*—Aromatic, bitter, and apparently, in large doses, a spinal excitant. A fatal case of poisoning with half an ounce of oil of tansy is recorded in the *Medical Magazine*, Nov. 1834. Frequent and violent clonic spasms were experienced, with much disturbance of respiration, and the action of the heart gradually became weaker till death took place from its entire suspension. No inflammation of the stomach or bowels was discovered upon dissection. In medicine, the plant is rarely employed by the regular practitioner; but it has been recommended in dyspepsia, intermittents, and gout. Its principal use, however, is as a vermifuge. *Tansy tea* (prepared by infusing ℥ij of the herb in Oj of boiling water) may be taken in doses of from f℥j to f℥iij. A drop or two of the *oil* may be added to vermifuge powders and pills. The *seeds* have been used instead of *semina santonici.*—W.]

## [ARTEMISIA ABSINTHIUM, *Linn.*

### Common Wormwood.

*Generic Character.*—Head discoid; the flowers all tubular, the marginal ones pistillate, or sometimes all similar and perfect. Involucral scales imbricated, dry, scarious at the edges. Receptacle small and flattish, naked.

*Specific Character.*—Stem leaves pinnatified, with the lobes variously cut or entire, linear-lanceolate. Heads ovoid, in open, leafy panicles. Receptacle smooth; flowers all fertile. Exterior scales of the involucre somewhat silky, linear, lax; interior ones rounded, scarious, somewhat naked. Herb covered with silky hoariness, intensely bitter, with a strong, peculiar odor. Stems numerous, about a foot high. Leaves rather greener on the upper side; lower ones on long footstalks; upper on shorter, broader, somewhat winged ones. Florets pale yellow or buff.

This plant is a native of Europe, but is naturalized in the United States, growing in waste places around dwellings.

### Absinthium, *Wormwood.* Mat. Med. List, U. S. P.

The tops and leaves of Artemisia absinthium.

The dried herb with the flowers have a whitish-gray appearance, a soft feel, a strong, aromatic and somewhat unpleasant odor, and an extremely bitter, aromatic taste. It contains resin, tannin, volatile oil, a bitter, nitrogenous principle which has received the name of absinthia, and absinthic acid, besides numerous unimportant substances. Absinthic acid is said to be identical with succinic acid.

*Therapeutics.*—In *moderate doses* it produces the ordinary effects of the *aromatic bitter tonics.* Its bitter principle becomes absorbed; hence, the flesh and milk of animals fed with it are rendered bitter. *Large doses* irritate the stomach and excite the vascular system. A specific influence over the nervous system, characterized by headache, giddiness, &c., has been ascribed to it. This has usually been supposed to depend on the volatile oil; but a similar power has been assigned to the bitter principle.

*Uses.*—Wormwood is but little employed in medicine. It is adapted for dyspepsia occurring in debilitated and torpid constitutions. It was at one time celebrated for the cure of intermittents, but has been superseded by other and more powerful febrifuges. It is said to be efficacious as an anthelmintic, but is very rarely employed as such.

*Administration.*—Dose of the *powder*, ℈j to ʒj; of the *infusion* (prepared by macerating ℥j of the dried herb in Oj of boiling water), f℥j to f℥ij.—W.]

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## [ANACYCLUS PYRETHRUM, *De Cand. Pellitory.*

*Generic Character.*—*Head* many-flowered, heterogamous. *Florets* of the ray female, sterile, ligulate or somewhat so, very rarely tubular; of the disk hermaphrodite, with 5 callous teeth. *Involucre* in few rows, somewhat campanulate, shorter than the disk. *Achenia* flat, obcompressed, bordered with broad, entire wings. *Pappus* short, irregular, tooth-letted, somewhat continuous with the wings on the inner side. (De Cand.)

*Specific Character.*—*Stems* several, procumbent, somewhat branched, pubescent. Radical *leaves* expanded, petiolated, smoothish, pinnatisect;

the segments pinnatipartite, with linear subulate lobes; the cauline leaves sessile. *Branches* 1-headed. *Involucral* scales lanceolate, acuminate, brown at the margin. *Receptacle* convex, with oblong-obovate, obtuse paleæ. (De Cand.)

*Habitat.*—Syria, Arabia, &c.

**Pyrethrum,** *Pellitory.* Secondary List, U. S. P.

The root of Anacyclus pyrethrum.

This root is in small pieces about the length and thickness of the little finger, with a thick brown bark, studded with black shining points. It breaks with a resinous fracture, and presents a radiated structure. It is inodorous, but when chewed excites prickling and a glowing heat in the lips and tongue. Its active principle is pyrethrin, an acrid oleoresin which exists in greater abundance in the bark than in the wood. It is brown, soft, has a burning acrid taste, is insoluble in water, but soluble in ether and alcohol; still more so in acetic acid and the oils (volatile and fixed).

*Therapeutics.*—Pellitory is an energetic local irritant. Applied to the skin, it acts as a rubefacient. It is scarcely ever employed internally. Its principal use is to yield a tincture for the relief of toothache. As a masticatory and sialagogue, it is chewed in some rheumatic and neuralgic affections of the head and face, and in palsy of the tongue. In relaxation of the uvula it is occasionally employed in the form of gargle. It was formerly employed internally as a gastric stimulant.

*Administration.*—Dose, as a *masticatory*, ʒss to ʒj. *Tinctura pyrethri* (composed of pyrethrum, water, of each one part; rectified spirit, five parts) is used to relieve toothache.—W.]

[The root of *Lappa minor* or common Burdock is also officinal in the Secondary List of the U. S. Ph. It has been considered as an alterative and stimulant to the secretions. It is best given in form of decoction ℥ij of the recent root to Oiij of water boiled to Oij. Dose, Oj in 24 hours, continued for some weeks. It has been especially recommended in venereal, rheumatic, and scorbutic diatheses, and in chronic skin diseases.

The leaves of the sweet scented golden rod (*Solidago odora*) are also recognized. They contain a small amount of volatile oil, and yield, with hot water, a slightly stimulant, carminative, aromatic infusion.—W.]

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## [LACTUCA SATIVA. *De Cand.*

*Generic Character.*—*Heads* many or few-flowered. *Involucre* cylindrical, calyculate-imbricate, in 2 or 4 rows; outer rows short. *Receptacle* naked. *Achenes* plane, obcompressed, wingless, abruptly terminating in a filiform beak. (De Cand.)

*Specific Character.*—*Leaves* not concave, erect, oblong, narrowed at the base, smooth at the keel. *Stem* elongated, leafy. (DeCand.)

*Annual.* *Stem* erect, simple below, branched above, 1 or 2 feet high, smooth. *Leaves* rounded or ovate, semi-amplexicaul, frequently wrinkled, usually pale green; varying much in the different varieties. *Flowers* yellow.

*Habitat.*—Native country unknown; perhaps the East Indies. Extensively cultivated in Europe under the name of the *Cos Lettuce*, and in the United States under the name of *Salad* and *Lettuce*.

**Lactucarium,** *Lactucarium.* Mat. Med. List, U. S. P.

The concrete juice of Lactuca sativa.

In the young state, the plant abounds in a cooling, bland, slightly bitterish, pellucid, watery juice. At this period, while it consists chiefly of a bunch of succulent leaves, *L. sativa* is employed at table as a very agreeable salad. As the flowering period approaches, the stem shoots up above the early leaves, and the juice of the plant becomes milky and bitter, and acquires a smell allied to that of opium. When incisions are made into the stem, this milky juice exudes, and, by exposure to the air, dries and becomes the brown solid called *lactucarium* or *lettuce-opium.* The incisions are effected either by cutting off the top of the stem and removing a fresh slice as often as the surface ceases to yield juice, or by cutting the sides of the stem. The exuded juice is removed in various ways, placed in glass and earthenware vessels, and allowed to concrete. By drying in the air, the milky juice of *L. virosa* loses about half its weight of water, and yields from 50 to 55 per cent. of lactucarium. According to Mr. Duncan, after the middle period of inflorescence, although the juice becomes thicker, it contains a less proportion of bitter extract, and, therefore, is less fit for yielding lactucarium.

*Properties.*—*Lactucarium* or *lettuce-opium*, as usually found in the shops of this country, is in small lumps, which are seldom larger than a pea or small bean; they are rough and irregular on the surface, sometimes covered with an ash-gray efflorescence, of a brown or reddish-brown color, friable, with an opiate smell and bitter taste. That which is collected in the neighborhood of Edinburgh is in larger, roundish masses, weighing often several ounces. There is a variety known as the German which is in more or less concavo-convex, four-sided pieces, an inch to an inch and a half in thickness. This variety is said to be inferior to the English. Chemists have found in lactucarium, resins, mannite, pectin, and a large number of unimportant substances. A bitter, neutral crystalline substance has also been found, to which the name of lactucin has been given. It does not, however, appear to be the active principle, which has been conjectured to be an unknown alkaloid. It yields its virtues to alcohol. Its watery solution throws down an olive-brown precipitate with the sesquichloride of iron.

*Uses.*—It is employed as an anodyne, hypnotic, antispasmodic, and sedative, where opium is considered objectionable, either from peculiarities on the part of the patient or from the nature of the disease. Thus, it may be used where there is morbid excitement of the vascular system, in which condition opium is usually contraindicated. But though it is free from several of the inconveniences which attend the use of opium, yet it is far less certain in its operation. It may be given with advantage to allay cough in phthisis and other pulmonary affections; to relieve nervous irritation and watchfulness in febrile disorders in which opium is not admissible.

*Dose.*—Gr. xv—xxx.

Syrupus Lactucarii, U. S., *Syrup of Lactucarium.*—"Take of lactucarium, a troyounce; syrup, fourteen fluidounces; diluted alcohol, a sufficient quantity. Rub the lactucarium with sufficient diluted alcohol, gradually added, to bring it to a syrupy consistence. Then introduce it into a conical percolator, and, having carefully covered the surface with a piece of muslin, gradually pour diluted alcohol upon it until half a pint of tincture has passed. Evaporate this, by means of a water-bath, at a temperature not exceeding 160°, to two fluidounces, mix it with the syrup, previously heated, and strain while hot." U. S. Used as an anodyne vehicle in cough mixtures. Dose, f℥ss—f℥iss.—W.]

## VALERIANACEÆ, *Lindl.* The Valerian Order.

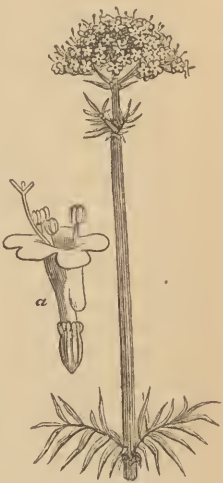
## VALERIANA OFFICINALIS, *Linn.*

### Common Valerian.

Triandria Monogynia, *Linn. Syst.*

*Botanic Character.*—Herbaceous, perennial. *Rhizome* stoloniferous; giving off numerous long, cylindrical, slender rootlets. *Stem* solitary, annual, furrowed, two to four feet high. *Leaves* all pinnate; leaflets in 7–10 pairs, lanceolate or elliptical-lanceolate, dentate-serrate or entire, terminal leaflet very little, if at all, larger than the others; *stem leaves* opposite, on short broad petioles; *radical leaves* on long petioles. *Inflorescence* panicled, cymose; *flowers* flesh-colored or whitish. *Calyx-limb* involute during flowering, unrolled into a feathery pappus. *Corolla* with a 5-lobed limb, and a somewhat funnel-shaped tube, which is gibbous at the base. *Stamens* 3. *Fruit* indehiscent, 1-celled, 1-seeded, compressed, crowned with the pappus.—*Woodv.* pl. 96, page 202.

Fig. 142.




*Valeriana officinalis.*
*a*, Flower.

*Habitat.*—It is indigenous, and is also found in most countries of Europe. It commonly grows in ditches and damp places, and sometimes in dry heaths and elevated pastures. The plant found in the latter situations has a shorter stem and narrower leaflets.

**Valeriana,** *Valerian.* [Mat. Med. List, U. S. P.]

The root of plants indigenous and also cultivated in Britain, collected in autumn and dried; that from wild plants growing on dry soil being preferred.

Although the preference is thus given to the roots of the variety growing on dry soil, there does not appear to be sufficient evidence of their greater medicinal value. The roots of cultivated plants are, however, certainly less active than those of wild plants.

*Collection.*—The valerian root of the shops is collected about August and September, from wild and cultivated plants. The roots of the wild sort are now gathered chiefly in Hampshire; but the heaths of Kent and Essex formerly furnished a great deal of it. The cultivation of valerian is carried on at Ashover, near Chesterfield, in Derbyshire. The plants are either procured from the offsets of former plantations, or from wild plants found in wet places in the neighboring woods. Soon after the plant comes up in the spring, the tops are cut off, to prevent its running to seed, which spoils it. At Michaelmas, the roots are dug up carefully and clean washed, and the remaining top is then cut close off, and the thickest part slit down to facilitate their drying, which is effected on a kiln, after which they must be packed tight, and kept very dry, to prevent their spoiling.

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

*Description.*—The so-called root consists of a short tuberculated underground stem or rhizome from which numerous rootlets arise below; the rhizome is whitish internally, and when fresh, grayish or yellowish-white externally, but when dried yellowish-brown. The taste is warm, camphoraceous, slightly bitter, somewhat acrid, and nauseous. The odor of the fresh roots is not very considerable, but of the dry, especially when they have been kept for some time, much stronger; it is fetid, and very characteristic. Two varieties of valerian root are found in English commerce; viz. the *cultivated*, which, being the finer-looking, is usually kept by druggists; and the *uncultivated*, or *wild-sort*, which is to be preferred for medicinal use.

*Composition.*—Valerian yields its active properties to water and alcohol. Its more important constituents are, volatile oil, resin, peculiar extractive matter (*valerianin*), and yellow extractive matter. *Volatile Oil.*—According to Huralt, this oil does not exist ready-formed in valerian root, but is produced only by the action of water; for pure ether does not extract any volatile oil from the root. When the root is submitted to distillation with water, it yields about 1.5 per cent. of oil, which is a mixture of at least five substances. Two of these are volatile oils, and may be regarded as its essential components; the more volatile of these is *valerene*, a colorless liquid, identical with a hydrocarbon obtained from Borneo camphor, and isomeric with oil of turpentine; the less volatile ingredient is *valerol*, which is lighter than water, has the odor of hay, and by exposure to the air absorbs oxygen and yields valerianic acid. The three other constituents of the oil are *valerianic acid*, a *resin*, and a kind of *camphor*, or solid volatile oil. Fresh prepared and rectified oil of valerian is neutral, clear, with an odor which is not disagreeable. By exposure to the air it resinifies, becomes colored, thick, acid (owing to the formation of valerianic acid), and acquires a more disagreeable odor. Oil of valerian has been used in medicine as a powerful stimulant and antispasmodic, in doses of one, two or more minims. *Valerianic Acid*, $C_{10}H_9O_3,HO$.—It can be procured from valerian root, in which, according to some persons, it pre-exists, but it is probably formed by the oxidation of valerol. Rabourdin, by previously acidulating the water with sulphuric acid, obtained 1 per cent. of valerianic acid from the root; whereas, when simple water was employed the product was only 0.25. Lefort advises that, prior to distillation, the coarsely-powdered root should be macerated in water mixed with sulphuric acid and bichromate of potash, in order to promote the oxidation of the valerol, and thereby to increase the product of valerianic acid. He obtained, by this method, 1.8 of valerianate of zinc from 100 of the root. By boiling the root in a solution of carbonate of soda, and decomposing the saline solution by sulphuric acid, the Messrs. Smith procured four scruples of acid from a pound of root. Thirault is of opinion that caustic alkali is preferable to the carbonate. But valerianic acid is a product of the decomposition of various animal and vegetable substances, and is most economically obtained, for commercial purposes, from fousel oil. (See **Valerianate of Soda**.) Valerianic acid is a colorless limpid liquid. Its odor is strong, and somewhat allied to, though distinct from, that of valerian root; its taste is acrid. Its density, at 60° F., is 0.937. It boils at 347° F. It is very slightly soluble in water, with which it forms a hydrate, $C_{10}H_9O_3,3HO$; but is soluble in all proportions in alcohol and in ether. With the exception of the valerianates of silver and of the protoxide of mercury, all the valerianates are soluble in water. M. Gerhardt has obtained anhydrous valerianic acid, as a colorless, slightly odorous, oily fluid, lighter than water, boiling at 419°.—*Valerianin, Peculiar Extractive Matter.*—A yellowish-brown substance, which tastes at first sweetish, afterwards slightly bitter. It is soluble in water, but insoluble in both absolute alcohol and pure ether. Neither perchloride of iron nor acetate of lead produce any change in the aqueous solution. *Yellow Extractive Matter.*—Bitterish, soluble in water. The perchloride of iron causes a green precipitate, and acetate of lead a dirty yellowish precipitate, in the aqueous solution. *Resin.*—Insoluble in water, but soluble in alcohol, ether, and oil of turpentine. The alcoholic solution does not redden litmus, nor yield any precipitate on the addition of an alcoholic solution of ether acetate of lead or acetate of copper.

*Physiological Effects.*—Valerian excites the cerebro-spinal system. Large doses cause headache, mental excitement, visual illusions (scintillation, flashes of light, &c.), giddiness, restlessness, agitation, and even spasmodic movements. Its operation on the nervous system is also evinced by its occasional therapeutic influence over certain morbid states of this system; whence it has been denominated *nervine* and *antispasmodic.* The effects of valerian on the nervous system are, however, by no means constant. More inconsistent still are its effects on the functions of organic life. For while in some cases it has accelerated the pulse, augmented the heat of the body, and promoted the secretions, in others it has failed to produce these effects. Large doses often create nausea.

*Therapeutics.*—Valerian may be employed as a nervous excitant, and, where stimulants are admissible, as an antispasmodic. It was formerly in great repute. It has been principally celebrated in *epilepsy.* Its employment has found numerous advocates and opponents; but at the present time most practitioners regard it as a medicine of very little power. In the few cases in which I have employed it, it has failed to give the least relief. In some of the milder and more recent forms of the disease, neither dependent on any lesion within the cranium nor accompanied with plethora, as in hysterical epilepsy, it may occasionally prove serviceable. In *chorea* and other spasmodic affections, it has been used with variable success. I have found temporary benefit from its use in females affected with *hypochondriasis* and *hysteria.* Of its use as a nervous stimulant in the low forms of *fever*, we have but little experience in this country. In Germany, where it is more esteemed, its employment in these cases is highly spoken of.

*Administration.*—The dose of *powder* is from 20 to 60 grains, or even 120 grains. Though objected to by some, on account of the quantity of inert woody fibre which it contains, it is, when well and recently prepared, an efficacious form of administration.

### *Officinal Preparations.*

INFUSUM VALERIANÆ [U. S.], *Infusion of Valerian.*—Take of valerian, bruised, one hundred and twenty grains; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain. ["Take of valerian, in moderately coarse powder, half a troyounce; water, a sufficient quantity. Moisten the powder with two fluidrachms of water, pack it firmly in a conical percolator, and gradually pour water upon it until the filtered liquid measures a pint. This infusion may also be prepared by macerating the valerian with a pint of boiling water, for two hours, in a covered vessel, and straining." U. S.]

This infusion contains a small quantity of volatile oil, some valerianate of potash (Trommsdorf), and extractive matter, but no resin. It is somewhat less apt to disturb the stomach than the powder.

*Dose.*—Fl. oz. j to fl. oz. ij.

TINCTURA VALERIANÆ [U. S.], *Tincture of Valerian.*—Take of valerian, bruised, two ounces and a half; proof spirit, one pint. Macerate the valerian for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. [" Take of valerian, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

This preparation contains a portion of volatile oil, some valerianate of potash, valerianin, and resin. It possesses the virtues of valerian, but is scarcely sufficiently strong to produce the full effects of the root, without giving it in doses so large as to be objectionable, on account of the spirit contained therein.

*Dose.*—Fl. drm. j to fl. drs. iv.

TINCTURA VALERIANÆ AMMONIATA [U. S.], *Ammoniated Tincture of Valerian.*—Take of valerian, bruised, two ounces and a half: aromatic spirit of ammonia, one pint. Macerate the valerian for seven days in a well-closed vessel, then filter, and add sufficient aromatic spirit of ammonia to make one pint. Although the proportions of the ingredients are unaltered, this preparation contains a larger quantity of carbonate of ammonia than the London tincture, in consequence of the increased strength of the aromatic spirit. [" Take of valerian, in moderately fine powder, four troyounces; aromatic spirit of ammonia, two pints. Macerate for seven days, express, and filter through paper." U. S.]

The stimulant influence of the valerian is greatly increased, and its therapeutical efficacy often augmented, by the ammonia in this preparation. [One of our most valuable temporary remedies in the legionary forms of feminine nervousness.—W.]

*Dose.*—Fl. drm. ss to fl. dr. j.

[EXTRACTUM VALERIANÆ ALCOHOLICUM, *Alcoholic Extract of Valerian.*—" Take of valerian, in fine powder, twelve troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Moisten the powder with four fluidounces of alcohol, pack it in a percolator, and gradually pour upon it the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour on diluted alcohol until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol until two pints more are obtained, and evaporate this by means of a water-bath, to the consistence of syrup. Lastly, mix the two liquids, and continue the evaporation, at a temperature not exceeding 120°, until the mixture is reduced to the proper consistence." U. S. Probably the larger part of the volatile oil of the root is lost in this process, and the preparation, therefore, is not equal to some of the others. Dose, gr. x–xxx, in pill.

EXTRACTUM VALERIANÆ FLUIDUM, U. S., *Fluid Extract of Valerian.*—" Take of valerian, in fine powder, sixteen troyounces; alcohol a sufficient quantity. Moisten the valerian with six fluidounces of alcohol, introduce it into a conical percolator, press it firmly, and gradually pour alcohol upon it until twelve fluidounces of the tincture have passed. Set this aside, and continue the percolation until two pints more of tincture have been obtained. Evaporate this to four fluidounces, at a temperature not exceeding 120°, mix it with the reserved tincture, and filter through paper." U. S. This preparation is nothing more than a very concentrated tincture, in which a fluidounce represents an ounce of the valerian root. It is a very serviceable preparation, and may be given in doses of f℥j–ij, in water.

OLEUM VALERIANÆ, U. S., *Oil of Valerian.*—"Prepare this oil from valerian, bruised, by the general formula given at page 399." U. S. For characters, see Valerian.

*Therapeutics.*—Oil of valerian exercises an influence on the system similar to that of valerian. Dose, gtt. j–iij, in emulsion or in pill with other substances.

## **Acidum Valerianicum**, U. S., *Valerianic Acid.*

"Take of valerianate of soda, in coarse powder, eight troyounces; sulphuric acid, water, each a sufficient quantity. To the valerianate of soda, add, first, three fluidounces of water, and then three troyounces and a half of sulphuric acid. Mix them thoroughly, and from the mixture, after standing, separate the oily acid liquid which rises to the surface. Agitate this repeatedly with small portions of sulphuric acid until its specific gravity is reduced below 0.950. Then introduce it into a retort, and distil nearly to dryness, rejecting the distillate, so long as it has a specific gravity above 0.940, and keeping the remainder for use. The rejected portion of the distillate, after agitation with sulphuric acid, may be returned to the retort during the progress of distillation." U. S. In this process the acid is obtained by the decomposition of one of its salts, the sulphate of soda being formed.

*Officinal Characters.*—Valerianic acid is a colorless liquid, of an oily consistence, a penetrating disagreeable odor, and caustic taste. Its specific gravity is 0.933. It is soluble in thirty parts of cold, and, by agitation with a small quantity of that liquid, takes up about twenty per cent. of its weight, without losing its oily consistence. It mixes in all proportions with alcohol and ether. A solution of valerianic acid in fifty parts of hot water, saturated with hydrated carbonate of zinc, yields a liquid which, when filtered, and evaporated to ten parts and cooled, affords white pearly crystals of valerianate of zinc. The mother-water drained from these crystals, should not yield, by further evaporation and cooling, a salt crystallizing in six-sided tables, and very soluble in water. When the acid is added to a concentrated solution of acetate of copper, the transparency of the solution is not disturbed. The first of the last two officinal tests shows the absence of acetic acid; the other that of butyric acid.

*Therapeutics.*—Valerianic acid is not used itself in medicine, but has been introduced into the Pharmacopœia because used in the manufacture of the valerianates of quinia and zinc.—W.]

## CINCHONACEÆ, *Lindley.* The Cinchona Order.

## CEPHAËLIS IPECACUANHA, *Richard.*

### The Ipecacuanha Plant. Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, annulated, simple, or dividing into a few diverging flexuous branches, from 4 to 6 inches long. *Stem* somewhat shrubby, 2 or 3 feet long, emitting runners. *Leaves* opposite, stalked, oblong-lanceolate, rough above, downy beneath, rarely more than 4 or 6; *petioles* pubescent, connected to each other by the erect stipules; *stipules* membranous at their base. *Peduncles* solitary, erect when in flower, reflexed when in fruit. *Head* semi-globose, 8–10-flowered; *involucre* 1-leafed, spreading, deeply 4–6-parted, segments obovate; *bracts* acute, pubescent; a single one to each flower. *Calyx* minute. *Corolla* white, *Stamens* 5. *Ovary* ovate; *style* filiform, white; *stigmas* linear, spreading. *Berry* soft, fleshy, violet-black. *Seeds* pale, plano-convex.—*Steph. and Church.*, pl. 62.

Fig. 143.

*Cephaëlis ipecacuanha.*

*Habitat.*—Brazil; in moist shady situations from 8° to 20° south latitude. Abundant in the valleys of the granitic mountains, which run through the provinces of Rio Janeiro, Espirito Santo. and Bahia; also met with in Pernambuco. It appears to be more or less abundant throughout the greater part of Brazil. Humboldt and Bonpland also found it on the St. Lucar mountains of New Granada.

### Ipecacuanha, *Ipecacuan.* [Mat. Med. List, U. S. P.]

The root dried; imported from Brazil.

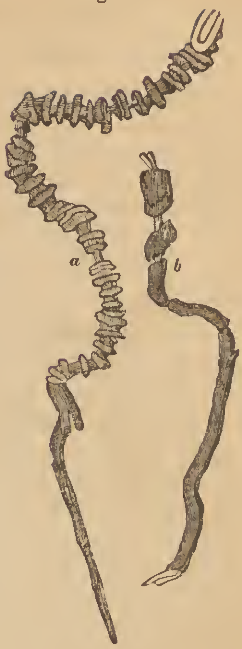
*Collection.*—The roots are gathered at all seasons of the year, though more frequently from January to March inclusive; and as no care is taken in the cultivation of the plant, it has become scarce around the principal towns. According to Weddel, it was principally collected, in the year 1851, in the interior province of Matto Grasso, in Brazil. The roots are cut from the stems by the Indians, who are the chief collectors, cleaned and hung up in the sun to dry.

*Commerce.*—Ipecacuan is principally imported into this country in bales or in serons, from Rio Janeiro; but also from Bahia, Pernambuco, and rarely from Carthagena.

*Officinal Characters.*—In pieces three or four inches long, about the size of a small quill, contorted, and irregularly annulated. Color 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 odor, and a somewhat acrid and bitter taste.

*Description.*—Ipecacuan has a knotty appearance, in consequence of a number of deep, circular fissures, about a line in depth, and which extend inwardly to a central ligneous cord, so as to produce the appearance of a number of rings strung upon a thread (hence the name, *annulated*, which is applied to it by Continental writers). These rings are unequal in size, both with respect to each other and to different parts of the same ring. It has a resinous fracture. In 100 parts of good ipecacuan, there are about 80 of cortical portion, and 20 of meditullium. Ipecacuan has an acrid, feebly aromatic, somewhat bitter, nauseous taste, and a slightly nauseous, but peculiar odor. The color of the root varies, being brownish, reddish-brown, grayish-brown, or gray. The powder is of a pale brown or gray color.

Fig. 144.




Three varieties of ipecacuan are found in commerce, whose principal distinction is the color of the epidermis. The age of the root, the nature of the soil, and the mode of drying, are among the different circumstances producing these varieties. Sometimes they are met with in the same package. *Brown Ipecacuan.*—This is the best kind. The greater part of the ipecacuan of commerce consists of this variety. Its epidermis is more or less deeply brown, sometimes even blackish; its fracture is gray or brownish, its powder is gray. The cortical portion has a horny appearance. *Red Ipecacuan.*—This differs from the preceding by the lighter and reddish color of its epidermis, by its less powerful odor, and by its want of aromatic taste. Sometimes it has, when broken, the same horny and semi-transparent quality as the brown ipecacuan, but more frequently it is opaque, dull, and farinaceous; in which case it is generally less active. *Gray Ipecacuan.*—The color of this variety is grayish-white. Gray ipecacuan occurs in pieces of larger diameter than either of the foregoing kinds, with fewer, more irregular, and less prominent rings.

*Composition.*—The more important constituents of ipecacuan are a peculiar *alkaloid*, called *emetia*, *a trace of volatile oil*, *fatty matter*, and a peculiar astringent acid, which was at first mistaken for gallic acid, but is now termed *ipecacuanhic* or *cephaëlic acid.* The emetic property resides in the emetia, which is principally contained in the cortical portion, hence this is the most active portion of the root. The medicinal properties of ipecacuan are extracted in a great measure by water, but alcohol and the strong wines are the best solvents. Boiling injures its properties. Tincture of nutgalls forms, in the decoction, as well as in the tincture diluted with water, a grayish-white precipitate (*tannate of emetia*). Perchloride of iron communicates a greenish tint (*ipecacuanhate of iron*) to the decoction as well as to the diluted tincture. A solution of isinglass forms in the infusion, after twelve hours, a precipitate. *Emetia.*—When first discovered by Pelletier and Magendie, in 1817, it was in a very impure state, and was so termed (from ἐμέω, I vomit). Pure emetia is white (when not absolutely pure it has a grayish-yellow tinge), pulverulent, inodorous, with a slight bitter taste; fusible at 122° F.; very slightly soluble in cold, but much more so in hot water; very soluble in alcohol, but scarcely soluble in ether and oils. It dissolves in acids, the acidity of which it does not entirely destroy. Its composition is $C_{35}H_{25}O_9N$. The best ipecacuan yields about one per cent. of pure emetia. The *salts of emetia* are slightly acid, and very crystallizable. An alcoholic solution of iodine, added to an alcoholic solution of emetia, produces a reddish precipitate (*iodide of emetia?*). Tincture of galls copiously precipitates solutions of emetia (*tannate of emetia*). The effect of these reagents on emetia is similar to their effect on morphia; but from this last substance emetia is distinguished by the salts of iron, which produce no change of color in it. According to Magendie, a quarter of a grain of impure emetia administered to a man excited nausea and vomiting; a grain and a half, or two grains, taken fasting caused continued vomiting and decided disposition to sleep. The effects of *pure* emetia are similar, but more energetic. In one case $\frac{1}{16}$ of a grain caused vomiting in a man eighty-five years of age; two grains are sufficient to kill a dog. Emetia has been proposed as a remedial agent as a substitute for ipecacuan, all the advantages of which it is said to possess in a much smaller dose, and without the unpleasant taste and odor which the root is known to have. I confess, however, I think very little advantage is likely to be gained by the substitution. When we wish to give emetia in a liquid form, it may be readily dissolved in water by the aid of acetic or dilute sulphuric acid.

*Physiological Effects.*—If the powder or dust of ipecacuan be applied to the eyes or face, it acts as an irritant, and causes redness and swelling of these parts. Inhaled, it irritates the respiratory passages, and, in some persons, brings on difficulty of breathing, similar to an attack of spasmodic asthma. There is one case recorded of poisoning by the incautious inhalation of the dust of ipecacuan, in the process of powdering it, by a druggist's assistant. It is mentioned by Dr. Prieger. The patient, who was suffering with catarrh and cough, inhaled, during three hours, the dust from the root; in consequence of which vomiting came on, followed by a tightness of the chest. An hour after this he complained of a sense of suffocation, and constriction of the trachea and throat; his appearance was pale and deathly. Under suitable treatment he recovered, and was able to leave the house in two days, but suffered several days with difficulty of breathing. When taken *in small and repeated doses*, ipecacuan principally directs its influence to the secreting organs, especially those of the chest, whose activity it promotes. It specifically affects the bronchial membrane, in some morbid conditions of which it promotes expectoration, while in others, attended with a profuse secretion of phlegm, it exerts a beneficial influence, and often contributes to the restoration of the part to its normal condition. *In somewhat larger doses* it creates nausea, with its concomitant phenomena, depression, increased secretion of saliva and buccal mucus, &c. If a diaphoretic regimen be adopted, it exerts a powerfully relaxing influence over the skin. *In full medicinal doses* it occasions vomiting, followed by a tendency to sleep. Its operation as an emetic is exceedingly safe, since inflammation is not produced by it, even when an overdose has been swallowed. The vomiting produced by ipecacuan is not so violent as that induced by emetic tartar, neither is it so long continued, nor attended with such nausea and depression. Furthermore, ipecacuan is less disposed to act on the bowels. The tonic and astringent qualities of the salts of zinc, as well as their want of diaphoretic power, distinguish these emetic substances from ipecacuan. Squill (with which ipecacuan agrees in its expectorant and emetic qualities) is distinguished by its greater acridity, and by its influence not being concentrated on the pulmonary organs, as is the case with ipecacuan, which does not, therefore, possess that power of stimulating the urinary organs possessed by squill.

*Therapeutics.*—Ipecacuan is employed in full doses as an emetic, or in smaller doses as an expectorant and nauseant. *As an emetic.*—The mildness of its operation adapts ipecacuan for the use of delicate and debilitated persons, where our object is merely to evacuate the contents of the stomach. Thus it is well fitted for the disorders of children requiring the use of emetics (as when the stomach is overloaded with food in whooping-cough, croup, &c.). It is also exceedingly useful for adults (especially delicate females); thus, in gastric disorders, to evacuate undigested acrid matters from the stomach—to promote the passage of biliary calculi—as a counter-irritant at the commencement of fevers—in many inflammatory diseases (as acute mucous catarrh, cynanche, orchitis, and ophthalmia)—in asthma—and as an evacuant in cases of narcotic poisoning. When the indication is to excite gentle vomiting in very weak and debilitated frames, Dr. Pye has shown that it may be effected frequently with the utmost ease and safety by ipecacuan, in doses of from two to four grains. The mildness of its operation is not the only ground for preferring ipecacuan to other emetic substances. Its specific power over the pulmonary organs and the stomach leads us to prefer it in maladies of these parts, in which vomiting is likely to be beneficial; especially in those affections in which the nerves appear to be more than ordinarily involved, as spasmodic asthma and whooping-cough. Dr. Wright recommends gentle emetics of ipecacuan at the commencent of the treatment of dysentery. *As a nauseant, antispasmodic, diaphoretic, and expectorant.*—When given in doses insufficient to occasion vomiting, ipecacuan is serviceable in several classes of complaints, especially those of the chest and alimentary canal. *In affections of the respiratory organs.*—Nauseating doses of ipecacuan are used with considerable advantage in acute cases of *mucous catarrh.* They favor expectoration and relaxation of the cutaneous vessels. In milder and more chronic forms, smaller doses, which do not occasion nausea, will be sufficient. In children, who bear vomiting much better than adults, full nauseating or even emetic doses are to be preferred. In *whooping-cough*, in which disease considerable benefit is obtained by the use of emetic substances, ipecacuan is frequently administered with advantage. After giving it to create vomiting, it should be administered in nauseating doses. In *asthma*, benefit is obtained by it, not only when given so as to occasion nausea and vomiting, as above noticed, but also in small and repeated doses. In *bronchial hemorrhage*, the efficacy of ipecacuan has been greatly commended. A. N. Aasheim, a Danish physician, gave it in doses of one-fourth of a grain every three hours during the day, and every four hours during the night. In this way it excites nausea and sometimes even vomiting. It checks the hemorrhage, alleviates the cough, and relaxes the skin. *In affections of the alimentary canal.*—In *dysentery* ipecacuan has gained no trifling celebrity, whence its name of *radix antidysenterica.* In severe forms of the disease no one, I suspect, now would think of relying on it as his principal remedy; but, as an auxiliary, its efficacy is not to be denied. It is best given, I think, in conjunction with opium. Its determination to the skin should be promoted by warm clothing, and the free use of mild, tepid aliments.

*Administration.*—The usual dose of ipecacuan in *powder*, as an *emetic*, is fifteen grains. But a much smaller quantity (for example, six, or four, or even two grains) will frequently suffice. But twenty or thirty grains may be taken with perfect safety. A commonly-used emetic consists of one grain of tartarated antimony, and ten or fifteen grains of ipecacuan. For infants, half a grain or a grain of this is sufficient to occasion vomiting. In all cases the operation of the remedy should be assisted by diluents. As a *nauseant*, the dose is from one to three grains. As an *expectorant* and *sudorific*, the dose should not exceed one grain; for infants, one-quarter or one-eighth of a grain. *Infusion of ipecacuan* (prepared by digesting a quarter of an ounce of the coarsely powdered root in six ounces of boiling water) may be used as an emetic, in cases of narcotic poisoning, in doses of one or two fluidounces.

*Pharmaceutic Use.*—It is a constituent of morphia and ipecacuan lozenges.

### *Officinal Preparations.*

PULVIS IPECACUANHÆ CUM OPIO, *Powder of Ipecacuan and Opium* [PULVIS IPECACUANHÆ COMPOSITUS, U. S.] (*Pulvis Ipecacuanhæ Compositus*, *Lond.*, *Ed.*, *Dub.*).—Take of ipecacuan, in powder, half an ounce; opium, in powder, half an ounce; sulphate of potash, four ounces. Rub them well together, and pass the powder through a fine sieve. Keep it in a stoppered bottle. ["Take of ipecacuanha, in fine powder, opium dried and in fine powder, each sixty grains; sulphate of potash, a troyounce. Rub them together into a very fine powder." U. S.]

This preparation is an imitation (though not a very exact one) of a formula given by Dr. Dover, whence it is commonly known in the shops as *Dover's Powder*. It is one of our most certain, powerful, and valuable sudorifics. The sulphate of potash is intended to serve the double purpose of promoting the sudorific operation of the other ingredients, and of minutely dividing, by the hardness of its particles, the opium and ipecacuan. The opium and ipecacuan, combined, enjoy great sudorific properties not possessed, in the same degree, by either of these substances individually. I am inclined, however, to ascribe the greater part of the activity of the compound to the opium, which, it is well known, strongly determines to the cutaneous surface (see **Opium**), and often produces pricking or itching of the skin; and, when assisted by the copious use of warm aqueous diluents, operates as a sudorific. This effect, however, is greatly promoted by the ipecacuan, which has a relaxing influence over the cutaneous vessels. The contraindications for the use of powder of ipecacuan and opium are an irritable condition of the stomach (when this preparation is apt to occasion sickness), and cerebral disorder. Thus, in fever, with a dry furred tongue, a dry skin, and with much disorder of the cerebrospinal functions, it, like other opiates, is calculated to prove injurious; but when the tongue is moist, the skin, if not damp, at least soft, and the functions of the brain not much involved, it will probably operate beneficially. In slight colds, catarrhs, and rheumatic pains, it often proves most effectual. In various inflammatory affections, when the febrile excitement does not run too high, and when the brain is undisturbed, it may be used with good effect. In acute rheumatism it is occasionally highly serviceable, and in diarrhœa and dysentery. In hemorrhages from internal organs, as the uterus, it is useful on the principle of revulsion or counter-irritation, by its power of determining to the skin.

*Dose.*—Usually from five to ten grains; but where the stomach is irritable, I have frequently seen five grains cause sickness. On the other hand, in some cases where a powerful sudorific is required, and the brain is unaffected, fifteen or even twenty grains of this powder are not unfrequently given.

VINUM IPECACUANHÆ [U. S.], *Wine of Ipecacuan.*—Take of ipecacuan, bruised, one ounce; sherry, one pint. Macerate for seven days, with occasional agitation, strain, express, and filter. ["Take of ipecacuanha, in moderately fine powder, two troyounces; sherry wine, a sufficient quantity. Moisten the powder with half a fluidounce of sherry wine, pack it moderately in a conical percolator, and gradually pour sherry wine upon it until two pints of filtered liquid are obtained." U. S.]

This preparation is diaphoretic, expectorant, and emetic.

*Dose.*—For an adult, as a diaphoretic and expectorant, min. x to min. xl; as an emetic, fl. drs. ij to fl. drs. iv. On account of the mildness of its operation, it is given as an emetic to children: the *dose* is from min. xx to fl. drm. j, according to the age of the child. It is also exceedingly useful as an expectorant in the diseases of infants: *dose* from min. v to min x.

[Extractum Ipecacuanhæ Fluidum, U. S., *Fluid Extract of Ipecacuanha.*—"Take of ipecacuanha, in fine powder, sixteen troyounces; acetic acid, a fluidounce; alcohol, water, each a sufficient quantity. Moisten the ipecacuanha with six fluidounces of alcohol, introduce it into a conical percolator, press it firmly, and pour alcohol upon it until three pints of tincture have slowly passed, or until the ipecacuanha is exhausted. Distil off the alcohol from the tincture, by means of a water-bath, until a syrupy liquid is left. Mix this with the acetic acid and ten fluidounces of water, boil the mixture gently until it is reduced to half a pint, and the resinous matter has separated. Filter the liquid when cold, and add sufficient water, through the filter, to make the filtered liquid measure half a pint. Lastly, mix this with half a pint of alcohol." U. S. A fluidounce of this extract represents an ounce of the solid ipecacuanha. Dose, as an emetic, f℥ss in water, repeated if necessary; as an expectorant, gtt. v.

Syrupus Ipecacuanhæ, U. S., *Syrup of Ipecacuanha.*—"Take of fluid extract of ipecacuanha, two fluidounces; syrup, thirty fluidounces. Mix them." U. S. A favorite preparation when the expectorant action of ipecacuanha is desired. Dose, as an expectorant, gtt. xx–xl.

Trochisci Ipecacuanhæ, U. S., *Troches of Ipecacuanha.*—"Take of ipecacuanha, in fine powder, half a troyounce; arrowroot, in fine powder, four troyounces; sugar, in fine powder, fourteen troyounces; mucilage of tragacanth, a sufficient quantity. Rub the powders together until they are thoroughly mixed; then with mucilage of tragacanth form a mass, to be divided into troches, each weighing ten grains." U. S. Each lozenge contains about a quarter of a grain of ipecacuanha.—W.]

## CINCHONA, *Weddell.*

Pentandria, Monogynia, *Linn. Syst.*

*Generic Character.*—Evergreen *trees* or *shrubs. Leaves* opposite, entire, petiolated; *stipules* interpetiolar, usually free, and soon deciduous. *Flowers* cymose-paniculate, white or usually roseate or purplish, very fragrant. *Calyx* with a turbinated tube, connate with the ovary, pubescent; limb superior, 5-toothed, persistent; the teeth valvate in æstivation. *Corolla* salver-shaped, with a roundish tube; limb 5-cleft, the segments lanceolate, valvate in æstivation. *Stamens* 5; the filaments inserted on and adnate to the lower part of the tube; *anthers* linear. *Ovary* crowned with a fleshy disk; *ovules* numerous, peltate; *style* simple; *stigma* bifid. *Capsule* ovate, oblong, or linear-lanceolate, grooved on both sides, crowned by the limb of the calyx, 2-celled, many-seeded, septicidal, dehiscing from the base to the apex. *Seeds* numerous, winged.

*Habitat.*—Intertropical valleys of the Andes in New Granada, Ecuador, Peru, and Bolivia, at an elevation of from 4,000 to 10,000 feet above the level of the sea.

About thirteen species of Cinchona are known to yield barks which are met with in commerce; but of these only four are mentioned in the British Pharmaeopœia, viz: *Cinchona Condaminea*, *C. Calisaya*, *C. succirubra*, and *C. lancifolia.* Of these species, the former three yield respectively Pale, Yellow, and Red Cinchona barks, and the fourth a bark which is one of the sources of Quinia.

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## CINCHONA CONDAMINEA, *Weddell.*

### Condamine's Cinchona.

*Specific Character.—Leaves* lanceolate, ovate, or subrotund, usually acute, very smooth and shining above, beneath sometimes pitted in the axils of the veins. *Calyx* with triangular-acuminate or lanceolate teeth. *Filaments* about half the length of, or longer than, the *anthers. Capsule* oblong-ovate, or lanceolate, much longer than the flowers. *Seeds* elliptical, toothleted at the margin.

*Habitat.*—Forests of Loxa in Ecuador, and the adjacent parts of Peru.

Several varieties of this plant have been noticed by different botanists, which by others again have been regarded as specifically distinct. The Pharmacopœia names as varieties of this species—*Cinchona Chahuarguera*, Pavon (*Howard's Illustrations*, pl. 1), occasionally a lofty tree, which yields *rusty*, *H. O. or yellow*, and *red crown bark;* and *C. crispa*, Tafalla (*Howard's Illustrations*, pl. 2), a small *tree* or *shrub* which grows on the mountains of Cuenca, Loxa, Riobamba, Jaen de Bracamoros, &c., in Ecuador and Peru, and yields *fine crown bark.* Young plants of *Cinchona Condaminea* are now cultivated on the higher plateau of the Neilgherries, at an elevation of about 8,000 feet, and are said to be very thriving.

**Cinchona pallida,** *Pale Cinchona Bark.* [Mat. Med. List, U. S. P.]

The bark; collected about Loxa in Ecuador.

*History.*—Cinchona bark is usually said to have been first introduced into Europe in 1640; but Sebastian Badus gives an extract from a letter of a Spanish physician, D. Joseph Villerobel, from which it appears that it was imported into Spain in 1632, though no trial was made of it until 1639. Condamine states that the Countess of Chinchon, wife of the Viceroy of Peru, brought some bark to Europe on her return from South America in 1639, from which circumstance it acquired the names of Cinchona bark, and the Countess's powder. About ten years afterwards it was carried by the Jesuits to Rome, and distributed among the members of the order, by whom it was taken to their respective stations, and used in the treatment of ague. In this way it gained the name of Jesuit's bark. It subsequently acquired the name of Crown bark, in consequence of its having been employed by the royal family of Spain. The bark thus introduced into Europe appears to have been the bark of the species described by Condamine as growing about Loxa, which Linnæus called *Cinchona officinalis*, Pavon *C. Chahuarguera*, *Uritusinga*, and Weddell *C. Condaminea*, var. *vera*, and according to Howard, Ruiz states that the bark, to which the tradition attaches among the bark-gatherers of Loxa of having been the identical bark which cured the Countess of Chinchon, is Cascarilla Chahuarguera, which was the produce of *C. Condaminea* var. *Chahuarguera.*

*Commerce.*—Crown bark is imported from Loxa in chests. After its arrival it is frequently picked and sorted.

*Officinal Characters.*—From half a line to a line thick, in single or double quills, which are from six to fifteen inches long, two to eight lines in diameter, brittle, easily splitting longitudinally, and breaking with a short transverse fracture; outer surface brown and wrinkled, or gray 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.

*Varieties and Description.*—Of late years, various kinds of quilled barks, differing in botanical origin, in appearance, and in chemical constitution, have been imported—sometimes mixed, sometimes unmixed—under the name of Loxa or Crown bark. The following are those which, at the present time, are more commonly met with, and which are officinal.

*Rusty Crown Bark.*—This is the produce of *C. Condaminea*, var. *Chahuarguera.* It is the *true Chahuarguera* of Howard. It occurs in variously-sized quills, with a whitish or grayish epidermis, which is striated or furrowed longitudinally, is devoid of transverse cracks, and may be removed by the nail. The prevailing tint is a somewhat rusty brown, and on many of the pieces, particularly the larger ones, we observe rusty-colored warts, which, when numerous, are disposed in irregular longitudinal lines. It has a marked aroma, resembling that of fine crown bark, which latter has been compared by Guibourt to that of tobacco. Though a good bark, and superior in medicinal value to fine crown bark, it fetches a lower price than any other variety of Loxa bark. It contains chiefly cinchonidia, about 1.5 per cent. This and the fine crown bark are the sorts most commonly met with in commerce.

*H. O.*[1] *Crown Bark; Yellow Crown Bark.*—This appears to be the produce of *C. Chahuarguera*, Pavon, var. *Cascarilla Amarilla del Rey.* It is imported from Payta, and occurs in the form of single or double, fine and middling coated quills, which vary in length from six to fifteen inches; in diameter from two lines to an inch; in thickness from one-third of a line to two lines. It is generally rolled in a double volute. Some of the quills are remarkably devoid of lichens, are composed of a thin bark, which externally has a brown shrivelled appearance, being covered with numerous longitudinal wrinkles, and having a very few transverse cracks. The transverse fracture is short. The internal surface is of a cinnamon color, but the fractured surface is pale yellow. Howard adds that in the fresly-imported bark the color of the internal surface is of a pale lemon-yellow, which at first contrasts remarkably with the rusty brown of the external surface, and deepens into cinnamon color on being kept for some time. This is a valuable bark, and well deserves its old reputation.

*Red Crown Bark.*—This is the produce of *C. Chahuarguera*, Pavon, var. *Cascarilla Colorado del Rey.* It is far less common than the last-described variety. It is still, however, imported from Payta, and is probably collected in forests near, though not in Loxa. M. Laubert says: "We have remarked in it the following characters: the epidermis thin, but *rather thicker than that of the yellow* (*amarilla*); wrinkled, of a chestnut-brown, and covered with silvery flakes and very small lichens; transverse fissures *more numerous*, and very distinct; thickness somewhat less than a line, size the same as the former, *internal surface not so fine*, and of a grayish-yellow; no perceptible difference from the *amarilla* in the other qualities." This and the preceding variety are inter-

[1] H. O was a brand adopted in the time of the Spanish dominion to indicate this kind of Crown bark.

mediate in commercial value between the fine crown and the rusty crown bark.

*Fine Crown Bark.*—This is the produce of *C. Condaminea* var. *crispa*, *C. crispa*, Tafalla. It is the *silvery crown bark* of the author, the *quina fina de Loja* of Pavon. It is in slender quills, has a silvery appearance externally from the presence of adherent crustaceous lichens, is marked with numerous transverse cracks, and breaks transversely with a brittle vitreous fracture. As already noticed, fine crown bark and rusty crown bark are now the most common sorts; and at the present time the former commands the highest price.

*Composition.*—Soubeiran states, that one pound of Loxa bark yields from ninety to one hundred and twenty grains of sulphate of cinchonia. It is somewhat remarkable that Von Santen obtained quinia, and but little cinchonia, from Loxa bark. Winckler procured from sixteen ounces of selected Loxa bark fifty-six grains of alkaloids; namely, thirty-three grains of pure quinia and twenty-three grains of cinchonia. Howard's analyses have shown that the different barks, known in commerce as Loxa or crown bark, vary considerably in the proportion of alkaloids which they contain. Thus, in the larger and thicker *rusty crown* sort, he found from two to three parts of the alkaloids in a hundred of bark. The principal constituent was cinchonidia, the cinchonidine of Pasteur, which was associated with more or less quinia. In the *yellow* and *red crown* varieties he also found cinchonidia, associated with traces of quinia and cinchotannic acid. A very fine specimen of *fine Loxa* yielded one and a half per cent. of cinchonidia and quinia, with much cinchotannic acid; but ordinary specimens of this latter sort of Loxa bark only yielded on an average from 0.50 to 1.00 per centage of alkaloids. With regard to the old original "Crown Bark," from *C. Uritusinga*, Pavon, Howard concluded from his analyses that the total amount of alkaloids it contained equalled the sum total of alkaloids in the Calisaya bark of Bolivia.

*Test.*—Two hundred grains of the bark, treated in the manner directed in the test for yellow cinchona bark, with the substitution of chloroform (which separates all the alkaloids present) for ether, should yield not less than two grains of alkaloids.

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## CINCHONA CALISAYA, *Weddell.*

### The Calisaya Cinchona.

*Specific Character.*—*Leaves* obtuse, oblong or lanceolate-obovate, attenuated at the base, rarely acute at both ends, smooth, shining or pubescent beneath, pitted in the axils of the veins. *Filaments* usually shorter than one half the length of the *anthers*. *Capsule* ovate, scarcely equal in length to the flowers. *Seeds* frequently fimbriate-denticulate at the margin.—*Weddell*, *Hist. Nat. des Quinquinas*, pl. 2, 3 bis, and 28.

Weddel has described two varieties of this species, one of which only, var. *Calisaya vera*, yields the officinal yellow bark. Its botanic characters are as follows:—

A tall *tree*. *Trunk* straight or bent, naked, not unfrequently twice the thickness of a man's body; the leafy head for the most part elevated above all the other forest trees. *Leaves* obtuse, oblong-obovate or oblong-lanceolate. (Fig. 145.)

*Habitat.*—It grows in declivities and steep and rugged places of the mountains, at an altitude of from 4,921 to 5,905 English feet in the hottest forests of Bolivia and Southern Peru; between 13° and 16° 30′ south latitude, and from 68° to 72° west longitude; in the Bolivian pro-

Fig. 145.


*Cinchona calisaya, var. vera.*

A. Fruit-bearing branch. B. Flowers (*natural size*). C. Corolla laid open (*magnified*).
D. Capsule (*magnified*). E. Seed *magnified*).
F. Leaf of var. Josephiana, from a specimen gathered in the province of Jungas, Bolivia.

vinces of Enquisivi, Yungas, Larecaja, and Caupolican; and in the Peruvian province of Carabaya. It flowers in April and May.

**Cinchona Flava**, *Yellow Cinchona Bark.* [Mat. Med. List, U. S. P.]

The bark; collected in Bolivia and Southern Peru.

*Commerce.*—In Bolivia there has been established a monopoly in the trade of this bark, in virtue of which it can be exported only by a National Company at La Paz; and hence the bark sold by this company is usually known in trade as *Monopoly bark.* From time to time it has been found necessary to issue decrees prohibiting, for a limited period, the cutting of the bark, in order to protect the bark-forests whose existence has been endangered by excessive cutting, and also to keep up the price of the bark. Calisaya bark is usually exported from Arica, the nearest Peruvian port to the Bolivian district of La Paz. It is imported in serons.

*Officinal 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.

*Description.*—Two kinds of yellow cinchona bark are distinguished in commerce; the *quilled* and the *flat.* *Quilled Yellow Bark.*—The quills usually met with vary in length from about six to twenty-four inches; in diameter, from one to one and a half inch; and in thickness, from three to six lines. Smaller quills are also occasionally found. Sometimes they are doubly, though in general they are singly quilled. Quilled yellow bark is usually *coated;* but occasionally we meet with quills which are more or less *uncoated.* The periderm or coat varies in its thickness. It is more or less rough, and is marked with transverse impressions or furrows or cracks, which often form complete circles or rings around the quills, and whose edges are thick, raised, and everted. When the periderm is very thick, its substance acquires a corky or elastic consistence, and the annular furrows assume the appearance of deep incisions. Between these rings there are longitudinal wrinkles and cracks. These furrows and cracks, in the coarser quills especially, give the bark a very rough character, by which it may generally be readily distinguished from the large quills of gray bark. The periderm is almost insipid. Its color is naturally brown, but it is often rendered more or less silvery or gray by the crustaceous lichens with which it is covered. The derm or uncoated portion consists chiefly of liber, whose taste is very bitter and but slightly astringent. Externally it is brown, and marked with impressions corresponding to the furrows or cracks of the periderm. Internally it is finely fibrous, and has a deep cinnamon-brown color. Its transverse fracture is resinous externally, and fibrous internally. *Flat Yellow Bark.*—The pieces of this sort are from eight to fifteen or eighteen inches long; from one to three inches broad, and from one to five lines thick. They are but little curved or arched; occasionally the inner surface is slightly convex, and the outer one concave from drying. In general the pieces are uncoated, and then consist almost solely of liber, which sometimes has a thickness of one-third or even half of an inch. This derm or liber has considerable density, usually a perfectly uniform texture, and on the external surface is marked by longitudinal digital furrows, or shallow depressions, which are more or less confluent and separated from one another by projecting ridges (Fig. 146). The color of its external surface is slightly brownish tawny yellow, frequently with blackish-red patches. The internal surface is fibrous, often with an undulating grain, of a yellowish tawny color, sometimes with an orange tint, especially when the bark is fresh. The transverse fracture is purely and uniformly fibrous, the fibres being short and readily detached, and irritating the skin like the hairs of *Mucuna pruriens*. The longitudinal fracture is without splinters, and presents a surface covered with brilliant points, owing to the reflection of light from the denuded fibres, and of a uniform color. Its taste is very bitter—the bitterness being gradually developed on mastication—with scarcely any astringency.

Fig. 146.

*Bark of C. Calisaya entirely deprived of periderm, showing the digital furrows, and the short fibrous fracture of the liber.*

*Diagnosis.*—"The best characters," says Dr. Weddell, "by which the true Calisaya may be distinguished from every other species, are—the shortness of the fibres which cover the whole surface of its transverse fracture, and the facility with which they may be detached instead of being flexible and remaining adherent, as is the case with the barks of *rufinervis* and *scrobiculata*. Lastly, its uniform dull yellow (tawny) color, and its substance not being marbled with white, readily distinguishes it from *C. boliviana*. Add to these characters its great density (which is such that when a nail is drawn across it a bright mark is left); the depth of the digital furrows and the prominence of their separating ridges are generally sufficient to distinguish the flat Calisaya from all the other bark with which it may be mixed. The quilled Calisaya is more difficult to distinguish, because its periderm, in its physical characters, greatly resembles several other species, especially *scrobiculata* and *rufinervis*; and also because the fracture does not present the same clear characters which it does in the older barks." To these characters we must add the degree of bitterness, which, in doubtful cases, is the most sure method of deciding the question. Barks whose periderms are white or micaceous, or red, or which are devoid of the transverse or angular furrows or cracks, are not genuine Calisaya barks. Those barks whose derm or liber has an ochrey or very red tint, or which presents two distinct colors (a whitish one internally and a reddish one externally), or whose fracture is more fibrous internally than externally, are suspicious.

In a paper published by Howard recently in the *Pharmaceutical Journal*, he states that in almost every recent importation of the finest Calisaya bark from Bolivia, an unprecedented admixture of the *root bark* has occurred. This is readily known by its *curly shape*. The experiments of Howard show that the root-bark is very inferior to the officinal stem-bark.

*Composition.*—Pelletier and Caventou analyzed this bark, and found in it *superkinate of quinia*, *cinchonia*, *kinate of lime*, *red cinchonic*, *soluble red coloring matter* (tannin), *fatty matter*, &c. Subsequently, *quinoidine* or *amorphous quinia* has been separated, which Van Heijningen has resolved into four or five different substances, one being a peculiar base called *quinidia*, or *β-quinia*, and another *γ-quinia*. Schwartz has recently detected both *kinovic* and *cinchotannic* as well as *kinic acid* in this bark. It may be stated generally, that 100 parts of yellow or

Calisaya bark yield from 3 to $3\frac{1}{2}$ per cent. of crystallized sulphate of quinia, or 2 lbs. avoir. of bark yield nearly 1 oz. avoir. of the crystallized sulphate. Assuming that this sulphate contains 74.3 per cent. of pure quinia, it follows that 100 parts of Calisaya bark contain from $2\frac{1}{5}$ to $2\frac{3}{5}$ parts of pure quinia. I have heard that as much as 4 per cent. of sulphate of quinia has been obtained from one sample of Calisaya bark. [The U. S. Pharmacopœia directs that this bark should not contain less than two per cent. of alkaloids, yielding crystallizable salts.—W.]

*Test.*—Boil 100 grains of the bark, reduced to very fine powder, for a quarter of an hour in a fluidounce of distilled water acidulated with ten minims of hydrochloric acid; and allow it to macerate for twenty-four hours. Transfer the whole to a small displacement tube, and after the fluid has ceased to percolate, add at intervals about an ounce and a half of similarly acidulated water, or add until the fluid which passes through is free from color. Add to the percolated fluid solution of subacetate of lead, until the whole of the coloring matter has been removed, taking care that the fluid remains acid in reaction. Filter and wash with a little distilled water. To the filtrate add about thirty-five grains of caustic potash, or as much as will cause the precipitate which is at first formed to be nearly re-dissolved, and afterwards six fluidrachms of pure ether. Then shake briskly, and, having removed the ether, repeat the process twice with three fluidrachms of ether, or until a drop of the ether employed leaves on evaporation scarcely any perceptible residue. Lastly, evaporate the mixed ethereal solutions in a capsule. The residue, which consists of nearly pure quinia, when dry, should weigh not less than 2 grains, and should be readily soluble in dilute sulphuric acid.

*Adulterations.*—Various barks, both quilled and flat, which are more or less allied to or simulate the genuine Calisaya sort, are known to the dealers as *false or spurious Calisaya barks.* They are imported from Bolivia and Peru either alone or intermixed with genuine Calisaya bark, and frequently pass as the latter sort. The following are the more important of these barks:—

*Bark of C. boliviana.*—It is called in Bolivia *Calisaya morada* (mulberry-colored calisaya), and in Peru *Cascarilla verde* (green) *morada.* It occurs in both quilled and flat pieces, and greatly resembles the genuine Calisaya, from which it is with difficulty distinguished; but its fibre is somewhat coarser, and more easily reduced to powder. Its taste is bitter, with a somewhat smoky flavor. The fractured surface presents, when quite fresh, paler or whitish patches, which, however, become at first red and afterwards brownish-yellow in the air. The periderm or coat is less thick, and its fissures less marked than in the genuine Calisaya. *Quilled Bolivian bark* is quite similar to quilled Calisaya. *Flat Bolivian bark* is composed solely of liber. It is in general equally dense, but thinner than flat Calisaya. The digital furrows are shallower, a little more confluent, and the separating ridges more rounded. Its color is brownish fawn yellow, with somewhat greenish tints in some places. Although the species yielding this bark is, according to Weddell, quite distinct from that from which the officinal yellow bark is obtained, Mr. Howard regards the bark as a more or less valuable sort of Calisaya.

*Bark of C. rufinervis; Cascarilla Carabaya; Cascarilla zamba morada*, Peruv.; *Dark Mulberry-colored Calisaya.*—Dr. Weddell states that in the province of Carabaya, where this bark is collected, it is habitually used to sophisticate Calisaya bark, from which it is very difficult to distinguish it. In the quilled variety, called by Dr. Weddell *pseudo-Calisaya*, the periderm exfoliates very readily. The flat pieces consist either of liber only, or, of liber with a portion of the cellular coat. The fibre is finer and closer than the Calisaya sort; and the external surface presents darkish spots, due to the remains of the cellular crust filled with a brown juice.

*Bark of C. micrantha.*—This occurs in both quilled and flat pieces. It seems probable that the barks of several species are confounded together under the same name. The *quilled micrantha bark*, according to the statements of Poeppig and Reichel, constitutes part of the Huanuco or gray bark of commerce. Its characters, as given by Weddell, are as follows: periderm very thin, adherent, slightly wrinkled longitudinally as if shrivelled, or very slightly warty, bright brownish-gray, marbled with some deeper tints. Derm almost smooth externally, finely fibrous, and of a bright orange-yellow internally. Transverse fracture short externally, fibrous internally. Bitterness very marked and rapidly-developed. The *flat micrantha* simulates genuine Calisaya, but is less dense. It consists either of liber only, or of the liber and cellular coat. The external surface frequently presents concavities or superficial digital furrows, like those of Calisaya bark, and separated by irregular suberous elevations. It is much more rarely smooth by the persistence of the whole of the cellular coat; of a grayish and bright orange-yellow color. The internal service is remarkably fibrous, and of a brighter tint than the external one. Transverse fracture stringy throughout the whole thickness of the bark, or somewhat suberous externally. Longitudinal fracture a little splintery, with a dullish substance. Taste very bitter, speedily developed, a little piquant, scarcely styptic.

*Bark of C. scrobiculata.*—This bark is collected, and sold as a substitute for the Calisaya sort, to which it is greatly inferior. It is to this bark that Guibourt has especially applied the name of light (or *flimsy*) *Calisaya of commerce.* If we examine a piece of *flat scrobiculata bark*, we shall find, says Dr. Weddell, that instead of the digital furrows with a fibrous bottom, which characterize Calisaya bark, it presents a surface almost even, and consisting of cellular tissue, traversed here and there by a slight linear impression; the inner surface being, as in Calisaya bark, of a fibrous texture. The transverse fracture is more or less suberous or fungous externally, according to the thickness of the cellular coat; and very fibrous or stringy internally; the fibres being long and pliant. (Fig. 147).

Fig. 147.

*Bark of C. scrobiculata, showing stringy fracture of liber.*

Weddell makes two varieties of *C. scrobiculata*, namely, var. *genuina* and var. *Delondriana*. The barks of these, although not distinguished by Weddell, are very distinct. The following are the characters they present:—

*Bark of C. scrobiculata* var. *genuina.*—This bark is called red cuzco or cusco bark. It occurs in flat pieces, composed of the liber covered externally by a thin layer of the cellulo-resinous tissue. My specimens are readily distinguishable from Calisaya bark by their fresher or brighter color, but Weddell states that the color of this bark is very variable. The external or cellulo-resinous surface is brick-red or purplish-red, or within reddish-orange, marked by superficial transverse impressions or furrows. The internal surface (of the liber) is of a fine reddish-orange color. Fracture more or less short or suberous externally, according to the thickness of the cellular coat; fibrous or stringy internally; the color of the fractured surface is not uniform. Taste both astringent and bitter. The reddish color of this bark explains why it is called *red bark* (Cascarilla colorada) in Cuzco. This bark is imported both unmixed and mixed with Calisaya.

*Bark of C. scrobiculata var. Delondriana.*—This bark is imported from Lima, and is known in English commerce by the name of *Peruvian Calisaya.* It occurs in flat pieces, which in color closely resemble the genuine Calisaya bark, for which it is often passed off. They are thicker and denser than those of the last described bark, from which they also differ in color. Externally this bark is smoother than the Calisaya bark, and the ridges between the furrows are smoother and rounded—not sharp, as in the bark just mentioned. The fracture is fibrous; the taste, in the larger pieces, less bitter than that of Calisaya bark.

Weddell states that 1000 parts of the scrobiculata bark will yield only from 7 to 8 parts of sulphate of cinchonia, and from 3 to 4 parts of sulphate of quinia; and he adds that the large quantity of red coloring matter which it contains is a great impediment to its use for manufacturing purposes.

Mr. Howard states that the chief adulteration of Calisaya bark at the present time is Cochabamba bark, the produce of *C. australis.*

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## CINCHONA SUCCIRUBRA, *Pavon MSS. Nueva Quinologia.*

### The Red Cinchona.

*Specific Character.*—A *tree* from fifteen to forty feet high; *trunk* erect, with a branched head. *Leaves* petiolate, large, broadly ovate, attenuated at each end, membranous, smooth, somewhat shining and of a full green color above, paler and downy beneath; petioles and veins red and downy. *Flowers* in dense terminal panicles. *Calyx* adherent, pubescent, turbinate, with a cup-shaped, five-toothed, reddish limb. *Corolla* pubescent, salver-shaped, five-lobed; *lobes* bearded internally with long yellowish-white hairs. *Stamens* included, smooth. *Style* bipartite, included, *Capsule* oblong, slightly incurved. The trunk, when wounded, exudes a milky juice, which afterwards becomes red, whence the name *C. succirubra.*—*Howard's Illustrations*, pl. 9.

This species yields red bark. The discovery of the source of red bark, and the accurate description of the tree which yields it, are mainly due to the investigations of Mr. J. Eliot Howard.

*Habitat.*—Western slopes of Chimborazo, between Chillanes and Guaranda (Huaranda), including the village of San Antonio, in the province of Quito. It has also been introduced into India, and is now cultivated with great success at Ootacamund in the Neilgherries. [According to the United States Pharmacopœia, red bark is the product of an undetermined species of cinchona.—W.]

### Cinchona Rubra, *Red Cinchona Bark.* [Mat. Med. List, U. S. P.]

The bark; collected on the western slopes of Chimborazo.

*Commerce.*—Imported from Guayaquil and Lima in chests. Good samples are scarce. I am informed by an experienced dealer that this bark was formerly imported in much larger-sized pieces than are now met with.

*Officinal 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.

*Description.*—Red bark occurs in quills and flat pieces. The quills vary in diameter from two lines to an inch and a quarter; and in length from two to twelve or more inches. The so-called flat pieces are frequently slightly incurved; their breadth is from one to five inches; their thickness from one-third to three-quarters of an inch; their length from two inches to two feet. Red bark is generally coated, and consists of liber, the cellular and suberous coats, and usually more or less of the epidermis; its outer surface is usually rough, wrinkled, furrowed, and frequently warty. The color of the epidermis varies: in the thinner quills it is grayish-brown, or faint red-brown; in thick quills and flat pieces it varies from a reddish-brown to a chestnut-brown, frequently with a purplish tinge. As a general rule, it may be said that the larger and coarser the quills and pieces, the deeper the color. Cryptogamic plants are not so frequent on this as on some other kinds of bark. The cellular coat is frequently thick and spongy, especially in large flat pieces; much more so than in yellow bark. It forms the round tubercles or warts. The inner surface of the bark is, in fine quills, finely fibrous; in large quills and flat pieces, coarsely fibrous, or even splintery. Its color increases with the thickness and size of the pieces; thus, in fine quills it is light rusty-brown; in thick quills and flat pieces it is a deep reddish or purplish-brown. Some of the specimens of red bark found in English commerce, approach yellow bark in their color. The transverse fracture of fine quills is smooth; of middling quills, somewhat fibrous; of thick quills and flat pieces, fibrous and splintery. The taste is strongly bitter, somewhat aromatic, but not so intense and persistent as that of yellow bark; the odor is feeble and tan-like; the color of the powder is faint reddish-brown.

*Composition.*—According to Pelletier and Caventou, red bark contains *superkinate of cinchonia*, *superkinate of quinia*, *kinate of lime*, *red cinchonic*, *soluble red coloring matter* (tannin), *fatty matter*, *&c.* Souberian states that one pound of dark-red cinchona yields two drachms of sulphate of quinia and one drachm of sulphate of cinchonia; while one pound of pale-red cinchonia yields a drachm and a half of the sulphate of quinia and one drachm of sulphate of cinchonia. The quantities of cinchonia and quinia obtained from this bark by Van Santen, by Michaelis, by Goebel and Kunze, and by Winckler, varied much in different specimens. Thus, in one pound of bark the amount of cinchonia varied from twenty to one hundred and eighty-four grains; and of quinia from six to sixty-four grains. Howard states that the characteristic peculiarity of the red bark is that it ordinarily contains, and that quite irrespective of the brightness of the color, a much larger proportion of alkaloids than most other kinds, amounting to as much as three to five per cent. of the substance of the bark, and this divided amongst the alkaloids quinia, cinchonia, and cinchonidia. In one sample from a new district he chiefly found quinidia. [According to the United States Pharmacopœia, this bark ought to contain not less than two per cent. of alkaloids yielding crystallizable salts.—W.]

*Test.*—One hundred 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 two grains of alkaloids.

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## CINCHONA LANCIFOLIA, *Mutis.*

### Lance-leaved Cinchona.

*Specific Character.*—*Leaves* lanceolate or ovate-lanceolate, acute at both ends, without pits. Teeth of the *calyx* short, triangular. *Anthers* usually shorter than the filaments. *Capsules* for the most part lanceolate. *C. condaminea* var. *lancifolia*, Weddell.—*Hist. Nat. des Quinquinas*, pl. 5.

*Habitat.*—New Granada, Ecuador, and Peru.

*Commerce.*—Lancifolia bark used to be brought to England from New Granada by way of Santa Fé de Bogota down the Magdalina, and from Carthagena on the Atlantic side. In Santa Fé the bark is known by the name of *quina naranjada*, or orange-colored bark. It is best known to our dealers by the name of Caqueta or Coquetta, or Bogota bark. It is the bark which I formerly designated as *new spurious yellow bark*, and which Guibourt described as spongy Carthagena bark. In English commerce the name of *Carthagena bark* is now applied to a similar bark, chiefly, Mr. Howard informs me, the bark of *C. Palton*, Pavon, which he considers to be closely allied to *C. lancifolia.* This bark is produced in the district of Cuenca, chiefly about Gualaquisa, and is shipped from Guaiaquil on the Pacific. *Pitayo bark*, supposed by some to be a variety of lancifolia bark, has been shown by Howard to be the produce of a distinct species (*C. Pitayensis*). It is one of the best kinds of bark, and far superior to lancifolia bark, which is now almost entirely neglected by the collectors. Only Pitayo bark is now shipped from the port of Carthagena.

*Description.*—The lancifolia barks of commerce vary considerably in appearance. Those obtained from the younger stems and branches would scarcely be identified, by a superficial observer, with those procured from old stems. But their leading and common characteristic is an extremely fibrous quality, whence they have been called *towy bark* (*quina estoposa*). They may be arranged in two divisions:—

1. Barks of young stems and of branches, mostly quilled, coated usually with a brownish or yellowish epidermis, often covered with whitish crustaceous lichens, which give them a grayish or silvery appearance, as well as with foliaceous and fibrous lichens. The quills vary in size from that of the little finger to an inch and a half in diameter. Some of them are smoothish, others rather rough from numerous short slight cracks (longitudinal and transverse), with slightly everted edges. They are extremely fibrous, and moderately bitter. The smaller quills are not used in the preparation of quinia.

2. Barks of the trunk or of old stems composed of the liber, the cellular coat, and usually a whitish or yellowish-white thin micaceous suberous coat. The larger pieces are semi-cylindrical, or more or less incurved, four or five inches in diameter, and vary in length from one or two to twenty-one inches. The liber is extremely fibrous, very slightly bitter, in some pieces almost insipid, and of an orange or red color. The fracture of the cellular coat is short, of the liber long-fibrous or stringy. Many of the pieces are marked by one or more oblique grooves or depressions apparently produced by a twining plant, and which are almost

peculiar to this bark. In general, this bark, as found in commerce, is *trimmed;* that is, part of the outer coat has been removed by rasping. These trimmed pieces are somewhat smooth externally, covered with bark-dust, as if abraded from mutual friction, and present here and there flat and angular marks, the result of the trimming process, and resembling those seen on trimmed Russian rhubarb. In regard to color, there are two sorts of lancifolia bark, one orange or yellow, the other red. *Orange lancifolia bark* is the standard sort, and to which the name of *Coquetta bark* is exclusively applied. It is Guibourt's *quinquina orangé de Mutis.* The *red lancifolia bark* is known in commerce as *red Carthagena bark.* It is Guibourt's *quinquina rouge de Carthagène.* It is a New Granada bark, gathered from a tree growing side by side with that which yields the orange lancifolia bark, and is employed by chemical manufacturers in the preparation of quinidia.

*Composition.*—This bark yields quinia, quinidia, and cinchonia, but in very variable proportions. In some sorts (*e. g.* the red Carthagena sort) the quinidia greatly predominates; and hence they are sometimes called "quinidia barks."

*Use.*—The bark of *Cinchona lancifolia* is referred to in the Pharmacopœia as one of the sources of quinia. [Not officinal in the U. S. P.]

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### *Composition of the Officinal Cinchona Barks.*

The principal organic constituents of the officinal cinchona barks as determined by Pelletier and Caventou, and subsequently by other chemists, are *volatile oils*, *quinia*, *quinidia*, *cinchonia*, *tannic*, *kinic*, and *kinovic acids*, and *cinchona red.* Puttfarcken found that, by incineration, the cinchona barks yielded from 0.58 to 3.4 per cent. of ashes, the chief constituent of which was carbonate of lime. Puttfarcken's results favor the opinion that with the increase of the alkaloids in the barks, the proportion of lime diminishes. *Volatile Oil of Cinchona Bark* (*Odorous, Aromatic Principle*).—By submitting bark with water to distillation, the product has the peculiar odor of the bark, and a bitterish, acrid taste; and the oil which floats on the water is thick and butyraceous. From 20 lbs. of bark, Trommsdorff obtained two grains of oil. *Tannic Acid* (*Cincho-tannic Acid; Astringent Principle: Soluble Red Coloring Matter*).—Cincho-tannic acid differs from the tannic acid of galls in being less astringent, in yielding a green color or precipitate with the salts of the peroxide of iron, and in the remarkable facility with which its solution absorbs the oxygen of the air, especially under the influence of alkalies, and the compounds which it forms with acids are more soluble than those of gallo-tannic acid. The products of the oxidation of this acid are, according to the same authority, cinchona red, carbonic acid, and water. *Cinchona Red* (*Red Cinchonic*).—It is an inodorous, insipid, reddish-brown substance, insoluble, or nearly so in cold water, somewhat more soluble in hot water, but readily soluble in alcohol and alkalies. As obtained by Schwartz, it is also dissolved easily by ether. Acids favor its solution in water. Its alkaline solution is intensely red. Pelouze and Frémy assert that "the tannin contained in cinchona is nothing else than catechuic acid, and that red cinchonic is a product of its oxidation which precedes the formation of rubinic acid." *Kinic Acid* (*Quinic Acid*); $C_{14}H_{12}O_{12}$.—Exists in cinchona barks in combination probably with the cinchona alkaloids and with lime. It crystallizes from its aqueous solution in large, hard, transparent prisms with rhombic bases. *Kinovic Acid* (*Kinova Bitter*).—This is a white amorphous substance, almost insoluble in water, but readily soluble in alcohol and ether. A solution of the kinovate of magnesia yields precipitates (*kinovates*) with solutions of acetate of lead, chloride of mercury, and the salts of cinchonia.

*Cinchona Alkaloids.*—Three alkaloids obtained from cinchona barks have been used in medicine; viz. *Quinia*, *Quinidia*, and *Cinchonia*. The cinchona alkaloids exist in cinchona bark in combination with one or more acids; according to Henry fils and Plisson, with kinic acid and cinchona red. They reside chiefly in the liber. Cinchonia and quinia were regarded by Pelletier as being respectively the monoxide, and binoxide of a hypothetical nitrogenous base, which he called *quinogen*, and whose formula is $C_{20}H_{12}N$.

*Quinia*, *Quinine*. $C_{40}H_{24}N_2O_4=324$.—Discovered in 1820 by Pelletier and Caventou. It is a probable constituent of all genuine cinchona barks, but especially of the yellow bark (*Cinchona Calisaya*), from which it is chiefly obtained. It is also procured by chemical manufacturers from the cheaper but inferior cinchona barks of Carabaya, Bolivia, and New Granada. The simplest, readiest, and cheapest mode of procuring quinia, is by adding ammonia to a solution of the sulphate and collecting and drying the precipitated hydrate of quinia. It is usually in the form of a whitish, porous mass. Pelletier crystallized it by dissolving it in alcohol of sp. gr. 0.815, and setting the solution aside to evaporate spontaneously in a dry place. Liebig obtained it from a somewhat ammoniacal watery solution, in the form of fine silky needles. Quinia crystallized from its aqueous solution is a *hydrate*. Quinia is inodorous, very bitter, and fusible at about 300° F. The fused mass, when cold, is yellow, translucent, friable, and somewhat like resin in appearance. One part of quinia requires about 400 parts of cold water, or 250 parts of boiling water, or two parts of boiling alcohol, and 60 parts of cold ether to dissolve it. The aqueous and alcoholic solutions react as an alkali. Dissolved in either alcohol or acidulated water it possesses the property of left-handed rotatory polarization. At a temperature above 72° F. this rotatory power decreases. Dilute solutions of quinia (especially an acidulated aqueous solution of the sulphate) exhibit in certain aspects a peculiar azure blue color. This property has been denominated, by Professor Stokes *fluorescency*, and he has shown that, in this process of true internal dispersion, the chemical or invisible rays of the spectrum, which are more refrangible than the violet rays, change their refrangibility, thereby becoming visible, and producing the blue superficial light in question. The *salts of quinia* are of two classes—one termed *neutral*, the other *acid;* the former contain one, the latter two, equivalents of acid to each equivalent of base. They are for the most part readily crystallizable, of a pearly aspect, and more bitter than the corresponding salts of cinchonia. They yield precipitates on the addition of tannic acid, ammonia, chloride of mercury, and bichloride of platinum. Hyposulphite of soda causes a white crystalline precipitate (*hyposulphite of quinia*) when added to a solution of hydrochlorate of quinia. According to Winckler, neither amorphous quinia nor amorphous cinchonia, when saturated with hydrochloric acid, yields any precipitate with the hyposulphite of soda.

*Amorphous Quinia.*—A supposed uncrystallizable form of quinia contained in the mother-liquors from which sulphate of quinia has crystallized, and which is usually found in the substance called *quinoidine*. Winckler states that ordinary quinia may be rendered amorphous by the action of acids, and that the amorphous cinchona alkaloids may be distinguished and separated from the crystalline alkaloids quinia and cinchonia by hyposulphite of soda, which precipitates the latter, from their hydrochloric solution, in the form of crystalline hyposulphites, but occasions no precipitate with corresponding solutions of the amorphous alkaloids. Roder, however, declares that amorphous quinia is merely ordinary quinia combined with a resin; while Van Heijningen resolved the so-called quinoidine into ordinary quinia, cinchonia, quinidia, and a resinous substance.

*Quinidia* or *Quinidine*; β *Quinine*; $C_{40}H_{24}N_2O_4$.—In 1833, Henry and Delondre discovered this alkaloid, to which they gave the name of *quinidine*; but, in the following year, they declared it to be identical with quinia. In 1848, Van Heijningen recognized it as a peculiar base which possessed the same composition as quinia. He, therefore, called it β *quinine*, to distinguish it from ordinary quinia, which he termed α *quinine*. It is found in many, perhaps in most, of the genuine *Cinchona* barks; as in *pale*, *yellow*, and *lancifolia* barks. Howard has also found it in a specimen of *red* bark. It is obtained from them by the same process as that by which quinia is procured from the quinia-yielding barks; but its sulphate, being more soluble than sulphate of quinia, is left in the mother-waters. Quinidia readily crystallizes by the spontaneous evaporation of its solution in alcohol. The crystals are anhydrous, colorless, hard prisms, with a vitreous lustre. Their taste is bitter, but less so than that of quinia. When heated in a platinum crucible over the flame of the spirit lamp, they at first retain their shape and lustre, and at 347° F. fuse, without either decomposing or giving out water, and form a clear wine-yellow liquid, which, by cooling, congeals into a whitish gray crystalline mass. If the heat be raised above 347°, the liquid takes fire and burns with a very sooty flame. One part of quinidia is soluble in 2580 parts of water, at 62½° F., or in 1858 parts of boiling water, or in 12 parts of alcohol, sp. gr. 0.135 at 62½° F. (in boiling spirit it is freely soluble), or in about 142 parts of ether at 62½° F. From both its alcoholic and ethereal solutions it readily crystallizes. A solution of quinidia in acidulated water agrees with one of quinia, both in possessing the property of left-handed polarization, and in being fluorescent. These properties distinguish it from a solution of cinchonia. If the solution of quinidia be treated first with chlorine water, and then with ammonia, it becomes green like a solution of quinia. The salts of quinidia are, for the most part, more soluble in water than those of quinia. They readily dissolve in spirit of wine, but scarcely at all in ether.

*Cinchonia*; *Cinchonine*; $C_{40}H_{24}N_2O_2$.—Its presence was inferred in 1803 by Dr. Duncan, Jun.; but Gomes first succeeded in obtaining it in 1810. It is a probable constituent of all genuine Cinchona barks. [Howard, however, informs me that, contrary to the general belief, it is rarely found in pale bark.—Ed.] It is obtained from the sulphate of cinchonia in the same way that quinia is procured from its sulphate. Cinchonia readily crystallizes from its alcoholic solution. The crystals are anhydrous, colorless, inodorous, and bitter, though less so than quinia. Their shape is that of a four-sided prism, with oblique terminal facets. It fuses, but with more difficulty than quinia, and, by the cautious application of heat, it is volatilized, and yields a crystalline sublimate. During its sublimation it evolves an aromatic odor (by which, according to Liebig, it is distinguished from quinia). It is less soluble in water, alcohol, and ether, than quinia. Thus cold water scarcely dissolves any of it, and boiling water takes up only $\frac{1}{2500}$th part of its weight. It is somewhat soluble in spirit of wine, and the more so in proportion as the spirit is stronger and its temperature higher. According to Duflos, strong spirit of wine dissolves only 3 per cent. of its weight of cinchonia. In ether it is insoluble, and by this property it is both distinguished and separated from quinia. Cinchonia dissolved either in alcohol or in acidulated water possesses the property of right-handed rotatory polarization, and is thereby distinguished from quinia, whose rotation is left-handed. Cinchonia and its salts dissolve in solution of chlorine without undergoing any obvious change. In this respect it agrees with quinia and quinidia. But if ammonia be added to the solution, a white precipitate is produced. By this latter character cinchonia is distinguished from both quinia and quinidia. Of the salts of cinchonia, those which are interesting in a medicinal point of view are the sulphate and hydrochlorate.

*Table showing the amount of Alkaloids in the officinal Cinchona Barks.*

| | Quinia. | Quinidia. | Cinchonia. | Total. | Authority. |
|---|---|---|---|---|---|
| 100 parts of *Pale Bark.* | | | | | |
| Crown bark, large quills (Chahuarguera, var.) | 2.07 | 0.35 | 1.43 | 3.85 | Howard. |
| Red Crowu bark, finest . . . . . . | + | + | 0.37 | 1.94 | Howard. |
| HO Crown bark, fine sample . . . . | + | + | 0. | 1.31 | Howard. |
| Rusty Crown bark . . . . . . . | 0.75 | 0 58 | 0. | 1.33 | Howard. |
| Fine Crown bark, best . . . . . . | 1.00 | 0.50 | 0. | 1.50 | Howard. |
| Fine Crown bark . . . . . . . | + | + | 0.03 | 0.43 | Howard. |
| 100 parts of *Yellow Bark.* | | | | | |
| Calisaya, large quills, finest . . . . | 5.00 | 0.64 | 0.06 | 5.66 | Howard. |
| Calisaya, medium . . . . . . . | 2.5 | + | + | .. | Riegel |
| Calisaya, average produce . . . . | 2.2 to 2.6 | .. | .. | .. | Pelletier & Soubeiran. |
| Calisaya, flat, with epidermis . . . | 2.3 to 2 5 | .. | 0.4 to 0.6 | .. | Delondre. |
| Calisaya, quills . . . . . . . . | 1.1 to 1.5 | .. | 0.6 to 0.7 | .. | Delondre. |
| 100 parts of *Red Bark.* | | | | | |
| Red bark, best . . . . . . . . | 2.65 | + | 1.51 | 4.16 | Riegel. |
| Red bark, broad, and flat . . . . . | + | + | + | 3.85 | Riegel. |
| Red bark, from Guyaquil . . . . . | 1.5 to 1.9 | .. | 0.7 to 0.9 | .. | Delondre. |
| Red bark, bright . . . . . . . . | 1.1 to 1.2 | .. | 0.6 to 0.7 | .. | Pelouze. |
| 100 parts of *Bark of Cinchona lancifolia.* | | | | | |
| Carthagena bark, orange bark of Mutis . | 1.15 to 1.2 | .. | 0.46 to 0.62 | .. | Delondre. |
| Carthagena bark, fibrous . . . . . | 1.04 | .. | 1.04 | 2.08 | Riegel. |
| Coquetta bark . . . . . . . . . | 0.76 | 0.15 | 0.44 | 1.35 | Hindsley. |
| Lancifolia bark, trimmed . . . . . | 0.34 | 0.25 | 0 35 | 0.94 | Hindsley. |
| Lancifolia bark, uncoated quills . . . | 0.62 | 0.23 | 1.26 | 2.11 | Hindsley. |

+ indicates the presence of alkaloids, the amount of whi h is uot stated.

*Physiological Effects.*—Before I proceed to describe the effects of the cinchona barks, it appears to me desirable to notice the separate effects of those principles on whose combined operation the activity of the bark depends.

*Effects of the Active Principles of Cinchona Barks.*—The essential or tonic and antiperiodic or specific effects of the bark reside in the cinchona alkaloids; but these are aided by some of the other constituents. The astringent and aromatic qualities of the bark reside in other principles. *Cincho-tannic Acid.*—Like other varieties of tannic acid, this acid possesses astringent qualities, and promotes the tonic operation of the alkaloids. *Kinovic Acid.*—Recent investigations have shown that this bitter principle possesses well-marked tonic properties. It has been successfully used in intermittent fevers. *Kinic Acid.*—Nothing positive is known of the effects of kinic acid. *Cinchona-red or Red Cinchonic* may perhaps slightly contribute to the astringent and tonic effects of the barks. *Volatile Oil and Resin.*—The aromatic flavor depends on these principles. *Cinchona Alkaloids.*—Quinia, quinidia, and cinchonia are the only alkaloids with whose operation we are acquainted.

*Quinia.*—In *small doses* quinia occasions an intensely bitter taste, promotes the appetite, and assists digestion. It possesses in a pre-eminent degree the properties of a pure or simple bitter. In *large doses* (as ten to twenty or more grains), sulphate of quinia has produced three classes of effects: *Gastro-enteritic irritation*, marked by pain and heat in the gastric region, nausea, gripings, and purging. *Excitement of the vascular system*, manifested by increased frequency and fulness of pulse and augmented respiration. Furred tongue, and other symptoms of a febrile state, are also observed. *Disorder of the cerebro-spinal functions*, indicated by headache, giddiness, contracted, in some cases dilated, pupils, disorder of the external senses, agitation, difficulty of performing various voluntary acts (as writing), somnolency, in some cases delirium, in others stupor. A remarkable case is mentioned by Trousseau and Pidoux. A soldier took forty-eight grains of sulphate of quinia for the cure of spasmodic asthma, which returned daily at a certain hour. Four hours after taking it he experienced buzzing in the ears, diminished sensibility, giddiness, and violent vomitings. Seven hours after taking the quinia he was blind and deaf, delirious, incapable of walking on account of the giddiness, and vomited bile copiously. In fact, he was in a state of intoxication. These effects subsided in the course of the night. Sulphate of quinia has even produced fatal effects. Recamier, at the Hôtel Dieu, prescribed for a patient affected with acute rheumatism 46 grains of the sulphate in twelve powders, one to be taken every hour. The next day the quantity was increased to 77 grains, one to be taken every hour as before. When the patient had taken 53 grains he was suddenly seized with violent agitation, followed by furious delirium and death in a few hours. Dangerous consequences have been reported by other writers. But in many cases no ill effects have resulted from the use of large doses. Sulphate of quinia, when taken into the stomach, becomes absorbed in the blood, and is eliminated by the urine, the sweat, and the milk. The *tannate of quinia* has been declared, by Dr. Rolander, of Stockholm, to be the most powerful of the quinia salts. The tannic acid, though not the peculiar febrifuge constituent of cinchona bark, yet contributes to its tonic powers, and thereby promotes the activity of the alkaloids. This statement is supported by the already referred to remark of Berzelius, that the most active cinchonas are those which contain the largest quantity of tannin. Recent observations have not, however, confirmed Rolander's statement.

*Quinidia.*—But few observations have hitherto been made on the effects of this alkaloid. Bauduin declares it to be as effective a febrifuge as quinia. "I have for some months past used at the London Hospital the sulphate of quinidia as a substitute for sulphate of quinia, and have found it equally serviceable both as a tonic and febrifuge. Several cases of ague in the hospital have got entirely well under its use. I have administered it in varying doses not exceeding ten grains." The *sulphate of quinidia* is the only salt of quinidia whose effects have been examined. Dr. Peacock has administered the sulphate of quinidia as an antiperiodic, in doses of three to six grains, with perfect success. In some cases a dose of fifteen grains was given at first. Dr. P. considers quinidia as efficacious as quinia, while it possesses the advantage of not giving rise to the disagreeable nervous effects occasionally observed when quinia is administered in large doses. Cinchonidia is not distinguished commercially from quinidia, from which it is separated with difficulty.

*Cinchonia.*—When cinchonia and quinia were first submitted to examination, cinchonia and its salts were thought, principally on the evidence of Chomel, to be much inferior in activity to quinia and its salts. But subsequent observations have appeared to prove that the sulphates of these alkaloids may be substituted for each other. As cinchonia and its salts are less bitter than quinia and its salts, we might expect that the former would possess somewhat less medicinal activity than the latter; and this inference is probably correct. Moreover, I have been informed that large doses of sulphate of cinchonia are more apt to create nausea and vomiting than similar doses of quinia. I must confess, however, that I have been unable to verify it. I have extensively used in hospital practice sulphate of cinchonia, in doses not exceeding ten grains, and have not met with the nausea and vomiting I expected to have met with. I have found the sulphate of cinchonia valuable both as a tonic and a febrifuge, or antiperiodic. Bouchardat, Delondre, and Gerault have made numerous experiments, comparing the effects of cinchonia with quinia, and they assert that though the action of cinchonia on a healthy man presents considerable resemblance to that of quinia, still there exist differences which are not merely in degree. Thus, the sulphate of cinchonia does not cause noises in the ears and disturbances of vision so readily as sulphate of quinia; but in smaller doses, and more frequently than the latter, it causes a severe headache, which affects the forehead in particular, and is accompanied by a remarkable feeling of compression. These symptoms are observed after a dose of from 9 to 15 grains, which quantity of cinchonia is followed by præcordial pain, and a very evident debility (which may even bring on syncope) more often, and to a greater degree, than would occur after a similar dose of quinia. Sulphate of cinchonia appears to be equal to sulphate of quinia in the treatment of the milder cases of intermittent fever when time is not important, and there is no reason to dread a severe attack; but in the more severe cases the sulphate of quinia ought to be preferred. The salts of cinchonia, except the sulphate, have been imperfectly examined.

[The opinion of the author of the relative value of cinchonia and quinia is here given at length; but the question is still undecided, as will be seen from the opposite conclusions arrived at by Dr. Daniel and Dr. Macpherson. Dr. Daniel, after administering cinchonia, in the doses in which sulphate of quinia is usually given to European and negro soldiers in Sierra Leone and Jamaica, while suffering from the milder forms of remittent and intermittent fever, was obliged to discontinue the medicine in consequence of the headache and cerebral disturbance induced; and he concludes that in tropical diseases cinchonia can never be resorted to as an efficient substitute for quinia. Dr. Macpherson, Presidency-Surgeon in Bengal, after long observation found that cinchonia in the state of sulphate produced effects precisely similar to those of quinia, the same cerebral disturbance, and the same amount of irritation of the digestive organs; only its power was less by about one-third; and he concludes that it is absolutely certain that cinchonia is as good a febrifuge as quinia.—Ed.]

[It seems most probable that Dr. Macpherson is right in this opinion, except it be in the relative strength of the two alkaloids. The sulphate of cinchonia has been very largely tried in this country, both in civil and military hospitals and in private practice, and it is, I believe, universally admitted that its action is similar to that of quinia, although there is some difference of opinion as to the amount of it requisite to produce a given effect, many considering it very nearly equal in strength to the sulphate of quinia, but probably the majority of practitioners coinciding with Dr. Macpherson. It is preferred to the other alkaloid, both as a tonic and antiperiodic, on account of its far greater cheapness. —W.]

*Effects of the Cinchona Barks.*—The *topical effects* are astringent and slightly irritant. The astringency depends on tannic acid and red cinchonic: hence those barks whose infusions are most powerfully affected by gelatin and the persalts of iron possess the greatest astringent power. The *constitutional effects* vary with the condition of the patient. In some conditions of system cinchona operates as an *irritant* or *stimulant:* in others as a *stomachic*, *tonic*, or *corroborant*. If a man in a state of perfect health take a small or moderate dose of bark, no obvious effects are produced, or perhaps a little thirst, with some slight disorder of stomach; or a temporary excitement of appetite may be brought on. An increased dose occasions a dry tongue, nausea, vomiting, loss of appetite, thirst, constipation, and even purging, a quick pulse, a throbbing headache, and giddiness. The disturbance of the stomach is produced not only when the bark is given in the more nauseating form of powder, but also in the form of infusion, or decoction, or tincture. These symptoms indicate a stimulant operation, which is still more manifest when the bark is given to a person suffering with gastro-enteritic irritation, accompanied with fever. All the morbid phenomena are exasperated, the febrile disorder is increased, and symptoms of gastritis come on. None of the effects now enumerated include those to which the term *tonic* is properly applicable. These are to be sought for in patients suffering from debility, without symptoms of local irritation. In such we find cinchona improves the appetite, promotes the digestive functions, and increases the strength of the pulse. The muscular system acquires more power, and the individual is capable of making greater exertion, both mental and bodily, than before; the tissues acquire more firmness to the touch, and lose their previous flabbiness: moreover, it has been asserted (and with great probability of truth) that the quality of the blood improves.

*Comparison of the Cinchona Barks with each other.*—Those barks are the most active which contain the largest proportion of the cinchona alkaloids, especially of quinia. In this point of view *yellow bark* stands pre-eminent; and Dr. Relph's assertion of its superiority to both red and pale bark is fully borne out by modern observations. *Red bark* is also a very valuable sort. The experiments and observations of Saunders, Rigby, and Skeete seem to have established its superiority to pale bark. But in adopting this statement we ought, if possible, to ascertain what kind of pale bark was used in making the above observations; and also to determine whether the red bark referred to be identical with that now in commerce. Mr. J. E. Howard has shown that the *original or old Loxa bark*, the sort probably which was originally employed under the name of pale or Crown bark, is as rich in cinchona alkaloids as many specimens of Calisaya bark. As an astringent yellow bark is inferior to pale bark, on account of its containing a smaller proportion of tannic acid.

*Comparison of the Effects of the Cinchona Barks with their Alkaloids.*—It has been asserted that the cinchona alkaloids possess all the medicinal properties of the barks, and may be substituted for them on every occasion; but I cannot subscribe to either of these statements; for, in the first place, the alkaloids are deficient in the aromatic quality possessed by the barks, and which assists them to sit easily on the stomach; and it is to this circumstance that I am disposed to refer a fact which I have often observed, that sulphate of quinia will sometimes irritate the stomach, occasion nausea and pain, and give rise to febrile symptoms, while the infusion of bark is retained without the least uneasiness. Moreover, we must not overlook the tannic acid, which confers on bark an astringent property. So that while we admit that the essential tonic operation of the barks depends on the alkaloids which they contain, yet the latter are not always equally efficacious. In some cases, however, they are of great advantage, since they enable us to obtain, in a small volume, the tonic operation of a large quantity of bark.

*Therapeutics.—As a general or constitutional remedy*, the indications for the use of cinchona are, debility with atony and laxity of the solids, and profuse discharges from the secreting organs. I have observed that it proves less successful, and often quite fails, when the complexion is chlorotic or anæmic: in such cases chalybeates often succeed where cinchona is useless or injurious. As contraindications for its employment, may be enumerated acute inflammation, inflammatory fever, plethora, active hemorrhages, and nervous and vascular irritation. To these may be added, an extremely debilitated condition of the digestive and assimilative organs. Thus, patients recovering from protracted fever are at first unable to support the use of bark, which acts as an irritant to the stomach, and causes an increase of the febrile symptoms. But the diseases in which this remedy manifests the greatest therapeutic power, are those which assume an intermittent type.

*In periodic or intermittent diseases.*—In such cases cinchona and sulphate of quinia stand pre-eminent for their success, and are usually resorted to. There are two modes of attempting the cure of an intermittent by cinchona: one is, to put an immediate stop to the disease by the use of very large doses of the remedy given a few hours prior to the recurrence of the paroxysm; the other is to extinguish the disease gradually by the exhibition of moderate doses at short intervals during the whole period of the intermission, so that the violence of every succeeding paroxysm is somewhat less than that of the preceding one. It has been asserted that cinchona is admissible in the interval only of an intermittent fever; and that if it be exhibited during the paroxysm it has a tendency to prevent the subsidence of the latter. But this statement is much overcharged. Morton and others have given it in almost every stage without injury. Dr. Heberden observes, "The only harm which I believe would follow from taking the bark even in the middle of the fit is, that it might occasion a sickness, and might harass the patient by being vomited up, and might set him against it." It is, however, more efficacious during the interval, though it may not be absolutely hurtful in the paroxysm. Dr. Cullen was strongly of opinion that the nearer the exhibition of the cinchona is to the time of accession, the more certainly effectual will it be. Dr. Elliotson and others gave one large dose, fifteen grains, immediately after the fit. [I commonly give one large dose, say ten grains, an hour *before* the fit is expected, and find it succeed.—Ed.] A very necessary condition to its perfect success is, that it should sit well on the stomach; for if it occasion vomiting or purging it is much less likely to act beneficially. Hence an emetic and a purgative are recommended to precede its employment. A senna draught, with a calomel pill, forms a good purgative. To enable it to sit well on the stomach, cinchona or the sulphate of quinia is frequently given in conjunction with aromatics. The infusion or decoction of cinchona, though much less effective, is, however, less liable to disturb the stomach than the powder of cinchona or the sulphate of quinia. Opium is sometimes a necessary adjunct to cinchona to prevent its running off by the bowels. Both cinchona and sulphate of quinia are often better borne by the stomach after a meal. In some cases where the stomach was too irritable to admit of the administration of cinchona or sulphate of quinia by the *mouth*, these agents have been otherwise introduced into the system. Thus *clysters* of cinchona were used by Helvetius, Torti, and Baglivi. Van Swieten says he has often seen this method successful in infants; but that it takes three times as much bark as would suffice if the remedy were swallowed. Cinchona and its preparations prove most successful in the simple or uncomplicated form of intermittents; that is, where the disease appears to be purely nervous. But when agues are accompanied with inflammatory excitement or with visceral disease, cinchona generally proves either useless or injurious. In remittents it proves much less successful than in regularly-formed intermittents. Piorry considered that quinia diminished the volume of the spleen, and in this way cured ague. [It certainly does diminish the volume of the spleen when enlarged by ague, with great rapidity; and if the patient is anæmic, it does so more certainly when combined with sulphate of iron—each salt being given in doses of three or four grains three or four times a day.—Ed.] Intermittent fevers are not the only periodical diseases in which cinchona has been found beneficial. It is a remedy which has proved serviceable in several other cases in which a paroxysm of pain, spasm, inflammation, hemorrhage, or fever returns at stated periods. Thus intermittent neuralgia, rheumatism, headache, amaurosis, catarrh, ophthalmia, stricture, &c., have been greatly benefited by its use. When periodical diseases recur at uncertain periods, as in the case of epilepsy, no particular advantage can be expected from the use of cinchona.

*In continued fever.*—In the latter stage of continued fever, when the vital powers are beginning to sink, and when there are no marked and decided symptoms of inflammatory disease of the brain or digestive organs, cinchona or sulphate of quinia sometimes proves highly beneficial. If the tongue be dry, as well as furred, and the skin hot and dry, no advantage, but the reverse, can be anticipated from its employment. It is most applicable to the low forms of fever occurring in debilitated constitutions. When exacerbations or remissions, however indistinct, occur at regular periods, the administration of cinchona is more likely to be followed by good effects. Under the preceding circumstances there can scarcely be two opinions as to the admissibility of bark. But on the general propriety of administering this remedy in continued fever, considerable difference of opinion has prevailed. Dr. Heberden cautiously observes, "I am not so sure of its being useful, as I am sure of its being innocent." In order to avoid offending the stomach, it is frequently advisable to begin with the infusion, for which, afterwards, first the decoction, then the sulphate of quinia may be substituted. [I am in the habit of treating typhus fever, as soon as the alvine evacuations have become tolerably natural, with three or four grains of sulphate of quinia every three or four hours, and find its effect very beneficial, and free from any disturbance of the head, stomach, or bowels. In typhoid fever, in consequence of the frequent ulceration of the bowels, this remedy is not so well borne. It is said to produce deafness when given in these doses; but deafness is an ordinary consequence of fever, and I never find that quinia occasions it, until the patient's improvement renders such doses unnecessary. I need hardly add that I do not adopt this treatment with any expectation of *stopping* the fever.—ED.]

*In inflammatory diseases.*—As a general rule, stimulants and tonics, as cinchona, are improper in inflammatory diseases. Yet to this statement, which applies principally to the first stage, to acute and active cases, and to the disease when it occurs in strong and vigorous habits, many exceptions exist. Thus when it takes place in old and debilitated constitutions; when it is of a mild or atonic character, and has existed for some time without giving rise to any obvious organic changes; cinchona is sometimes admissible and advantageous after evacuations have been made proportioned to the activity of the disease and the vigor of the system. *In scrofulous inflammation* (as of the eye) its value, especially in combination with bicarbonate of soda, is fully appreciated. *In rheumatism*, in which disease Morton, Fothergill, Saunders, and Haygarth strongly recommended it, and in *erysipelas*, it is also much esteemed. *Erythema nodosum*, which chiefly occurs in persons of a rheumatic constitution, or who have rheumatic fever, rapidly subsides under its use.

*In maladies characterized by atony and debility.*—Cinchona is useful in a great variety of diseases dependent on, or attended by, a deficiency of tone or strength, as indicated by a soft and lax condition of the solids, weak pulse, incapability of great exertion, impaired appetite, and dyspeptic symptoms. Thus, *in chronic atonic affections of the alimentary canal* it proves very serviceable, especially in some forms of dyspepsia and anorexia. In these it should be given half an hour or an hour before meal-times. *In some chronic maladies of the nervous system*, as chorea, when it occurs in delicate girls; also in the neuralgia of weakly subjects. *In mortification*, it is useful in those cases in which tonics and astringents are obviously indicated; but it has no specific power of checking the disease, as was formerly supposed. It may also be employed *in passive hemorrhages*, from relaxation of vessels, as in some cases of profuse menstruation, or uterine hemorrhage consequent on miscarriage, *in profuse mucous discharges*, with great debility, as in leucorrhœa, excessive bronchial secretion, old diarrhœas, &c., in *cachectic diseases*, as enlargements and indurations of the absorbent glands, of a scrofulous nature, ophthalmia, obstinate ulcers, &c. Also in venereal diseases, when the secondary symptoms occur in shattered and broken-down constitutions, and after the full use of mercury. Likewise in some of the chronic skin diseases, which are seen in cachectic habits. *In the convalescence* of either acute or chronic lingering diseases, as fever, inflammation, hemorrhage, profuse suppuration, &c.; also after imperfect surgical operations, when the strength is greatly reduced. In no class of cases is the efficacy of cinchona or its alkaloids more manifest than in these.

*As a topical astringent and antiseptic.*—The efficacy of cinchona as an astringent and antiseptic depends on tannic acid. But as many vegetable substances exceed cinchona in the quantity of this acid which they contain, so they surpass it in astringency. Hence the topical uses of bark are comparatively unimportant; and, for the most part, are nearly obsolete. Powdered red cinchona is frequently employed as a tooth-powder. The decoction, with or without hydrochloric acid, is applied as a gargle in putrid sore-throat.

*Administration.*—In the form of *powder*, cinchona is now rarely administered. The bulk of a full dose, its disagreeable taste, its tendency to cause nausea and vomiting, and the quantity of inert woody fibre which it contains, form great objections to its employment. Yet of its great efficacy, as a febrifuge or antiperiodic, in intermittents, and of its superiority in these cases to the decoction or infusion, no doubt can exist; but sulphate of quinia has almost entirely superseded it. The dose of the powder of cinchona is from twenty to sixty grains, or even more than this when the stomach can bear it.

### *Officinal Preparations.*

Decoctum Cinchonæ Flavæ [U. S.], *Decoction of Yellow Cinchona.*—Take of yellow cinchona bark, in coarse powder, one ounce; distilled water, one pint. Boil for ten minutes in a covered vessel. Strain the decoction, when cold, through calico; and add sufficient distilled water through the filter to make up the quantity to sixteen fluidounces. ["Take of yellow cinchona, bruised, a troyounce; water, a sufficient quantity. Boil the yellow cinchona in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint." U. S.]

By boiling, water extracts from cinchona the kinates of quinia, cinchonia, and lime, gum, tannic acid, starch, and a portion of the compound of the red cinchonic with the cinchona alkaloids. While hot, the liquor is transparent; but, as it cools, it becomes turbid—owing partly to the deposition of the tannate of starch when the temperature falls below 88° F., and partly because the red cinchonic compound, being more soluble in hot than in cold water, is deposited on cooling. If the deposit, with a portion of the supernatant liquor, be poured off and gently heated, it is dissolved. The perchloride of iron almost blackens it; a few drops of sulphuric acid and a few drops of tincture of iodine render it bluish-black—indicative of the presence of starch. Of one hundred and forty-six parts of the deposit from decoction of yellow (Calisaya) bark, Soubeiran found sixty parts (principally tannate of starch) were insoluble in alcohol, and the remaining eighty-six parts were readily soluble in alcohol, and yielded the cinchona alkaloids. The same author also found that by decoction, yellow (Calisaya) bark lost two-thirds of its weight; whereas, by infusion, it merely lost one-third of its weight. If the water employed in preparing the decoction or infusion be acidulated (with sulphuric or hydrochloric acid), the medicinal value of the preparation is greatly increased; for the acid decomposes the insoluble red cinchonic salt, and forms with the cinchona alkaloids a soluble combination. Decoction of cinchona is stomachic, tonic, and febrifuge.

*Dose.*—Fl. oz. j to fl. oz. ij.

[As no other decoction of cinchona is given in the Pharmacopœia, *Decoctum Cinchonæ* should always be understood to mean decoction of *yellow* cinchona. If it is intended that pale or red bark should be used, it will be sufficient to order *Decoctum Cinchonæ pallidæ*, *Decoctum Cinchonæ rubræ.* The same remark will apply to the infusion.—Ed.]

[Decoctum Cinchonæ Rubræ, U. S., *Decoction of Red Cinchona.*—"Take of red cinchona, bruised, a troyounce; water a sufficient quantity. Boil the red cinchona in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint." U. S. Both of the decoctions of cinchona are very inelegant preparations, and very liable to ferment. They possess no especial virtues, and are in every way inferior to the infusions made with sulphuric acid. Dose, f℥j to ij.—W.]

Extractum Cinchonæ Flavæ Liquidum, *Liquid Extract of Yellow Cinchona.*—Take of yellow cinchona bark, in coarse powder, one pound; distilled water, a sufficient quantity; rectified spirit, one fluidounce.

Macerate the cinchona bark, in two pints of the water, for twenty-four hours, stirring frequently; then pack in a percolator, and add more water, until twelve pints have been collected, or a sufficient quantity to exhaust the bark. Evaporate the liquor at a temperature not exceeding 160° to a pint; then filter through paper, and continue the evaporation to three fluidounces, 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.

This preparation is similar to the *Infusum Cinchonæ spissatum* (*Lond.*). [The latter preparation was the *Liquor Cinchonæ* of Mr. Battley, the formula for which was furnished by that gentleman to the London College. Percolation is now employed (as it was by Mr. Battley, though not by the London College), and a larger quantity of water by which the bark is more thoroughly exhausted, and the evaporation is conducted at a lower temperature.—Ed.]

Four fluidounces represent one pound of the bark. In a general way, one fluidrachm may be considered equal to eight fluidounces of the infusion. *Dose*, min. x to fl. drm. ss.

[Extractum Cinchonæ Fluidum, U. S., *Fluid Extract of Cinchona.* —"Take of yellow cinchona, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, twenty troyounces; diluted alcohol, a sufficient quantity. Moisten the cinchona with ten fluidounces of diluted alcohol, allow it to stand for half an hour, pack it firmly in a cylindrical percolator, and gradually pour upon it diluted alcohol until four pints have been obtained. Evaporate this, by means of a water-bath, to two pints, and strain the liquid while hot." U. S.

In this process, owing to the use of alcohol, the bark is pretty thoroughly exhausted, and two fluidounces of the extract may be relied on as representing one ounce of the bark. Dose, f℥ij to iij.

Extractum Cinchonæ, U. S., *Extract of Cinchona.* Extractum Cinchonæ Flavæ, *Pharm.*, 1850.—"Take of yellow cinchona, in fine powder, twelve troyounces; alcohol, four pints; water, a sufficient quantity. Introduce the powder, previously mixed with three fluidounces of alcohol, into a conical glass percolator, and gradually pour upon it the remainder of the alcohol. When the liquid ceases to pass, pour upon the residue sufficient water to keep its surface covered, until four pints of tincture have passed. Set this aside, and continue the percolation until six pints of infusion are obtained. Distil off the alcohol from the tincture, and evaporate the infusion until the liquids respectively are brought to the consistence of thin honey; then mix them, and evaporate to the proper consistence." U. S One drachm of this extract is said to represent three drachms of the bark. Dose, gr. x to xxx in pill.—W.]

Infusum Cinchonæ Flavæ [U. S.], *Infusion of Yellow Cinchona.*— Take of yellow cinchona bark, in coarse powder, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for two hours, and filter through paper. ["Take of yellow cinçhona, in moderately fine powder, a troyounce; aromatic sulphuric acid, a fluidrachm; water, a sufficient quantity. Mix the acid with a pint of water. Then moisten the powder with half a fluidounce of the mixture, and, having packed it firmly in a conical glass percolator, gradually pour upon it the remainder of the mixture, and afterwards water, until the filtered liquid measures a pint." U. S.]

The water extracts from cinchona bark the gum and a portion of the kinates of quinia, cinchonia, and lime, tannic acid, and a little starch.

The greater part of the cinchona alkaloids remains in the marc, as a very small quantity only of the compound of red cinchonic and the cinchona alkaloids is extracted. The infusion of cinchona is stomachic and tonic, but is scarcely energetic enough to be febrifuge. It is a light preparation, applicable as a tonic where the stomach is very delicate, and cannot support the more active preparations of this medicine.

*Dose.*—Fl. oz. j to fl. oz. ij.

[INFUSUM CINCHONÆ RUBRÆ, U. S., *Infusion of Red Cinchona.* Infusum Cinchonæ Compositum, *Pharm.*, 1850.—"Take of red cinchona, in moderately fine powder, a troyounce; aromatic sulphuric acid, a fluidrachm; water, a sufficient quantity. Mix the acid with a pint of water. Then moisten the powder with half a fluidounce of the mixture, and, having packed it firmly in a conical glass percolator, gradually pour upon it the remainder of the mixture, and afterwards water, until the filtered liquid measures a pint." U. S. Owing to the use of sulphuric acid, the bark is completely exhausted in both of these processes. Either infusion may be administered as a tonic in one dose of f℥j to ij.—W.]

TINCTURA CINCHONÆ FLAVÆ, *Tincture of Yellow Cinchona.*—Take of yellow cinchona bark, in coarse powder, four ounces; proof spirit, one pint. Macerate the cinchona bark for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.

Spirit extracts all the bitter and astringent principles of cinchona, the kinates of the alkaloids, as well as the combinations of these substances with the red cinchonic. If the spirit be too concentrated, the kinates are less readily dissolved by it. This tincture is about two-thirds of the strength of the London tincture, in consequence of the additional spirit used to replace the tincture which is retained in the marc. Tincture of cinchona is stomachic, tonic, and stimulant. It is usually employed as an adjuvant to the infusion or decoction of cinchona, or to the solution of the sulphate of quinia. Dose, fl. drm. j to fl. drs. iij.

[TINCTURA CINCHONÆ, U. S., *Tincture of Cinchona.*—"Take of yellow cinchona, in moderately fine powder, six troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a glass percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S. Dose, fℨj to fℨiij.—W.]

TINCTURA CINCHONÆ COMPOSITA [U. S.], *Compound Tincture of Cinchona.*—Take of pale cinchona bark, in coarse powder, two ounces; bitter orange peel, cut small and bruised, one ounce; serpentary, bruised, half an ounce; saffron, sixty grains; cochineal, in powder, thirty grains; proof spirit, one pint. Macerate the cinchona bark, and the other ingredients, for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquors, and add sufficient proof spirit to make one pint. ["Take of red cinchona, in moderately fine powder, four troyounces; bitter orange peel, in moderately fine powder, three troyounces; serpentaria, in moderately fine powder, three hundred and sixty grains; saffron, in moderately coarse powder, red saunders in moderately fine powder, each, one hundred and twenty grains; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with four fluidounces of diluted alcohol, pack it firmly in a glass percolator, and gradually pour diluted alcohol upon it until two pints and a half of tincture are obtained." U. S.]

This is usually sold as *Huxham's Tincture of Bark.* It is a more agreeable and more stimulant, though less powerful, tonic than the simple tincture, and is less apt to disturb the stomach. It contains only half as much pale cinchona bark as the simple tincture contains of yellow bark. It is employed as a tonic and stomachic. Dose, fl. drm. j to fl. drs. iij.

### **Quiniæ Sulphas** [U. S.], *Sulphate of Quinia.*

The sulphate of an alkaloid, $C_{40}H_{24}N_2O_4,HO,SO_3+7HO=436$, prepared from yellow cinchona bark, and from the bark of *Cinchona lancifolia*, Mutis.

Sulphate of quinia was for some years prepared exclusively from yellow cinchona bark, but the monopoly of the trade of this bark established in Bolivia has forced the manufacturers of quinia to use as substitutes the generally inferior, but cheaper, quinia-yielding barks of New Granada. The barks so employed are chiefly the produce of *Cinchona lancifolia*, Mutis, and *C. Pitayensis.* The process given in the Pharmacopœia for preparing sulphate of quinia from yellow cinchona bark, will succeed equally well with the lancifolia barks of New Granada.

*Preparation.*—Take of yellow cinchona bark, in coarse powder, one pound; hydrochloric acid, three fluidounces; distilled water, a sufficiency; solution of soda, four pints; dilute sulphuric acid, a sufficiency. Dilute the hydrochloric acid with ten pints of the water. Place the cinchona bark in a porcelain basin, and add to it as much of the dilute sulphuric (*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 color. Transfer the precipitate to a porcelain dish containing a pint of distilled water, and applying to this a steam heat gradually add dilute sulphuric acid until very nearly the whole of the precipitate has been dissolved, and a neutral liquid has been obtained. Filter the solution while hot through paper, wash the filter with boiling distilled water, concentrate till a film forms on the surface of the solution, and set it aside to crystallize. The crystals should be dried on filtering paper without the application of heat.

In this process the salts of quinia are dissolved out of the bark by the dilute hydrochloric acid; and the solution is decomposed by soda. The impure alkaloid is precipitated, and afterwards washed, to remove saline matters; and the quinia is gradually treated with very dilute sulphuric acid, until nearly the whole of it is dissolved, that the solution may remain neutral. It is then filtered, evaporated, and crystallized. If other alkaloids are present, they will remain in solution after the crystallization of the sulphate of quinia. [Sulphuric acid is evidently printed by mistake in the former part of the process for hydrochloric acid.—Ed.] ["Take of yellow cinchona, in coarse powder, forty-eight troyounces; muriatic acid, three troyounces and a half; lime, in fine powder, five troyounces; animal charcoal, in fine powder, sulphuric acid, alcohol, water, distilled water, each, a sufficient quantity. Boil the cinchona in thirteen pints of water, mixed with one-third of the muriatic acid, and strain through muslin. Boil the residue twice successively with the same quantity of water and acid as before, and strain. Mix the decoctions, and, while the liquid is hot, gradually add the lime, previously mixed with two pints of water, stirring constantly, until the quinia is completely precipitated. Wash the precipitate with distilled water, and, having pressed, dried, and powdered it, digest it in boiling alcohol. Pour off the liquid, and repeat the digestion several times until the alcohol is no longer rendered bitter. Mix the liquids, and distil off the alcohol until a brown viscid mass remains. Upon this, transferred to a suitable vessel, pour four pints of distilled water, and, having heated the mixture to the boiling point, add as much sulphuric acid as may be necessary to dissolve the quinia. Then add a troyounce and a half of animal charcoal, boil the liquid for two minutes, filter while hot, and set it aside to crystallize. Should the liquid, before filtration, be entirely neutral, acidulate it very slightly with sulphuric acid; should it, on the contrary, change the color of litmus paper to a bright red, add more animal charcoal. Separate the crystals from the liquid, dissolve them in boiling distilled water slightly acidulated with sulphuric acid, add a little animal charcoal, filter the solution, and set it aside to crystallize. Lastly, dry the crystals on bibulous paper with a gentle heat, and keep them in a well-stopped bottle.

"The mother-water may be made to yield an additional quantity of sulphate of quinia by precipitating the quinia with water of ammonia, and treating the precipitated alkaloid with distilled water, sulphuric acid, and animal charcoal, as before." U. S.

In this process the alkaloids are dissolved out of the bark by the hydrochloric acid. From this solution they are precipitated by the lime, the muriate of lime remaining in solution, while the excess of the lime together with an insoluble compound of the coloring matter and lime falls with the precipitate. Out of this heterogeneous mass the boiling alcohol dissolves the alkaloids. The brown viscid mass remaining after evaporation is impure quinia, with more or less cinchonia, quinidia, &c. Subsequently the quinia is dissolved as a sulphate by sulphuric acid and boiling water, decolorized by animal charcoal, and allowed to cool and crystallize. This is then repeated to obtain the quinia perfectly pure. The very small amount of cinchonia yielded by the yellow bark remains in solution in the mother liquors, because its sulphate is so much more soluble than that of quinia.—W.]

*Officinal Characters.*—Filiform, silky, snow-white crystals, of a pure intensely bitter taste, sparingly soluble in water, yet imparting to it a peculiar bluish tint. The solution gives with chloride of barium a white precipitate insoluble in nitric acid (*sulphate of baryta*); and when treated first with solution of chlorine and afterwards with ammonia it becomes of a splendid emerald-green color (*indicating quinia*).

*Description.*—Sulphate of quinia is odorless, and the fibrous crystals have a flexibility like asbestos. Exposed to the air, they effloresce slightly. When heated they become luminous; friction promotes this phosphorescence. At 212° F. they lose 7 atoms of water, or 14.45 per cent. At 240° F. they melt like wax; at a more elevated temperature the salt assumes a fine red color, and when ignited in the air burns, leaving at first a carbonaceous residuum, but which is subsequently dissipated. One part of this salt requires 80 parts of cold alcohol (sp. gr. 0.850) or

740 parts of cold, or 30 parts of boiling water to dissolve it; as the saturated solution cools, part of the salt separates. A remarkable property of this salt is to give a blue tinge to the surface of water. By exposure to the air the crystals lose 4 (Souberian says 6) equivalents of water, equal to about 8 per cent. When fused they evolve two more equivalents. One hundred grains of the crystals dissolved in water, acidulated with hydrochloric acid, yield, by the addition of chloride of barium, a quantity of sulphate of baryta, which, when ignited, weighs 26.6 grs. ["Insoluble in ether. When ten grains of the salt are agitated in a test-tube with ten minims of officinal water of ammonia and sixty grains of ether, and allowed to rest, the resulting liquid separates into two transparent and colorless layers, without any white or crystalline matter at the surface of contact." U. S.]

*Adulterations.*—Various foreign bodies (as earthy and alkaline salts, gum, sugar, starch, fatty matters, sulphate of cinchonia and of quinidia, and salicine) are, it is said, occasionally intermixed with sulphate of quinia. The following are the tests by which the presence of these bodies is ascertained: By digesting sulphate of quinia in alcohol, this salt is dissolved, leaving any alkaline or earthy sulphates, gum, or starch, that may be present. Gum is soluble in cold water; starch is colored blue by solution of iodine. When heated in the open air the sulphate of quinia is burned and dissipated; the earthy salts, on the other hand, are left. The sulphate is soluble in water acidulated with sulphuric acid, whereas fatty matters are insoluble. To detect sugar, add to a solution of the sulphate, carbonate of potash; quinia is precipitated, while sulphate of potash and sugar are left in solution; the latter may be detected by its sweet taste, or by evaporating the liquor to dryness, and digesting the residue with spirit which dissolves the sugar but leaves the sulphate. Ammoniacal salts are detected by the ammoniacal odor emitted on the addition of caustic potash. Salicine may be recognized by oil of vitriol, which turns it red. Sulphate of cinchonia may be made to crystallize, in a pulverulent form, by stirring the solution, and in this state it may be readily intermixed with sulphate of quinia. This fraud, I suspect, has recently been carried on to no very slight extent. To detect it, precipitate a solution of the suspected salt in water by potash; collect the precipitate, and boil it in alcohol. The cinchonia crystallizes as the liquor cools, while the quinia remains in the mother-liquor. Or Schweitzer's ether test may be used by precipitating the suspected specimen by solution of ammonia and then adding ether, when the quinia will be dissolved, but the cinchonia will float undissolved between the two liquids. This test is recommended by the French government, who refuse to allow the sale of sulphate of quinia containing more than 3 per cent. of cinchonia. The same test will indicate the presence of quinidia, but this is partly soluble in ether. Howard states that the admixture of quinidia with quinia may be detected by boiling 100 grains of the suspected salt in two ounces of water; it will not be entirely dissolved if it is all sulphate of quinia; but on adding two ounces more water, and again boiling, a clear solution will be obtained, from which, after cooling for six hours, only 10 grains of pure sulphate of quinia will remain in solution, but of sulphate of quinidia no less than 46 grains; hence, the crystals in one case will weigh 90, in the other 54 grains.

*Tests.*—Dissolves in pure sulphuric acid with a feeble yellowish tint, and undergoes no further change of color when gently warmed. Ten grains with ten minims of diluted sulphuric acid and half a fluidounce of water form a perfect solution, from which ammonia throws down a white precipitate. This redissolves on agitating the whole with half a fluidounce of pure ether, without the production of any crystalline matter floating on the lower of the two strata, into which the agitated fluid separates on rest. The upper stratum of fluid, if entirely removed by a pipette and evaporated, leaves a white residue, which, when dried in the air without heat, weighs 8.6 grains (*hydrate of quinia*).

The efficacy of this test depends on the insolubility of cinchonia, and the partial solubility of quinidia in ether; and as the quantity of that agent is limited, the quinidia, if any is present and is at first held in solution, soon separates in the crystalline form, and floats at the surface of the saline solution.

*Dose.*—Gr. j to gr. x.

*Officinal Preparation.*

Tinctura Quiniæ Composita, *Compound Tincture of Quinia.*—Take of sulphate of quinia, one hundred and sixty grains; tincture of orange peel, one pint. Digest for seven days, and strain.

A fluidrachm contains about one grain of the sulphate.

*Dose.*—Fl. drm. j to fl. drs. ij or more.

[Pilulæ Quiniæ Sulphatis, U. S., *Pills of Sulphate of Quinia.*—"Take of sulphate of quinia, a troyounce; gum arabic, in fine powder, one hundred and twenty grains; clarified honey, a sufficient quantity. Mix the sulphate of quinia and gum arabic; then beat them with clarified honey so as to form a pilular mass, to be divided into four hundred and eighty pills." U. S. Each pill contains one grain of the sulphate of quinia.—W.]

### [**Quiniæ Valerianas,** U. S., *Valerianate of Quinia.*

"Take of valerianic acid, half a troyounce; sulphate of quinia, two troyounces; diluted sulphuric acid, water of ammonia, water, each, a sufficient quantity. Dissolve the sulphate of quinia in a pint of water, with the aid of diluted sulphuric acid; then add water of ammonia in slight excess, and wash the precipitated quinia with water until freed from sulphate of ammonia. Dissolve the valerianic acid in five pints of water, heated to 180°, add the quinia to the solution, and, when it is dissolved, set the whole aside for several days to crystallize. Decant the mother-water from the crystals, dry them on bibulous paper, and keep them in a well-stopped bottle. By evaporating the mother-water at a temperature not exceeding 120°, more crystals may be obtained." U. S. In this process the valerianate is formed by the direct action of valerianic acid on quinia, recently precipitated by ammonia. The valerianate of quinia crystallizes because so much more soluble in hot than cold water.

*Properties.*—"A colorless salt, crystallizing in rhomboidal tables, and having a peculiar, repulsive odor, and bitter taste. When heated it fuses, and gives off white vapors. It is soluble in one hundred and ten parts of cold and forty parts of boiling water, and in six parts of cold and one part of boiling alcohol. It is also soluble in ether." U. S. P. This salt undergoes decomposition when thrown into boiling water, the valerianic acid being liberated. Its odor is that of valerianic acid. It may be given in cases of debility, with marked nervous disturbances, and combined with iron in neuralgic affections. Its superiority to the sulphate is questionable. *Dose*, gr. j to iij, t. d., administered either in pill or alcoholic solution.—W.]

[**Cinchoniæ Sulphas,** U. S., *Sulphate of Cinchonia.*

"Take of the mother-water, remaining after crystallization of sulphate of quinia, in the process for preparing that salt, a convenient quantity; solution of soda, alcohol, diluted sulphuric acid, animal charcoal, in fine powder, each, a sufficient quantity. To the mother-water add gradually, with constant stirring, solution of soda, until the liquid becomes alkaline. Collect on a filter, the precipitate formed, wash it with water, and dry it. Then wash it with successive small portions of alcohol, to remove other alkaloids which may be present. Mix the residue with eight times its weight of water, and, having heated the mixture, add gradually diluted sulphuric acid until it is saturated and becomes clear. Then boil the liquid with animal charcoal, filter it while hot, and set it aside to crystallize. Lastly, drain the crystals and dry them on bibulous paper. By evaporating the mother-liquid, more crystals may be obtained." U. S. The mother-water contains in solution the sulphate of cinchonia and other alkaloids; when the solution of soda is added, these are decomposed, the alkaloids are thrown down, and the very soluble sulphate of soda left in solution. The remainder of the process explains itself.

*Officinal Characters.*—Sulphate of cinchonia is in white, shining crystals, having the form of short, oblique prisms, with dihedral summits. It melts at 212°, loses its water of crystallization at a somewhat higher temperature, and is dissipated at a red heat. It dissolves in fifty-four parts of cold water, in much less boiling water, in seven parts of alcohol, and very sparingly in ether. Its aqueous solution gives with terchloride of gold a yellow precipitate, and with chloride of calcium a white one. Ammonia, added to its solution in chlorine water, causes a white precipitate. If the salt be rubbed with water of ammonia, and then treated with ether, the cinchonia, separated by the former, will not be dissolved by the latter.

*Therapeutics.*—Its action on the system is very similar to that of sulphate of quinia.—See page 640.

*Dose*, as a tonic, gr. j to ij, t. d.; as an antiperiodic gr. xij to ʒj. It may be given in pill form or dissolved in water by the aid of a few drops of sulphuric acid.—W.]

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## UNCARIA GAMBIR, *Roxburgh.*

### The Gambir Plant. Pentandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A stout climbing shrub, with round branches. *Leaves* ovate-lanceolate, acute, shortly petiolate, smooth; *stipules* ovate. *Peduncles* axillary, opposite, bracteolated about the middle; the lowest ones sterile, ultimately converted into hooked spines. *Flowers* in loose heads, green and pink. *Calyx* short, urceolate 5-cleft. *Corolla* funnel-shaped; *lobes* 5, spreading, oval-oblong. *Stamens* 5. *Style* filiform, protruded; *stigma* tumid, undivided. *Capsules* stalked, clavate, 2-celled, 2-valved. *Seeds* numerous, winged.—*Trans. Linn. Soc.* vol. ix. plate 22. (*Nauclea Gambir.*)

*Habitat.*—Islands of the East Indian Archipelago. Extensively cultivated. On the island of Bintang there are 60,000 *Gambir plantations*

### Catechu Pallidum, *Pale Catechu.*

An extract of the leaves and young shoots; prepared at Singapore and in the Eastern Archipelago.

*Preparation.*—Dr. Roxburgh describes its manufacture as practised eastward to the Bay of Bengal. The process consists in "boiling the leaves and young shoots; evaporating the decoction by fire and the heat of the sun. When sufficiently inspissated, it is spread out thin, and cut into little square cakes and dried." Mr. Bennett has given a very full account of the method of making it as practised at Singapore. The leaves are boiled and the decoction thus obtained is evaporated to the consistence of a very thick extract, of a light yellowish-brown color, like clay, which is placed in oblong moulds. The pieces thus obtained are divided into squares, and dried in the sun. Hunter says, sago is often intermixed with the extract, but Bennett denies that this is done at Singapore. *Gambier* or *Gambir* is the Malay name for this extract. The best gambir is made at Rhio, in the isle of Bintang; the next best is that of Lingin.

*Commerce.*—Pale catechu or gambir is imported from Singapore principally. Its principal use here is for tanning; and among dealers it is distinguished from black catechu, cutch, &c., by the name of *terra japonica.*

*Officinal 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.

*Description.*—The term *catechu*, from *cate*, a tree, and *chu*, juice, is applied officinally to the two following astringent extracts: 1. *Gambir Catechu*, which is the substance we are now describing, under the officinal name of *Catechu pallidum* [not officinal, U. S. P.]; and 2. *Cutch*, *Catechu of the Acacia Catechu*, which will be afterwards described under the name of *Catechu nigrum*. Pale catechu occurs in cubes, whose faces are about one inch square. When thrown into water these cubes float. They are externally of a deep reddish or yellowish-brown color; their fracture is dull and porous, and internally their color is paler than that of their surface, being yellowish-cinnamon brown; the fractured surface not unfrequently presenting some darker feebly shining stripes, extending from without inwards. The cubes are frequently combined together so as to form masses of variable size. Catechu has no odor. It melts entirely in the mouth. When heated in a platinum crucible it undergoes a kind of semifusion, and swells up; and when incinerated leaves a light white ash. Nees v. Esenbeck says twenty grains leave only half a grain of ash. It is partially soluble in cold water. When boiled in water it is almost completely dissolved, and yields a decoction which, while hot, is of a clear reddish-brown color, but, on cooling, becomes turbid, owing to the deposition of catechine. By digestion in ether it forms a deep reddish-brown tincture, which, by evaporation, yields a reddish-brown astringent extract; the portion which is insoluble in ether is dark-brown, tough and elastic. Examined by the microscope, gambir is found to consist in great part of myriads of minute crystals (*catechine*) intermixed with a kind of mucous tissue.

*Composition.*—Gambir essentially contains from thirty-six to forty per cent. of tannic acid and catechine. *Tannic Acid.*—The properties of this acid have been before described. That extracted from Gambir is readily soluble in water, alcohol, and slightly so in ether. It gives a green color to the salts of iron. *Catechine; Catechuic Acid.*—When Gambir is treated with cold water. an insoluble residuum is left; this is *impure catechine*, and was termed by Nees, *Resinous Tannin.* When obtained quite pure, it is a white light powder, composed of silky needles, having a peculiar sweet taste. It is very slightly soluble in cold water, but more so in boiling water. Ether, and especially alcohol, are better solvents for it. It produces a green color with salts of iron, but does not produce a precipitate with a gelatinous solution. The sweet taste of pale catechu depends on catechuic acid.

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

*Physiological Effects.*—Catechu produces the local and general effects of the astringents already described. When of good quality it is more powerful than kino. In its operation it is closely allied to rhatany.

*Therapeutics.*—It is employed as an astringent in the following cases: *In affections of the mouth and throat.*—In various affections of the mouth and throat I have frequently employed catechu, and found it a convenient and efficacious astringent. Thus, in relaxed uvula, and in that slight chronic inflammatory affection of the throat usually denominated the relaxed sore-throat, and which is especially observed in delicate females, catechu, chewed or sucked, is a most useful remedy. Catechu lozenges may be also employed. Pale catechu is sweeter and more agreeable than black catechu. To public speakers or singers it is supposed to be useful; it prevents or diminishes the hoarseness consequent on a too frequent use of the vocal organs. In slight ulcerations of the mouth also it is useful. *As a stomachic in dyspeptic complaints.*—I have known catechu chewed with advantage in dyspeptic complaints, especially when accompanied with pyrosis. It should be used just before taking food; it promotes the appetite and assists digestion. *As an alvine astringent* it may be employed in old-standing diarrhœas and dysenteries, when there are no inflammatory symptoms present. It is often conjoined with the chalk mixture, and not unusually with opiates.

*Administration.*—Dose, gr. x to gr. xl. It may be administered in the form of bolus, or of mixture with sugar and gum Arabic, or may be allowed to dissolve in the mouth.

## *Officinal Preparations.*

[*Catechu pallidum* is not officinal in the United States Pharmacopœia, and consequently *all* the *U. S. preparations* are made with the catechu yielded by the *Acacia catechu.*—W.]

Infusum Catechu, *Infusion of Catechu.*—Take of catechu (pale or black), in coarse powder, one hundred and sixty grains; cinnamon, bruised, thirty grains; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for half an hour, and strain.

Frequently given in diarrhœa in conjunction with opiates. Sometimes used in the form of enema.

*Dose.*—Fl. oz. j to fl. oz. ij.

[Infusum Catechu Compositum, U. S., *Compound Infusion of Catechu.*—"Take of catechu, in fine powder, half a troyounce; cinnamon, in moderately fine powder, sixty grains; boiling water, a pint. Macerate for an hour in a covered vessel and strain." U. S. The stimulating effect of the cinnamon increases the efficiency of this infusion in atonic diarrhœas. Dose, f℥j—ij, administered in water.—W.]

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

*Dose.*—Gr. xx to gr. lx.

Employed in chronic diarrhœa and dysentery. It may be conveniently given in the form of confection, made by adding gradually (as in the Dublin Pharmacopœia) a fluidounce of syrup to an ounce of the compound powder.

Tinctura Catechu [U. S.], *Tincture of Catechu.*—Take of catechu (pale or black), in coarse powder, two ounces and a half; cinnamon, bruised, one ounce; proof spirit, one pint. Macerate the catechu and cinnamon for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. ["Take of catechu, in moderately coarse powder, three troyounces; cinnamon, in moderately coarse powder, two troyounces; diluted alcohol, a sufficient quantity. Mix the powders, and, having moistened the mixture with a fluidounce of diluted alcohol, pack it in a conical glass percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

Astringent. Usually employed as an adjunct to chalk mixture in chronic diarrhœa and dysentery; or taken with port wine and some aromatic as nutmeg or cinnamon.

*Dose.*—Fl. drm. j to fl. drms. ij.

Trochisci Catechu, *Catechu Lozenges.*—Take of pale catechu, in powder, two ounces; refined sugar, in powder, one pound; gum arabic, in powder, one ounce; tincture of capsicum, half a fluidounce; distilled water, a sufficiency. Add to the catechu sugar and gum arabic, previously mixed, the tincture of capsicum, and sufficient distilled water to make a proper mass. Mix thoroughly, divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

*Dose.*—From one to three or more.

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## [CAFFEA ARABICA.

*Botanic Characters.*—An evergreen *shrub*, from 15 to 20 feet high, with oblong-ovate, acuminate, smooth *leaves*, a 5-toothed *calyx*, a white tubular *corolla*, with a 5-parted spreading limb, 5 *stamens*, 1 *pistil* with a bifid style, and an oval, succulent, blackish-red or purplish 2-seeded *berry*. The *seeds* are inclosed in a membranous endocarp (the parchment-like putamen of some botanists), and are convex on one side, and flat with a longitudinal groove on the other. They consist of a horny, yellow, bluish or greenish convoluted albumen, at the one end of which is the embryo, with its cordiform cotyledons: the position of the radicle being indicated by the micropy.

*Habitat.*—Ethiopia, Arabia, extensively cultivated in Asia and America.

### **Caffea**, *Coffee.* Mat. Med. List, U. S. P.

The seed of Caffea Arabica.

Occasionally, the seeds contained in their endocarp (*coffee in the husk*) are met with in commerce. The *raw coffee* of the shops consists of the seeds (in commerce frequently, but erroneously, called "berries") deprived of their endocarp and in part of their testa. Portions of the testa are, however, found on the convex surface, and lining the groove on the flat surface.

Fig. 148.


*Caffea Arabica.*

Unroasted coffee contains, besides unimportant substances, caffein, fatty and volatile oil, tannin, a peculiar sugar, and caffeic acid.

Berzelius states that caffeic acid ($C_{14}H_8O_7$ according to Payen) bears the same relation to the tannin (*caffeotannic acid*) of unroasted coffee, that gallic acid bears to the tannin of nutgalls. The *aromatic volatile oils* of raw coffee are tenaciously retained by the *fatty oil;* they undergo alteration of properties by the operation of roasting. *Caffein* ($C_8H_5N_2 O_2$) is a weak alkaloid, white, crystallizable in long silky needles, fusible, volatile, and soluble in water, alcohol, and ether. Its aqueous solution is precipitated by tannic acid. It is identical with *theine* extracted from China tea, and from Paraguay tea (*Ilex paraguayensis*), and with *guaranin* obtained from guarana (*Paullinia sorbilis*).

According to M. Schwazenbach, if a solution of caffein in chlorine water be evaporated, a red residue is obtained, which when heated becomes yellow, regaining its original color on the addition of a few drops of ammonia. It is said to exist in the berry partly as a cafferate (chlorgenate) and partly in a free state. It is probably *one* of the active principles of roasted coffee. When coffee is roasted there is developed in it one or more volatile oils, which give it its peculiar flavor, the caffein remaining unchanged. In roasting the coffee care should be taken not to burn it or overdo it, as thereby the various principles are driven off, or decomposed.

*Therapeutics.*—Unroasted coffee has been employed as a substitute for cinchona in intermittent fevers.

*Roasted coffee* possesses powerfully anti-soporific properties; hence its use as a drink by those who desire nocturnal study, and as an antidote to counteract the effects of opium and other narcotics, and to relieve intoxication. In those unaccustomed to its use, it is apt to occasion thirst and constipation. On some persons it acts as a slight purgative. It is occasionally useful in relieving headache, especially the form called nervous. It has also been employed as a febrifuge, in intermittents; as a stomachic, in some forms of dyspepsia; and as a stimulant to the cerebro-spinal system, in some nervous disorders. Floyer, Dr. Percival, and others, have used it in spasmodic asthma; and Laennec says, "I have myself seen several cases in which coffee was really useful." The immoderate use of coffee is said to produce nervous symptoms; such as anxiety, tremor, disordered vision, palpitation, and feverishness.

The action of caffein requires farther investigation. Mulder gave a grain of it to a rabbit; the animal ate but little the next day, and aborted the day after. Liebig has suggested that it probably contributes to the formation of taurine, the nitrogenized constituent of bile. According to Lehmann, caffein, in doses of from 2 to 10 grains, causes violent excitement of the vascular and nervous systems, palpitations of the heart, extraordinary frequency, irregularity, and often intermission of pulse, oppression of the chest, pains in the head, confusion of the senses, singing in the ears, scintillations before the eyes, sleeplessness, erections, and delirium. In all cases an augmentation was found in the amount of urea secreted.

It has been used as an antidote to opium, administered by the rectum in twenty grain doses. The citrate has been recommended for the relief and prevention of sick headache. It may be given in doses of 1 grain every hour before and during the paroxysm.—W.]

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## [RUBIA TINCTORIA, *Linn.* *Madder.*

*Botanic Characters.*—An herbaceous plant.—*Root* perennial, horizontal, long, reddish-brown. *Stems* several, herbaceous, tetragonal, with hooked prickles. *Leaves* somewhat membranous. *Flowers* small, yellow. *Berries* dark purple. A native of the Levant and South of Europe; cultivated in France, Holland, &c. for the sake of the roots.

### Rubia, *Madder.* Secondary List, U. S. P.

The root of Rubia tinctorum.

Madder roots (*radix rubiæ tinctorum*) are long, cylindrical, about the thickness of a writing-quill, branched, externally deep reddish-brown. They consist of a dark easily separable cortex, whose epidermis is thin, and of a ligneous meditullium, which in the fresh state is yellow, but by drying becomes reddish. The odor of the root is feeble; the taste is bitter and astringent. The microscope discovers abundance of needle-shaped crystals (*raphides*) in the cells of the cortex of the root.

In commerce, madder occurs in two forms—in the entire root, and in the ground or pulverized state.

The name of *lizari* or *alizari* is applied to the entire roots.

The powdered madders are subject to adulteration; the substances used for this purpose are both mineral and vegetable.

The mineral substances are brickdust, ochre, sand, and argillaceous earths. The vegetable substances are sawdust, bran, almond shells, &c.

The *coloring matter* of madder has been the subject of repeated investigation. Decaisne has shown that in the living state madder root contains only yellow coloring matter. This is held in solution, and resides not in any peculiar vessels or secretory apparatus, but in the cellular tissue and latex vessels. Nor is it confined to the root, for in the stem of full-grown plants, larger or smaller spots are here and there found, where the cells and spiral vessels are filled with it. As the root becomes older the yellow liquid becomes deeper colored. By exposure to atmospheric oxygen this yellow liquid becomes red, cloudy, and granular; the granules appearing to be of a gummy resinous nature, and partly soluble in alcohol.

A very interesting coloring matter has been obtained from madder by Robiquet and Collin, who have named it Alïzarin. "It is orange-red, inodorous, insipid, crystallizable, capable of being sublimed without change, scarcely soluble in cold water, soluble in boiling water, and very readily so in alcohol, ether, the fixed oils, and alkaline solutions. The alcoholic and watery solutions are rose colored; the ethereal, golden-yellow; the alkaline, violet and blue when concentrated, but violet-red when sufficiently diluted. A beautiful rose colored lake is produced by precipitating a mixture of the solutions of alizarin and alum." U. S. D.

The influence of madder over the system is exceedingly slight. Its topical effect is scarcely obvious. Home ascribed to it emmenagogue qualities. Others have declared it to be diuretic. Neither of these effects, however, were observed by Dr. Cullen. It may, perhaps, possess mild astringent and tonic properties.

But the most remarkable physiological effect of madder is that of coloring the bones of animals fed with it, red. This fact was noticed by Belcher; though Beckmann has adduced evidence to prove that some hints of it are to be found in the works of the ancients. This effect on the bones is produced more effectually, and in a much shorter time, in young than in old animals. In birds, the beak and claws become colored. As the nerves, cartilages, aponeuroses, tendons, and periosteum are not tinged, the effect is ascribed to the chemical affinity of the phosphate of lime for this coloring matter. Mr. Gibson accounts for it as follows: The blood charged with the red particles imparts its superabundance of them to the phosphate as it circulates through the bones. But as soon as the blood is freed from the madder by excretion, the serum then attracts the coloring matter, and in a little time entirely abstracts it.

It was formerly a favorite remedy in jaundice, in which disease Sydenham used it. On account of its capability of tinging the bones red, it has been recommended in rickets and mollities ossium, on the supposition of its promoting the deposition of bone earth; but this notion appears to be groundless. Home employed it as an emmenagogue in uterine complaints. The dose of it is ʒss to ʒij three or four times a day.—W.]

## '[SPIGELIA MARILANDICA, *Pinkroot.*

*Generic Character.*—*Calyx* 5-partite, persistent; the segments linear-subulate, glandular. *Corolla* gamopetalous, funnel-shaped; the lobes 5, shorter than the tube, with a valvate æstivation. *Stamens* 5, inserted on the tube of the corolla, inclosed or rarely exserted; filaments slender; anthers linear, erect, 2-lobed at the base. *Ovary* 2-celled; ovules numerous, amphitropal; placentæ basilar, stipitate. *Style* filiform, hairy above, jointed beneath the capitate or concave stigma. *Capsule* obovoid-compressed, didymous, dicoccous, circumsessile at the base; the cocci at length bi-partite. *Seeds* few, cuneate-turbinate; the testa scabrous-areolate; the embryo at the base of horny albumen, small, straight. (De Cand.)

Fig. 149.

*Spigelia Marilandica.*

*Specific Character.*—Stem erect, simple, quadrangular, smooth. Leaves sessile, ovate-lanceolate, acute or acuminate; the margin and nerves scabrous-hairy. Spike 3–8-flowered. Flowers sessile. Segments of the calyx 4 times shorter than the tube of the corolla. Anthers projecting from the tube. Lobes of the corolla lanceolate. Capsule smooth, somewhat shorter than the caylx.

*Root* perennial, consisting of numerous fibres, from a short, cylindrical rhizome. *Stems* several, winged (from the decurrent leaves). *Leaves* decussate, entire. *Flowers* in simple one-sided spikes (or racemes). *Corolla* much longer than the calyx, of a rich carmine color externally, paler at the base, and orange-yellow within. *Capsule* obcordate, smooth.

*Habitat.*—Southern States of North America; seldom found north of the Potomac.

### **Spigelia,** U. S., *Pinkroot.* Mat. Med. List, U. S. P.

The root of Spigelia Marilandica.

Pinkroot was formerly collected in the northern parts of Georgia by the Creek and Cherokee Indians. But since their emigration the supply has come from the far Southwest. They used to send large quantities of the herb itself to market, but now this herb is comparatively seldom met with in the shops. It is not nearly so active as the root, and is of a greenish-gray color, faint odor, and bitter taste, with the stem oval below, squarish above. The root (*radix spigeliæ*) consists of numerous slender, branching, dark brown fibres, issuing from a short, dark brown rhizome; its odor is rather faint and peculiar, its taste sweetish, decidedly bitter, peculiar, and disagreeable. The principal constituents of pinkroot are resin, volatile and fixed oils, tannic acid, saccharine matter, and a non-crystallizable, acrid, bitter substance, which is thought to be the active principle. This is soluble in water and alcohol, non-volatilizable, deliquescent, and neutral.

*Therapeutics.*—In large doses spigelia sometimes acts as a gastro-intestinal irritant, causing purging and vomiting with severe griping pains; at other times these symptoms are not manifested. In poisonous doses it is a narcotic, producing "vertigo, dimness of vision, dilated pupils, spasms of the facial muscles, and sometimes very general convulsions. The narcotic effects are said to be less apt to occur when the medicine purges, and to be altogether obviated by combining it with a purgative." U. S. D. Spigelia is a very certain anthelmintic, especially useful in cases of round worm. It appears to act as a vermicide, poisoning and killing the parasite. It is best given combined with purgatives; the officinal fluid extract of spigelia and senna is perhaps the best form for exhibition. If the powdered root be administered, it should be followed by a brisk purgative.

*Dose.*—Gr. xx—xxx to a child six years old; ʒj—ʒij to an adult.

Infusum Spigeliæ, U. S., *Infusion of Spigelia.*—"Take of spigelia, half a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel and strain." U. S. Dose, f℥iss—f℥iij for a child six years old; f℥iv—f℥viij for an adult.

Extractum Spigeliæ Fluidum, U. S., *Fluid Extract of Spigelia.*—"Take of spigelia, in fine powder, sixteen troyounces; sugar, in coarse powder, eight troyounces; diluted alcohol, a sufficient quantity. Moisten the spigelia with six fluidounces of diluted alcohol, introduce it into a conical percolator, press it firmly, and gradually pour upon it diluted alcohol until a pint of tincture has passed. Set this aside in a warm place until it is reduced by spontaneous evaporation to half a pint. Continue the percolation until two pints more of tincture have been obtained. To this add the sugar, and, having evaporated it, by means of a water-bath, to half a pint, mix it with the reserved tincture, and strain." U. S. A fluidounce of this preparation represents a troyounce of the root. Dose, gtt. ʒxx—fss for a child six years old; fʒj—fʒij for an adult.

Extractum Spigeliæ et Sennæ Fluidum, U. S., *Fluid Extract of Spigelia and Senna.*—"Take of fluid extract of spigelia, ten fluidounces; fluid extract of senna, six fluidounces; carbonate of potassa, half a troyounce; oil of anise, oil of caraway, each, twenty minims. Mix the fluid extracts, and dissolve in the mixture the carbonate of potassa and the oils, previously rubbed together." U. S. This extract is said to have a strong tendency to gripe, which may be, in a measure, obviated by the addition of an aromatic oil and tincture of hyoscyamus. Dose, gtt. xxv—xl for a child six years old; fʒiss—f℥ss for an adult.—W.]

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## CAPRIFOLIACEÆ, *Jussieu.* The Honeysuckle Order.

## SAMBUCUS NIGRA, *Linn.*

### Common Elder.

Pentandria, Trigynia, *Linn. Syst.*

*Botanic Character.*—*Stem* shrubby, somewhat arboreous, much and irregularly, though always oppositely, branched. *Leaves* pinnate, smooth; *leaflets* ovate or ovate-lanceolate, pointed, serrate, usually two pairs, with an odd leaflet. *Flowers* cymose, white. *Cymes* five-partite, terminate. *Calyx* adherent; *limb* five-cleft, small. *Corolla* rotate, five-lobed; *Stamens* five. *Stigmas* three, sessile. *Berry* globular, black, 3–4-seeded.—*Woodv.* pl. 76.

*Habitat.*—Indigenous; common in hedges, coppices, and woods.

Fig. 150.

*Sambucus nigra.*

## Sambucus, *Elder Flowers.*

The fresh flowers; from indigenous plants.

*Officinal Characters.*—Flowers small, white, fragrant, crowded in large cymes.

*Description.*—*Elder flowers* are white when fresh, but by drying become yellow, and retain an agreeable odor. Their taste is feebly bitter.

*Composition.*—Their principal constituent is *volatile oil*, to which they owe their properties.

*Uses.*—They are only employed in the preparation of elder-flower water.

### *Officinal Preparation.*

Aqua Sambuci, *Elder-Flower Water.*—Take of fresh elder flowers, separated from the stalks, ten pounds; water, two gallons. Distil one gallon.

Elder-flower water is sometimes made from the *pickled flowers*, which have been prepared with alternate layers of the flowers and common salt compressed and preserved in a well-closed vessel, usually a cask, the water which exuded being rejected. This however is not the officinal process. Elder-flower water is principally used as a perfume.

[The root of *Triosteum perfoliatum*, or fever root, is officinal in the Secondary List, U. S. P. This is an indigenous plant, which may be recognized by its connate, oval leaves, which are abruptly narrowed below, its clustered dull brownish-purple flowers, and orange-colored fruit. The root is an emeto-cathartic, acting on the bowels in doses of twenty to thirty grains; in larger quantities vomiting.—W.]

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## *Sub-class:* CALYCIFLORÆ.

## UMBELLIFERÆ, *Jussieu.* The Umbelliferous Order.

## CARUM CARUI, *Linn.*

### Common Caraway.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Biennial.* *Stem* branched, about two feet high. *Leaves* bipinnate; *leaflets* cut into linear segments. *Involucre* none, or of one leaf; *involucel* none. *Umbels* numerous, dense. *Calyx* adherent; *limb* obsolete. *Petals* obcordate, with a narrow acute inflexed point, white or pale flesh-colored. *Fruit* oblong. *Carpels* or *mericarps* laterally compressed, with five equal filiform ridges; *channels* with single vittæ; *commissure* bivittate; *stylopodium* depressed.—*Woodv.* plate 45, page, 125.

*Habitat.*—In meadows and pastures all over Europe: naturalized in England. Largely cultivated in Essex.

## **Carui**, *Caraway.*

[**Carum.** Mat. Med. List, U. S. P.]

The fruit dried; cultivated in England and Germany.

Fig. 151.


*Carum carui.*

*Officinal 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 odor, and a spicy taste.

*Description.*—The mericarps are commonly called *caraway seeds.* The caraway of the shops is in part the produce of this country, but is partly supplied from Germany.

*Composition.*—The aromatic qualities depend on a volatile oil. (See **Oleum Carui.**)

*Physiological Effects.*—Caraway is an aromatic stimulant and condiment.

*Uses.*—Its medicinal employment is not extensive. It is more frequently employed in substance than the *oil* or *water.* It is given to relieve the flatulent colic of children, and enters as an ingredient into confection of pepper, compound tincture of cardamoms, and tincture of senna.

### *Officinal Preparation.*

Aqua Carui, *Caraway Water.*—Take of caraway bruised, twenty ounces; water, two gallons. Distil one gallon.

This water is employed as a carminative vehicle for purgatives (as saline purgatives, magnesia, &c.), and in the flatulent colic of children.

## **Oleum Carui** [**Oleum Cari,** U. S.], *Oil of Caraway.*

The oil distilled in England from caraway.

["Prepare this oil from caraway, bruised, by the general formula," U. S., see page 399.]

*Officinal Characters.*—Colorless or pale yellow, odor aromatic, and taste spicy.

*Description.*—The quantity obtained from a given weight of fruit varies from about 4.7 per cent. to about 5.4 per cent. When fresh prepared it is colorless; but it becomes yellow and subsequently brown by keeping. It is limpid, and has the aromatic odor of the fruit, and an acrid taste. Its sp. gr. is 0.950.

*Uses.*—Oil of caraway is used to impart flavor, to correct the nauseating and griping qualities of some medicines, and to relieve flatulence. It is used with these objects in confection of scammony and pill of Barbadoes aloes. It is frequently added to cathartic pills and powders.

[Oleum cari enters into the composition of Extractum Spigeliæ et Sennæ Fluidum, U. S., and also Spiritus Juniperi Compositus, U. S.—W.]

*Dose.*—One to five drops.

## PIMPINELLA ANISUM, *Linn.*

### The Anise.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.—Annual. Stem* erect, smooth, about 1 foot high. *Radical leaves* cordate, lobed, incised, serrate; *stem-leaves*—middle ones pinnate, lobed, the lobes cuneate or lanceolate; the *upper leaves* trifid. *Umbels* on long stalks, without involucres or involucels. *Flowers* small, white. *Calyx* adherent; *limb* obsolete. *Petals* obcordate, with an inflexed point. *Fruit* laterally compressed, ovate, with a few scattered hairs; *carpels* or *mericarps* with 5 equal filiform ridges; *channels* with 3 or more vittæ; *stylopodium* tumid; *styles* recurved.—*Woodv.* pl. 180, page 490.

*Habitat.*—Island of Scio, Egypt, and some parts of Asia. Largely cultivated for its fruit in Malta, Spain, and various parts of Germany.

[**Anisum,** *Anise.* Mat. Med. List, U. S. P.

The fruit of Pimpinella anisum.

Anise seeds are of a greenish-brown color, sometimes verging towards yellow. They are double, oval, laterally compressed, each striate with five ridges, about a line in length, and furnished with scattered hairs. Their odor is aromatic, peculiar, and increased by friction. They contain both a volatile and fixed oil. The former of these is found in the "oil tubes," or vittæ which exist in their outer envelope. To it they owe their medicinal powers and peculiar odor. The fixed oil exists in their internal substance, in the albumen of the seed. They yield their virtues freely to alcohol, and sparingly to boiling water.

*Therapeutics.*—See Ol. anisi.—W.]

### Oleum Anisi [U. S.], *Oil of Anise.*

The oil distilled from the fruit in Europe. (See also **Oil of Illicium Anisatum**.) ["Prepare this oil from anise, bruised, by the general formula," U. S., see page 399.]

*Officinal Characters.*—Colorless or pale yellow; with the odor of anise, and a warm sweetish taste. Concretes at 50°.

*Description.*—The oil, when carefully prepared, is transparent and nearly colorless, having a slightly yellow tinge. It has the odor and taste of the fruit from which it is obtained. Its specific gravity increases with its age; thus Martius says, that when the oil is fresh distilled, the specific gravity is only 0.979; but after keeping it for a year and a half, the specific gravity had increased to 0.9853. It congeals at 50° F., and does not liquefy again under 62°. It is soluble in all proportions in alcohol; but spirit, whose specific gravity is 0.84, dissolves only 0.42 of its weight. By exposure to the air it forms resin, and becomes less disposed to concrete. It is composed of two volatile oils—one solid at ordinary temperatures (*stearoptène*), the other liquid (*eleoptène*), in the following proportions: eleoptene 75, stearoptene 25.

*Adulterations.*—Spermaceti, which is said to be sometimes added to oil of anise, to promote its solidification, may be distinguished by its insolubility in cold alcohol. Camphor, said to be added for the same purpose, is recognized by its odor.

*Physiological Effects.*—Aromatic, stimulant, and carminative.

*Therapeutics.*—In medicine it is employed to relieve flatulence and colicky pains, especially of children, and to prevent the griping effects of some cathartics.

*Dose.*—Two to five drops on sugar, or rubbed up with sugar in camphor water.

*Pharmaceutic Use.*—It is an ingredient in camphorated tincture of opium.

[SPIRITUS ANISI, U. S., *Spirit of Anise.*—"Take of oil of anise, a fluidounce; stronger alcohol, fifteen fluidounces. Dissolve the oil in the stronger alcohol." U. S. Dose, f℥ss to f℥iss in sweetened water.—W.]

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## FŒNICULUM DULCE, *DC.*

### Sweet Fennel.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Annual.* *Stem* slightly compressed at the base. *Radical leaves* somewhat distichous; *segments* capillary, elongated. *Umbels* of 6–8 rays; *calyx* adherent; *limb* obsolete. *Petals* roundish, entire, with a broad obtuse inflexed point. *Fruit* oblong; *mericarps* or *carpels* with five prominent, bluntly-keeled ridges; *channels* univittate; *commissure* bivittate; *stylopodium* conical.

*Habitat.*—Italy, Portugal, &c.

### Fœniculum, *Sweet Fennel Fruit.*

The fruit imported from Malta.

*Officinal 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 odor aromatic.

*Description.*—The fruits, commonly termed *sweet fennel seeds*, have a more agreeable odor and flavor than those of the common or wild fennel. Two kinds are known in trade, *shorts* and *longs;* the latter are most esteemed, and are occasionally nearly five lines long.

*Composition.*—The peculiar properties of the fruit depend on a volatile oil.

*Physiological Effects.*—Sweet fennel is an aromatic stimulant; its effects are similar to those of caraway.

*Therapeutics.*—Seldom employed in substance; more frequently as a carminative in the form of the water.

#### *Officinal Preparations.*

AQUA FŒNICULI, *Fennel Water.*—Take of sweet fennel fruit, bruised, twenty ounces; water, two gallons. Distil one gallon.

Carminative. Employed to relieve flatulent colic of infants, and as a vehicle for other medicines.

*Dose.*—For an adult, fl. oz. j to fl. oz. iij; for an infant, fl. dr. j to fl. drs. ij.

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### [FŒNICULUM VULGARE, *Wild or Common Fennel.*

*Specific Characters.*—*Biennial or perennial.* Stem almost terete at the base. Umbel 13-20 rays.

This plant differs from the sweet fennel in being also larger and flowering later, and having its fruit not so long.

### Fœniculum, *Fennel.* Mat. Med. List, U. S. P.

The fruit of Fœniculum vulgare.

The fennel seed of the U. S. P. is scarcely two lines in length, oval, and of a dark brown or blackish color. The two halves (the carpels) are almost always separated and free also from their footstalk. The taste is said to be stronger, more acrid, less finely aromatic than that of the cultivated plant [F. dulce].

Their medical properties are precisely those of the sweet fennel.

### Oleum Fœniculi, U. S., *Oil of Fennel.*

"Prepare this oil from fennel, bruised, by the general formula," see page 399. A pale yellow limpid oil, having the odor of the fruit. Dose, two to five drops administered on sugar.

Aqua Fœniculi, U. S., *Fennel Water.*—"Take of oil of fennel, half a fluidrachm; carbonate of magnesia, sixty grains; distilled water, two pints. Rub the oil, first with the carbonate of magnesia, then with the water, gradually added, and filter through paper.

"Fennel water may also be prepared by mixing eighteen troyounces of fennel, in coarse powder, with sixteen pints of water, and distilling eight pints." U. S. Dose, f℥j to f℥iij for an adult; f℥j to ij for an infant.—W.]

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## ANETHUM GRAVEOLENS, *Linn.*

### Common Garden Dill.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Annual.* *Stem* 1 to 2 feet high, smooth, finely striated. *Leaves* tripinnate, with fine capillary leaflets, and broad sheathing petioles. *Umbels* long, stalked, without involucres or involucels. *Calyx* adherent; *limb* obsolete. *Petals* roundish, yellow, entire, involute. *Fruit*, lenticular, compressed dorsally, and surrounded by a flattened border. *Carpels* or *mericarps* with equidistant filiform ridges, the 3 dorsal acutely keeled, the 2 lateral more obsolete, losing themselves in the border; *vittæ* broad, solitary in the channels, the whole of which they fill, 2 on the commissure.—*Woodv.* pl. 159, page 439.

*Habitat.*—South of Europe, Astrachan, Egypt, Cape of Good Hope, &c. Probably migratory. Cultivated in England.

### Anethum, *Dill.*

The fruit; cultivated in England, or imported from Middle and Southern Europe.

*Officinal Characters.*—Oval, flat, about a line and a half in length, with a pale membranous margin. Odor aromatic, taste warm, somewhat bitter.

*Composition.*—Dill owes its peculiar properties to a volatile oil. (See **Oleum Anethi.**)

*Physiological Effects.*—Aromatic, stimulant, carminative, and condimentary.

*Therapeutics.*—In medicine it is principally employed in the diseases of children. It is a common domestic remedy among nurses to relieve flatulence and griping of infants. Practitioners generally use dill as a vehicle for the exhibition of purgative and other medicines to children, the griping of which it assists in preventing. The whole fruits may be given to adults in doses of ten to sixty grains.

*Officinal Preparation.*

Aqua Anethi, *Dill Water.*—Take of dill, bruised, twenty ounces; water, two gallons. Distil one gallon.

Carminative.

*Dose.*—For adults, fl. oz. j to fl. oz. iij; for infants, fl. drm. j to fl. drs. iij. It is generally given to infants with their food.

### Oleum Anethi, *Oil of Dill.*

The oil distilled in England from Dill.

*Officinal Characters.*—Color pale yellow, odor pungent, taste acrid, sweetish.

*Description.*—Two hundredweights of the fruit yield eight pounds, five ounces of oil. This oil is pale yellow. Its specific gravity is 0.881. Its odor is peculiar and penetrating, analogous to that of the fruit. Alcohol and ether readily dissolve it. According to Tietzmann, 1,440 parts of water dissolve one part of this oil.

*Use.*—Principally used to prepare dill water. May be taken in the dose of a few drops on sugar, or dissolved in spirit.

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## CORIANDRUM SATIVUM, *Linn.*

### The Coriander.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Annual.* *Stem* erect, round, striated, smooth, from 1 to 2 feet high. *Leaves* scarcely stalked, bipinnate, cut; *leaflets* of some of the lowermost wedge-shaped or fan-shaped, of the others in fine linear segments. *Calyx* adherent, with five acute teeth. *Petals* white or with a reddish tinge, obcordate, with an inflexed point, the exterior ones radiating, bifid. *Fruit* globose; *carpels* or *mericarps* without evident primary ridges, but with four permanent, keeled, secondary ridges; *channels* without vittæ; *commissure* with 2 vittæ.—*Woodv.* pl. 181, page 492.

*Habitat.*—Grows wild about Ipswich and some parts of Essex, but is not really indigenous. Native of the South of Europe. Cultivated in Essex.

### Coriandrum, *Coriander.* [Mat. Med. List, U. S. P.]

The ripe fruit, dried; cultivated in Britain.

*Officinal Characters.*—Globular, nearly as large as white pepper. beaked, finely ribbed, yellowish brown; has an agreeable aromatic odor and flavor.

*Composition.*—The odor, taste, and medicinal qualities of the fruit depend on volatile oil. (See **Oleum Coriandri**.)

*Physiological Effects.*—Aromatic stimulant.

*Therapeutics.*—It is said to correct the odor and taste of senna better than any other aromatic. It is only employed in medicine as an adjuvant or corrigent.

*Pharmaceutic Uses.*—It is a constituent of the confection of senna. compound infusion of gentian, tincture of rhubarb, and tincture of senna.

*Dose.*—From gr. xxx to gr. lx.

### Oleum Coriandri, *Oil of Coriander.*

The oil distilled in England from Coriander.

*Officinal Characters.*—Yellowish, having the odor of coriander.

*Description.*—Oil of coriander is colorless or pale yellow. Its specific gravity varies from 0.859 to 0.871. It is soluble in alcohol, ether, and glacial acetic acid.

*Pharmaceutic Use.*—It is an ingredient in the syrup of senna.

*Dose.*—2 drops to 5 drops.

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## NARTHEX ASSAFŒTIDA, *Falconer.*

### The Assafœtida Plant.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Perennial. Root* fleshy, a foot or upwards in length, about three inches in diameter at the top, the summit invested above the soil with dark hair-like fibrous tegmenta, dark gray and transversely corrugated on the outside, internally white or ash-colored, and abounding in a white, milky, opaque, excessively fetid juice. *Leaves* collected into a fascicle above the root, numerous, large, and spreading, about 18 inches in length when fully grown, 3-parted, with bi-pinnatifid segments, and oblong, lanceolate, obtuse, decurrent lobes. *Stem* rising from the midst of the leaves, erect, herbaceous, 6 to 9 feet high, about 2 inches in diameter at the base, round, smooth, striated, solid, and terminating in a luxuriant head of compound umbels. *Umbels* without involucres or involucels, 10–20-rayed, each terminated by a roundish partial umbel, barren or fertile. *Calyx* adherent; *limb* obsolete. *Petals* oblique, acute. *Stylopodium* urceolate, plaited; *styles* filiform, ultimately reflexed. *Fruit* oval, thin, flat, foliaceous, and reddish brown.—Plates 20, 21, vol. xxii. *Edinb. Roy. Soc. Trans.*

Fig. 152.


*Narthex assafœtida.*

9. Ovary. Style and stylopodium, magnified. 10. Partial umbel with fertile flowers. 11. Barren umbel. 12. Partial umbel in fruit, with persistent carpophores.

*Habitat.*—Persia, Afghanistan, and the Punjaub.

### Assafœtida, *Assafœtida.* [Mat. Med. List, U. S. P.]

A gum resin, obtained by incision from the living root, in Afghanistan and the Punjaub.

*Extraction.*—Assafœtida is obtained by making incisions into the upper part of the root; the earth around it, the footstalks of the leaves, and the fibres at the top of the root having been previously removed. According to Kæmpfer, the collection commences on the 25th of May. Each collector is provided with a sharp knife to cut the root, a broad iron spatula to scrape off the juice, a cup fixed to his thigh to receive it, and two baskets hung over his shoulders upon a pole. The top of the root is cut off transversely, and two days afterwards the juice is scraped off and put into the cups. A fresh incision is then made, and the juice removed after the same interval, when they again cut the roots. The cups are from time to time emptied into large vessels. The juice is ex-

Fig. 153.

*Extraction of assafœtida.*

posed to the sun to become harder, and is conveyed home in the baskets (see Fig. 153). These operations are repeated in June and early in July. Except after the last operation, the roots are carefully defended from the sun, after each incision, by covering them with leaves. The quantity of assafœtida obtained from each root varies from a few ounces to two pounds, according to the size of the roots. The mode of obtaining assafœtida varies somewhat in different localities, but not in any essential particulars.

*Commerce.*—Assafœtida is exported from the Persian Gulf, or conveyed principally by way of the Indus to Bombay, whence it is sent to Europe.

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

*Description and Varieties.*—Assafœtida is fusible and inflammable, burning in the air with a white flame and the evolution of much smoke. Its odor is to most persons remarkably disagreeable. Two varieties are met with in English commerce, namely the Tear and Lump. *Assafœtida in the tear.*—This kind, which was formerly rare, is now more frequently met with. It occurs in distinct, roundish, flattened, or oval tears, and also in irregular pieces, varying from the size of a pea to that of a walnut, of a yellow or brownish-yellow color externally, but white internally. I think it not at all improbable that this variety is obtained from a different plant to that which furnishes the lump variety; for its color, externally, is more yellow, its odor is much feebler, and its fresh-fractured surface becomes more slowly and less intensely red by exposure to the air. [There does not appear to be any real foundation for this opinion of the author. A recent observer, Dr. Bellew, as reported by Mr. Cooke, states that both *tear* and *lump* assafœtida are obtained from the same plant (*Narthex Assafœtida*); that "the 'tear' sort is the gum resin that exudes, and dries drop by drop, from incisions around the top of the root; and that the 'lump' sort is the gum resin as it exudes from a broad surface, as when the top of the root is sliced off." Guibourt says that the reason why the "tear" sort does not become so red by exposure to the air as the "lump" sort is owing to its containing less volatile oil. —Ed.] *Lump Assafœtida.*—This variety is the kind usually met with in the shops. It occurs in variable-sized masses, of irregular form, and having a reddish or brownish-yellow color. Frequently these masses are observed to be made up of tears, agglutinated by a reddish-brown substance; these form the kind of assafœtida sometimes denominated *amygdaloid.*

*Adulterations.*—Assafœtida is frequently more or less mixed, intentionally or otherwise, with impurities, such as sand, stones, &c. A recent observer says that the commercial assafœtida from Candahar is always adulterated, the common adulterants being wheat or barley-flour, or powdered gypsum, to the extent of one-fifth to one-third.

*Properties.*—Assafœtida possesses the usual characteristics of a gum-resin. From other gum-resins it is distinguished by its peculiar odor, which is especially obvious when a small portion is heated on the point of a knife, and by its fresh-fractured surface becoming reddish-pink on exposure to air. Heated with sulphuric acid it is blackened, yields a dark, blood-red liquid, and develops sulphurous acid gas; if the liquid be diluted with water, and saturated with caustic potash, it becomes blue, especially on the surface by reflected light, similar to that observed when sulphate of quinia is dissolved in water (see p. 642).

*Composition.*—Assafœtida contains a variable quantity of volatile oil, usually from about 3.5 to 4.5 per cent., to which its properties are essentially due; resin, gum, and other unimportant substances. *Volatile Oil.*—This is obtained by distilling assafœtida with either water or alcohol. It is on this principle that the odor of this gum-resin depends. It is lighter than water, and is at first colorless, but by exposure to the air, acquires a yellow tinge. It dissolves in all proportions in alcohol and ether, but requires more than 2,000 times its weight of water to dissolve it. Its taste is at first mild, then bitter and acrid; its odor is very strong. It evaporates very quickly, and soon fills a large room with its odor. Sulphur, and probably phosphorus are among its elementary constituents. The presence of sulphur in assafœtida is shown in various ways; thus if chloride of barium be added to water distilled from assafœtida, and likewise a little chlorine, the sulphur becomes gradually acidified, and after some time a precipitate of sulphate of baryta is formed. If the oil be rubbed with mercury, it forms sulphuret of mercury. Moreover, if pills made of assafœtida be rolled in silver leaf, the latter, after a few days, is blackened by the formation of a sulphuret of silver. According to Hlasiwetz the oil is composed of two sulphurets of the hydrocarbon, $C_{12}H_{11}$, and when fresh distilled, like the essential oil of black mustard and horseradish, it contains no oxygen. It becomes acid by exposure to air, and on boiling the oil sulphuretted hydrogen is disengaged. *Resin.*—The resinous matter of assafœtida is soluble in alcohol. When the alcoholic solution is mixed with water a milky fluid is formed, owing to the deposition of the *hydrated resin.* Oil of turpentine and the oil of almonds also dissolve the resin, but less readily than alcohol.

*Physiological Effects.*—Assafœtida is usually placed, by pharmacological writers, among those remedies denominated antispasmodics or stimulants. It is the most powerful of the fetid gum-resins. Its local effects are moderate; it is devoid of the acrid and irritating properties possessed by gamboge, scammony, and many other resinous and gum-resinous substances. In the mouth it causes a sensation of heat, and the same effect, accompanied by eructations, is experienced in the stomach, when it is swallowed. In Professor Jörg and his pupils (males and females), who endeavored to elucidate the effects of this medicine by experiments made on themselves, doses of assafœtida, not exceeding 20 grains, caused uneasiness and pain of the stomach, increased secretion of the gastro-intestinal membrane, and alvine evacuations. The pulse was increased in frequency, the animal heat augmented, the respiration quickened, and the secretions from the bronchial membrane and skin promoted. A very constant effect was headache and giddiness. The urino-genital apparatus appeared to be specifically affected, for in the males there was an increase of the venereal feelings with irritation about the glans penis, while in the females the catamenial discharge appeared before its usual period, and uterine pain was experienced. These stimulant effects of assafœtida were observed in a greater or less degree in all the nine persons experimented on; and it should be borne in mind, that the dose did not, in any one case, exceed 20 grains. Very opposite to these results, and to the observation of practitioners generally, is the statement of MM. Trousseau and Pidoux, who tell us that they have taken half an ounce of good assafœtida at one dose, with no other effect than that of altering the odor of their secretions, by which they were kept for two days in an infected atmosphere, possessing a more horrible degree of fetidity than even assafœtida itself! These apparently contradictory results seem to prove that different individuals are most unequally susceptible of the influence of this remedy. The influence of assafœtida in convulsive and spasmodic diseases seems indisputable. As in these cases the functions of the excito-motory system are the functions principally or essentially involved, it is not assuming too much to suppose that the influence of assafœtida is principally directed to the excito-motory nerves. To paraphrase the words of Dr. M. Hall, assafœtida acts through the *excitor* nerves; while its effects are manifested through the *motor* nerves. Assafœtida, or its odorous principle, becomes absorbed by the veins, though slowly. We are told that the transpiration of Asiatics who use assafœtida daily is extremely fetid; a circumstance to which Aristophanes alludes. The stimulant influence of assafœtida over the organs of circulation and of secretion (as the bronchial membrane and skin), depends apparently on the topical action of the oily and resinous particles on the vessels in their passage through the latter.

*Therapeutics.*—From the foregoing remarks it will be readily gathered that assafœtida is contra-indicated in febrile and inflammatory diseases, on account of its stimulant properties; as also in vascular irritation, or inflammation of the stomach, on account of its topical influence on this viscus. On the other hand, it is found highly useful in spasmodic or convulsive diseases not dependent on disease of the nervous centres, but of the kind called by Dr. Hall eccentric. *In spasmodic and convulsive diseases.*—Few remedies have acquired such celebrity in *hysteria* as assafœtida. Dr. Cullen speaks in the highest terms of it, and I believe the experience of most practitioners corroborates his opinions of its virtues. When the circulation is very languid, ammonia may with advantage be conjoined. Schönheyder recommends assafœtida with opium in the form of clyster. *In infantine convulsions*, clysters of assafœtida are often used with good effect. Even in the *epilepsy* of adults they are not always without value. In purely *spasmodic asthma*, I have never seen relief from the use of assafœtida. This observation, which accords with Dr. Cullen's experience, does not agree with the statements of others. Trousseau and Pidoux declare they have seen it produce good and undoubted effects. But in old chronic catarrhs, with occasional spasmodic difficulty of breathing and spasmodic cough, I have procured the most marked relief by the combined use of assafœtida and ammonia. I have no experience of the use of this gum-resin in the disease called *laryngismus stridulus*, in which Millar and others have found it beneficial. In *whooping-cough*, both Millar and Kopp have found it beneficial. It promotes expectoration, and diminishes both the violence and frequency of the attacks. The repugnance which children manifest to its use is, however, a great drawback to its employment. [Assafœtida often affords so great relief in this disease, that the little sufferers themselves perceive it, and clamor for the medicine.—W.] *As a stimulating expectorant and antispasmodic in chronic catarrh*, it is of considerable use. It is adapted for old persons, and where the disease is of long standing. I have found it most beneficial in those cases where the cough and difficulty of breathing assume at intervals a spasmodic form, and where the wheezing is considerable. In such I have found full doses of assafœtida with ammonia give great relief. In delicate females, subject to repeated attacks of catarrh, attended with wasting, sweating, and other constitutional symptoms of phthisis, I have found assafœtida of frequent benefit. In these cases it does not act merely by its expectorant effects, for oftentimes one good consequence of its use is diminution of bronchial secretion. In *flatulent colic* of hysterical and dyspeptic individuals, or of infants, few remedies are more efficacious, when the disease is unaccompanied by any marks of inflammatory action, and is attended with constipation. Of its efficacy in the flatulent colic of infants, I can speak from repeated observation; it is given with great benefit in the form of clyster. In affections of the alimentary canal it is often of considerable value, as noticed above, in relieving flatulence in old persons, especially in hypochondriacal and hysterical subjects, and when accompanied with constipation, as it has a laxative effect. It provokes the expulsion of the gaseous matter, and appears to aid in preventing its reproduction. It is beneficially used in the form of clyster, to relieve a tympanitic condition of the abdomen and flatulent distension of the bowels in low fevers. *In constipation with flatulence*, it is a useful addition to purgative mixtures or enemata.

*Administration.*—The *dose* of assafœtida is from five grains to twenty or even thirty grains. It may be given in substance, in the form of pill, or made into an emulsion. In hysteria and flatulent colic, where we want an immediate effect, it is best administered in a liquid form. Used as an *enema*, it may be administered to the extent of 120 grains, rubbed up with warm water.

*Pharmaceutic Use.*—Assafœtida is an ingredient in the pill of aloes and assafœtida.

### *Officinal Preparations.*

Enema Assafœtidæ, *Enema of Assafœtida* (*Enema Fœtidum, Ed., Dub.*).—Take of tincture of assafœtida, six fluidrachms; mucilage of starch, six fluidounces. Mix.

The enema of assafœtida is a valuable stimulant, antispasmodic, and carminative purgative, which may be used with most beneficial results in hysteria, flatulent colic, infantile convulsions, and worms in the rectum.

Pilula Assafœtidæ Composita, *Compound Pill of Assafœtida* (*Pilula Galbani Composita, Lond.*) [*Pilulæ Galbani Compositæ*, U. S.].—Take assafœtida, two ounces; galbanum, two ounces; myrrh, two ounces; of treacle, by weight, one ounce. Heat altogether in a capsule by means of a steam or water bath, and stir the mass until it assumes a uniform consistence.

This compound is stimulant and antispasmodic. It is used in hysteria, chlorosis, &c.

*Dose.*—Gr. v to gr. xx.

Tinctura Assafœtidæ [U. S.], *Tincture of Assafœtida.*—Take of assafœtida, in small fragments, two ounces and a half; rectified spirit, one pint. Macerate for seven days, strain, filter, and add sufficient rectified spirit to make one pint. ["Take of assafetida, bruised, four troyounces; alcohol, two pints. Macerate for fourteen days, and filter through paper." U. S.]

Stimulant and antispasmodic. Used in hysteria and flatulent colic. When mixed with aqueous liquids, it becomes milky, owing to the deposition of the hydrated resin. *Dose.*—Fl. drm. ss to fl. drs. ij.

[Pilulæ Assafœtidæ, U. S., *Pills of Assafetida.*—"Take of assafetida, a troyounce and a half; soap, in fine powder, half a troyounce. Beat them together with water so as to form a pilular mass, to be divided into two hundred and forty pills." U. S. Each of these pills contains three grains of assafetida, and consequently from two to six pills may be given at a dose.

Mistura Assafœtidæ, U. S., *Mixture of Assafetida.*—"Take of assafetida, one hundred and twenty grains; water, half a pint. Rub the assafetida with the water, gradually added, until they are thoroughly mixed." U. S. In consequence of assafetida being a gum resin, when it is rubbed with water, an emulsion is formed, the gum holding the resin suspended. This preparation is white and opaque, like milk, and is therefore widely known as the milk of assafetida (lac assafœtidæ). It may be used for enemata. Dose, f℥ss—f℥ij.

Emplastrum Assafœtidæ, U. S., *Plaster of Assafetida.*—"Take of assafetida, plaster of lead, each, twelve troyounces; galbanum; yellow wax, each, six troyounces; alcohol, three pints. Dissolve the assafetida and galbanum in the alcohol by means of a water bath, strain the liquid while hot, and evaporate to the consistence of honey; then add the plaster and wax, previously melted together, stir the mixture well, and evaporate to the proper consistence." U. S. This plaster may be used when the indications are for nervous stimulants and counter-irritation. Thus it may be applied over the abdomen in hysterical flatulence, and to the chest in children suffering from whooping-cough, or in any sub-acute inflammatory lung affection, with marked nervous symptoms.—W.]

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## DOREMA AMMONIACUM, *Don.*

### The Ammoniacum Plant.

Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.—Perennial herb. Stem* seven to nine feet high, glaucous green. *Leaves* large, petiolate, somewhat bipinnate; *petioles* downy, sheathing at the base. *Umbels* proliferous, racemose, partial ones, globose, on short stalks, often arranged in a spiked manner; *involucres* and *involucels* none; *pedicels* woolly. *Calyx* adherent, five-toothed. *Petals* white. *Ovaries* densely woolly; *stylopodium* cup-shaped. *Fruit* elliptic, compressed from the back; *mericarps* or *half-fruits* with three distinct filiform primary ridges near the middle, and alternating with them, four obtuse secondary ridges (two of the primary ridges confluent with the margin), the whole enveloped in wool; *vittæ*, one to each secondary ridge, one to each primary marginal ridge, and four to the commissure.

*Habitat.*—Persia, in the province of Irak, and near Bamcean in the Punjaub.

### Ammoniacum, *Ammoniac.* [Mat. Med. List, U. S. P.]

A gum-resinous exudation from the stem; collected in Persia and the Punjaub.

*Extraction.*—The whole plant is abundantly pervaded with a milky juice, which oozes forth upon the slightest puncture being made, even at the end of the leaves. This juice, when hardened, constitutes ammoniac. It does not appear that artificial insertions are ever made in the stem. Lieut.-Colonel Kennet says, "When the plant has attained perfection, innumerable beetles, armed with an anterior and posterior probe of half an inch in length, pierce it in all directions; it (ammoniac) soon becomes dry, and is then picked off and sent, *viâ* Bushire, to India and various parts of the world." According to Dr. Grant, the drug is collected in the Punjaub, like assafœtida, from the root of the plant.

*Commerce.*—Ammoniac is usually imported from Bombay, but occasionally it comes from the Levant. It is brought over in chests, cases, and boxes.

*Officinal Characters.*—In tears or masses; the tears from two to eight lines in diameter, pale cinnamon brown, breaking with a smooth shining opaque white surface; the masses composed of agglutinated tears; hard and brittle when cold, but readily softening with heat; has a faint odor, and a bitter acrid nauseous taste. Rubbed with water it forms a milky emulsion.

*Description.*—Ammoniac occurs in two forms; in the tear and in the lump. *Ammoniac in the Tear* occurs in distinct dry tears, usually more or less spheroidal, though frequently of irregular forms, varying in size from that of the fruit of coriander (or even smaller) to that of a walnut. Externally they are of a yellow (pale reddish or brown) color, with a waxy lustre; internally they are white or opalescent, opaque, or only feebly translucent at the edge of thin films. At ordinary temperatures it is moderately hard and brittle, but softens like wax in the hand. *Lump Ammoniac.*—This occurs in masses, usually composed, as above stated, of agglutinated tears, whose properties it possesses. It is sometimes met with in soft plastic masses of a darker color, and mixed with various impurities. To separate these, it is melted and strained. Both kinds have a faint, unpleasant, peculiar odor, by which this gum-resin may be readily distinguished from all others. This odor is best detected by heating the ammoniac on the point of a pen-knife. Umbelliferous fruits are not unfrequently found intermixed with both sorts. In most of its other properties ammoniac agrees with other gum-resins.

*Composition.*—Ammoniac, like the other fetid umbelliferous gum-resins, is essentially composed of a volatile oil, resin, and gum. *Volatile Oil.*—Transparent, lighter than water, with a strong disagreeable odor, and ultimately a bitter and nauseous taste. It does not, like the volatile oil of assafœtida, contain sulphur. *Resin.*—Reddish-yellow, tasteless, has the odor of the gum-resin. Soluble in alkalies and alcohol; partly soluble in ether and the oils (fixed and volatile).

*Physiological Effects.*—The effects of ammoniac are similar to, though less powerful than, those of assafœtida. MM. Trousseau and Pidoux assert that in all the cases in which they have employed it, it had no stimulant effect, either local or general. I would remark, however, that the local irritation produced by the plaster of ammoniac is known to most practitioners—a papular eruption being a frequent result of the application of this agent. Ammoniac contains much less volatile oil than either assafœtida or galbanum; its stimulant influence is less than either of these. Full doses of it readily disturb the stomach.

*Therapeutics.*—Though applicable to all the same cases as assafœtida, its internal use is principally or almost solely confined to chronic pulmonary affections. It is not fitted for irritation or inflammation of the bronchial membrane; but in chronic coughs, with deficient expectoration, or in chronic catarrhs and asthmatic cases of old persons with profuse secretion, it sometimes gives slight relief. As a topical, discutient, or resolvent application, in the form of plaster, to glandular enlargements and indolent affections of the joints, it occasionally proves useful.

*Administration.*—The dose of ammoniac is from 10 to 30 grains. It may be given in the form of pill or emulsion.

*Pharmaceutic Uses.*—It is a constituent of the compound squill pill, and of galbanum plaster.

## *Officinal Preparations.*

[EMPLASTRUM AMMONIACI, U. S., *Plaster of Ammoniac.*—"Take of ammoniac, five troyounces; diluted acetic acid, half a pint. Dissolve the ammoniac in the diluted acetic acid, and strain; then evaporate the solution by means of a water-bath, stirring constantly, until it acquires the proper consistence." U. S. Ammoniac plaster is used as a stimulant application to chronic grandular tumors, enlarged joints, &c. It produces considerable irritation of the skin, and sometimes even a papular eruption.—W.]

EMPLASTRUM AMMONIACI CUM HYDRARGYRO [U. S.], *Ammoniac and Mercury Plaster.*—Take of ammoniac, twelve ounces; mercury, three ounces; olive oil, one fluidrachm; sulphur, eight grains. Heat the oil, and add the sulphur to it gradually, stirring till they unite. With this mixture triturate the mercury until globules are no longer visible; and, lastly, add the ammoniac previously liquefied, mixing the whole carefully. ["Take of ammoniac, twelve troyounces; mercury, three troyounces; olive oil, sixty grains; sublimed sulphur, eight grains. Heat the oil, and gradually add the sulphur, stirring constantly until they unite; then add the mercury, and triturate until globules of the metal cease to be visible. Boil the ammoniac with sufficient water to cover it, until they are thoroughly mixed; then strain through a hair sieve, and evaporate, by means of a water-bath, until a small portion taken from the vessel hardens on cooling. Lastly, add the ammoniac, while yet hot, gradually to the mixture of oil, sulphur, and mercury, and thoroughly evaporate all the ingredients." U. S.]

Employed as a stimulant discutient to indolent tumors, &c. A very useful application to the housemaid's swollen knee.

Mistura Ammoniaci [U. S.], *Ammoniac Mixture.*—Take of ammoniac, in coarse powder, a quarter of an ounce; distilled water, eight fluidounces. Triturate the ammoniac with the water, gradually added, until the mixture assumes a milky appearance, then strain through muslin. ["Take of ammoniac, one hundred and twenty grains; water, half a pint. Rub the ammoniac with the water, gradually added, until they are thoroughly mixed, and strain." U. S.]

The resinous constituent of ammoniac is more effectually suspended in water by the aid of the yelk of an egg. This mixture operates as a stimulant to the bronchial membrane, and is used as an expectorant in chronic coughs, humoral asthma, &c. It is a convenient useful vehicle for squill or ipecacuan.

*Dose.*—Fl. oz. ss to fl. oz. j.

### **Galbanum,** *Galbanum.* [Mat. Med. List, U. S. P.]

A gum-resin, derived from an unascertained umbelliferous plant; imported from India and the Levant.

*Source.*—The plant from which our officinal galbanum is obtained is uncertain. Lindley refers it to *Opoïdia galbanifera*, but the gum-resin of this plant does not appear to be galbanum. Mr. Don gave the name of *Galbanum officinale* to the unknown umbelliferous plant whose fruits he found in commercial galbanum, and which he therefore concluded to be its source.

*Extraction.*—Geoffroy says, though I know not on whose authority, that galbanum is generally obtained by making an incision into the stalks about three fingers' breadth above the root, from which it issues in drops, and in a few hours becomes dry, and hard enough to gather.

*Commerce.*—The precise country where galbanum is produced has not been hitherto ascertained. Dioscorides says it is obtained in Syria; a statement which is perhaps correct, though hitherto no evidence of this has been obtained. It is not improbable that it is also procured in Persia, or even in Arabia, as suggested by Dr. Royle.

*Officinal Characters.*—In irregular tears, about the size of a pea, usually agglutinated into masses, of a greenish-yellow color, translucent, having a strong disagreeable odor, and an acrid, bitter taste.

*Description.*—Galbanum occurs in the two forms of tears and lump. *Galbanum in the tear* occurs in distinct, round, yellow or brownish-yellow translucent tears; rarely exceeding the size of a pea. Their fracture is feebly resinous and yellow. *Lump galbanum* is the more common sort of commerce. It consists of large irregular masses of a brownish or dark brownish-yellow color, and composed of agglutinated tears, some few of which, when broken, are observed to be translucent and bluish, or pearl-white. The fruit, pieces of the stem, &c., are found intermixed with the tears. To separate these, galbanum is melted and strained. The odor of both kinds is the same, strong and peculiar. The taste is hot, acrid, and bitter. When exposed to cold, galbanum becomes brittle, and may be reduced to powder. In many of its other properties it agrees with the fetid gum-resins already described.

*Composition.*—Galbanum contains a volatile oil, resin, gum, &c. *Volatile Oil.*—This is colorless and limpid. Its specific gravity is 0.912; its odor is like that of galbanum and camphor; its taste is hot, afterwards cooling and bitterish. It does not contain sulphur. It is soluble in spirit, ether, and the fixed oils. *Resin.*—This is the residue obtained by boiling the alcoholic extract of galbanum in water. It is dark yellowish-brown, transparent, brittle, and tasteless; soluble in ether and alcohol, scarcely so in spirit containing 50 per cent. of water, or in almond oil. Very slightly soluble in oil of turpentine, even when aided by heat. It dissolves in oil of vitriol, forming a dark yellowish-brown liquid. According to Pelletier, galbanum-resin has the remarkable property of yielding an indigo-blue oil when heated to 248° F. or 266° F.

*Physiological Effects.*—The general effects of galbanum are those of the fetid antispasmodic gum-resins already described. It is usually ranked between assafœtida and ammoniac, being weaker than the former but stronger than the latter. As it yields, by distillation, more volatile oil than assafœtida does, it has been supposed that it must exceed the latter in its stimulant influence over the vascular system; but as an antispasmodic, it is decidedly inferior to assafœtida. A specific stimulant influence over the uterus has been ascribed to it.

*Therapeutics.*—Galbanum is principally adapted for relaxed and torpid habits, and is objectionable in inflammatory or febrile disorders. It is employed in the same cases as assafœtida, with which it is generally given in combination. It is principally used in chronic mucous catarrh, in which it oftentimes proves serviceable. It has also been employed in amenorrhœa and chronic rheumatism. Externally it is applied as a mild stimulant, resolvent, or suppurant, in indolent swellings.

*Administration.*—It may be given in substance in the form of pill, in doses of from 10 to 30 grains; or in the form of emulsion.

*Pharmaceutic Use.*—It is an ingredient in compound pill of assafœtida.

### *Officinal Preparation.*

EMPLASTRUM GALBANI, *Galbanum Plaster.*—Take of galbanum, one ounce; ammoniac, one ounce; yellow wax, one ounce; litharge plaster, eight ounces. Melt the galbanum and ammoniac together, and strain. Then add them to the litharge plaster and wax, also previously melted together, and mix the whole thoroughly.

This plaster, spread upon leather, is applied to indolent tumors, to promote their suppuration, and to disperse them. Its operation appears to be that of a mild stimulant. It is also applied to the chest in chronic pulmonary complaints. In weakly, ricketty children, with weakness of the lower extremities, it is applied to the lumbar region.

[EMPLASTRUM GALBANI COMPOSITUM, U. S., *Compound Plaster of Galbanum.*—" Take of galbanum, eight troyounces; turpentine, a troyounce; Burgundy pitch, three troyounces; plaster of lead, thirty-six troyounces. To the galbanum and turpentine, previously melted together and strained, add first the Burgundy pitch, and afterwards the plaster, melted over a gentle fire, and mix the whole together." U. S. Owing to the Burgundy pitch and turpentine, this plaster is more stimulating than the simple galbanum plaster of the British Pharmacopœia. It is used, however, for the same purposes.

PILULÆ GALBANI COMPOSITÆ, U. S., *Compound Pills of Galbanum.* —"Take of galbanum, myrrh, each, three hundred and sixty grains; assafetida, one hundred and twenty grains; syrup, a sufficient quantity. Beat them together so as to form a pilular mass, to be divided into two hundred and forty pills." U. S. These pills correspond to the compound pill of assafœtida of the British Pharmacopœia, and are used to fulfil the same indications. Dose, 1—3 pills.—W.]

## CONIUM MACULATUM, *Linn.*

**Hemlock.** Pentandria, Digynia, *Linn. Syst.*

*Botanic Character.*—*Root* biennial. *Stem* from 2 to 6 feet high, round, smooth, glaucous, shining, hollow, spotted with dark purple. *Leaves* tripinnate with lanceolate pinnatifid leaflets, or decompound, of a dark and shining green color, smooth, fetid when bruised, with long furrowed petioles, sheathing at their base. *Umbels* of many general as well as partial rays: *general involucre* of several (usually 3 to 7) leaflets; *partial involucre* of 3 leaflets on one side, ovate-lanceolate. *Calyx* adherent; *limb* obsolete. *Petals* 5, obcordate, white, with inflexed points. *Stamens* 5. *Styles* 2, filiform, spreading; *stigma* round. *Fruit* ovate, compressed laterally; *mericarps* (half fruits) with 5 prominent primary ridges, which are undulato-crenated; the *channels* have many striæ, but no vittæ. *Seed* with a deep, hollow groove in front.—*Flor. Lond.*, Fasc. 1, pl. 17.

In distinguishing *Conium maculatum* from other umbelliferæ, the following characters should be attended to: The large, round, smooth, spotted *stem;* the smooth, dark, and shining green color of the lower *leaves;* the *general involucre* of from 3 to 7 leaflets; the *partial involucre* of 3 leaflets; the *fruit* with undulated, crenated, primary ridges. To these must be added, that the whole *herb*, when bruised, has a disagreeable smell (compared by some to that of mice, by others to that of fresh cantharides, or of cats' urine).

Fig. 154.


*Conium maculatum.*

*Habitat.* — Indigenous; hedges and waste ground, especially near towns and villages; also in other parts of Europe, the east of Asia, and in the cultivated parts of North America and Chili, into which it has been introduced.

*History.* — This plant is usually supposed to be the κώνειον of the Greek writers, —the celebrated *Athenian state poison*, by which Socrates and Phocion died. Various reasons contribute to give the common opinion on this a high degree of probability.

**Conium**, *Hemlock.* [Mat. Med. List, U. S. P.
*Conii Folia*, *Ph.* 1850.]

The fresh leaves and branches of wild British plants, gathered when the fruit begins to form; and the leaves dried in the sun or at a temperature not exceeding 120°.

*Officinal Characters.*—Fresh leaves tripinnate, smooth, arising from a smooth stem with dark purple spots; dried leaves of a full green color and characteristic odor. The leaf rubbed with caustic potash gives out strongly the odor of conia.

*Description.*—The leaves should be dried quickly in baskets by the gentle heat of a proper stove. Exclusion from solar light contributes greatly to the preservation of the color. If properly dried, the leaves should have a fine green color, and their characteristic odor; and when rubbed with caustic potash they should evolve the odor of conia. They should be preserved in cool, closed, perfectly opaque, and dry vessels. Tin canisters possess these properties. However, little reliance can be placed on the dried leaves, even when most carefully prepared, for they sometimes yield no conia, though they possess the proper hemlock odor and a fine green color.

**Conii Fructus**, *Hemlock Fruit.*

The ripe fruit dried.

*Officinal Characters.*—Broadly ovate, compressed laterally; half-fruit with five waved or crenated ridges.

The fruit, commonly termed *hemlock seeds*, has a very little odor, and a slight, somewhat bitterish taste. It retains for a much longer time than the leaves its active principle unchanged (see *Conia*). On this account it has been introduced into the British Pharmacopœia.

*Composition.*—All parts of the plant contain a peculiar liquid volatile alkaloid, termed conia, to which their active properties are essentially due, and a trace of volatile oil. *Volatile Oil* (*odorous principle*).—The distilled water of hemlock possesses, in a high degree, the characteristic odor of hemlock, but is scarcely, if at all, poisonous. Hence it is obvious that the odorous matter is not the active principle, and that the characteristic odor of hemlock, in the different preparations of this plant, is not to be taken as a necessary indication of their activity. Bertrand isolated the odorous matter, and found it to be a volatile oil of an acrid taste and peculiar odor. *Conia* (*Coniin*, *Cicutine*), $C_{16}NH_{15}$, exists in hemlock in combination with an acid (*coniic acid*, Peschier); so that it cannot be recognized by its odor, nor obtained by distillation, without the assistance of an alkali. It is more copious in the fruit than in the leaves. Geiger procured from six lbs. of fresh, and nine lbs. of dried fruits, about one ounce of conia; whereas from 100 lbs. of the fresh herb he obtained only a drachm of this alkaloid. Conia, free from all impurity but water, may be obtained by distilling the alcoholic extract of the fruit with its own weight of water and a little caustic potash. The conia passes over readily, and floats on the surface of the water, which contains conia in solution. When pure, conia is at ordinary temperatures an oily-looking, transparent, volatile liquid, lighter than water, its specific gravity being 0.89, but according to Blyth 0.878. Its odor is strong, penetrating, and stupefying, somewhat like that of hemlock, or more analogous to a combination of the odors of tobacco and mice. Its vapor excites a flow of tears. Its taste is acrid, somewhat resembling that of tobacco. Conia is volatile, and when dropped on paper produces a transparent greasy-looking stain like an essential oil. By a gentle warmth the stain entirely disappears; if slowly evaporated, there is a brown color produced. The boiling point of conia is between 340° and 413° F. In close vessels it passes over without decomposition, and when mixed with water, its vapor may be distilled over at 212°. These differences in the boiling point have probably arisen from the variable degrees of purity of the conia. It burns with a bright smoky flame. It combines with one-fourth of its weight of water, forming *hydrate of conia*. At common temperatures it is soluble in 100 parts of water, in six of ether, and in alcohol in all proportions. The aqueous solution becomes turbid when warmed; but if exposed to the air it becomes brown, and deposits a brown resinous-looking mass. The alcoholic solution of conia combines with water more readily than the pure alkaloid; and one part of conia dissolved in four parts of alcohol is not rendered turbid by the addition of water. Anhydrous conia has no alkaline reaction, but on the addition of a small quantity of water its alkalinity is strongly and permanently manifested. Conia produces copious white fumes with the vapors of nitric, hydrochloric and acetic acids, and completely neutralizes these acids. It coagulates albumen, requires a blood-red color on the addition of a small quantity of nitric acid, and, when sulphuric acid is added, evolves much heat, and acquires a purple-red color, which changes subsequently to olive-green. Dry hydrochloric acid gas at first produces with it a purple-red tint, and afterwards an indigo-blue. Conia, when exposed to air, is resolved into ammonia, and a bitter extractive matter possessed of no poisonous properties. This tendency to spontaneous change, which is materially increased by temperature, may account for the variable proportion of the active principle found in some preparations of hemlock, as also for the conflicting accounts of authors regarding their medicinal action. It is a strong base, and resembles ammonia in many of its reactions. It precipitates oxide of silver from the nitrate, and redissolves it when added in excess. Chloride of silver is almost as soluble in it as in ammonia. It is a violent poison.

*Physiological Effects.*—Under the continued use of small and repeated doses of hemlock, glandular and visceral enlargements have frequently subsided; hence has arisen the opinion, entertained in all ages, of the *resolvent* and *discutient* powers of this remedy, and of the stimulus which it communicates to the absorbing vessels. The mammæ and the skin are the parts in which these powers have been supposed to be more especially manifested; and the asserted effects (wasting of the breast, profuse sweating, and eruptions) of hemlock on these parts, in healthy individuals, lend support to this opinion. But the influence of hemlock over the organic functions does not appear to be limited to this resolvent operation. In foul ulcers the quality of the discharge has been greatly improved, while pain has been alleviated, and the tendency of the sores to spread has apparently been greatly diminished. If then, these effects be really referable to hemlock (and they have been asserted by so many writers, in all ages, that we can scarcely refuse to admit them), they prove that this plant exercises a most profound influence over nutrition and the other organic functions, and which we have no better term to indicate than that of *alterative*. But so frequently has this influence failed to manifest itself, especially in those cases where it was most desired, that a very proper doubt has prevailed among practitioners of the present day whether it really exists, and whether those phenomena which have been supposed to indicate it, are not really referable to other influences and circumstances. That hemlock has some influence of the kind referred to, I do not doubt; but it has been greatly exaggerated, and thereby much unmerited discredit has been brought on the remedy; for practitioners, finding that it would not do all that had been ascribed to it, have frequently dismissed it as altogether useless. Whether the failures ought, in part at least, to be ascribed to imperfect modes of preparing and administering this plant, we are, as yet, unable positively to affirm. One fact, however, is certain, that many of the preparations of hemlock in ordinary cases are inert, or nearly so; and others, probably, have had their properties greatly changed in the process of their preparation. The remark made by Dr. Christison, with respect to the physiological effects of this plant, applies well to the point under discussion. "If," says this writer, "physicians or physiologists would acquire definite information as to the physiological effects of hemlock, in small or medicinal doses, they must begin the inquiry anew. Little importance can be attached to anything already done in this field, as I have no doubt whatever that by far the greater proportion of the preparations of hemlock hitherto employed has been of very little energy, and, in the doses commonly used, is absolutely inert." In *large* or *poisonous doses* the symptoms are those indicating disorder of the cerebro-spinal functions. In some of the best recorded cases the leading symptom was coma; the effects being altogether analogous to those of opium. In other instances convulsions or violent delirium, or both, were the prominent symptoms. We have no well detailed cases in which *delirium* was the leading symptom. The following must suffice, by way of illustration; it is from Kircher: Two priests ate hemlock root by mistake; they became raving mad, and plunged into the water. For three years they suffered from partial palsy and violent pain. Orfila also mentions a vine-dresser and his wife, who became mad and furious from hemlock. General *paralysis* has also been observed in this form of poisoning. A case in which this was a most prominent symptom is mentioned by Alderson. An overdose of conium maculatum "produced general paralysis; the under jaw fell, the saliva ran from the patient's mouth, the urine dropped from the bladder, and the contents of the rectum were discharged; in short, every voluntary muscle lost its energy, and the patient continued for nearly an hour in this most deplorable state, unable to move or to command the slightest exertion, though all the time perfectly sensible." He recovered by the use of stimulants. Mr. Judd performed a series of experiments on cats, in whom the most marked effect was paralysis of the posterior limbs. As illustrations of the *convulsions* caused by hemlock, I may refer to the cases mentioned by Limprecht and Ehrhard. The first states that an old woman suffered for three months with abdominal pain and convulsive movements of the limbs, in consequence of eating hemlock root. Ehrhard mentions trismus as one of the symptoms in another case. Dr. Watson has related two cases in which giddiness, coma, and convulsions occurred. These statements, as well as others of a like tendency which might be quoted, do not agree with the (as yet) ascertained effects of conia. The *post-mortem* appearances throw but little light on the *modus operandi* of hemlock. Venous congestion, especially of the cerebral vessels, a fluid condition of the blood, and, in the lower animals, redness of the alimentary canal, are occasional appearances.

*Effects of Conia.*—The following are the symptoms produced, as detailed by Dr. Christison: "It is, in the first place, a local irritant. To whatever texture or part it is applied, expressions of pain are immediately excited. But these local effects are soon overwhelmed by the indirect or remote action which speedily follows. This consists essentially of swiftly-spreading palsy of the muscles, affecting first those of voluntary motion, then the respiratory muscles of the chest and abdomen, lastly the diaphragm, and thus ending in death by asphyxia." Convulsive tremors, and twitches of the limbs, sometimes, though not invariably, are observed. The external senses do not appear to be affected until respiration is impaired. The primary seat of the action of conia is probably the spinal cord. In this, conia and strychnia agree; but in the nature of the effect they seem, as Dr. Christison has observed, to be the counterparts of each other. Conia exhausts the nervous energy of the cord, and causes muscular paralysis; strychnia irritates it, and causes permanent spasm of the respiratory muscles. These effects of conia suggest its employment in convulsive or spasmodic diseases; as tetanus, poisoning by strychnia or nux-vomica, hydrophobia, &c. I have tried it on two rabbits under the influence of strychnia, and found that it stopped the convulsions, but hastened rather than prevented death. It was tried in a case of hydrophobia, in a middle-aged man, at the London Hospital. Two minims of conia, dissolved in thirty drops of acetic acid, were applied endermically to the præcordium (the cuticle being previously removed by a blister). The relief was instantaneous but transitory, and in about seven minutes the symptoms began to reappear, and shortly assumed their previous urgency. Three minims of conia were afterwards injected into the rectum without benefit. The remedy was not repeated, and the man died in a few hours.

*Therapeutics.*—In the present state of uncertainty with respect to the real physiological operation of hemlock, it is obviously impossible to lay down indications or contra-indications for its use, which can be much relied on. Acute inflammation, fever, apoplexy, or tendency to it, and paralysis, are among the circumstances which oppose the employment of hemlock. The uses of hemlock may be reduced to two heads: those which depend on its influence over the organic functions; and, secondly, those which have reference to its influence over the cerebro-spinal system. The resolvent or discutient and alterative uses come under the first head; the antispasmodic and anodyne under the second.

*As a resolvent and alterative.* The diseases in which the discutient and alterative properties of hemlock are likely to be serviceable are, *enlargements and indurations of the absorbing and secreting glands* and *of the viscera*, *scrofula*, *obstinate chronic skin diseases*, and *foul ulcers*. I am not prepared to offer any opinion as to whether the diseases to which the terms *scirrhus* and *cancer* are strictly applicable, have ever been cured by hemlock. One fact is undoubted, that diseases, supposed to have been scirrhous and cancerous, have been greatly alleviated, and, in some cases, apparently cured by this remedy. In *scrofula*, in which disease Fothergill and many others have praised it, it seems to be occasionally useful as a palliative in irritable constitutions. It allays the pain, and assists in reducing the volume of enlarged lymphatic glands, and in scrofulous ulcerations improves the quality of the discharge, and disposes the sores to heal. Even *enlargements of the liver*, *spleen*, and *pancreas* have been, at times, apparently, benefited by hemlock. In *mammary tumors* and *profuse secretion of milk*, a trial of it should never be omitted. In *bronchocele* it has been found efficacious by Dr. Gibson, Professor of Surgery in the University of Pennsylvania. In *syphilis* it is useful, by alleviating nocturnal pains, and in diminishing the tendency to spread of irritable sores. In *chronic skin diseases* (lepra, herpes, &c.) it is now but rarely employed.

*As a cerebro-spinal agent* (*anti-spasmodic and anodyne*). The power possessed by conia of paralyzing the motor nerves, suggests the employment of hemlock as an *antispasmodic*. Hitherto, however, trials of it have been made in a few spasmodic diseases only, and those have not proved favorable to its reputation. In some spasmodic affections of the respiratory organs, it has gained a temporary celebrity only. In *hooping cough*, Dr. Butter spoke favorably of it, as having the advantage over opium of not being liable to check expectoration. But though the violent and periodic fits of coughing are obviously of a spasmodic nature, and, therefore, apparently adapted for the use of hemlock, experience has fully proved that the disease is one which will run through a certain course. At the best, therefore, hemlock can prove a palliative only. In other forms of *spasmodic cough*, as well as in *spasmodic asthma*, hemlock deserves farther trial. In *tetanus*, conia or hemlock held out some hopes of doing good. Mr. Curling has kindly furnished me with the notes of a case which occurred in the London Hospital. A tincture of hemlock fruit was exhibited on the eighth day of the disease, at first in doses of 20 minims every hour, which were increased in the course of the three following days to 2 fluidrachms every quarter of an hour, until the patient (a man aged 46) had taken, in all, two pints! but without any decided effect on the spasms or brain. Morphia and laudanum were afterwards used, but the man died. A small quantity of conia, obtained from three ounces of the same tincture used in this case, killed a cat in less than four minutes. In a case of *chorea*, treated by Mr. Curling, no relief was obtained by the use of the above-mentioned tincture, given to the extent of three ounces in twelve hours. The patient (a young man) ultimately died, exhausted from the long-continued and violent convulsions of nearly all the voluntary muscles. Hemlock has been frequently employed as an *anodyne*, and often with apparent relief. As conia does not appear to have the same paralyzing influence over the sensitive, that it has over the motor nerves, some doubt has been raised on the real anodyne influence of hemlock. However, *in tender glandular enlargements*, *in painful ulcers*, *in scirrhus* and *cancer*, *in rheumatism*, and *in neuralgia*, hemlock has, at times, evidently mitigated pain; and its power of *allaying troublesome cough* is, in some instances, referable to its diminishing the preternatural sensibility of the bronchial membrane. [I have derived marked advantage from its use in reflex paraplegia, arising from irritation of the kidneys.—Ed.]

*Administration.*—Hemlock is used in the form of powder, tincture, juice, extract, and poultice. Dose of the powder 3 grains to 10 grains, or more.

*Antidote.*—No chemical antidote is known for hemlock, though it is not improbable that an infusion of galls might be serviceable. The first object, therefore, is to evacuate the poison from the stomach; this is to be effected by the same means as directed for poisoning by opium. If the poison be suspected to have passed into the bowels, a purgative is to be administered, unless diarrhœa have come on. The subsequent treatment will depend on the symptoms: bloodletting is frequently required to relieve the congested state of the cerebral vessels. Opium is generally prejudicial. Artificial respiration should not be omitted in extreme cases. As strychnia and nux vomica appear to produce a condition of the spinal cord opposite to that of conia, it is a question whether either of these agents might not be serviceable in the treatment of a case of poisoning by hemlock.

*Officinal Preparations of Conium.*

Cataplasma Conii, *Hemlock Poultice.*—Take of hemlock leaf, in powder, one ounce; linseed meal, three ounces; boiling water, ten fluidounces. Mix the hemlock and linseed meal, and add them to the water gradually, constantly stirring.

This is sometimes employed as a soothing anodyne application to cancerous, scrofulous, venereal, and other foul ulcers.

Extractum Conii [U. S.], *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 coloring 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 coloring matter previously separated, and stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence. ["Take of hemlock, fresh, twelve troyounces. Bruise the hemlock in a stone mortar, sprinkling on it a little water, and express the juice; then, having heated this to the boiling point, filter it, and evaporate to the proper consistence, either in a vacuum with the aid of heat, or in shallow vessels, at the ordinary temperature, by means of a current of air directed over the surface of the liquid." U. S.]

This extract is of good quality only when a strong odor of conia is disengaged by degrees on its being carefully triturated with solution of potash.

*Dose.*—Gr. v to gr. x. [I frequently give it in still larger quantity in obstinate acute rheumatism, increasing the dose gradually from 5 to 20 grains three or four times a day.—Ed.]

[This extract may be administered either in pill or solution.—W.]

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 an excellent preparation, and keeps well.

*Dose.*—Min. xxx to fl. drs. jss.

[Extractum Conii Alcoholicum, U. S., *Alcoholic Extract of Hemlock.*—"Take of hemlock, recently dried and in fine powder, twelve troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Introduce the powder, previously mixed with one-third of the alcohol, into a conical percolator, and pour upon it the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour diluted alcohol upon it until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol until two pints more of tincture have passed, or until the powder is exhausted; then evaporate this liquid, by means of a water-bath, at a temperature not exceeding 160°, to the consistence of syrup. To this add the three fluidounces of tincture first obtained, and continue the evaporation, at a temperature not exceeding 120°, until the whole is reduced to the proper consistence." U. S. Dose, gr. j–ij, cautiously increased, administered in pill.

Tinctura Conii, U. S., *Tincture of Hemlock.*—"Take of hemlock, recently dried and in fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S. This is an uncertain preparation, not nearly so reliable as the British tincture of the seeds. Dose, f℥ss to f℥j, administered in water and cautiously increased.

Extractum Conii Fluidum, U. S., *Fluid Extract of Hemlock.*—"Take of hemlock, recently dried and in fine powder, sixteen troyounces; acetic acid, half a fluidounce; diluted alcohol, a sufficient quantity. Mix the acid with three pints of diluted alcohol, moisten the powder with half a pint of the mixture, pack it in a conical glass percolator, and gradually pour the mixture upon it until twelve fluidounces of tincture have passed. Set this aside, and continue the percolation, first with the remainder of the mixture, and afterwards with diluted alcohol, until three pints more of tincture have been obtained. Evaporate this, by means of a water-bath, at a temperature not exceeding 150°, to four fluidounces, mix it with the reserved tincture, and filter through paper." U. S. This extract is sometimes valueless from too great heat having been used in its preparation. The test of its value is the development of the mouse-like odor of conium by the addition of potassa. One fluidounce of it represents a troyounce of the leaves. Dose, gtt. v, rapidly increased until some effect is produced.—W.]

*Officinal Preparations of Conium Fruit.*

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

The Tinctura Conii of the London Pharmacopœia was made from hemlock leaves. The present tincture is at least twice as strong. Good tincture of hemlock should evolve a strong odor of conia on the addition to it of solution of potash.

*Dose.*—Min. xx to fl. drm. j.

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## [DAUCUS CAROTA, *Linn.*

### Wild Carrot.

*Generic Characters.*—Inner face of each mericarp (half fruit), flat or nearly so. Flowers in compound, perfect umbels. Fruit bristly with weak prickles in single rows on the ribs.

*Specific Characters.*—Stem bristly; involucre pinnatifid, nearly the length of the umbel.

This plant is native from Europe, but has become a very noxious weed in the old pasture-fields of this country. It is a rather handsome plant, attaining the height of two or three feet, with large dense umbels of white or cream-colored flowers, with a dark purple abortive one in the centre. It is biennial, and has 2–3-pinnatifid leaves.

### **Carota,** *Carrot Seed.* Sec. List, U. S. P.

The fruit of Daucus carota.

The officinal fruits, usually called carrot seeds, are brownish, from one to one and a half lines long, with an aromatic odor, and a bitter and warm taste. The seeds of the cultivated carrot are much milder. They owe their virtue to a volatile oil.

*Therapeutics.*—The fruit (seed of the shops) of the carrot is an aromatic stimulant and carminative, like the other aromatic umbelliferous fruits. Aretæus says it possesses diuretic properties, a statement confirmed by Eberle. It has been employed in suppressions of urine and painful micturition, and also in dropsies. They may be administered in infusion made with boiling water (℥j–Oj).—W.]

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## [ARCHANGELICA OFFICINALIS, *Hoffm. and Koch.*

## Garden Angelica.

*Synonym.*—Angelica archangelica, *Linn.*

*Generic Characters.*—Margin of the *calyx* with 5 short teeth. *Fruit* somewhat compressed at the back, with a somewhat central raphé, 2-winged on each side. *Mericarps* (half-fruits) with thick, keeled ridges; the three dorsal ones elevated, the two lateral ones dilated into a twice as broad wing. *Seed* not adhering to the integuments; the nucleus free, covered all over with numerous vittæ. Perennial *herbs.* (De Cand.)

*Specific Characters.*—*Stem* smooth, terete, striated. *Leaves* bipinnatisect; segments subcordate, lobed, sharply serrated, the odd one 3-lobed; sheaths loose, saccate. Leaflets of the *partial involucre* equalling the partial umbel. (De Cand.)

*Root* biennial, large, fleshy, branched, resinous, pungently aromatic. *Stem* four or five feet high, a little glaucous. *Foliage*, *stalks*, and even the *flowers*, bright green. It flowers from June to September.

*Habitat.*—England and the northern parts of Europe. Cultivated in moist situations, and on the banks of ditches.

### **Angelica,** *Angelica.* Sec. List, U. S. P.

The root of Angelica archangelica.

The dried root of the shops consists of a short cylindrical head, from which numerous branches arise. The size of these branches varies; the larger ones are as thick as the little finger, and six or eight inches long. Externally, the root is corrugated and grayish-brown. Internally, it is dirty white, and presents, when cut transversely, numerous dark points, which are the cut extremities of vessels, or intercellular spaces filled with a liquid, strongly odorous oil, or oleoresin. To the taste, the root is at first sweet, then hot, aromatic, and bitter. The odor is peculiar, and not very disagreeable. The fruit, called *angelica seeds* (*fructus* seu *semina angelicæ*), have the odor and taste, but in a diminished degree, of the root. The aromatic qualities of the root and seeds depend on volatile oil and resin. Both root and seeds are pungent aromatic stimulants and mild tonics.

Angelica (either root or seeds) is scarcely employed in modern practice, though it was formerly much esteemed. The tender stems, stalks, and midribs of the leaves are made, with sugar, into a sweetmeat or candy (*candied angelica; caules* seu *rami angelicæ conditi*), which, taken as a dessert, is a very agreeable stomachic. The principal consumption of angelica root and seeds is by rectifiers and compounders in the preparation of gin and the liqueur termed *bitters*.—W.]

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## [PETROSELINUM SATIVUM, *Hoffm.*

### Parsley.

*Generic Characters.*—Fruit ovate, compressed laterally; capels 5-ribbed, intervals with single oil tubes, commissure with two.

*Specific Characters.*—Leaves decompound, segments of lower ones cuneate-ovate, terminal ones trifid; involucels of 3–5-subulate bracts.

A well-known garden plant, a native of Southern Europe.

### **Petroselinum**, *Parsley Root.* See. List, U. S. P.

The root of Petroselinum sativum.

This root contains a volatile oil, to which it owes the familiar taste and odor of parsley. Beside this there has been obtained from it a peculiar oily, non-nitrogenized liquid, which has received the name of *apiol.* This is heavier than water, of a peculiar tenacious odor, distinct from that of the plant, and an acrid, pungent taste. It is soluble in alcohol, insoluble in water, and does not saponify with the alkalies.

*Therapeutics.*—Parsley root has been used as a stomachic stimulating diuretic, adjuvant to other more active drugs. Apiol is said by its discoverers to possess very similar therapeutic powers to the sulphate of quinia, acting as a pretty certain antiperiodic in the intermittent of temperate climates, and, in large doses, producing cerebral symptoms similar to those caused by the sulphate of quinia. Its taste is very disagreeable, and it should be administered in gelatin capsules—gr. xv–xxv—being exhibited shortly before the expected return of the chill.—W.]

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## [ARALIACEÆ.

## ARALIA SPINOSA, *Linn.*

### Angelica Tree, *Hercules Club.*

*Generic Characters.*—Calyx-tube coherent with the ovary, the teeth very short or almost obsolete. Petals 5, epigynous, oblong or obovate, imbricated in the bud, deciduous. Stamens 5, epigynous, alternate with the petals. Styles 2–5, mostly distinct and slender, or, in the sterile flowers, short and united. Ovary 2–5-celled, with a single anatropous ovule suspended from the top of each cell, ripening into a berry-like drupe, with as many seeds as cells.

*Specific Characters.*—Umbels very numerous in a large compound panicle; leaves very large, quinately or pinnately decompound. Shrub, or a low tree; the stout stem and stalks prickly.

*Habitat.*—River banks, Pennsylvania to Kentucky and southward; common in cultivation.

### **Aralia Spinosa**, *Aralia Bark.* See. List, U. S. P.

The bark of Aralia spinosa.

This bark occurs in small quills. It has a bitterish, somewhat aromatic taste, causing, when chewed, a persistent burning sensation. It yields to boiling water. It is a stimulant diaphoretic, and is used in the South in rheumatic affections.—W.]

## [ARALIA NUDICAULIS, *Linn.*

### Wild Sarsaparilla.

Umbels. 2–7, corymbed; stem short, somewhat woody. Stem scarcely rising out of the ground, smooth, bearing a single long-stalked leaf, and a shorter naked scape.

Fig. 155.

*Aralia nudicaulis.*

*Habitat.*—Moist woodlands; common northward and southward along the mountains, United States.

**Aralia Nudicaulis,** *False Sarsaparilla.* Sec. List, U. S. P.

The root of Aralia nudicaulis.

This root has a fragrant odor and sweetish, aromatic taste. It is somewhat stimulating and diaphoretic, and is thought to be an alterative resembling sarsaparilla in its action on the system. It has been used in syphilitic rheumatic and cutaneous diseases.—W.]

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## [ARALIA QUINQUEFOLIA, *Gray.*

### Ginseng.

*Synonym.*—Panax quinquefolium.

Root large and spindle-shaped, often forked, 4 to 9 inches long, aromatic; stem 1 foot high; leaflets long-stalked, mostly 5, large and thin, obovate-oblong, pointed; styles mostly 2; fruit bright red.

*Habitat.*—Rich mountain woods, Northwestern United States.

**Panax,** *Ginseng.* Sec. List, U. S. P.

The root of Panax quinquefolium.

This root is entirely destitute of medical properties, except it be those

Fig. 156.

*Panax quinquefolium.*

of a feeble demulcent. The great esteem in which it has been held by the Chinese has given it its world-wide notoriety.—W.]

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## CUCURBITACEÆ, *Jussieu.* The Gourd Order.

## CITRULLUS COLOCYNTHIS, *Schrad.*

### The Bitter Cucumber, or Colocynth.

Monœcia Syngenesia, *Linn. Syst.*

*Botanic Character.—Annual herb. Stem* procumbent, somewhat hispid, angular. *Leaves* cordate-ovate, many-lobed; *lobes* obtuse, bright green on the upper side, paler and clothed with whitish hairs beneath; *petioles* as long as the laminæ; *tendrils* short, opposite each leaf, filiform, branching. *Flowers* monœcious, axillary, solitary, stalked. *Calyx* 5-toothed. *Corolla* yellow, with greenish veins; *petals* small, scarcely adherent to each other, and to the calyx. *Males: Stamens* 3, short, two of which have doubly-bent anthers, or consist of two anthers, in which case the number of stamens is really 5. *Females: Calyx* globose, and somewhat hispid. *Ovary* inferior, smooth; *style* short; *stigmas* 3. *Fruit* globose, smooth, about the size of an orange, yellow when ripe, with a thin solid rind, 6-celled; *pulp* very bitter. *Seeds* ovate.—*Woodv.* page 476, pl. 175 (*Cucumis Colocynthis*).

*Habitat.*—Japan, Coromandel, Cape of Good Hope, Syria, Nubia, Egypt, Turkey, and the islands of the Grecian Archipelago. Cultivated in France and Spain.

Fig. 157.

*Citrullus colocynthis.*

**Colocynthis**, *Colocynth.*
[Mat. Med. List, U. S. P.]

The dried decorticated fruit, freed from the seeds.

*Preparation of the Fruit.*—The fruit is gathered in autumn, when ripe and yellow, and in most countries is peeled, and dried either by the sun or by stoves.

*Commerce.*—Colocynth is imported from Spain, France, Trieste, Smyrna, Alexandretta, and Mogadore.

*Officinal Characters.*—Light, spongy, white, or yellowish-white, intensely bitter.

*Description.*—The fruit called *colocynth* is generally imported *peeled*, but sometimes *unpeeled*. Its *pulp* (the officinal part) is nearly white, inodorous, porous, tough, and nauseously bitter. The seeds are smooth, either white or yellowish-white, or brownish, bitter, especially the dark-colored ones, and inodorous. These are directed to be removed. Two kinds of colocynth are known in commerce, the *peeled* and the *unpeeled*.

*Peeled Colocynth: Turkey, French, and Spanish Colocynth.*—The *Turkey* is imported from Smyrna, Alexandretta, Constantinople, and the Italian seaports. The fruit of this kind is not only larger, but contains a much greater proportion of pulp than the *Spanish*, which fetches a much lower price in the market. The usual size of each fruit is about two or three inches in diameter; the shape is more or less globular, according to the evenness with which the rind has been removed, and the degree of contraction in drying; the color is white, or pale brownish white. One hundred parts by weight consist of about 28 parts pulp, and 72 parts seed. *French Colocynth* is white, or pale yellow, of good quality and handsome appearance, but somewhat less powerful than *Turkey Colocynth* in its medicinal effects. Peeled colocynth should *alone* be employed in the officinal preparations of this drug.

*Unpeeled Colocynth: Mogadore Colocynth.*—This kind is larger than the preceding, and is covered with a yellowish, smooth, firm rind. It is imported from Mogadore in small quantity only, and is principally used by druggists for show-bottles.

*Composition.*—The principal constituent of colocynth pulp is colocynthin. *Colocynthin: Bitter* or *Purgative Principle of Colocynth.*—By digesting the watery extract of colocynth in alcohol, and evaporating the tincture thus procured, we obtain a mass, composed, according to Vauquelin, of a bitter principle and acetate of potash. A little water readily dissolves the latter, leaving the bitter resinoid matter, to which the name of *colocynthin* has been applied. It is a yellowish-brown, translucent, brittle substance, dissolving in water, but much more readily in alcohol. It is said to be insoluble in ether. By boiling with acids it is decomposed into glucose and resin.

*Physiological Effects.*—Colocynth taken in *small or moderate doses* acts as a very safe and useful purgative. Its operation is not limited to the acceleration of the vermicular movements, but is extended to the secreting and exhaling vessels of the alimentary canal, whose functions it promotes. Moreover, it stimulates the other abdominal organs; and after the absorption of its bitter acrid principle, it not unfrequently proves diuretic. *In full doses*, it operates as a very active or drastic cathartic and hydragogue; but I have never seen any ill effects from its use. These remarks apply to the compound extract, the only preparation of colocynth of which I have personal experience. It would appear, partly from observation in the human subject, and also from the experiments of Orfila on dogs, that colocynth is one of those purgatives which exert a specific stimulant influence over the large intestines. *In excessive doses*, colocynth, both in powder and decoction, has on several occasions operated as a mortal poison, causing violent vomiting and purging, griping pain, and other symptoms of gastro-intestinal inflammation. A teaspoonful and a half of the powder (about ninety grains) has proved fatal. Considered in relation to other cathartics, colocynth will be found to rank near gamboge, from which it is distinguished by at least two circumstances: first, its cathartic effect is not the mere result of its topical acrid operation, but, in part, of its specific influence over the bowels; secondly, its action on the large intestine is more manifest than that of gamboge. In the latter property, colocynth approximates to aloes; but while it greatly exceeds the latter in its cathartic and hydragogue effects, it is devoid of the tonic influence possessed by aloes, when used in small doses.

*Therapeutics.*—Besides being useful as an ordinary purgative, colocynth is adapted for acting as a stimulus to the abdominal and pelvic vessels and nerves in cases of torpor or inactivity, and on the principle of counter-irritation for determining from other organs. The objections to its use are acute inflammatory affections of the alimentary canal, diseases of the large intestine, &c. The following are the principal cases in which it is employed: *In habitual constipation.*—As an ordinary purgative for keeping the bowels regular, the compound extract of colocynth is in common use both among the public and medical men. It operates mildly, certainly, and effectually. *In alvine obstruction.*—In some cases of obstinate constipation, with sickness and other symptoms of an extremely irritable stomach, the compound extract of colocynth occasionally proves invaluable. Occupying but a small bulk, it is retained on the stomach, and succeeds in producing alvine evacuations, where the ordinary liquid purgatives fail in consequence of being vomited up. Doubtful cases of intussusception and hernia, even with stercoraceous vomiting, I have seen completely relieved by it. More than once have I known an operation averted by its use, in those who, in addition to the above symptoms, had old herniæ, which led the surgeon to suspect strangulation. A slight degree of abdominal tenderness is not to be considered as absolutely prohibiting its use. Occasionally the extract is rubbed down with soap and water, and administered as an enema. *In diseases of the brain.*—In apoplexy, or a tendency thereto, in paralysis, insanity, violent headache, &c., colocynth is sometimes employed with good effect, on the principle of revulsion and counter-irritation. *In* *dropsy.*—In dropsical affections, colocynth has been used as a *hydragogue.* But in this country it is less frequently employed for this than for other purposes; various other hydragogues (especially elaterium and jalap) being usually preferred. *In amenorrhœa and chlorosis.*—In some cases of obstructed menstruation, benefit is obtained by the use of drastic purgatives, like colocynth, which act on the rectum, and, by contiguous sympathy, affect the uterus.

*Administration.*—The *powder*, which is rarely used alone, may be administered in doses of from two to ten grains, intimately mixed with some mild powder (gum or starch).

*Antidotes.*—See *Elaterium.*

### *Officinal Preparations.*

[Extractum Colocynthidis Alcoholicum, *Alcoholic Extract of Colocynth.*—"Take of colocynth, forty-eight troyounces; diluted alcohol, a sufficient quantity. Dry the colocynth, and having removed the seeds and reduced it to coarse powder by grinding or bruising, macerate it in eight pints of diluted alcohol for four days, with occasional stirring; then express strongly, and strain through flannel. Pack the residue, previously broken up with the hands, firmly in a cylindrical percolator, cover it with the strainer, and pour diluted alcohol upon it, until the tincture and expressed liquid taken together measure sixteen pints. Mix the tincture with the expressed liquid, and, having recovered from the mixture ten pints of alcohol by distillation, evaporate the residue to dryness by means of a water-bath. Lastly, reduce the dry mass to powder, and keep it in a well-stopped bottle. The extract obtained by this process weighs about seven troyounces." U. S.

One grain of this extract represents between six and seven grains of colocynth. It is not often administered by itself, but may be exhibited in pill form in from one to three grain doses. It is an important ingredient in the compound extract and therefore in the compound cathartic pill.—W.]

Extractum Colocynthidis Compositum [U. S.], *Compound Extract of Colocynth.*—Take of colocynth, freed from the seeds, six ounces; extract of Socotrine aloes, twelve ounces; scammony, or resin of scammony, in powder, four ounces; hard soap, in powder, three ounces; cardamoms, freed from the capsules, in fine powder, one ounce; proof spirit, one gallon. Macerate the colocynth in the spirit for four days; press out the tincture and add to it the extract of aloes, the soap, and the scammony. Distil off the spirit, and evaporate the residue by a water-bath to a pilular consistence, adding the cardamoms towards the end of the process.

The British Pharmacopœia has restored the original compound extract of colocynth, to which the London Pharmacopœia gave the name of Pilula Colocynthidis Composita after substituting extract of colocynth for a tincture of the pulp. In the present extract the ingredients are said to be more intimately blended than in the London Compound Pill. It is a powerful and sure, yet safe cathartic. Dose, gr. v to gr. xv.

["Take of alcoholic extract of colocynth, in fine powder, three troyounces and a half; Socotrine aloes, in fine powder, twelve troyounces; resin of scammony, in fine powder, three troyounces; cardamom, in fine powder, a troyounce; soap, in fine powder, three troyounces. Mix the powders thoroughly, and keep the mixture in a well-stopped bottle." U. S.

In small quantity an excellent habitual laxative. Dose, as a laxative, gr. j to v, as a purgative, gr. x to xx, in pill.—W.]

Pilula Colocynthidis Composita, *Compound Pill of Colocynth.*—Take of colocynth, in powder, one ounce; Barbadoes aloes, in powder, two ounces; scammony, in powder, two ounces; sulphate of potash, in powder, a quarter of an ounce; oil of cloves, two fluidrachms; distilled water, a sufficiency. Mix the powders, add the oil of cloves, and beat into a mass, with the aid of the water.

This is the Pilula Colocynthidis, *Edinb.*, excepting that Barbadoes aloes is substituted for Socotrine, and water for spirit. It differs materially from the Pilula Colocynthidis Composita, *Lond.*, and from the present compound extract, in containing colocynth in powder instead of an extract or tincture of colocynth, Barbadoes aloes instead of extract of Socotrine aloes, more than twice as much scammony, and oil of cloves and sulphate of potash instead of cardamoms and soap, besides the ingredients being combined by means of water instead of spirit. Used in similar cases to the preceding.

*Dose.*—Gr. v to gr. xv.

Pilula Colocynthidis et Hyoscyami, *Pill of Colocynth and Hyoscyamus.*—Take of colocynth, in powder, one ounce; Barbadoes aloes, in powder, two ounces; scammony, in powder, two ounces; sulphate of potash, in powder, a quarter of an ounce; oil of cloves two fluidrachms; extract of hyoscyamus, three ounces; distilled water, a sufficiency. Mix the powders, add the oil of cloves and the extract of hyoscyamus, and beat into a mass with the aid of the water.

Extract of hyoscyamus diminishes the pain and griping frequently experienced from the use of colocynth, but does not injure its evacuant properties.

*Dose.*—Gr. viij to gr. xv.

[Pilulæ Catharticæ Compositæ, U. S., *Compound Cathartic Pills.*—"Take of compound extract of colocynth, half a troyounce; extract of jalap, in fine powder, mild chloride of mercury, each, one hundred and eighty grains; gamboge, in fine powder, forty grains. Mix the powders together; then with water form a pilular mass, to be divided into one hundred and eighty pills." U. S.

This is a very useful purgative, acting on the whole alimentary canal and its appendages. It causes but little griping and is very efficient. The calomel is probably decomposed by the potassa of the soap, and does not exist in it as a chloride but as the black or protoxide. Owing to its containing mercury it should not be used as an habitual laxative. Dose, j to iv pills.—W.]

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## ECBALIUM OFFICINARUM, *Richard.*

### Squirting Cucumber.

Monœcia Syngenesia.—*Linn. Syst.*

*Botanic Character.*—*Annual. Stem* without tendrils, trailing, hispid, scabrous. *Leaves* cordate, somewhat lobed, crenate-toothed. *Flowers* axillary, monœcious. *Males.*—*Calyx* 5-toothed. *Corolla* yellow, 5-parted. *Stamens* five, one being distinct, and four united in pairs; *anthers* sinuous. *Females.*—*Filaments* 3, sterile. *Ovary* 3-celled; *style* trifid; *stigma* bifid. *Fruit* (pepo) muricated, elliptical, pedunculated, about 1½ inch long, when ripe separating from its stalk, and expelling with violence its juice and seeds from the aperture at the insertion of the stalk (see *a*, Fig. 158). *Seeds* brown, compressed.—*Steph.* and *Church.* pl. 34.

*Habitat.*—Common on rubbish in the villages of Greece and the Archipelago. A few acres of it are annually cultivated at Mitcham, Hitchin, Market Deeping, &c.

### Squirting Cucumber Fruit. (Appendix A.)

The nearly ripe fruit.

*Description.*—(See *Botanic Character.*) The stalk should remain attached to the fruit; otherwise the fruit may have burst and expelled its juice.

Fig. 158.


*Ecbalium officinarum.*
*a.* Pepo expelling its juice and seeds.
*b.* Stalk.
*c.* Transverse section of the pepo.

### Elaterium, *Elaterium.*
[Mat. Med. List, U. S. P.]

A sediment from the expressed juice of the fruit. [A substance deposited by the juice of the fruit of Momordica Elaterium, Ecbalium agreste (*Richard*).—Mat. Med. List, U. S. P.]

*Preparation.*—Take of the fruit of squirting cucumber, very nearly ripe, one pound. Cut the fruit lengthwise, and lightly press out the juice. Strain it through a hair sieve, and set aside to deposit. Carefully pour off the supernatant liquor, pour the sediment on a linen filter, and dry it on porous bricks with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way.

*Seat of Elaterium.* — Some years since, Dr. Clutterbuck ascertained that the active substance, elaterium, is not found in any quantity in the body of the fruit itself, or in the seeds contained within it; but only in the juice around the seeds. The precise situation of it will be readily comprehended by inspecting a transverse section of the elaterium pepo (Fig. 158, *c*). The centre of the fruit is divided into three cells, by projections of the three parietal placentas to which the seeds are attached. Between these projections, and surrounding the seeds, is the *pulp*, *the placentary matter*, or the *juice around the seeds.*

*Theory of the Process.*—Dr. Clutterbuck's experiments have shown that the finest elaterium is obtained without pressure from the fruits when nearly as ripe as possible. In practice, however, pressure must be employed, because the cucumbers must not be too ripe when gathered, otherwise they are apt to burst during their journey to town, or by handling; and in this imperfectly ripe state the juice does not flow from them until pressure be employed.

*Officinal Characters.*—In light, friable, slightly incurved cakes, about one line thick, greenish-gray, acrid, and bitter; fracture finely granular.

*Description.*—Elaterium of commerce is a very variable article. Two kinds are distinguished, the *English* and the *Maltese.*

*English Elaterium* is manufactured at Apothecaries' Hall, Mitcham, Hitchin, Market Deeping, and some other places. The *finest* occurs, as described in the officinal characters, in light, friable, thin, very slightly curled flakes, or flat cakes, or fragments, which frequently bear the impression of the paper or muslin on which the elaterium was dried. Its color is pale grayish-green, which by exposure becomes yellowish. Its taste is acrid and bitterish; it has a faint animal odor, not very dissimilar to that of ergot, but combined with a fragrance that reminds me of senna or tea. Digested in rectified spirit, it yields a fine green tincture. Thrown into water it floats. It does not effervesce in diluted hydrochloric acid, and, if it be boiled in water, the decoction, when cold, gives but slight traces of starch by the blue color developed on the addition of iodine. *Inferior kinds* are sometimes hard, break with difficulty or with a resinous fracture, are much curled, gummy, and dark-colored (brown or olive-green). They are probably prepared from the juice, after the finest elaterium has been separated.

*Maltese Elaterium.*—This is imported from Malta. It is in much larger flakes than the best English elaterium, and frequently has some adherent paper on which it has been dried; it has no odor, and its color is much paler, sometimes with hardly a trace of green. Examined by the microscope, it is found to contain granules of wheat starch. Some specimens are more friable and softer, and occasionally are rather chalky to the touch. They are commonly mixed with chalk as well as starch, hence they effervesce with dilute hydrochloric acid, and become blue with iodine. I am assured that Maltese elaterium is mixed in this country with buckthorn juice, to deepen its color.

*Composition.*—Elaterium contains elaterine, green, soft resin, bitter matter, starch, &c. *Elaterine*, *Momordicine*, $C_{20}H_{14}O_5$.—This may be obtained, as stated in the test below, by boiling elaterium in rectified spirit. The tincture concentrated and added to a warm solution of potash, yields the elaterine on cooling. Elaterine occurs in colorless silky prisms, is very bitter, but odorless; neither acid nor alkaline; nearly insoluble in water and in ether, moderately soluble in cold, and much more so in hot alcohol, from which, however, the greater part separates on cooling. It forms from twenty to thirty-three per cent. of well-prepared elaterium. It is a very powerful purgative, and should be administered cautiously, in the dose of one-sixteenth of a grain, repeated every two hours until it begins to act. *Green Resin.*—This is insoluble in water, but dissolves in alcohol, ether, and caustic potash. *Bitter Matter.*—This is soluble both in water and alcohol. Its taste is intensely bitter; its color is brownish yellow.

*Tests.*—Does not effervesce with acids; yields half its weight to boiling rectified spirit. This solution concentrated, and added to a warm solution of potash, yields, on cooling, not less than twenty per cent. of elaterine in colorless crystals.

*Physiological Effects.*—The acridity of elaterium in its local operation is well shown by various facts. Pliny truly observes that the juice of the elaterium apple is dangerous when applied to the eye; and Dr. Clutterbuck mentions that some of it "getting accidentally into the eye in one instance, it occasioned severe pain and inflammation, with an erysipelatous swelling of the eyelids that continued till the following day." [A similar effect has been occasionally produced at Hitchin, on boys employed in collecting the fruits.—Ed.] We have a further proof of its irritant properties in the inflammation and ulceration of the fingers of those employed in its preparation. When swallowed, it irritates the gastro-intestinal membrane, and occasions vomiting and violent purging; hence it is called a *drastic purgative*. Fine elaterium, in the dose of one-eighth of a grain, seldom fails to purge violently, and sometimes to vomit. This was long since noticed by Dr. Clutterbuck; and I can verify his statement from repeated observations. Even one-sixteenth of a grain will generally excite considerble purging. The elaterium of the shops, however, is rarely so active as this; and I have known two grains given with no more effect than the pure elaterium would excite in the dose of one-eighth of a grain. Elaterium powerfully excites the secreting and exhaling vessels of the alimentary canal, and thereby occasions very watery stools; hence the term *hydragogue* applied to it. In some dropsical cases I have known a single dose discharge several pints of water by the bowels. The gripings and the increased number of evacuations prove that the irritation is not confined to the mucous coat, but is extended to the muscular coat. Under the influence of a full dose, the pulse is excited, the tongue becomes dry, and sometimes furred, and great thirst is produced. Occasionally the skin becomes damp under the operation of elaterium. Considered with respect to other cathartics, we find it pre-eminently distinguished by the violence of its purgative effect. Croton oil alone approximates to it. Its hydragogue operation exceeds that of most, if not all other drastic purgatives.

*Therapeutics.*—The principal use of elaterium is to excite watery evacuations *in dropsy*, by which a twofold effect is to be hoped for: viz., *first*, absorption of the effused fluid; *secondly*, the stoppage of any further effusion in consequence of the metastasis of vital action from the seat of the dropsy to the intestinal membrane. In dropsies dependent on or accompanied with disease of the kidney, the evacuation of water from the bowels is much to be preferred to the employment of stimulating diuretics, which may add to the severity of the renal malady. Of the violent hydragogue purgatives, elaterium I believe to be the most useful in dropsy. It evacuates more watery fluid than the others; while if it be good, its operation may be relied on. It is inadmissible where there is great debility, where there is a febrile condition of system, and where any inflammatory or other disease of the bowels exists. I have seen the fatal termination of dropsy apparently accelerated by the use of elaterium. It is least adapted for cold, phlegmatic constitutions. Where no contra-indication to the use of elaterium exists one or two doses of it should be given every other day, for a week or ten days. [I have sometimes continued its use with great advantage twice a week for six weeks.—Ed.] Several ancient and modern practitioners of great experience have borne testimony to its great efficacy in dropsy when judiciously administered. *In cerebral affections*, such as apoplexy, or a tendency to it (manifested by sleepiness, stupor or giddiness), mania, &c., elaterium, as a drastic purgative, sometimes proves serviceable on the principle of counter-irritation or revulsion. *In obstinate constipation* from sluggishness of the intestinal tube elaterium is occasionally useful. But care must be taken to ascertain that the constipation does not depend on any mechanical impediment (as hernia, or intussusception) to the passage of the feces. *In gout.*—A combination of elaterium and opium has been found serviceable in gout.

*Administration.*—The dose of good elaterium is from one-sixteenth to one-half of a grain. I hear and read of practitioners giving this substance to the extent of one, two, or even three grains; but this can only be from the bad quality of the drug. I have repeatedly employed, and seen others exhibit elaterium, and have always observed that a quarter of a grain of good elaterium acted very powerfully, sometimes bringing away several pints of fluid; and half a grain usually occasioning vomiting as well as violent purging. I confess I should not venture to exhibit a grain of the same preparation. It is usually given in the form of pills. The basis of the pills may be extract of gentian.

*Antidotes.*—In the event of a case of poisoning by elaterium, the remedies would be demulcent drinks and clysters, opium, the warm bath, and fomentations to the abdomen; stimulants (such as ammonia and brandy) if the circulation fail; bloodletting to subdue the inflammatory symptoms, should the state of the system not contraindicate it.

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## [CUCURBITA PEPO, *Linn. Pumpkin.*

*Generic Characters.*—Monœcious. Corolla campanulate; petals united, coherent with the calyx. Stamens 5, triadelphous, anthers syngenecious, straight, parallel. Stigmas 3, thick, 2-lobed. Pepo fleshy or ligneous, 3–5-celled.

*Specific Characters.*—Leaves very large, cordate, denticulate, palmately 5-lobed. Flowers and fruit yellow. The pumpkin is too well known to need description. It is said originally to have been a native of the Levant, but is now cultivated all through the temperate zone.

### Pepo, *Pumpkin Seed.* Mat. Med. List, U. S. P.

The seed of Cucurbita pepo.

These seeds are obovate, rather pointed at the smaller end, flat, a little thickened in the middle, with a more or less distinct groove running around their slightly thickened margin. Externally they are brownish, internally white. They are composed of an external husk or covering, and the embryonic plant with large thickened leaf-like cotyledons.

They contain a large amount of a fixed oil, and a peculiar acid, which has been named citrallic acid.

*Therapeutics.*—Pumpkin seeds are one of the very best, and most certain of all our remedies for tapeworm. In many instances they have been entirely successful, where all the other ordinary remedies had failed, and as they produce no serious or troublesome symptoms, may be uniformly given. They are undoubtedly a vermicide, killing the tapeworm. The oil is said to have been given in one or two cases with complete success, but as the decoction of the seeds has acted very well, it would seem that the oil is not the active principle. This point certainly needs investigating. The seeds are best given in an emulsion made by beating them up with sugar and gum arabic. Dose, f℥ss to f℥j.—W.]

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## MYRTACEÆ, *R. Brown.* The Myrtle Order.

## MELALEUCA MINOR, *Smith.*

### The Cajuput Tree.

Polyadelphia, Icosandria, *Linn. Syst.*

*Botanic Character.*—*Small tree*, with an erect, though crooked trunk; *bark* thick, spongy, light-colored; *branches* scattered, often drooping. *Leaves* shortly petiolate, alternate, elliptical-lanceolate, somewhat acute, slightly falcate, 3–5-ribbed. *Flowers* spiked, rather distant. *Spikes* terminal. *Rachis*, *calyx*, and *branchlets* downy, terminating ultimately in a leafy branchlet. *Bracts* solitary, 3-flowered, lanceolate. *Calyx* urceolate, 5-parted. *Petals* 5, white. *Stamens*, from 30 to 40; *filaments* united at the base into 5 bundles. *Ovary* ovate, more or less adherent; *style* longer than the stamens. *Fruit* capsular, inclosed within the tube of the calyx, 3-celled, 3-valved.—*Steph.* and *Church.* pl. 84 (*M. Cajuputi*).

*Habitat.*—Moluccas, and the South of Borneo.

### Oleum Cajuputi, *Oil of Cajuput.*

The oil distilled from the leaves in the Molucca Islands. [The volatile oil obtained from the leaves of Melaleuca cajuputi (Roxburgh, *Trans. Lond. Medico-Bot. Society*). Mat. Med. List, U. S. P.]

*Extraction of the Oil.*—Rumphius states that the leaves are gathered on a warm day, and placed in a sack, where they become hot and damp.

Fig. 159.


*Melaleuca minor.*

They are then macerated in water, and left to ferment for a night, and afterwards submitted to distillation. Two sackfuls of the leaves yield scarcely three drachms of oil.

*Officinal Characters.*—Very mobile, transparent, of a fine pale bluish-green color. It has a strong agreeable odor, and a warm aromatic taste, and leaves a sensation of coldness in the mouth.

*Description.*—*Oil of Cajuput* is commonly imported in long-necked green glass bottles. Its color is usually a pale myrtle-green. It is transparent, limpid, of a strong penetrating smell, resembling the combined odor of camphor, rosemary, and cardamom, and of an aromatic camphoraceous taste, succeeded by a sensation of coolness like that caused by oil of peppermint. In the mass the odor is disagreeable, but in small quantity, as when rubbed on the hand, it is much more fragrant. The specific gravity has been found to vary from 0.914 to 0.930. Oil of cajuput is soluble in alcohol. Its boiling point is 343°. When carefully distilled with water, the first portion of oil which passes over is very light, and quite colorless: but towards the end of the process a heavier and greenish oil distils over.

*Adulteration.*—M. Guibourt detected oxide of copper in several samples of oil, derived as he supposed from the copper vessels in which it had been distilled, and he ascribed the green color to its presence. Neither Mr. Brande nor myself have ever found copper in the samples of oil we have examined. The green color must be, therefore, natural to the oil. At the present time the oil met with in this country is, I believe, pure as imported.

*Composition.*—According to Blanchet, the composition is $C_{10}H_9O$.

*Physiological Effects.*—Cajuput oil is a powerful antispasmodic, diffusible stimulant, and sudorific. From the ordinary distilled oils (as those of the labiate plants and umbelliferous fruits) it is distinguished by its stronger influence over the nervous system (evinced by its antispasmodic qualities), and by the greater diffusibility of its stimulant operation. It is allied to valerian, between which and camphor it ought to be placed, in a physiological classification; but in large doses it does not disorder the mental faculties as these two medicines do.

*Therapeutics.*—By British practitioners it has hitherto been little employed, but it is now becoming much more esteemed. *As a diffusible stimulant* it is useful where we wish promptly to raise the energy of the vital powers, especially when at the same time any spasmodic movements are to be allayed. With these views it has been employed in low fevers, paralytic affections, and cholera. In the last mentioned diseases it acquired an ephemeral reputation, in consequence of the favorable reports of Sir Matthew Tierney, and others. *As an antispasmodic*, it is a very efficacious remedy, in painful spasmodic affections of the stomach, and in flatulent colic. *As a stimulating sudorific*, it proves occasionally useful in chronic rheumatism, painful affections, and local paralysis. It has been found useful, when mixed with olive oil, as an external application in chronic rheumatism, &c.

*Administration.*—Dose from 2 to 10 drops. It may be taken on sugar, or in the form of an emulsion.

*Officinal Preparation.*

Spiritus Cajuputi, *Spirit of Cajuput.*—Take of oil of cajuput, one fluidounce; rectified spirit, nine fluidounces. Dissolve.

*Dose.*—Min. xx to fl. dr. j.

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## CARYOPHYLLUS AROMATICUS, *Linn.*

### The Clove Tree.

Icosandria Monogynia, *Linn. Syst.*

*Botanic Character.*—Evergreen *tree; trunk* from 12 to 30 feet high. *Leaves* petiolate, opposite, obovate-oblong, or ovate-lanceolate. *Flowers* corymbose. *Calyx* at first green, afterwards purplish-red. *Petals* 4, larger than the calyx, imbricated into a globe in bud, at length spreading, roundish, concave, yellowish-red, caducous. In the centre of the calyx, and occupying the top of the ovary, is a quadrangular disk surrounding, but not embracing, the base of the shortest, obtusely subulate *style. Stamens* numerous; *filaments* much longer than the petals, yellow, in 4 bundles; *anthers* ovate-cordate, yellow, 2-celled. *Ovary* oblong, or almost cylindrical, 2-celled. *Fruit* baccate, purplish, elliptical, 1-celled, 1-seeded. *Seed* with a thin, soft integument.—*Bot. Mag.* vol. 54. Plates 2749, 2750.

Fig. 160.

*Caryophyllus aromaticus.*

*Habitat.*—Molucca Islands; where, as well as at Sumatra, Mauritius, Bourbon, Martinique, and St. Vincent's, it is now extensively cultivated.

### Caryophyllum, *Cloves.*

**[Caryophyllus.** Mat. Med. List, U. S. P.]

The unexpanded flower-bud dried; cultivated in Penang, Bencoolen, and Amboyna.

*Collection.*—Cloves are collected by the hand, or beaten with reeds, so as to fall upon cloths placed under the tree, and dried by fire, or, what is better, in the sun.

*Officinal Characters.*—About six lines long, dark reddish-brown, plump, heavy and entire, consisting of a nearly cylindrical body surmounted by four teeth and a globular head, with a strong fragrant odor, and a bitter, spicy, pungent taste.

*Description.*—The clove of commerce is the unexpanded flower, the corolla forming a ball or sphere at the top, between the four teeth of the calyx, and thus with the tapering, somewhat quadrangular tube of the calyx, giving the appearance of a nail (whence the word *clove*, from the French *clou*, a nail). The length of the clove is from five to ten lines; its thickness from one to one and a half lines. Its color is dark brown with a yellowish-red tint; the corolla somewhat deeper. Good cloves should be dark brown, and perfect in all parts, have a strong fragrant odor, and a hot acrid taste, and, when slightly pressed with the nail, give out oil. They are distinguished in commerce by their place of growth. Those from the East Indies (*Penang*, *Amboyna*, and *Bencoolen cloves*) are the best; they are the largest, plumpest, and most oily. Cloves produced in the French possessions (*Bourbon* and *Cayenne cloves*) are smaller, more shrivelled, contain less oil, and are of inferior value.

*Test.*—It emits oil when indented by the nail.

*Composition and Chemical Characteristics.*—Cloves owe their properties to a volatile oil (see below). They also contain tannin, resin, extractive, &c. Nitric acid reddens infusion of cloves. Tincture of perchloride of iron renders it blue. The oil of cloves also undergoes similar changes to the infusion. These facts deserve especial attention in relation to opium and morphia (see **Opium**) on account of the analogous phenomena presented by morphia when acted on by nitric acid and perchloride of iron. Infusion and oil of pimento are similarly affected.

*Physiological Effects.*—Cloves have a very agreeable flavor and odor, and are devoid of the fiery taste and acridity which distinguish pepper and ginger; in other respects their effects agree with those of other spices. Though the volatile oil is by far the most important of their active principles, yet the tannin, extractive, and resin, must contribute something to their operation.

*Therapeutics.*—Cloves are rarely employed alone, or as the basis or principal medicine, but usually as an addition to other medicines, the flavor of which they improve, or whose operation they correct. When, however, they are given alone, it is merely as a stomachic and carminative, to relieve nausea, vomiting, flatulence, or some allied stomach disorder.

*Administration.*—In substance cloves may be taken in doses of five or ten grains, or *ad libitum.*

*Pharmaceutic Use.*—Cloves are a constituent of aromatic powder.

### *Officinal Preparation.*

INFUSUM CARYOPHYLLI [U. S.], *Infusion of Cloves.*—Take of cloves, bruised, a quarter of an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for half an hour, and strain. ["Take of cloves, bruised, one hundred and twenty grains; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S.]

Aromatic, stimulant, and stomachic. Employed in dyspepsia, flatulent colic, and gout, generally in combination with other medicines. Ammonia increases its efficacy.

*Dose.*—Fl. oz. j to fl. oz. ij.

## **Oleum Caryophylli** [U. S.], *Oil of Cloves.*

The oil distilled in England from cloves. ["Prepare this oil from cloves, bruised, by the general formula," U. S. See page 399.]

*Officinal Characters.*—Colorless when recent, but gradually becoming red-brown, having the odor of cloves and a pungent spicy taste. Sinks in water.

*Extraction and Description.*—To extract the whole of the oil from cloves, they must be subjected to repeated cohobations. On an average they yield from seventeen to twenty-two per cent. of volatile oil. By distillation with water, cloves yield two volatile oils—one lighter, the other heavier, than water. The oil of cloves of commerce is a mixture of these two oils. It has a hot, acrid taste, and the well-known odor of cloves, and is soluble in alcohol, ether, concentrated acetic acid, and the fixed oils. Its specific gravity is 1.034 to 1.055. To separate it into the two oils, Ettling mixed it with potash lye, and distilled. *A light oil* passed over, while a compound of the *heavy oil* (*clove acid*) and potash remained in the retort, and, by distillation with phosphoric or sulphuric acid, gave out the heavy oil. *Light Oil of Cloves* ($C_{20}H_{16}$) is isomeric with oil of turpentine, which it resembles in its odor. It is colorless, and has a specific gravity of 0.9016. It is incapable of combining with bases, but absorbs hydrochloric acid gas without yielding a crystalline compound. *Heavy Oil of Cloves; Caryophyllic Acid; Eugenic Acid* ($C_{20}H_{13}O_5$). It is colorless when recently prepared, but becomes colored by age. Its specific gravity is 1.079. It combines with alkalies to form crystalline salts (*alkaline caryophyllates* or *eugenates*). If a salt of iron be added to one of these, it yields a blue, violet, or reddish compound (*a ferruginous caryophyllate*), varying somewhat according to the nature of the ferruginous salt used; thus the protosulphate of iron yields a lilac, the persulphate a red, which becomes violet and afterwards blue; while the perchloride gives a vinous tint, which turns to red. Nitric acid reddens caryophyllic acid.

*Uses.*—The oil of cloves is sometimes placed in the hollow of a carious tooth, to relieve toothache; but its more frequent medicinal use is as an addition to purgatives to check nausea and griping. It is used for this purpose in confection of scammony, compound pill of colocynth, and pill of colocynth and hyoscyamus.

*Dose.*—From two to six drops.

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## EUGENIA PIMENTA, *DC.*

### The Allspice Tree.

Icosandria Monogynia, *Linn. Syst.*

*Botanic Character.*—*Tree* about thirty feet high, evergreen; *branches* round; *twigs* compressed, pubescent. *Leaves* shortly petiolate, oblong or oval, pellucid-dotted, smooth, about four inches long. *Peduncles* axillary and terminal, trichotomously-paniculate, pubescent. *Flowers* numerous. *Sepals* roundish. *Petals* reflexed, greenish-white. *Stamens* numerous. *Ovary* two to three-celled. *Berry* spherical, crowned by the calyx, black or dark purple when ripe, two-seeded.—*Woodv.* pl. 26, p. 77.

*Habitat.*—West Indies. It is cultivated in Jamaica.

**Pimenta**, *Pimento.* [Mat. Med. List, U. S. P.]

The dried unripe berries; from the West Indies.

*Collection.*—When the fruit has attained the full size, but is yet green, it is gathered and sun-dried. It is afterwards put in bags of 1 cwt. each, for the European market. Some planters kiln-dry it.

*Commerce.*—Pimento is imported almost entirely from Jamaica.

*Officinal 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. Odor and taste aromatic, hot, and peculiar.

*Description.*—*Pimento*, commonly called *allspice* (because its flavor is considered to approach that of cinnamon, cloves, and nutmegs), is about the size of, or somewhat larger than, a peppercorn. It is round, brown, dull, roughish but not wrinkled, crowned with the segments of the calyx, and occasionally, though rarely, has a short pedicel. It consists of an external, somewhat hard but brittle shell, which is paler within, and incloses two dark-brown cochleate seeds. Allspice has an aromatic agreeable odor (intermediate between pepper and cloves), and a strong aromatic clove-like taste. The odor and taste chiefly reside in the shell (*pericarp*).

*Composition.*—The principal constituents are volatile oil, green oil, and tannin. *Volatile oil.* (See **Oleum Pimentæ.**) *Green oil.* (*Resin?*) —This substance, which has an acrid burning taste, contributes to the activity of pimento. Its odor is rancid, but somewhat clove-like. It dissolves readily in alcohol and ether, to which it communicates a green color. *Tannin.*—Is soluble in alcohol, strikes a green color with the persalts of iron, and precipitates tartarated antimony.

*Physiological Effects.*—Pimento is a stimulant, carminative, and stomachic, holding an intermediate rank between pepper and cloves.

*Therapeutics.*—It may be taken with advantage by those troubled with relaxed or atonic conditions of the stomach. Its uses are similar to those of cloves; viz., to relieve flatulency, to cover the flavor of nauseous remedies, to promote the operation of tonics and stomachics, and to prevent the griping of purgatives.

*Administration.*—In substance, pimento may be taken in doses of from ten grains to sixty grains.

### *Officinal Preparation.*

AQUA PIMENTÆ, *Pimento Water.*—Take of pimento, bruised, fourteen ounces; water, two gallons. Distil one gallon.

Employed for its flavoring, carminative, and stomachic properties, as a vehicle for stimulant, tonic, and purgative medicines.

*Dose.*—Fl. oz. j to fl. oz. ij.

## **Oleum Pimentæ** [U. S.], *Oil of Pimento.*

The oil distilled in England.

[" Prepare this oil from pimento, bruised, by the general formula," U. S. See page 399.]

*Officinal Characters.*—Colorless or slightly reddish when recent, but becoming brown by age, having the odor and taste of pimento. Sinks in water.

*Description.*—Mr. Whipple informs me that from 8 cwt. of pimento he procured 41 lbs. 6 oz. of oil (heavy and light). This is nearly 6 per cent. The oil of pimento of the shops is a mixture of these two oils. Except in odor, its properties are identical with those of oil of cloves. By distillation with caustic potash, the *light oil* is separated; the residue, mixed with sulphuric acid and submitted to distillation, gives out the *heavy oil*. *Light oil of Pimento* has not, to my knowledge, been previously examined. Its properties appear to be similar to the light oil of cloves. It floats on water and on solution of potash, and is slightly reddened by nitric acid. Potassium sinks in, and is scarcely, if at all, acted on by it. *Heavy Oil of Pimento* (*Pimentic Acid*) is very similar to caryophyllic acid. It forms with the alkalies crystalline compounds (*alkaline pimentates*), which become blue or greenish on the addition of the tincture of chloride of iron (owing to the formation of a *ferruginous pimentate*). Nitric acid acts violently on and reddens it.

*Therapeutics.*—The medicinal uses of the oil of pimento are very limited. It is sometimes employed to relieve the toothache, and to correct the operation of other medicines, as purgatives and tonics.

The *dose* of it is from 2 to 5 drops.

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## GRANATEÆ, *Don.* The Pomegranate Order.

## PUNICA GRANATUM, *Linn.*

### The Pomegranate.

Icosandria Monogynia, *Linn. Syst.*

*Botanic Character.*—Small *tree*, with a brownish bark. *Leaves* oblong-lanceolate, entire, on short stalks, smooth. *Flowers* terminal on the young branches. *Calyx* adherent, thick, fleshy, red. *Petals* 5–7, much crumpled, membranous, rich scarlet. *Stamens* numerous, inserted on the calyx; *anthers* yellow. *Ovary* roundish; *style* filiform, simple; *stigma* globular. *Fruit* larger than an orange, with a thick leathery rind, and crowned by the teeth of the calyx; cells several, arranged in two strata, one upper, the other lower, separated by an irregular transverse diaphragm; lower stratum of 3, upper one of from 5 to 9 cells. (Fig. 162.) *Seeds* numerous, involved in pellucid pulp.—*Steph. and Church.*, pl. 57.

*Habitat.*—Northern Africa, from whence it has been introduced into Europe, where it is now naturalized. Bengal, China, Persia.

### Granati Radix, *Pomegranate Root.*

### [Granati Radicis Cortex. Mat. Med. List, U. S. P.]

The bark of the root, fresh or dried; chiefly imported dried from Germany.

*Officinal Characters.*—In quills or fragments of a grayish-yellow color externally, yellow internally, having a short fracture, little odor, and an astringent slightly bitter taste.

Fig. 161.

*Punica granatum.*

*a.* Branch with flowers.
*b.* Transverse section of fruit.

Fig. 162.

*Vertical section of the fruit, showing the two strata of cells.*

*Description.*—By its almost entire want of bitterness this bark may be distinguished from that of the box-tree, which is said to be sometimes substituted for it. Moistened with water, and rubbed on paper, it leaves a yellow stain, which becomes deep-blue by the contact of sulphate of iron. Barberry bark is very bitter, and its infusion is not affected by solution of sulphate of iron like that of pomegranate.

*Composition.*—It contains about 20 per cent. of tannin, some gallic acid, resin, mannite, and other substances. A peculiar acrid principle called punicine, has also been found in the fresh bark.

*Physiological Effects.*—The root-bark possesses astringency, owing principally to tannic acid, and in some slight degree to a minute quantity of gallic acid. To these two substances, and more especially to the tannic acid, its medicinal properties are doubtless essentially due. The substance called punicine is also probably possessed of active properties. The fresh root-bark is by many practitioners much preferred to that in a dried state. Taken *in small quantities*, it occasions no remarkable effects. *In full doses*, however, it causes nausea, vomiting, and purging, and occasionally giddiness and fainting.

*Therapeutics.*—The *root-bark* has been occasionally used as a vermifuge. Celsus, Dioscorides, Pliny, and other ancient writers, speak of its anthelmintic qualities. Of late years attention has been again drawn to this bark as a remedy for tapeworm, by the recommendations of Dr. Fleming, Dr. Buchanan, Mr. Breton, and others.

### *Officinal Preparations.*

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

The *dose* is a wine-glassful every half hour till the whole is taken. It usually occasions slight sickness, but seldom fails to destroy the tapeworm. The patient should be prepared for the remedy by the use of a dose of castor oil and a strict regimen the day previously.

[**Granati Fructus Cortex,** *Pomegranate Rind.* Mat. Med. List, U. S. P.

The rind of the fruit of Punica granatum.

Pomegranate rind occurs in commerce in regular segments, or in pieces of them, of a dark orange-color externally, lighter internally. Its taste is strongly astringent.

*Therapeutics.*—It contains tannic acid, and may be classed among the pure vegetable astringents. It is seldom or never employed internally, but is used in the form of decoction, as an astringent wash. The strength of such decoction may be ℥j to ij to the Oj.—W.]

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## ROSACEÆ, *Jussieu.* The Rose Order.

## AMYGDALUS COMMUNIS, *Linn.*

### The Common Almond.

Icosandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A small *tree*. *Leaves* on glandular petioles, lanceolate, serrulate. *Flowers* solitary, nearly sessile, appearing before the leaves. *Calyx* campanulate, 5-cleft. *Petals* 5, ovate, irregularly notched. *Stamens* numerous, shorter than the petals. *Ovary* woolly; *style* simple; *stigma* round. *Fruit*, a dry drupe, ovoid, compressed, bursting when ripe; *epicarp* greenish-gray, tomentose; *mesocarp* or *sarcocarp*, fibrous; *endocarp* or *putamen*, woody or almost osseous. Within the putamen there is usually but one seed (rarely two), which is the almond of commerce.—*Woodv.* pl. 83, page 230.

There are several varieties of this species, one only of which is alluded to in the British Pharmacopœia, namely, var. *dulcis*, or the Sweet Almond.

*Habitat.*—Barbary, Persia, and Syria; cultivated in the southern parts of Europe.

### **Amygdala**, *Jordan Almonds.*

The seed; from trees cultivated about Malaga.

### [**Amygdala Dulcis**, *Sweet Almond.* Mat. Med. List, U. S. P.

Fig. 163.


*Section of an almond.*
*a.* One of the cotyledons.
*b.* Radicle and plumule.

"The kernel of the fruit of Amygdalus communis, variety dulcis (*De Candolle*)." U. S.]

*Officinal Characters.*—Above an inch in length, lanceolate, acute, with a clear cinnamon-brown seed-coat, and a bland sweetish nutty-flavored kernel.

*Description.*—The seed (*almond*) is of an oval shape, compressed, rounded at one end, and somewhat pointed at the other. The outer covering is of a yellowish-brown color. By soaking almonds in warm water, the seed-coats are easily removed. They are then termed *blanched almonds*, and consist of the *embryo* only, composed of the two large fleshy *cotyledons*, between which, at the pointed extremity of the seed we observe the *plumule* with the *radicle*. There are two sorts of almonds known as the sweet and the bitter; the former kind is alone officinal.

*Sweet almonds*, as their name implies, have a sweetish, bland, and agreeable taste; they are without odor. Six varieties are distinguished in commerce, namely: 1. *Jordan almonds*, which are the finest, and come from Malaga. Of these there are two kinds: the one above, an inch in length, flat, and with a clear brown seed-coat, sweet, mucilaginous, and rather tough; the other more plump and pointed at one end, brittle, but equally sweet with the former. 2. *Valentia almonds* are about three-eighths of an inch broad, not quite an inch long, round at one end, and obtusely pointed at the other; flat, of a dingy-brown color, and a dusty epidermis. 3 and 4. *Barbary* and *Italian almonds*, resembling the latter, but are generally smaller and less flattened. 5. *Portugal almonds*, which are smaller than the Valentia, somewhat ovate, but less broad at the lower part; this kind is termed the *Oporto almond*, and is sold in Provence. 6. The *Canary almonds* which resemble the Sicily almonds, but are somewhat smaller. Of these six varieties, Jordan almonds are alone officinal, not only on account of their superior quality, but because their size and elongated form makes it very improbable that bitter almonds should be mistaken for them; while bitter almonds, though generally somewhat smaller, sufficiently resemble the other varieties in form to allow of their unintentional commixture or substitution.

*Bitter almonds* are brought from Barbary and France. They are distinguished from the finer varieties of sweet almonds, such as the Jordan, by their smaller size and more ovate form; and from all varieties by their bitter taste; and when rubbed with a little water, by their remarkable odor.

*Composition.*—The principal constituents of sweet almonds are fixed oil, emulsion, sugar, and gum. *Fixed Oil of Almond* (see p. 698). *Emulsin (Vegetable Albumen).*—This remarkable constituent of almonds is white, and soluble in cold water; hence it is a constituent of almond emulsion. From its watery solution it is precipitated in thick white flocks by alcohol. These dissolve in water, even if they have been previously dried. If the watery solution be heated to 212° F. the emulsin coagulates, and the liquor becomes thick, like starch mucilage. From ordinary vegetable albumen, emulsin is distinguished by its producing the decomposition of amygdalin in bitter almonds, and giving rise, among other products, to the volatile oil of bitter almonds and hydrocyanic acid. When, however, emulsin has been coagulated by heat, it loses its power of acting on amygdalin.

*Tests.*—Not bitter; not evolving the odor of bitter almonds when bruised with water.

*Physiological Effects.*—Sweet almonds are nutritive and emollient; but on account of the quantity of oil which they contain they are somewhat difficult of digestion, at least if taken in large quantities, or by persons whose digestive powers are weak. When rancid they are still more apt to disorder the stomach. They sometimes occasion nausea and urticaria.

### *Officinal Preparations.*

MISTURA AMYGDALÆ [U. S.], *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. [" Take of sweet almonds, half a troyounce; gum arabic, in fine powder, thirty grains; sugar, one hundred and twenty grains; distilled water, eight fluidounces. Having blanched the almond, beat it with the gum arabic and sugar, in a mortar, until they are thoroughly mixed; then rub the mixture with the distilled water, gradually added, and strain." U. S.]

Almond mixture agrees in many of its properties with animal milk. Thus it is white; when examined by the microscope it is seen to consist of myriads of oleaginous globules, suspended in water by the aid of an albuminous principle (emulsin) and sugar; and, lastly, it agrees with milk in possessing nutritive and emollient qualities. It is used as a demulcent and emollient in pulmonary affections, to appease cough and allay irritation; and in inflammatory affections of the alimentary canal or of the urinary organs. It is an excellent vehicle for other remedies. As for the saline refrigerants (nitre, for example) in febrile cases, for expectorants and paregorics (squills, ipecacuanha, opiates, &c.) in pulmonary affections, for sudorifics (tartarated antimony, for example) in febrile and inflammatory cases, for alkalies and their carbonates in affections of the urino-genital organs, and for hydrocyanic acid in gastrodynia and pulmonary disorders. Acids and alcohol (hence tinctures) coagulate the emulsin, and cause almond mixture to separate into a kind of curd and whey; a change which also takes place spontaneously when the mixture has been kept, and which is accompanied with the development of free acid.

*Dose.*—Fl. oz. j to fl. oz. ij, or *ad libitum.*

PULVIS AMYGDALÆ COMPOSITUS.—*Compound Powder of Almonds* (*Confectio Amygdalæ, Lond., Conserva Amygdalarum, Ed.*).—Take of Jordan almonds, eight ounces; refined sugar, in powder, four ounces; gum arabic in powder, one ounce. Steep the almonds in cold water until their skins can be easily removed; and, when blanched, dry them thoroughly with a soft cloth, and rub them lightly in a mortar to a smooth consistence. Mix the gum and the sugar; and, adding them to the pulp gradually, rub the whole to a coarse powder. Keep it in a lightly-covered jar.

The only use of this powder is in the preparation of almond mixture.

### **Oleum Amygdalæ,** *Almond Oil.*

### [**Oleum Amygdalæ Dulcis.** *Oil of Sweet Almond.* Mat. Med. List, U. S. P.]

The oil expressed in England from almonds.

*Officinal Characters.*—Pale yellow, nearly inodorous, or having a nutty odor, with a bland oleaginous taste.

*Description.*—No mention is made in the British Pharmacopœia of the kind of almond from which the oil is to be expressed, whether from sweet or bitter almonds, or from both indifferently; and as bitter almonds are purposely excluded from the Materia Medica, it is probable that sweet almonds were here intended, but the compilers of the Pharmacopœia appear to have overlooked the fact that the oil of almonds of commerce is usually expressed from bitter almonds on account of their cheapness, as well as of the greater value of their residual cake. The average produce is from 48 to 52 lbs. of oil from 1 cwt. of almonds. When recently expressed it is turbid, but by rest and filtration becomes quite transparent. It usually possesses a slightly yellow tinge, which becomes somewhat paler by exposure to solar light. It is inodorous, or nearly so, and has a purely oleaginous bland taste. It congeals less readily by cold than olive oil. Its specific gravity has been found to vary from 0.911 to 0.920. Ether dissolves it. Six parts of boiling, or twenty-five parts of cold alcohol, are required to dissolve one part of this oil.

*Physiological Effects.*—It possesses the dietetic and medicinal properties of the other fixed oils. Its local action is emollient. Swallowed in moderate doses it is nutritive, but difficult of digestion. In large doses it acts as a mild laxative.

*Therapeutics.*—Almond oil may be employed for the same purpose as olive oil. Mixed with an equal volume of syrup of violets, or syrup of roses, it is given to new-born infants as a laxative. It is sometimes used with gum (in the form of mucilage), alkalies, or yelk of egg, to form an emulsion, which is used in the same cases as the almond mixture. To assist in allaying troublesome cough it is not unfrequently administered in the form of linctus, with confection of hips, and syrup of poppies.

*Dose.*—Fl. drm. j to fl. oz. ss.

*Pharmaceutic Uses.*—It is used in the preparation of ointment of spermaceti and simple ointment.

### [**Amygdala Amara,** *Bitter Almond.* Mat. Med. List, U. S. P.

The kernel of the fruit of Amygdalus communis, variety amara (*De Candolle.*)

Bitter almonds, when dry, are nearly inodorous, but when bruised with water give off the odor of hydrocyanic acid. Their taste is that of the peach-kernel, which contains the same active principles—amygdalin and emulsin. (For an account of the reaction that ensues when water is added to bitter almonds, see Prunus Virginianus.)

*Therapeutics.*—Bitter almonds may be used in cases to which hydrocyanic acid is applicable, but, as the proportion of the acid in them varies very much, it is much safer to administer the acid directly.

**Oleum Amygdalæ Amaræ,** *Oil of Bitter Almonds.* $C_{14}H_6O_2$. Mat. Med. List, U. S. P.

The oil obtained by distilling with water the kernels of the fruit of Amygdalus communis, var. Amara. (*De Cand.*)

*Officinal Tests.*—Soluble in nitric acid at ordinary temperatures without the evolution of nitrous acid fumes. When fifteen grains of potassa are added to a solution of fifteen minims of the oil in two fluidrachms of alcohol, and the mixture is heated until the potassa is dissolved, and the solution is reduced by evaporation to about one-third of its original bulk, the resulting liquid has a brownish-yellow color, and deposits no crystals upon standing for an hour in a cool place.

*Properties.*—The officinal oil of bitter almonds is a yellowish liquid, with the odor of hydrocyanic acid, and a bitter, acrid taste. Its sp. gr. is from 1.052 to 1.082. It is a complex body, composed of a peculiar volatile oil, hydrocyanic acid, and a concrete substance (benzoine) which is said to be isomorphous with the volatile oil, and to crystallize in colorless prisms. By standing, oxygen is absorbed and benzoic acid is precipitated.

*Therapeutics.*—The action of the officinal oil on the system is that of hydrocyanic acid. Two drachms of it are said to have destroyed life in ten minutes. The amount of hydrocyanic acid in it, and consequently its strength, varies very much. The dose should not exceed one-fourth of a drop to commence with, very cautiously increased till some effect is produced. It may be given in emulsion.

*Officinal Preparations.*

SYRUPUS AMYGDALÆ, U. S., *Syrup of Almond.*—"Take of sweet almond, twelve troyounces; bitter almond, four troyounces; sugar, in coarse powder, seventy-two troyounces; water, three pints. Having blanched the almonds, rub them in a mortar to a very fine paste, adding, during the trituration, three fluidounces of the water and twelve troyounces of the sugar. Mix the paste thoroughly with the remainder of the water, strain with strong expression, add to the strained liquid the remainder of sugar, and dissolve it with the aid of a gentle heat. Lastly, strain the solution through muslin, and, having allowed it to cool, keep it in well-stopped bottles in a cool place." U. S. This is an elegant demulcent and slightly sedative preparation, which, under the name of orgeat syrup, is much used as a flavor to carbonic acid water, &c. It may be used as an addition to cough mixtures.

AQUA AMYGDALÆ AMARÆ, U. S., *Bitter Almond Water.*—"Take of oil of bitter almond, sixteen minims; carbonate of magnesia, sixty grains; distilled water, two pints. Rub the oil, first with the carbonate of magnesia, then with the water, gradually added, and filter through paper." U. S. Dose, f℥iij–f℥ss.—W.]

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## PRUNUS DOMESTICA, *Linn.*

**The Plum Tree.** Icosandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A small *tree; branches* without spines. *Leaves* elliptical or lanceolate-ovate; *when young* convolute. *Flowers* white. *Calyx* inferior, bell-shaped, deciduous. *Petals* 5, oblong-ovate, perigynous. *Stamens* numerous, perigynous. *Ovary* superior. *Drupes* fleshy, roundish-ovate or oblong, smooth, covered with a bloom; *putamen* (stone) compressed, acute on both sides, somewhat furrowed at the edge, otherwise smooth.—*Woodv.* plate 85, p. 234.

The var. *Juliana* of De Candolle is the source of the officinal prune.

*Habitat.*—Apparently wild in various parts of Europe, but supposed to have been originally derived from Asia. It is extensively cultivated in the South of Europe; especially in France.

### **Prunum,** *Prune.* [Mat. Med. List, U. S. P.]

The dried Drupe; from plants cultivated in Southern Europe.

*Officinal Characters.*—About an inch long, ovate, wrinkled, black, sweet, and somewhat austere.

*Description.*—The dried fruits are called *prunes.* In warm countries they are dried on hurdles by solar heat; but in colder climates artificial heat is employed. In France both methods are adopted; the fruit being exposed to the heat of an oven and to that of the sun, on alternate days. *Medicinal Prunes* are principally imported from Bordeaux. The *pulp* only is employed in medicine.

*Composition.*—The principal constituents are sugar, malic acid, gum and pectin.

*Therapeutics.*—Prunes are employed as an agreeable and mild laxative for children, and during convalescence from febrile and inflammatory disorders. They are sometimes added to cathartic decoctions or infusions (as infusion of senna), to improve the flavor, and promote the purgative effect.

*Pharmaceutic Use.*—They enter into the composition of the confection of senna.

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## **PRUNUS LAUROCERASUS,** *Linn.*

*Cerasus Lauro-Cerasus, Loisel.*

### **The Common or Cherry-Laurel.**

Icosandria, Monogynia, *Linn. Syst.*

*Botanic Character.*—A small *tree* or evergreen *shrub* with smooth branches. *Leaves* with short petioles, oval-oblong, remotely serrate, with 2 or 4 glands beneath, acute, coriaceous, smooth, shining; *when young* conduplicate. *Flowers* in axillary racemes, which are commonly shorter than the leaves. *Calyx* inferior, deciduous. *Corolla* with five roundish, white, spreading petals. *Stamens* about twenty. *Drupe* round, without bloom, quite smooth, black, about the size of a small cherry; *putamen* (stone), somewhat globose, smooth.—*Steph. and Church.*, plate 117.

*Habitat.*—Originally a native of Asia Minor, from whence it was introduced into Europe in 1576, where it is now common in gardens and shrubberies everywhere.

### **Laurocerasus,** *Cherry-Laurel Leaves.*

The fresh Leaves; from plants cultivated in Britain.

*Officinal 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 odor when bruised.

*Description.*—Cherry-laurel leaves have scarcely any odor until bruised, when they give out the characteristic or bitter almond odor of the plant. Their taste is very bitter, aromatic, and slightly astringent. By drying they lose their odor, but retain their flavor. Their watery infusion is rendered green by the perchloride of iron.

*Composition.*—No complete analysis of cherry-laurel leaves has been hitherto made. The most important constituent is supposed to be amygdalin, but this is rather inferred than proved. *Volatile Oil of Cherry-Laurel.*—By distillation with water, cherry-laurel leaves yield a volatile oil and a distilled water. As the oil, like the volatile oil of bitter almonds, contains both hydrocyanic acid and hydruret of benzule, it is natural to suppose that the two oils are produced in a similar manner. And though they did not succeed in procuring amygdalin, MM. Wöhler and Liebig think its presence in cherry-laurel leaves highly probable; but what substance effects its decomposition has not yet been ascertained. Cherry-laurel oil is of a pale yellow color, and heavier than water. It attracts oxygen from the air, and deposits benzoic acid. Sulphuric acid colors it red. It contains hydrocyanic acid, which may be detected by an alkali and a ferruginous salt. The quantity, according to Schrader, is 7.66 per cent.; but Göppert declares it to be only 2.75 per cent. It appears, therefore, to be a weaker poison than the oil of bitter almonds, with which, according to Robiquet, it agrees in all its chemical properties.

Fig. 164.

*Cerasus laurocerasus.*

*Physiological Effects.*—Most parts of the plant, but more especially the leaves and seeds, possess poisonous properties. The effects of *medicinal doses* of cherry-laurel water are stated to be similar to those of small doses of hydrocyanic acid. *Large and poisonous doses* have occasioned symptoms similar to those caused by hydrocyanic acid, viz., painful sensation of the stomach, sudden insensibility, and death within a few minutes. Convulsions, however, have not been frequent. In the case referred to by Dr. Madden, in which brandy mixed with a fourth part of cherry-laurel water proved fatal, there was no vomiting, purging, or convulsions. But in the instances mentioned by Fodéré, the individuals expired in convulsions.

*Therapeutics and Administration.*—The powdered leaves have been sometimes administered in doses of 4 to 8 grains as a sedative, and have been applied, mixed with linseed-meal or flour, as a poultice to painful ulcers; but laurel water is the common form of administration.

## *Officinal Preparation.*

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. Distil one pint of liquid, using a chloride of zinc bath and a Liebig's condenser. Shake the product, filter through paper, and preserve in a stoppered bottle.

It is applicable to all the cases for which hydrocyanic acid has been employed. It has been used as a sedative narcotic in tic-douloureux, phthisis, spasmodic cough, and palpitation of the heart. The preparation is, however, of uncertain strength, being strongest when fresh made, or prepared from moderately young leaves; hence the dose is liable to great variation. The ordinary dose is from ten minims to one fluidrachm.

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## [PRUNUS SEROTINA, *Ehrhart.*

*Specific Characters.—Drupe* destitute of bloom; the stone globular and marginless. *Leaves* conduplicate in the bud, oblong or lanceolate-oblong, taper-pointed, serrate with incurved, short and callous teeth, thickish. *Flowers* in racemes, terminating the branches, developed after the leaves.

*Synonyms.*—Cerasus serotina, *De Candolle.* (U. S. P.) Cerasus Virginiana, *Michaux.* Prunus serotina, *Ehrhart*, *Gray.*

The confusion in the nomenclature of this species has arisen in great part from an error of Michaux, who confounded it with the choke cherry (*P. Virginianus*, Linnæus), and described it as Cerasus Virginianus. In regard to the generic name Prof. Asa Gray considers the Cerasus of Tournefort as only entitled to the rank of a subgenus, thus restoring Ehrhart's name to the plant; more than this, Mr. Gray recognizes the group Padus of Miller as of equal rank with Cerasus. It includes both the common wild cherry and also the choke cherry, so that, if these groups were given the rank of genera, the name of the officinal Prunus Virginianus would be Padus serotina.

It varies in height from twenty-five to eighty or more feet, attaining its extreme proportions in the southwestern portion of the Union. The *leaves* are 2—4 inches long; *racemes* 2—5 inches in length, and nodding at their termination. The *flowers* are white and fragrant, appearing in May. The bark of the tree is of a dark ashy hue on the trunk, where it is rough; smooth and dark upon the branches. The epidermis is readily separable, and peals off, when detached, circularly, leaving the green cellular tissue beneath. By this character it can be detected in the forests. The wood is hard, and valuable in the construction of furniture. The fruit has a sweet, somewhat prussic, and slightly bitter taste. It is used for flavoring liquors. This tree may be distinguished from the choke cherry (*P. virginianus*, Linnæus), by the latter being rather a large bush than a forest tree, and having its thin leaves oval, oblong, or obovate, abruptly pointed, very sharply (often doubly), serrate, with slender teeth.

*Habitat.*—The wild cherry is an inhabitant of the United States, where it is disseminated from Canada to Florida, and through the Western States.

### Prunus Virginianus, U. S., *Wild Cherry Bark.*

The bark of Cerasus serotina, *De Candolle.*

The bark of the branches or of the root is employed for medicinal purposes. The latter is regarded as best. It is collected by the herb-venders, and brought into the market in pieces or fragments several inches long, and from half an inch to two in width. From drying it becomes somewhat curved laterally. It is destitute of the epidermis, of a reddish-brown color, brittle, and pulverizable; fracture short, and presenting grayish surfaces. When fresh, the odor is prussic, which is in a measure lost by drying, but regained by maceration. The taste is aromatic, prussic, and bitter.

*Composition.*—The first satisfactory analysis of this bark was made by Mr. Stephen Procter (*Journal of Philad. Col. of Pharmacy*, vol. vi. p. 8), who found it to contain starch, resin, gallic acid, tannin, fatty matter, lignin, red coloring matter, salts of lime, potassa, and iron. By distilling the bark with water, a volatile oil was obtained, associated with hydrocyanic acid. More recently (*op. cit.* vol. ix. p. 300, and x. p. 197), Mr. William Procter has shown that the volatile oil is composed of *hydruret of benzule* and hydrocyanic acid, like oil of bitter almonds, and that they do not pre-exist in the bark, but are products of the decomposition of *amygdalin;* the same principle that exists in the bitter almond, by the reaction of emulsin in the presence of water.

It has been suggested that phloridzine is also a constituent; but Mr. Perot has sought for it without success. The tonic, stomachic powers are probably due to the presence in it of bitter extractive, or possibly some hitherto undiscovered principle.

Oil of Wild Cherry.—This oil has a light straw-color, a pungent taste, and an odor strongly resembling that of bitter almonds. When deprived of hydrocyanic acid by distillation with a mixture of protochloride of iron, potassa, and water, it is without any poisonous properties. Its sp. gr. is 1.046.

*Medical Properties.*—Dr. B. S. Barton informs us (*Collections*, p. 11) that the leaves of this tree are poisonous to certain animals, as calves, and even the berries intoxicate different kinds of birds.

The bark is tonic and invigorating in its impression upon the stomach and general system, but at the same time is regarded as exercising a sedative or depressing influence upon the circulation and nervous apparatus, which last effect is attributed to the action of the hydrocyanic acid.

From the experiments of Dr. Morris, who made it the subject of his inaugural dissertation (1802), it appears that the primary impression upon the pulse was an increase of rapidity, but that when it had been continued for some time, the pulse fell below the original standard, and at the same time it becomes fuller and stronger; in cases where some previous excitement existed, the rise of the pulse was steady, and in all his experiments, the medicine was pushed until drowsiness came on. Half-drachm doses of powdered bark were exhibited. This primary stimulant operation is concurred in by Dr. Eberle, who states, however, that when taken in large quantities and repeated frequently, it weakens the digestive powers, and produces an effect upon the action of the heart and arteries the reverse of stimulant; that in his own persons he several times reduced his pulse from seventy-five to fifty strokes in a minute, by copious draughts of the cold infusion, taken several times during the day, and continued for twelve or fourteen days. (*Treat. on Mat. Med.* vol. i. p. 272.) There must certainly be considerable difference of action between the powdered bark, in which the astringent and bitter principle is concentrated, and the hydrocyanic acid with difficulty eliminated, and the cold infusion, in which the latter principle has an opportunity of being fully generated.

*Uses.*—From its little stimulating properties, but, on the contrary, its power of allaying irritation, particularly of a nervous kind, it has been employed in a number of diseases connected with a debilitated state of the system. As a commencing tonic in the convalescence from fever or inflammatory attacks, it may frequently be ventured upon, when other roborants are inadmissible. This is especially the case where the attack of the disease has been pulmonary, and where any excitement of the circulation cannot but be prejudicial, as in pneumonia, bronchitis, &c. To phthisis it is regarded as being peculiarly adapted, and by several eminent writers is highly spoken of; thus, we are informed by Dr. Eberle, that "it lessens the frequency, tension, and irritated state of the pulse; moderates the cough and profuse nocturnal perspirations; checks the diarrhœa, and sustains the general strength of the system;" the same also is the testimony of Dr. Chapman. In hectic fever, from whatever cause proceeding, analogous results may be expected.

In dyspepsia, a quieting and at the same time invigorating impression is made upon the stomach; it should in this case, however, be but moderately employed, as large and repeated doses are prone to diminish the power of the organ. Professor B. S. Barton declares (*Collections*, p. 11) that the wild cherry bark has been used with success in intermittent fever; this is confirmed by the statements of numerous physicians, who have been induced to try it. Dr. Eberle (*op. cit.* p. 272) employed it while residing in the country, and in the majority of cases with success. No comparison, nevertheless, can be instituted between it and cinchona.

If given in substance, the dose is from ʒss to ʒij of the powder. A decoction is decidedly objectionable, as the easily volatilized prussic acid is driven on by the heat.

Infusum Pruni Virginianæ, U. S., *Infusion of Wild-Cherry Bark.*—"Take of wild-cherry bark, in moderately coarse powder, half a troyounce; water, a sufficient quantity. Moisten the powder with six fluidrachms of water, let it stand for an hour, pack it gently in a conical glass percolator, and gradually pour water upon it until the filtered liquid measures a pint." U. S. This infusion may also be made by maceration. It is a beautiful wine-colored liquid, possessing the taste and odor of the moistened bark. The menstruum being cold, the hydrocyanic acid is retained. Dose, f℥ij–iij.

Extractum Pruni Virginianæ Fluidum, U. S., *Fluid Extract of Wild-Cherry Bark.*—"Take of wild-cherry bark, in fine powder, sixteen troyounces; sweet almond, two troyounces; sugar, in coarse powder, twenty-four troyounces; alcohol, water, each, a sufficient quantity. Introduce the bark, previously mixed with four fluidounces of alcohol, into a cylindrical percolator, press it firmly, and gradually pour alcohol upon it until three pints of tincture have slowly passed. From this distil off two pints and a half of alcohol, and, having mixed the residue with a pint of water, evaporate, by means of a water-bath, to half a pint. Beat the almond into a paste, and rub this with successive portions of water until, after straining through a coarse sieve or cloth, nearly all the substance of the almond has been converted into an emulsion, and twelve fluidounces of liquid have been obtained. Mix this, with the liquid first obtained, in a suitable bottle, and, having closely stopped it, agitate occasionally during twenty-four hours. Then express quickly and strongly through a cloth; and, if the expressed liquid measure less than eighteen fluidounces, add water to the residue, and again express until that quantity is obtained. Filter the expressed liquid through cotton flannel, in a covered funnel, into a bottle containing the sugar. Shake the bottle occasionally during the process until the sugar is dissolved, and continue the filtration until the syrupy liquid measures two pints. Lastly, mix the whole thoroughly together." U. S.

The difficulty to be overcome in making this preparation is to obtain a concentrated extract without volatilizing the hydrocyanic acid. If an infusion of bark were evaporated down, the acid would all be driven off. To avoid this, the present process has been directed. The alcohol dissolves out of the bark the amygdalin, and probably also the bitter principle, leaving the emulsin, which is insoluble in it. Evaporating this tincture, we get a concentrated solution of amygdalin, &c. Sweet almonds contain a large amount of emulsin, but no amygdalin, and therefore there is obtained from them a concentrated solution of the former substance. When the two substances are mixed, the characteristic reaction takes place, and a fluid is obtained representing the wild-cherry bark in a very concentrated form.

Fluid extract of wild-cherry bark is a wine-colored, slightly syrupy fluid, which possesses in a high degree the sensible properties of the infusion. It is the most elegant of all the preparations, agreeing better with the stomach and most palates than the syrup, because it does not contain nearly so much sugar. Dose, f ʒj–iij.

Syrupus Pruni Virginianæ, U. S., *Syrup of Wild-Cherry Bark.*—"Take of wild-cherry bark, in coarse powder, five troyounces; sugar, in coarse powder, twenty-eight troyounces; water, a sufficient quantity. Moisten the bark thoroughly with water, and allow it to stand for twenty-four hours in a close vessel; then pack it firmly in a glass percolator, and gradually pour water upon it until a pint of filtered liquid is obtained. To this, transferred to a bottle, add the sugar, and agitate occasionally until it is dissolved." U. S. This preparation is very much used as a flavoring and sedative addition to cough mixtures, but, for reasons assigned above, the fluid extract seems to be more eligible. Dose, f ʒij to f ℥ss.—W.]

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## ROSA CANINA, *Linn.*

### The Dog Rose.

Icosandria Polygynia, *Linn. Syst.*

*Generic Character.*—*Shrubs* or small *trees*. *Leaves* pinnate, usually with an odd leaflet; *leaflets* serrate; *stipules* adnate. Apex of the tube formed by the combined *calyx* and *thalamus*, contracted, ultimately succulent, the limb 5-parted; segments during æstivation somewhat spirally imbricated at the apex, often pinnatisect. *Petals* 5. *Stamens* numerous. *Carpels* many, inserted into and inclosed within the fleshy tube formed by the calyx and thalamus, dry, indehiscent, somewhat crustaceous, bearing the style on their inner side; *styles* exserted, free, or aggregated into a columnar style. *Seed* in an achenium, solitary.

*Specific Character.*—*Shoots* more or less arched, or erect; *prickles* uniform, hooked. *Leaves* naked or slightly hairy, without glands. *Calyx-segments* pinnate, deciduous. *Styles* hairy, not united. *Fruit* coral-red, or more scarlet, usually oblong, elliptical, or ovate, rarely somewhat globose, soft and pulpy when ripe, with a pleasant, somewhat acid, taste.—*Woodv.*, plate 139, page 377.

*Habitat.*—Indigenous. Thickets, hedges, &c.; very common. Flowers in June and July. Perennial.

### Rosa Canina, *Hips.*

Rosa canina; and other allied species.

The ripe fruit of indigenous plants, deprived of the hairy seeds (achenes).

*Officinal Characters.*—An inch or more in length, ovate, scarlet, smooth, shining; taste sweet, subacid, pleasant.

*Description.*—The fruit used in medicine under the name of the *hip* or *hep* is somewhat oval. It is composed externally of the persistent calyx attached to the concave thalamus, whose sides have become thick, fleshy, beautifully red, shining; and internally of numerous, hard, hairy achenia (commonly called seeds, but which, in fact, are the real fruits). The pulp or fleshy matter is sweet, acidulous, and pleasant to the taste, especially when mellowed by the frost. The hairs surrounding the achenia act as mechanical irritants, like the hairs of the pods of the cowhage, and when swallowed are apt to occasion gastric uneasiness, vomiting, and pruritus about the anus.

*Composition.*—The pulp contains citric and malic acids, with citrates, malates, sugar, a little tannin, &c.

*Physiological Effects and Uses.*—The pulp is slightly refrigerant and astringent. It is only employed in medicine in the preparation of the confection.

### *Officinal Preparation.*

Confectio Rosæ Caninæ, *Confection of Hips.*—Take of hips, carefully deprived of their seeds, one pound; refined sugar, two pounds. Beat the hips to a pulp in a stone mortar, add the sugar, and rub them well together.

This conserve, being saccharine and acidulous, is usually employed as a convenient and agreeable vehicle for other remedies; as for a pill basis, or for the making of linctuses. A very agreeable linctus is made with confection of hips 16 parts, tragacanth 1, syrup of poppies 6, tincture of squill 6, boiling water 48, acidulated with dilute sulphuric acid. A drawback to the use of the confection is its tendency to candy or concrete by keeping.

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## ROSA GALLICA, *Linn.*

### Red Rose.

*Specific Character.*—A small *shrub* with the *shoots* armed with nearly uniform *prickles* and glandular bristles intermixed. *Leaflets* stiff, elliptical, rugose. *Flowers* several together, large; erect, with leafy bracts. *Sepals* ovate, leafy, compound. *Fruit* oblong.—*Woodv.* pl. 141, page 382.

*Habitat.*—South of Europe. Common in gardens. For medicinal purposes cultivated principally at Mitcham, where it is termed, though incorrectly, the damask rose.

**Rosa Gallica,** *Red Rose Petals. Red Rose.* [Mat Med. List, U. S. P.]

The unexpanded petals, fresh and dried; from plants cultivated in Britain.

*Officinal Characters.*—Color fine purplish red, retained after drying; taste bitterish, feebly acid, and astringent; odor roseate, developed by drying.

*Description.*—The dried petals of the unexpanded flowers, deprived of their white claws, constitute the *red rose leaves* of the shops. The flower-buds are brought to market when about the size of a large nutmeg. The calyx and claws being cut off, the petals are speedily dried. At Mitcham this is effected in a stove. Slow desiccation impairs both their astringency and color. The petals of the buds are much more astringent than those of the full-blown flowers; hence they are preferred for medicinal use. When dried, they are sifted to remove the stamens and insects. 2000 flowers yield about 100 lbs. of fresh, or 10 lbs. of dried petals. The dried petals have a velvety appearance. As they lose their fine color when exposed to light and air, and are apt to become mouldy or worm-eaten, they should be carefully preserved in bottles or canisters.

*Composition.*—The petals contain red coloring matter, tannic and gallic acids, a trace of volatile oil, &c. *Astringent Matter* (*tannic and gallic acids*).—The presence of astringent matter is shown by the very dark color (*tannate and gallate of iron*) produced in an infusion of red roses by the ferruginous salts, and by the slight precipitate (*tannate of gelatin*) caused on the addition of a solution of gelatin. *Coloring Matter.*—Has not yet been isolated. A watery infusion of red rose leaves has a pale yellowish-red color; the alcoholic tincture is also pale-colored. On the addition of sulphuric acid an intense bright-red color is produced. Alkalies communicate a greenish tint to the watery infusion (probably by neutralizing the free acid, to which, with the coloring matter, the red tint is owing). Sulphurous acid destroys the color of the infusion of roses; but on the addition of sulphuric acid the intense bright red is produced, with an evolution of sulphurous acid gas.

*Physiological Effects and Uses.*—Red rose leaves are mild astringents and tonics; but their power is exceedingly slight, and scarcely deserves notice. They are principally used for their color and flavor.

### *Officinal Preparations.*

CONFECTIO ROSÆ GALLICÆ, *Confection of Roses.* [CONFECTIO ROSÆ, U. S., *Confection of Rose.*]—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. [" Take of red rose, in fine powder, four troyounces; sugar, in fine powder, thirty troyounces; clarified honey, six troyounces; rose water, eight fluidounces. Rub the rose with the rose water heated to 150°; then gradually add the sugar and honey, and beat the whole together until thoroughly mixed." U. S.]

This preparation is slightly astringent. Over the confection of hips, it has the advantage of having no tendency to candy. Furthermore, it does not ferment or become mouldy. Its principal use is a vehicle for the exhibition of other medicines. Thus it is a common pill-basis for calomel, sulphate of quinia, &c., and is employed in the Pharmacopœia in the formation of pill of Barbadoes aloes, pill of Socotrine aloes, mercurial pill, pill of carbonate of iron, and several others.

INFUSUM ROSÆ ACIDUM, *Acid Infusion of Roses.* [INFUSUM ROSÆ COMPOSITUM, U. S., *Compound Infusion of Rose.*]—Take of red rose petals, a quarter of an ounce; dilute sulphuric acid, one fluidrachm; boiling distilled water, ten fluidounces. Add the acid to the water, infuse the petals in the mixture in a covered vessel for half an hour, and strain. [" Take of red rose, half a troyounce; diluted sulphuric acid, three fluidrachms; sugar, in coarse powder, a troyounce and a half; boiling water, two pints and a half. Pour the water upon the rose in a covered glass or porcelain vessel; then add the acid, and macerate for half an hour. Lastly, strain the liquid, and in it dissolve the sugar." U. S.]

Infusion of roses is a mild, but very agreeable, refrigerant and astringent drink in febrile disorders, hemorrhages, diarrhœa, and colliquative sweats. It forms a very elegant vehicle for other medicines; as for saline purgatives (especially sulphate of magnesia, the unpleasant taste of which it serves greatly to cover), for sulphate of quinia, the mineral acids, bitter tinctures and infusions, alum, &c. It serves as a very useful gargle; for which purposes acids, nitre, alum, or tincture of capsicum, are usually conjoined. Of course the alkalies and the earths, as well as their carbonates, are incompatible with it; they neutralize the acid, and change the color of the preparation to greenish or brownish-green. Sulphate of iron communicates a deep olive color, and after some hours causes a precipitate. The sulphuric acid of infusion of roses decomposes the activity of acetate of lead, by forming sulphate of lead. They cannot, therefore, be given at the same time.

*Dose.*—Fl. oz. j to fl. oz. ij.

Syrupus Rosæ Gallicæ [U. S.], *Syrup of Red Roses.*—Take of dried red rose petals, two ounces; refined sugar, thirty ounces; boiling distilled water, one pint. Infuse the petals in the water for two hours, squeeze through calico and filter. Dissolve the sugar in the liquor by means of heat. The product should weigh two pounds fourteen ounces, and should have the specific gravity 1.335. ["Take of red rose, in moderately fine powder, two troyounces; sugar, in coarse powder, eighteen troyounces; diluted alcohol, water, each a sufficient quantity. Moisten the rose with diluted alcohol, pack it firmly in a conical glass percolator, and gradually pour diluted alcohol upon it until a fluidounce of tincture has passed. Set this aside, and continue the percolation until five fluidounces more of tincture are obtained. Evaporate this with a gentle heat to a fluidounce and a half, and mix it with seven fluidounces of water. Then, having added the sugar, dissolve it with the aid of a gentle heat, and strain the solution while hot. Lastly, when the solution is cold, add the fluidounce of reserved tincture, and mix them thoroughly." U. S.]

This syrup, though very slightly astringent, is principally valuable for its red color, on account of which it is sometimes added to infusions, decoctions, mixtures, and electuaries.

*Dose.*—Fl. drm. j to fl. drs. ij.

[Mel Rosæ, U. S., *Honey of Rose.*—"Take of red rose, in moderately fine powder, two troyounces; clarified honey, twenty-five troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with half a fluidounce of diluted alcohol, pack it firmly in a conical glass percolator, and gradually pour diluted alcohol upon it until six fluidrachms of filtered liquid have passed. Set this aside, and continue the percolation until half a pint more of liquid is obtained. Evaporate this, by means of a water bath, to ten fluidrachms, add the reserved liquid, and mix the whole with the clarified honey." U. S. Honey of rose is principally used as an addition to gargles.—W.]

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## ROSA CENTIFOLIA, *Linn.*

### The Hundred-Leaved or Cabbage Rose.

*Specific Character.*—A bushy *shrub* with erect *shoots*, which are rather thickly covered with nearly straight *prickles*, intermixed with glandular hairs. *Leaflets* oblong or ovate, glandular at the margin, hairy beneath. *Flowers* several together, drooping. *Sepals* leafy, spreading, not deflexed, more or less pinnate. *Peduncles* and *sepals* glandulose. *Fruit* ovate.—*Woodv.*, plate 140, page 379.

*Habitat.*—Asia. Cultivated at Mitcham, and other places, for medicinal purposes.

**Rosa Centifolia**, *Cabbage-Rose Petals. Pale Rose.* [Mat. Med. List, U. S. P.]

The fresh petals, fully expanded; from plants cultivated in Britain.

*Officinal Characters.*—Taste sweetish, bitter, and faintly astringent; odor roseate, both readily imparted to water.

*Description.*—The petals of the hundred-leaved rose are commonly termed in the shops *Cabbage-rose leaves.* They should be gathered when the flowers are full-blown, and before the petals begin to fall. The odor is strongest when they are of a fine pale red, and before they begin to fade. When freed from the calyx and stamens, they are to be dried in the air. Unlike the petals of *R. gallica*, desiccation diminishes their fragrance.

*Composition.*—The principal constituent is volatile oil. They also contain saccharine matter, and a trace of astringent matter. *Volatile Oil*, *Attar* or *Otto of Roses.*—Obtained in the East, by distilling roses with water. The attar concretes and floats on the distilled water when cold. It is also obtained by exposing the rose leaves in water to the sun, when the oil floats out. 100,000 flowers yield only about 180 grains of otto. It varies somewhat in color, and below 80° F. is a crystalline solid. Its specific gravity at 90° F. is 0.832. It is soluble in alcohol, and a little is taken up by water. It consists of two volatile oils, a *solid* and a *liquid oil.* When properly diluted it has a most delicious odor. On account of its delightful fragrance, this rose is employed for the distillation of *rose water.*

### *Officinal Preparation.*

Aqua Rosæ [U. S.], *Rose Water.*—Take of fresh petals of the hundred-leaved rose, ten pounds; water, two gallons. Distil one gallon. ["Take of pale rose, forty-eight troyounces; water, sixteen pints. Mix them, and distil eight pints. When it is desirable to keep the rose for some time before distilling, it may be preserved by being well mixed with half its weight of chloride of sodium." U. S.]

During the distillation of the water a solid volatile oil comes over with it and floats on the water in the receiver (*English attar of roses*). To prevent the water becoming sour, it should be preserved in well-corked bottles, kept in cool places. Spirit of wine ought not to be mixed with it, for if a sufficient quantity be added to preserve the water, it renders it unfit for some medicinal purposes.

*Use.*—Rose water is employed, on account of its odor only, as an addition to lotions and collyria. It is a constituent of compound mixture of iron.

*Dose.*—Fl. oz. j to fl. oz. ij.

[Unguentum Aquæ Rosæ, U. S., *Ointment of Rose Water.*—"Take of oil of sweet almond, three troyounces and a half; spermaceti, a troyounce; white wax, one hundred and twenty grains; rose water, two fluidounces. Melt together, by means of a water bath, the oil, spermaceti, and wax; then gradually add the rose water, and stir the mixture constantly while cooling." U. S. This is a white, elegant, perfectly bland unguent, which has the odor of rose water and is much used under the name of Cold Cream as a protective application to chapped lips and abraded surfaces.—W.]

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## **BRAYERA ANTHELMINTICA,** *Kunth.*

## **The Kousso Tree.**

Diœcia Polyandria, *Linn. Syst.*

*Botanic Character.*—A *tree*, twenty feet high. *Leaves* crowded, alternate, interruptedly impari-pinnate, and sheathing at the base (Fig. 165, A); *leaflets* oblong or elliptical-lanceolate, acute, serrate, villose at the margin and on the veins of the under surface; *stipules* adnate to the petiole.

*Flowers* diœcious, small, greenish at first, ultimately purple; repeatedly dichotomous; the *pedicels* with an ovate bract at the base (Fig. 165, B). *Calyx* turbinate; throat constricted internally by a membranous ring; *limb* 10-partite; the segments in two series, the five outer ones much larger, oblong-lanceolate, obtuse, reticulate-veined, stellately patent, the five inner ones alternate, smaller, spathulate. *Petals* 5, inserted in the throat of the calyx, small, linear. *Stamens* from 15 to 20, inserted

Fig. 165.


*Brayera anthelmintica*, Kunth.

A. Flowering branch. B. Bunch of female flowers. C. Flowers seen laterally. D. Female flowers; *a*, *b*, *c*, *d*, *e*, the five outer segments of the calyx.

along with the petals; *filaments* free, unequal in length; *anthers* bilocular, dehiscing longitudinally. *Carpels* 2, placed at the bottom of the calyx, free, unilocular, containing one or two pendulous ovules; *styles* thickened upwards; *stigmas* subpeltate-dilated, crenato-oblong. The mature fruits are unknown. The *so-called male flowers* may be regarded as hermaphrodite flowers, inasmuch as the carpels are well developed. The *female flowers* are somewhat different in their structure. The outer segments of the *calyx* are much more developed than in the *male flowers;* and are four or five times larger than those of the inner row, and are placed somewhat below them (Fig. 165, D); the *petals* are entirely wanting; the *stamens* are rudimentary and sterile.—*Hook. Journ. Bot.*, 3d Ser., vol. 2, pl. 10.

*Habitat.*—It is found abundantly throughout the entire table-land of northeastern Abyssinia.

## Cusso, *Kousso.*

### [**Brayera**, Secondary List, U. S. P.]

The flowers; collected in Abyssinia.

*Preparation.*—Mr. Johnston states that the kosso or kousso is gathered for medicinal purposes before the seeds are quite ripe. The bunches are suspended in the sun to dry, and if not required for immediate use, are deposited in a jar.

*Officinal Characters.*—Flowers small, reddish-brown, on hairy stalks, outer limb of calyx 5-parted, the segments ovate, reticulated.

*Description.*—Commercial Kousso occurs in compressed, more or less broken bunches of flowers; or in unbroken bunches, which are sometimes from one to one and a half feet or more long. It has a reddish-brown color, a fragrant balsamic odor, and but a slight taste at first, although ultimately somewhat acrid and disagreeable. By soaking the dried flowers in water they may be unfolded sufficiently to determine their botanical characters, which have been already described. It will then be seen that the segments of the calyx are *not ovate*, as mentioned in the officinal characters given above, but oblong or oblong-lanceolate (Fig. 165, D).

*Composition.*—The flowers have been found to contain a small quantity of a peculiar volatile oil, bitter acrid resin, two kinds of tannin, &c. The medicinal properties appear to be essentially due to the bitter acrid resin, and doubtless, to some extent, to the volatile oil and tannin. M. Pavesi, and subsequently M. Vée, have obtained a principle from kousso which they have termed *koussine*, and which they describe as yellow, bitter, and uncrystallizable. Is this the active principle? An infusion or decoction of kousso strikes a dark green olive tint with a solution of the perchloride of iron.

*Physiological Effects.*—The physiological effects of *kousso* are not in general very great. The flavor, though not very strong, is by no means agreeable, and may even create disgust. Sometimes it excites a slight sensation of heat, nausea, or even vomiting, creates thirst, and frequently perhaps usually, a gentle action on the bowels. But the latter is commonly so slight that in a considerable number of cases it is necessary to follow its administration by a mild purgative. It is obvious, therefore, that the efficacy of kousso as an anthelmintic does not depend on its purgative or evacuant influence, but on its poisonous or toxic action on the worm; in fact, it is a true *vermicide*. In one case, that of a woman in France, it brought away ten worms, of which one only manifested evidences of vitality, and that for a few minutes only.

*Therapeutics.*—Kousso has been in use as an anthelmintic in Abyssinia for more than two centuries, and it is very highly valued in that country. It was introduced into Europe about the year 1847, and when first tried in England, France, Germany, and Switzerland, great expectations were raised as to its valuable medicinal properties. More recent trials, however, do not tend to confirm the extravagant notions then formed, and hence this remedy must be regarded as still upon its trial. The conflicting results which have been experienced from the employment of kousso are doubtless in part due to its varying age when administered, as its properties appear to be sensibly depreciated by keeping.

Kousso is said to be an effective anthelmintic in both kinds of tapeworm, viz., the *Tænia solium* and *Bothriocephalus latus*. In most of the reported successful cases the *Tænia solium* was the parasite expelled; but in one of Chomel's cases the worm which was evacuated was the *Bothriocephalus latus*, and I am informed that kousso has proved most effectual in Switzerland, where, as is well known, the *Bothriocephalus* is the prevailing tapeworm. No ill effects have resulted from its use in this country.

*Officinal Preparation.*

INFUSUM CUSSO, *Infusion of Kousso.*—Take of kousso, in coarse powder, a quarter of an ounce; boiling distilled water, four fluidounces. Infuse in a covered vessel for fifteen minutes, without straining.

The best mode of taking the infusion is as follows: 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 kousso should be taken in the morning, fasting. The only preparation necessary is, that the last meal of the previous evening should be slight. The evacuation of the bowels by a mild purgative or a lavement is also desirable.

*Dose.*—The quantity ordered in the Pharmacopœia is intended as the dose for an adult, though a larger dose may sometimes be required. Half this dose will suffice for children.

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## [CYDONIA VULGARIS, *Linn.*

### Quince Tree.

*Generic Character.*—*Calyx* 5-cleft. *Petals* somewhat orbicular. *Stamens* erect. *Styles* 5. *Pome* closed, 5-celled; cells many-seeded, cartilaginous. *Seeds* enveloped with mucilaginous pulp.—Small *trees. Leaves* undivided, quite entire or serrate. *Flowers* large, solitary or few, somewhat umbellate. (*De Cand.*)

*Specific Character.*—*Leaves* ovate, obtuse at the base, quite entire; their lower surface, as well as the *calyx*, tomentose. (*De Cand.*)—A small, much-branched, usually crooked *tree. Petals* pale rose-color or white. *Pome* varying in shape, yellow, covered with a thin cottony down, very austere, but having a peculiar fragrance.

*Habitat.*—South of Europe. Cultivated in gardens. Flowers in May and June.

### **Cydonium,** *Quince Seed.* Secondary List, U. S. P.

The seeds of Cydonia vulgaris.

Quince seeds are ovate-acute, flat on one side, convex on the other, and of a reddish-brown color. The most external coat (*epidermis seminalis*, Bischoff) is composed of very fine cells, in which is lodged a large quantity of mucilage. When, therefore, these seeds are thrown into water, the mucilage swells up, distends, and ultimately bursts the tender cells.

*Cydonin* (*Peculiar Gum of Quince Seed; Bassorin; Mucus; Quince Mucilage*).—One part of quince seed forms, with forty parts of water, a thick mucilage, which produces, with the following salts, gelatinous coagula or precipitates: acetate and diacetate of lead, protochloride of tin, nitrate of mercury, and sesquichloride of iron. Quince mucilage, usually termed bassorin, appears to be a peculiar substance; hence I (Pereira) propose to call it *cydonin*. It is distinguished from *arabine* (see **Gum Arabic**) by the effect on it of alcohol, silicate of potash, sulphuric acid, and oxalate of ammonia; from *bassorin* and *cerasin* by its solubility in water, both hot and cold; from *tragacanthin* (see **Gum Tragacanth**) by the effect of sulphate of iron, oxalate of ammonia, and alcohol; from *carrageenin* by the effect of silicate of potash and acetate of lead.

*Therapeutics.*—The *mucilage of quince seed* is nutritive, demulcent, and emollient. The whole seeds, if taken, in sufficient quantity, and well masticated, would perhaps act like bitter almonds, as they are said to yield hydrocyanic acid. Quince seeds are employed in medicine only on account of the mucilage which they yield.—W.]

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## [POTENTILLA TORMENTILLA, *Linn.*

### Tormentil; Septfoil.

*Generic Character.*—Tube of the *calyx* concave; limb 4- or 5-cleft, externally 4- or 5-bracteolate. *Petals* 4 or 5. *Stamens* numerous. *Carpels* numerous. *Style* lateral. *Receptacle* procumbent, persistent, juiceless, capitate. *Seed* appended.—*Herbs* or *under-shrubs*. *Leaves* compound. *Stipules* adnate to the petioles. *Flowers* white, yellow, rarely red. (*De Cand.*)

*Specific Character.*—Multiform, hairy. *Root* tuberous. *Stem* ascending, dichotomous. *Leaves* ternate-palmatisect, the caulinar ones sessile; lobes obovate-wedge-shaped, more or less deeply teethed. *Stipules* 0- or 3-toothed. *Flowers* axillary, solitary, with long peduncles. *Bracts* palmate-incised. Segments of the *calyx* lanceolate-linear, as long as the corolla. *Carpels* rugose. *Receptacles* villose. (*De Cand.*)—*Stems* weak, slender, often procumbent, branched. *Leaves* dark green, somewhat hairy, especially the veins. *Flowers* bright yellow.

*Habitat.*—Europe; growing on barren pastures, heaths, and bushy places.

**Tormentilla,** *Tormentil.* Secondary List, U. S. P.

The root of Potentilla tormentilla.

The root (*radix tormentillæ*) is large, compared with the size of the plant. Its external form is very irregular; sometimes it is more or less cylindrical, at others tuberculated and knobby. Its color externally is dark red-brown, internally flesh-red or brownish. Its taste is astringent. Its watery infusion is colored blackish-green (*tannate of iron*) by the sesquichloride of iron. By iodine, starch is detected in the root. It is dependent for its virtues on tannic acid and extractive.

*Therapeutics.*—Astringent and tonic. Employed in chronic diarrhœa and dysentery, passive hemorrhages, and intermittents. The decoction is also used as an astringent wash and injection; as in flabby ulcers and leucorrhœa. In the dysenteries of cattle it is reputed efficacious. In the Feroe and Orkney Islands it is used to tan leather; in Lapland, as a red dye.

*Administration.*—Dose, ʒss to ʒj, in powder or decoction, three or four times a day.—W.]

## [RUBUS CANADENSIS, *Linn.*

### Dewberry.

*Generic Character.—Calyx* open, not bracteolate. *Stamens* and *pistils* numerous. *Styles* terminal, deciduous. *Fruit* of numerous (rarely few) pulpy drupaceous achenia, aggregated on a conical or elongated receptacle.

*Specific Character.—Shrubby*, extensively trailing, slightly prickly; *leaflets* nearly smooth. Almost a running vine, frequenting gravelly and rocky banks and hillsides, bearing very large juicy fruit, which it ripens before the common blackberry.

## RUBUS VILLOSUS, *Ait.*

### Common Blackberry.

*Shrubby*, upright or reclining, armed with short curved prickles. *Flowers* racemed, numerous. *Stem* and lower surface of *leaves* hairy and glandular.

A stout bush, growing from 2 to 7 feet high in waste places, borders of thickets, &c., too well known to need description. There is one variety which is trailing, and closely resembles the dewberry.

### Rubus, *Blackberry Root.* Mat. Med. List, U. S. P.

The root of Rubus Canadensis and of Rubus villosus.

These roots are much branched, wrinkled, varying in size from that of a quill to an inch of thickness, and having a very thin bark. The virtues of the root are in the bark alone, the woody portion being tasteless and inert. The bark contains tannic acid and other unimportant ingredients.

*Therapeutics.*—A mild astringent and tonic. It is scarcely used except in the atonic diarrhœas of children, and may be given in infusion, or preferably in the officinal syrup. In domestic practice a very palatable and elegant remedy is prepared by making a conserve or jelly of the fruit, and placing the roots in it while boiling, so that their tannic acid is extracted.

SYRUPUS RUBI, U. S., *Syrup of Blackberry Root.*—"Take of blackberry root, in moderately fine powder, eight troyounces; syrup, a pint and a half; diluted alcohol, a sufficient quantity. Introduce the powder, previously moistened with four fluidounces of diluted alcohol, into a glass percolator, and pour diluted alcohol upon it until a pint and a half of tincture have passed. Evaporate this, by means of a water-bath, at a temperature not exceeding 160°, to half a pint; then mix it while hot with the syrup previously heated, and strain." U. S. Dose for a child 6 years old, f℥j–ij.—W.]

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## [GEUM RIVALE, *Linn.*

### Water Avens.

*Generic Character.— Calyx* 5-cleft. *Petals* 5. *Achenia* numerous. *Styles* persistent.

*Specific Character.—Stems* nearly simple, several-flowered, 2 feet high. *Root-leaves* lyrate and interruptedly pinnate; those of the stem few, 3-foliate or 3-lobed. *Petals* dilated, obovate-retuse, contracted into a claw, purplish orange. Head of *fruit* stalked.

*Habitat.*—Europe; naturalized in swamps and wet meadows, northern United States.

**Geum,** *Water Avens.* Secondary List, U. S. P.

The root of Geum rivale (water avens) is tonic and very astringent. It is used in diarrhœa, passive hemorrhage, leucorrhœa, &c. It is best given in decoction, an ounce of the root in a pint and a half of water boiled to a pint. Dose, a wineglassful.—W.]

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## [SPIRÆA TOMENTOSA, *Linn.*

### Hardhack.

*Generic Character.*—*Calyx* 5-cleft, persistent. *Petals* 5, obvate, equal, imbricated in the bud. *Stamens* 10–50. *Pods* (follicles) 3–12, several-(2–15-)seeded. *Flowers* white or rose-color, sometimes diœcious; rarely the parts are 4 instead of 5.

*Specific Character.*—*Stems* and lower surface of the ovate or oblong serrate *leaves* very woolly.

*Habitat.*—Low grounds northward in the United States.

**Spiræa,** *Hardhack.* Secondary List, U. S. P.

The root of Spiræa tomentosa.

This root contains tannic acid and bitter extractive, and is astringent and tonic. It is best given in infusion (℥iss–Oj. Dose, a wineglassful). —W.]

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## [GILLENIA TRIFOLIATA, *Mœnch.*

### Indian Physic.

*Generic Character.*—*Calyx* subcampanulate, border 5-toothed. *Corolla* partly unequal. *Petals* 5, lanceolate, attenuated, coarctate at the claws. *Stamens* fewer, included. *Styles* 5, contiguous. *Stigmas* capitate. *Capsule* 5-celled; cells 2-seeded. (*Nuttall.*)

*Specific Character.*—*Leaves* tennate, upper folioles lanceolate, serrate, subequal; lower folioles obtuse, with an abrupt, acute termination. *Stipules* linear, entire. *Flowers* terminate, loosely paniculated, 5-gynous. *Petals* linear, lanceolate, obtuse. *Calyx* tubulose, campanulate, ventricose. *Stamens* included. *Capsule* 5-celled, many-seeded.

*Habitat.*—This species is found scattered over the United States from Canada to Florida, on the eastern side of the Alleghany Mountains, occurring in open hilly woods, in light gravelly soil. The period of flowering is May, and the fruit is matured in August. The flowers are white, or of a rose tint.

## GILLENIA STIPULACEA, *Nutt.*

*Specific Character.*—*Leaflets* lanceolate, deeply incised. *Stipules* small, awl-shaped, entire.

The *Gillenia stipulacea* replaces the G. trifoliata on the western side of the Alleghany range.

**Gillenia.** Mat. Med. List, U. S. P.

Fig. 166.

*Gillenia stipulacea.*

The root of Gillenia trifoliata and of Gillenia stipulacea.

The root is perennial, composed of a great number of fibres, arising from a common rough and irregular dark-colored tube or head. These fibres are about the thickness of straws, many inches in length, irregular in thickness, with somewhat of an undulated form. When dried, the root is of a reddish-brown color, wrinkled, and composed of an easily separable cortical portion and an internal ligneous cord. The external part is readily reduced to powder. It has a feeble odor and a bitter taste. It contains *starch*, *gum*, *resin*, *wax*, *fatty matter*, *red coloring matter*, *volatile coloring matter*, and *a peculiar principle* soluble in alcohol and the dilute acids, but insoluble in water and ether. It contains nothing like *emetina*, according to the statement of Dr. Staples.

*Therapeutics.*—Gillenia is a safe emetic, operating without violence in the appropriate dose. In small doses it is a stimulant and tonic to the stomach. It is stated that the knowledge of its medicinal operation was derived from the aborigines. The cases to which it is applicable are intermittent and remittent fevers, in the commencing stages, and bowel affections, as diarrhœa and dysentery. It may also be beneficial in some forms of dyspepsia.

*Administration.*—The mode of administration is in the form of powder or strong infusion. The dose of the powder is gr. xxx for its emetic effect; in doses of gr. ij or gr. iv it acts as a tonic.—W.]

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## [SAXIFRAGACEÆ, *De Cand.*

## HEUCHERA AMERICANA, *Linn.*

*Generic Characters.*—*Calyx* bell-shaped, coherent, with the ovary below. *Petals* small, entire. *Stamens* as many as the lobes of the calyx, namely, 5. *Pod* 1-celled, with two parietal placentæ.

*Specific Characters.*—*Scapes* glandular and more or less hirsute, with short hairs. *Leaves* roundish, with short rounded lobes and crenate teeth. *Flowers* small, loosely panicled. *Stamens* and *styles* exserted. *Calyx* regular, spatulate petals not larger than its lobes.

This plant is very common in rocky woods and clearings, and may be readily recognized by its long naked scapes, loosely panicled flowers, and its numerous radical peculiar leaves. It flowers in May and June.

*Habitat.*—Northern United States.

**Heuchera,** *Alum Root.* Secondary List, U. S. P.

The root of Heuchera Americana.

This root is a powerful astringent, and may be used whenever such a remedy is indicated. It is best exhibited in infusion, made with hot water.—W.]

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## LEGUMINOSÆ, *Jussieu.* THE LEGUMINOUS ORDER.

## MYROSPERMUM PEREIRÆ, *Royle.*

**The Balsam of Peru Tree.** Decandria Monogynia, *Linn. Syst.*

*Botanic Character.*—*Branches* terete, warty, ash-colored. *Leaves* alternate, petiolate, impari-pinnate; *leaflets* 5 to 11, alternate, on short petiolules, oblong or ovate, abruptly acuminate, emarginate, punctuated; *petiolules* and *midribs* covered with microscopic hairs. *Calyx* 5-toothed, persistent. *Petals* 5. *Stamens* 10. *Ovary* stipitate, membranous. *Fruit* a winged legume, 1-celled, 1-seeded; *fruit-stalk* winged above; *fruit* with *stalk* about $3\frac{1}{4}$ inches long; rounded and unequal-sided at the peduncular extremity, enlarged and rounded at the summit; *mesocarp* fibrous. *Seed* solitary; *cotyledons* yellowish, oily, with an agreeable odor.—Plate *Pharm. Journ.* vol. 10, page 282.

*Habitat.*—Near Sonsonate, in the State of Salvador, Central America.

**Balsamum Peruvianum,** *Balsam of Peru.* [Mat. Med. List, U. S. P.]

A balsam obtained from the stem by incision; from Salvador in Guatemala. [The prepared juice of Myrospermum peruiferum. (De Cand.) U. S. P.]

*Collection and Manufacture.*—The mode of obtaining balsam of Peru has been variously described at different times by pharmacologists. Dr. Dorat, in a letter to Mr. Hanbury (*Pharm. Journ.* vol. 5; 2d ser. p. 242) has described the mode in which it is now obtained at Juisnagua, near Sonsonate, as follows:—

"Early in the month of November or December, or after the last rains, the balsam-trees are beaten on the four sides of their stems with the back of an axe, a hammer, or other blunt instrument until the bark is loosened, four intermediate strips being left untouched that the tree may not be injured for the next year. Five or six days after, men with resinous torches, or bundles of lighted wood, apply heat to the beaten bark, which becomes charred. It is left eight days, during which the burnt pieces of bark either fall or are taken off. As soon as they perceive that the bare places are moist with the exuding balsam, which takes place in a few days, pieces of rag are placed so as entirely to cover the bare wood. As these become saturated with the balsam, which is of a light yellowish color, they are collected and thrown into an earthenware boiler, three-quarters filled with water, and stirred and boiled gently until the rags appear nearly clean, and the now dark and heavy balsam sinks to the bottom. Fresh rags belonging to the same owner are continually being

Fig. 167.

*Myrospermum peruiferum.*

put into the boiler until sun-down, when the fire is extinguished; when cold, the water in the boiler is poured off, and the impure balsam set aside. During this process the rags that appear to have been cleared of balsam are taken out of the boiler at different times and given to a man to be pressed, by which means much balsam is still obtained. The press consists of a small open bag about fourteen inches long, made of stout rope fixed together with twine, open at the middle and looped at both ends to receive two sticks. The rags are placed inside, and the whole is twisted round by means of the sticks and the balsam thus squeezed out. A washerwoman wringing out a wet cloth, fairly represents the process. The balsam thus procured is added to that in the boiler. The next day, the cold balsam is weighed and put into *tecomates* or gourds of different sizes and sent to market. If it is wished to purify it, the boiler is left standing for several days, when the impurities float to the surface and are skimmed off. A little water is also left to float at the mouth of the tecomate when brought for sale. These *tecomates* are tied up in plantain leaves, with a stopper of the same."

"A healthy tree will produce balsam well for about thirty years, after which, if allowed to remain untouched for five or six years, it will again produce. The collecting begins shortly after the last rains, that is, some time in November, and is supposed to begin in May. During the rains none is collected. In the dog-days, that is, from the 15th July to the 15th of August, there being scarcely any rain here, a small quantity is collected by a few enterprising Indians."

M. Victor le Nouvel, who has been engaged in collecting this balsam since 1836, gives the following as the process used by the Indians to obtain it: An incision is made into the tree of about two or three inches broad, and three to four inches long. They raise the bark from the wood, and apply cotton rags to it; a fire being lighted round the tree to liquefy the balsam. Fresh incisions are made higher and higher up the tree, till the cotton rags are quite saturated. It takes from ten to twelve days to effect this. The rags are next boiled; and when the liquid is cold, the balsam collects below.

*Commerce.*—Balsam of Peru is exclusively the produce of the state of Salvador. The average production is about 25,000 lbs. per annum. Sometimes it comes direct to Europe by way of Acajutla, at other times indirectly by Lima, Valparaiso, and other ports of the Pacific, or by Belize or Honduras on the Atlantic side of Central America. The balsam was originally supposed to be the produce of Peru, hence its name. This error arose from its originally coming to Europe by way of Peru.

*Officinal Characters.*—A reddish-brown or nearly black liquid, translucent in thin films; having the consistence of treacle, a balsamic odor, and an acrid slightly bitter taste; soluble in five parts of rectified spirit.

*Description.*—Balsam of Peru, called also *black* or *liquid balsam of Peru*, has a powerful but agreeable odor, somewhat similar to that of vanilla and benzoin, and which is increased by dropping the balsam on a red hot coal, and a warm, acrid, bitter taste. It is inflammable, and burns with a fuliginous flame. It is soluble in alcohol; the solution, however, is not clear, but lets fall after some time a deposit. To boiling water it yields its acid, which was formerly believed to be *benzoic*, but is now known to be *cinnamic*. Its specific gravity varies from 1.150 to 1.160.

*Adulteration.*—The demand for the balsam being small, the supply quite equal to or even exceeding the demand, and the price being moderate, are circumstances which appear to remove all motive for adulteration, which I do not think is at present practised in this country. When newly imported it generally contains a varying proportion of water, and in some cases other impurities; hence it is purified by allowing it to stand until these have separated. The characters to be attended to in judging of its genuineness are, the purity of its odor, its complete solubility in, or miscibility with, alcohol (by which the absence of fixed oil is shown), and its undergoing no diminution of volume when mixed with water (by which the absence of alcohol is proved). A sign of its purity is, that 1000 parts of it saturate 75 parts of pure crystallized carbonate of potash.

*Test.*—Undergoes no diminution in volume when mixed with water.

*Composition.*—The principal constituents of balsam of Peru are volatile oil, cinnamic acid, and resin. *Oil of Balsam of Peru: Cinnamein.*—If an alcoholic solution of potash be added to an alcoholic solution of balsam of Peru, a compound of resin and potash is precipitated, while cinnamate of potash and cinnamein are left in solution. On the addition of water the latter separates, and floats on the surface. It is to be purified by solution in rectified petroleum. Cinnamein is a colorless, strongly refracting oil, neutral, having a sharp taste, and a slightly aromatic odor, heavier than water, specific gravity 1.092, soluble in alcohol and ether, insoluble in water, and inflammable. Its composition is $C_{32}H_{14}O_4$. *Cinnamic Acid.*—This constituent has been mistaken for benzoic acid. It is obviously formed in the balsam by the oxidation of the hydruret of cinnamyle, just as hydruret of benzule is transformed into benzoic acid. In some specimens of balsam of Peru, the hydruret of cinnamyle has been entirely converted into cinnamic acid. (See **Oleum Cinnamomi.**) *Resin of Balsam of Peru.*—The quantity of resin in balsam of Peru continually increases. It is formed by the union of cinnamein with the elements of water, and gradually acquires different degrees of viscosity. Soft resin differs from the hard only in its smaller proportion of the elements of water.

*Physiological Effects.*—Stimulant, slightly tonic, expectorant, and detergent. Topically it operates as a stimulant and mild acrid; and when applied to foul or indolent ulcers, often cleanses them and promotes their cicatrization. Taken internally its stimulant influence is directed to the secreting organs, especially the bronchial mucous membrane.

*Therapeutics.*—It proves serviceable in some old asthmatic cases, chronic pulmonary catarrhs, winter coughs, &c. It seems to be principally adapted to *old-standing chronic affections of the mucous membranes* (especially the bronchial mucous membrane), particularly in persons of a cold and torpid habit. Its stimulant influence is calculated only to aggravate acute cases.

As a topical remedy, balsam of Peru is a very useful application. It is applied either alone, or in the form of ointment, to indolent ill-conditioned ulcers, and bed-sores. I have used it in some obstinate ulcerations about the nose. Dr. Ainslie speaks very highly of its powers of arresting the progress of sphacelous and phagedenic affections, so common and destructive in India. He recommends lint, soaked in the balsam, to be applied night and morning. In offensive discharges from the ear, it is now and then dropped in after syringing.

*Administration.*—Dose, fl. drm. ss to fl. drm. j. It may be taken on sugar, or made into pills with some absorbent powder, or diffused through water by means of sugar, honey, gum, or yelk of egg.

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## MYROSPERMUM TOLUIFERUM, *Richard.*

### Balsam of Tolu Tree.

Decandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A *tree* with warty although otherwise smooth branches. *Leaves* smooth; *leaflets* equal-sided, from 7 to 8, thin, membranous, ovate-oblong, acuminate, rounded at the base. *Calyx* campanulate, slightly 5-toothed. *Petals* 5, the upper one largest. *Stamens* 10, free. *Ovary* stalked, oblong, membranous, with 2–6 ovules; *style* towards the apex, filiform, lateral. *Legume* indehiscent, 1-celled, oblique, with winged expansions and a winged stalk, which is very broad at the apex.

*Habitat.*—Mountains of Tolu, Turbaco, and on the banks of the Magdalena, between Garapatas and Monpox, in New Granada.

**Balsamum Tolutanum,** *Balsam of Tolu.* [Mat. Med. List, U. S. P.]

A balsam obtained from the stem by incision; from the mountains of Tolu in New Granada.

*Production.*—Balsam of Tolu is procured by making incisions into the bark of the tree, and receiving the liquid balsam in vessels made of a black wax. It is afterwards transferred into proper vessels. It only exudes from the tree during the heat of the day.

*Commerce.*—Balsam of Tolu is sometimes brought direct from Carthagena, Santa Martha, and Savanilla; more commonly, however, it comes by way of New York or Jamaica. It is usually imported in cylindrical tin canisters; now and then in earthen pots or jars; still more rarely in small calabashes.

*Officinal Characters.*—A soft and tenacious solid, with a fragrant balsamic odor; soluble in rectified spirit.

*Description.*—Balsam of Tolu, when first brought over, is generally soft and tenacious, but by age becomes hard and brittle, somewhat similar to resin, and has a granular or somewhat crystalline appearance. Formerly it was imported in this hardened state, but is now usually met with in the soft state. It is transparent, has a reddish or yellowish-brown color, a most fragrant odor, though less powerful than that of storax or Peruvian balsam, and a pleasant sweetish taste. It softens under the teeth; when heated, it readily melts, takes fire, and burns with an agreeable odor. It is very soluble in alcohol and ether, and gives out its acid to water. The soft balsam contains more oil but less acid than the dry balsam, the acid and the resin being formed at the expense of the oil. Balsam of Tolu hardens or resinifies with much more facility than balsam of Peru.

*Adulteration.*—Ulex states that common resin is present, if the balsam, instead of dissolving in sulphuric acid, swells up, blackens and disengages sulphurous acid. When pure, the same author states, that if heated in sulphuric acid, it dissolves without engagement of sulphurous acid, and yields a cherry-red liquid. I do not think it is adulterated in this country.

*Composition.*—According to Frémy, the composition of balsam of Tolu is similar to that of balsam of Peru, its constituents being cinnamein, cinnamic acid and resin. They differ, according to the same chemist, from those of balsam of Peru by the greater facility with which they become resinified. *Resin of Balsam of Tolu.*—Is essentially the same as that of balsam of Peru, and, like it, also forms a fine red color with sulphuric acid; but it is less fusible than the resin of the last mentioned balsam.

*Physiological Effects and Uses.*—The effects of balsam of Tolu are similar to those of balsam of Peru, and the other balsamic substances. It is employed as a stimulating expectorant in chronic bronchial affections, unaccompanied with inflammatory action. It is, however, more frequently used as an agreeable flavoring adjunct to pectoral mixtures. The vapor of the ethereal solution of the balsam has been inhaled in chronic affections with benefit. *Tolu lozenges* form a popular and pleasant remedy for appeasing troublesome cough.

*Administration.*—Dose, gr. x to gr. xxx. It may be taken in the form of an *emulsion*, made with gum or sugar.

*Pharmaceutic Use.*—Balsam of Tolu is a constituent of compound tincture of benzoin.

### *Officinal Preparations.*

SYRUPUS TOLUTANUS [U.S.], *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. ["Take of tincture of Tolu, two fluidounces; carbonate of magnesia, one hundred and twenty grains; sugar, in coarse powder, twenty-six troyounces; water, a pint. Rub the tincture of Tolu first with the carbonate of magnesia, and two troyounces of the sugar, then with the water, gradually added, and filter. To the filtered liquid add the remainder of the sugar, and, having dissolved it with the aid of a gentle heat, strain the solution while hot." U. S.]

Employed as an agreeable flavoring adjunct to pectoral mixtures.

*Dose.*—Fl. drm. j to fl. drs. ij.

TINCTURA TOLUTANA [U. S.], *Tincture of Tolu.*—Take of balsam of Tolu, two ounces and a half; rectified spirit, one pint. Macerate for six hours, or until the balsam is dissolved; then filter, and add sufficient rectified spirit to make one pint. ["Take of balsam of Tolu, three troyounces; alcohol, two pints. Macerate the balsam with the alcohol until it is dissolved; then filter through paper." U. S.]

A stimulating expectorant, principally used as a flavoring adjunct to other pectorals. Its use is, of course, objectionable in inflammatory cases. When mixed with water, the resin is precipitated; hence it should be rubbed with mucilage, or some viscid liquor, before adding the water, to keep the resinous precipitate in suspension.

*Dose.*—Min. xxx to fl. drm. j.

Tincture of Tolu is contained in several of the officinal Trochisci.

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## SAROTHAMNUS SCOPARIUS, *Wimmer.*

### Common Broom.

Monadelphia Decandria, *Linn. Syst.*

*Botanic Character.*—A *shrub* from 3–8 feet high. *Branches* angular, without spines. *Leaves* ternate, except towards the upper part, where they are generally simple; *leaflets* oblong. *Flowers* yellow, axillary, solitary, stalked, papilionaceous. *Calyx* bilabiate, the upper lip with 2, the lower with 3 teeth. *Standard* large, ovate; *keel* obtuse. *Stamens* 10, monadelphous. *Style* long, curved, thickened upwards, channelled within; *stigma* terminal, capitate, small; *Legume* flat.—*Woodv.* Plate 89, page 243. (*Sparitum scoparium*).

*Habitat.*—Indigenous; growing on dry hills and bushy places. Flowers in June.

### Scoparius, *Broom Tops.* [Mat. Med. List, U. S. P.]

The tops, fresh and dried; from indigenous plants.

["The tops of Cytisus scoparius (*De Candolle*)." U. S.]

*Officinal Characters.*—Straight angular dark-green smooth tough twigs, of a bitter nauseous taste, and of a peculiar odor when bruised.

*Composition.*—Dr. Stenhouse has noted the existence of two peculiar principles in the broom; *one* a neutral principle (Scoparin); and the *other* a volatile liquid alkaloid (Sparteine, or Spartia). *Scoparin*, $C_{20}H_{11}O_{10}$, when pure, is a yellow substance which crystallizes in needles. It is obtained by purifying the gelatinous matter, which is formed in a concentrated watery extract of broom, after it has stood for one or two days in a cold place. It is soluble in water and alcohol, and is without any bitter taste. The experiments of Stenhouse lead to the belief that scoparin is the diuretic principle of broom-tops. The dose of scoparin required to produce a decidedly diuretic effect is five grains, repeated at intervals. It does not appear to be at all poisonous or injurious. *Spartia*, $C_{15}H_{13}N$, was obtained by distillation from the mother-waters of the scoparin. It is a colorless oily liquid at first, but becomes brown by exposure to light. It forms crystalline salts with bichloride of platinum, terchloride of gold, &c., and these, as well as spartia itself, have a very bitter taste. It is regarded by Stenhouse as a narcotic principle. It is not quite so poisonous as conia or nicotia, but it produces in small doses a species of violent intoxication, followed by a profound slumber, from which the animal cannot be roused for a long time without great difficulty. Further experiments are, however, required upon these two principles, not only as regards their physiological effects, but likewise upon their composition and properties.

*Physiological Effects.—In large doses* broom tops are emetic and purgative. *In small doses* they are diuretic and mildly laxative. As a diuretic they have been celebrated by Mead and Cullen. Having very frequently employed broom in dropsies, I can add my testimony to its powerful effects as a diuretic. I cannot call to mind a single case in which it has failed to act on the kidneys. In some cases it produced a most marked and beneficial effect on the dropsical effusion. According to my experience, it is more certain than any other diuretic in dropsies.

*Therapeutics.*—It has been principally or solely employed in dropsies, and, as already mentioned, sometimes with great benefit. Of course its chance of cure depends on the nature of the cause of the dropsical effusion. In acute inflammatory cases, as well as in diseased kidney, its use might be objectionable.

*Administration.*—Broom tops are usually given in the form of *decoction.* To promote the operation of broom, diluents should be freely used.

### *Officinal Preparations.*

Decoctum Scoparii, *Decoction of Broom.*—Take of broom tops, dried, half an ounce; distilled water, half a pint. Boil for ten minutes in a covered vessel, and strain. The product should measure about eight ounces.

Diuretic.

*Dose.*—Fl. oz. j to fl. oz. ij.

Succus Scoparii, *Juice of Broom.*—Take of fresh broom tops, seven pounds; rectified spirit, a sufficiency. Bruise the broom tops in a stone mortar; press out the juice; and to every three measures of juice, add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place.

Diuretic.

*Dose.*—Fl. drm. j to fl. drs. ij.

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## INDIGOFERA TINCTORIA, *Linn.*

### Common East Indian Indigo.

Diadelphia Decandria, *Linn. Syst.*

*Botanic Character.*—A small *shrubby plant. Stem* erect, branched, pubescent; *branches* round. *Leaves* pinnate; *leaflets* 4–5 pairs, oval, nearly smooth beneath. *Flowers* in axillary racemes, which are shorter

Fig. 168.

*Indigofera tinctoria.*

than the leaves. *Calyx* 5-cleft, with acute lobes. *Standard* roundish, emarginate; *keel* at length bending back with elasticity. *Stamens* 10, diadelphous. *Style* filiform, smooth. *Legumes* nearly cylindrical, curved, deflexed. *Seeds* about 10, truncated.—*Wight*, *Icon. Pl. Ind. Or.* vol. ii. p. 365.

*Habitat.*—East and West Indies, and tropical Africa. Extensively cultivated in India.

**Indigo** (Appendix B. 1). $C_{16}H_5NO_2$.

A blue pigment prepared from various species of Indigofera.

*Description.*—In the East Indies *Indigofera tinctoria* is commonly cultivated for the purpose of preparing indigo. Indigo is formed from the plants by fermentation. During the fermentation, the indigo is deposited as a feculent matter. Lime water promotes its separation. Blue indigo does not exist in the plants previous to fermentation; it is, therefore, a product, not an educt of them. Commercial indigo is principally brought from the East Indies, but a considerable quantity is imported from Guatemala, and other places. It usually occurs in cubical cakes of an intense blue color. Rubbed with a smooth hard body (as the nail), it assumes a coppery or bronze hue. It is insoluble in water, cold alcohol, ether, diluted sulphuric or hydrochloric acids, weak alkaline solutions, and cold oils (both fixed and volatile). When heated to about 550° F. it evolves a reddish, violet vapor (vapor of *indigotin*), which condenses in minute crystals. This distinguishes it from Prussian blue. Deoxidizing agents (as protosulphate of iron, sesquisulphuret of arsenic, the process of fermentation, &c.) destroy its blue color by abstracting oxygen from the indigotin, and converting it into *indigogen*, or *white indigo*; which, by exposure to the air, attracts oxygen, and again becomes blue. Chlorine and the hypochlorites destroy the blue color of indigo. Heated with sulphuric acid it yields a deep blue liquid, commonly termed *sulphate of indigo*.

*Use.*—Indigo has been introduced into the Pharmacopœia, solely for testing.

### *Officinal Preparation.*

Solution of Sulphate of Indigo ($HO,C_{16}H_4NO,2SO_3$).—Take of indigo, five grains; pure sulphuric acid, one fluidrachm; distilled water, ten fluidounces. Mix the indigo and the sulphuric acid in a small test tube, and apply the heat of a water bath for an hour. Pour the blue liquid into the distilled water, agitate the mixture, and, when the undissolved indigo has subsided, decant the clear liquid into a stoppered bottle.

Employed to indicate the presence of free chlorine.

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## GLYCYRRHIZA GLABRA, *Linn.*

### Common Liquorice.

Diadelphia Decandria, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, round, running to a considerable distance. *Stem* herbaceous, erect, smooth, 4 or 5 feet high. *Leaves* pinnate, with stipules; *leaflets* about 13, oval or somewhat ovate, slightly retuse, viscid beneath. *Racemes* axillary, erect, shorter than the leaves. *Flowers* papilionaceous, bluish, or purplish, distant. *Calyx* tubular, 2-lipped. *Stamens* 10, diadelphous. *Style* filiform. *Legume* smooth, compressed, 3–4 seeded. *Steph. and Church.* Plate 134.

Fig. 169.

*Glycyrrhiza glabra.*

*Habitat.*—South of Europe. Cultivated at Mitcham in Surrey, and at other places, for medicinal use.

**Glycyrrhiza**, *Liquorice Root.* [Mat. Med. List, U. S. P.]

The root or underground stem, fresh and dried; cultivated in England.

*Officinal Characters.*—In long cylindrical branched pieces, an inch or less in diameter, tough and pliable; of a grayish-brown color externally, yellow internally, without odor, of a sweet mucilaginous and slightly acrid taste.

*Description.*—The underground stem is denominated *liquorice-root.* It is in pieces about the thickness of the finger. Its odor is rather sickly and earthy: its taste remarkably sweet. The epidermis possesses a slight degree of acridity; hence for medicinal use the root would be better *decorticated.*

*Composition.*—The principal constituents of the fresh root are, glycyrrhizin, resinous oil, gum, &c. *Glycyrrhizin* (*Liquorice Sugar*).—Belongs to the uncrystallizable sugars which are not susceptible of vinous fermentation. It is characterized by its affinity for acids, with which it unites to form compounds which are very slightly soluble only in water. It is yellow and transparent, and has the sweet taste of the root. It is soluble in both water and alcohol. Acids precipitate it from its solution.

It combines also with bases, as well as with salts. It causes precipitates with many metallic solutions. *Resinous Oil.*—To this constituent, liquorice root owes the slight degree of acridity which it possesses.

*Physiological Effects.*—Liquorice root and its extract are emollient, demulcent, and nutritive.

*Therapeutics and Pharmaceutic Uses.*—It is employed as an emollient and demulcent in catarrhal affections of the mucous membranes. It is also used as a flavoring adjunct to other medicines. Its powder is employed in the preparation of pills, either to give them a proper consistence, or to prevent their adhesion. It is used for these purposes as an ingredient in confection of turpentine, compound decoction of sarsaparilla, infusion of linseed, mercurial pill, pill of iodide of iron, and tincture of aloes.

## *Officinal Preparation.*

EXTRACTUM GLYCYRRHIZÆ [Mat. Med. List, U. S. P.], *Extract of Liquorice.*—Take of liquorice root, in coarse powder, one pound; distilled water, a sufficiency. Macerate the liquorice root in eight fluidounces of the water for twelve hours; then pack in a percolator and add more distilled water, until the root is exhausted. Heat the liquor to 212° and strain through flannel; then evaporate by a water-bath to a proper consistence.

Extract of liquorice is extensively imported from Spain, Italy, France, &c., under the name of *liquorice juice*, or according to the countries from whence it is brought, *Spanish*, or *Italian juice*. *Solazzi juice* is most esteemed. The Spanish extract is prepared in Catalonia from *G. glabra;* while the Italian extract is obtained in Calabria from *G. echinata.* It comes in cylindrical rolls, enveloped in bay leaves, and occasionally in masses or "*blocks*," the latter being generally superior to the stick. When pure it is black and dry, with a glossy fracture and a sweetish taste; and is completely soluble in water. As met with in commerce, it is rarely pure. None of these extracts, however, are equal to the officinal extract, when properly prepared, and they ought not to be substituted for it. Extract of liquorice is dissolved slowly in the mouth, to appease tickling cough. It is a very agreeable flavoring adjunct to other medicines. As it easily becomes soft by warmth, it does not answer well as a pill basis.

*Dose.*—Gr. x to gr. lx.

*Pharmaceutic Use.*—It is employed as a flavoring ingredient in compound decoction of aloes, confection of senna, and opium lozenges.

[MISTURA GLYCYRRHIZÆ COMPOSITA, *Compound Mixture of Liquorice.*—"Take of liquorice, in fine powder, sugar, in coarse powder, gum arabic in fine powder, each, half a troyounce; camphorated tincture of opium, two fluidounces; wine of antimony, a fluidounce; spirit of nitrous ether, half a fluidounce; water. twelve fluidounces. Rub the liquorice, sugar, and gum arabic with the water, gradually added; then add the other ingredients, and mix the whole together." U. S. This preparation is a very popular cough medicine, under the name of brown mixture. It is a demulcent, anodyne and slightly sedative expectorant, with a tendency to promote the action of the skin, and is suitable rather to the stage of commencing secretion than to the dry stage of catarrh. Dose f℥ss.—W.]

## ASTRAGALUS VERUS, *Olivier.*

### The Tragacanth Plant.

Diadelphia Decandria, *Linn. Syst.*

*Botanic Character.*—A small *shrub.* *Branches* covered with imbricated scales and spines, the remains of former petioles. *Leaves* pinnate; *leaflets* 8–9 pairs, linear, hispid. *Flowers* axillary, in clusters of 2–5, sessile, yellow, papilionaceous. *Calyx* obtusely 5-toothed, tomentose. *Corolla* with an obtuse keel. *Stamens* 10, diadelphous. *Legume* 2-celled, or half 2-celled by the turning inwards of the dorsal suture.—*Nees, Plant. Med.* Plate 322.

*Habitat.*—Asia Minor, Armenia, and Northern Persia. According to Olivier the tragacanth of these countries, forming the greater part of the tragacanth of Europe, is yielded by this species.

According to Labillardière, the white or best tragacanth is yielded by *Astragalus gummifer*, which grows in Lebanon and Kurdistan; but no flaky tragacanth is imported into this country from Syria, Persia, or Bombay.

### Tragacantha, *Tragacanth.* [Mat. Med. List, U. S. P.]

A gummy exudation from the stem of Astragalus verus, and possibly other species; collected in Asia Minor.

Nothing certain is known as to the species of Astragalus yielding commercial tragacanth; it is, however, quite clear, that other species besides the two mentioned above produce a similar gum, but the officinal flaky tragacanth appears to be derived, as stated in the Pharmacopœia, from more especially *Astragalus verus.*

*Production.*—Tragacanth exudes naturally from the stem of the species of Astragalus, and a portion of the inferior commercial tragacanth is thus derived, but the finest tragacanth is now obtained, according to Maltass, as follows: "In July and August the peasants clear away the earth from the lower part of the stem of shrub, and make several longitudinal incisions with a knife in the bark; the gum exudes the whole length of the incision, and dries in flakes; three or four days are sufficient for this purpose, and the gum is then collected. In some places also the peasants occasionally puncture the bark with the point of the knife. If the weather be hot and dry, the gum is white and clean; but if the atmosphere be damp and the heat but moderate, the gum requires a longer time to dry, and assumes a yellow or brown tinge." At the same time the peasants pick off the gum which exudes naturally, and this chiefly constitutes the commoner sorts of tragacanth of English commerce.

*Commerce.*—Tragacanth is imported from Smyrna and other ports of the Levant. The best comes from Smyrna. The several kinds of tragacanth are mixed together when they arrive at Smyrna, and are separated by picking and sorting.

*Officinal 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.

*Description.*—Tragacanth is commonly called in the shops *gum dragon.* It is hard, odorless, tasteless, swelling considerably in water, and forming a thick, tenacious mucilage. Two kinds of it are more especially known. 1. *Flaky Tragacanth: Smyrna Tragacanth* (Martius). This is the tragacanth usually found in English commerce, and which alone corresponds to the officinal description. It occurs in moderately large, broad, thin pieces, marked with arched or concentric elevations. According to Maltass the white broken fragments of this constitute what is termed *vermicelli tragacanth*. 2. *Vermiform Tragacanth: Morea Tragacanth* (Martius).—This variety is rarely met with in this country, but is common on the continent. It occurs in small, twisted, filiform, spiral pieces. A third kind of tragacanth is also distinguished as *common* or *sorts*.

*Adulterations.*—Maltass states that tragacanth is mixed with two other gums, collected in Caramania and Armenia, and termed Caramania and Moussul gums respectively. These gums are previously broken into irregular pieces and whitened with carbonate of lead. They are easily detected in flaky tragacanth (in which, however, they rarely occur) by their appearance, as neither of them occur in flaky pieces.

*Composition.*—Two distinct principles have been found in tragacanth, namely, tragacanthin, and bassorin. It also contains a little starch. *Tragacanthin: soluble gum* or *arabin of tragacanth.*—The soluble gum of tragacanth is usually regarded as similar to gum arabic, and hence it is called arabin; but is distinguished by silicate of potash and perchloride of iron producing no change in it, and by the peculiar appearance of the precipitate produced with alcohol (the precipitate is flocculent, and collects in a similar opaque and mucous mass). In common with arabin, it produces precipitates with subacetate of lead, chloride of tin, and protonitrate of mercury. *Bassorin or insoluble gum.*—Is distinguished by its insolubility in water, both hot and cold. It absorbs water and swells up. It is soluble in alcohol. 100 parts treated by 1000 of nitric acid furnished 22.61 of mucic acid, with a little oxalic acid.

*Tests.*—After maceration in cold water, the fluid portion is not precipitated by the addition of rectified spirit, and the gelatinous mass is not turned deep blue by tincture of iodine.

*Physiological Effects.*—Tragacanth is emollient and demulcent.

*Uses.*—Tragacanth, in powder, is used rather as a vehicle for active and heavy medicines (as calomel), than on account of its own proper effects. [Either in the form of powder or mucilage, tragacanth enters into the composition of most of the troches of the U. S. Pharmacopœia. Its slowness of solution and the density of its mucilage fit it particularly for this use.—W.]

## *Officinal Preparations.*

Mucilago Tragacanthæ [U. S.], *Mucilage of Tragacanth.*—Take of tragacanth, one hundred grains; boiling distilled water, ten fluidounces. Macerate for twenty-four hours, then triturate, and express through calico. [" Take of tragacanth, a troyounce; boiling water, a pint. Macerate the tragacanth with the water for twenty-four hours, occasionally stirring; then rub them together so as to render the mixture uniform, and strain forcibly through muslin." U. S.]

Employed in making pills and lozenges; also to suspend heavy powders, as the metallic oxides, in water. It has also been recommended as an application to burns.

*Dose.*—Fl. drm. j or more.

Pulvis Tragacanthæ Compositus, *Compound Powder of Tragacanth.*—Take of tragacanth, in powder, one ounce; gum arabic, in powder, one ounce; starch, one ounce; refined sugar, in powder, three ounces. Rub them well together.

Employed as a vehicle for the exhibition of active and heavy powders to children, and as a demulcent agent in irritation of the mucous membranes. Dose for an adult, gr. xx to gr. lx.

## [MUCUNA PRURIENS, *De Cand.*

*Generic Character.*—*Calyx* campanulate, 2-lipped; the lower lip trifid, with acute segments, the middle one the longest; the upper lip broader, entire. *Vexillum* ascending, shorter than the alæ and keel; *alæ* oblong, as long as the keel; *keel* oblong, straight, acute. *Stamens* diadelphous; *anthers* 10, of which 5 are oblong-linear, and 5 ovate, hirsute. *Legume* oblong, knotted, 2-valved, with cellular partitions. *Seeds* roundish, surrounded by a circular linear hilum. Twining *herbs* or *shrubs*. *Leaves* pinnately trifoliate. *Racemes* axillary. (De Cand.)

Fig. 170.

*Mucuna pruriens.*

*Specific Character.*—*Flowers* in racemes. *Legumes* stinging, with somewhat keeled valves. *Leaflets* hairy beneath, acuminate; the middle one rhomboidal, the lateral ones dilated externally. (De Cand.) *Root* perennial. *Stem* herbaceous. *Flowers* with a disagreeable alliaceous odor; *vexillum* flesh-colored; *alæ* purple or violet; *keel* greenish-white.

*Habitat.*—West Indies.

### Mucuna, *Cowhage.* Secondary List, U. S. P.

The hairs of the pods of Mucuna pruriens.

The legume of the Mucuna pruriens is of a brownish color, is shaped like the letter ʃ, about four or five inches long, contains from four to six seeds, and is clothed with strong, brown, bristly stinging hairs, which, examined by the microscope, appear like porcupine's quills, but are slightly notched or serrated towards the point. The hairs contain tannic acid.

*Therapeutics.*—A decoction of the root or of the legumes is said to be diuretic, and was formerly used in dropsy. The setæ applied to the skin produce intolerable itching, and, in some persons, pain, redness, swelling, and even an eruption. These effects, which are increased by rubbing, but diminished by the application of oil, are referable to the mechanical properties of the setæ.

*Uses.*—The setæ have been celebrated for their anthelmintic properties. Their action is supposed to be mechanical; that is, they are supposed to pierce and torment intestinal worms, and thereby to oblige them to let go their hold. In support of this explanation, Mr. Chamberlaine tells us he sprinkled some of the hairs in a calabash full of very large round worms (Ascaris lumbricoides), and that in a little time the animals began to writhe and twist about, evincing thereby extreme torture. On examining them with a magnifying-glass, the hairs were found sticking loosely in various parts of their bodies. Their usual want of action on the intestines is ascribed to the mucous secretion which defends the subjacent membrane from injury. In one case diarrhœa followed the use of a very large dose of the electuary, and in another instance enteritis came on after taking this preparation once; but it is not certain that these were the consequences of the operation of the hairs.

Cowhage has been principally celebrated for expelling the large round worm (*Ascaris lumbricoides*) and the small thread-worm (*A. vermicularis*). It has not proved equally serviceable against the tapeworm (*Tænia solium*.)

*Administration.*—The best mode of exhibiting the setæ is in treacle, syrup, or honey. The quantity of hairs should be sufficient to give the syrup or treacle the consistence of honey, or of an electuary; and of this mixture a teaspoonful may be given to children, and a tablespoonful to adults; this dose should be taken twice a day, namely, at going to bed, and in the morning an hour before breakfast. Chamberlaine says it usually operates more effectually where a gentle emetic has been premised. After continuing the electuary for three or four days, a brisk purgative of jalap or senna should be taken, which will in general bring away the worms.—W.]

## PTEROCARPUS, *Linn.*

Monadelphia Decandria, *Linn. Syst.*

*Generic Character.*—*Sepals* 5, cohering to form a 5-toothed calyx. *Petals* 5, forming a papilionaceous corolla. *Stamens* 10; the *filaments* variously combined. *Legume* indehiscent, irregular, somewhat orbicular, surrounded by a wing, 1-seeded. Unarmed *trees* or *shrubs*. *Leaves* unequally pinnated.

## PTEROCARPUS SANTALINUS, *Linn. Fil.*

### The Red Sandal Wood Tree.

*Specific Character.*—A lofty *tree*. *Leaflets* 3 (rarely 4 or 5?), roundish, retuse, glabrous. *Racemes* axillary, simple or branched. *Flowers* yellow, with red veins. *Petals* long-clawed, all waved or curled on the margins. *Stamens* combined into a sheath, split down to the base on the upper side, and half way down on the lower. *Legume* long-stalked, surrounded by a broad, membranous wing, obtuse at the base. 1 or rarely 2-seeded.—*Woodv.*, pl. 254.

*Habitat.*—Mountains of Coromandel and Ceylon.

### Pterocarpus, *Red Sandal-Wood.*

### [Santalum, *Red Saunders.* Mat. Med. List, U. S. P.]

The wood; from Coromandel and Ceylon.

*Officinal 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 odor, and an obscurely astringent taste. Also chips of the same.

*Description.*—*Red Sandal* or *Red Saunders Wood* is imported in roundish or somewhat angular billets. It is compact, of a fibrous texture, but is capable of taking a fine polish; almost tasteless and inodorous, except when rubbed, when it emits a feeble smell. It scarcely communicates color to water. Alcohol, as well as alkaline solutions, readily extract the coloring matter. The alkaline solution is violet-red, and forms a precipitate (santalin) on the addition of acids. The alcoholic solution produces precipitates with several metallic solutions; thus, violet with solutions of lead, scarlet with corrósive sublimate, and deep violet with sulphate of iron.

*Composition.*—Red sandal wood contains a peculiar coloring matter, called santalin and gallic acid. *Santalin*, or *santalic acid*, is a dark red crystalline substance, almost insoluble in water, but soluble in alcohol, alkaline solutions, ether, acetic acid, and slightly so in some of the volatile oils (as the oils of lavender and rosemary). It has an acid reaction and is without taste or odor. The effects produced on its alcoholic and alkaline solutions by salts, &c. are similar to those above mentioned on the tincture of the wood.

*Use.*—It is only employed in medicine as a coloring agent. The only officinal preparation into which it enters is compound tincture of lavender. [Red saunders enters into the composition of Spiritus Lavandulæ Compositus, U. S., Tinctura Cinchonæ Composita, U. S., and Tinctura Rhei et Sennæ, U. S.—W.]

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## PTEROCARPUS MARSUPIUM, *Roxb.*

### The Indian Kino-Tree.

*Specific Character.*—A leafy *tree*, with the outer coat of the bark brown; and the inner red, fibrous, and astringent. *Branches* smooth. *Leaves* alternate; *leaflets* 5–7, alternate, elliptical, rather emarginate,

Fig. 171.

*Pterocarpus marsupium.*

leathery, smooth. *Panicles* terminal. *Flowers* white, with a tinge of yellow. *Calyx* smooth. *Stamens* monadelphous. *Legume* with the upper side straight, and the under three-fourths round, the whole winged, one or two-celled. *Seed* kidney-shaped.—*Roxb. Coroman.* vol. 2, plate 116.

*Habitat.*—Circar mountains, and forests of the Malabar coast.

### Kino, *Kino.* [Mat. Med. List, U. S. P.]

The juice obtained from incisions in the trunk, inspissated; imported from Malabar.

*Officinal 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.

*Description.*—*East Indian kino*, sometimes called *Amboyna kino*, occurs in fragments, the larger of which appear almost black, the smaller being reddish. When entire they are opaque, but in thin laminæ are transparent and ruby-red. They are brittle between the fingers, soften in the mouth, and stick to the teeth. Both water and alcohol acquire, by digestion on kino, a deep red color. The aqueous decoction becomes turbid on cooling. The alcoholic solution has an acid reaction on litmus. It is quite insoluble in ether. The mineral acids and solutions of gelatin, tartarated antimony, acetate of lead, perchloride of iron, and nitrate of silver, produce precipitates with the watery infusion.

*Composition.*—Kino contains catechine, a substance already noticed as a constituent of catechu, a peculiar kind of tannin, red gum, &c.

*Physiological Effects.*—Astringent. Less effective, and less readily dissolved in the alimentary juices, than catechu, to which in its operation it is closely allied.

*Therapeutics.*—Employed in medicine as an astringent only; principally in obstinate chronic diarrhœa. In this disease it is usually given in combination with chalk, and frequently with opium. It has also been administered as an astringent in leucorrhœa and sanguineous exhalations. As a topical astringent it has been applied to flabby ulcers, and used as a gargle, injection, and wash.

*Dose.*—Gr. x to gr. xxx.

*Pharmaceutic Use.*—Kino is a constituent of compound powder of catechu.

### *Officinal Preparations.*

Pulvis Kino cum Opio, *Powder of Kino and Opium* (*Pulvis Kino Compositus, Lond.*).—Take of kino, in powder, three ounces and three-quarters; opium, in powder, a quarter of an ounce; cinnamon, in powder, one ounce. Mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

Twenty grains of this powder contain one grain of opium. This powder is employed as an astringent in chronic diarrhœa and pyrosis.

*Dose.*—Gr. v to gr. xx.

Tinctura Kino [U. S.], *Tincture of Kino.*—Take of kino, in moderately fine powder, two ounces; rectified spirit, one pint. Macerate for seven days, filter, and add sufficient rectified spirit to make one pint. ["Take of kino, in fine powder, three hundred and sixty grains; alcohol, water, each, a sufficient quantity. Mix two measures of alcohol with one of water. Then mix the powder thoroughly with an equal bulk of dry sand, and having introduced the mixture into a conical glass percolator, gradually pour the menstruum upon it until half a pint of tincture is obtained." U. S.]

Astringent. Used in diarrhœa and hemorrhages, generally as an adjunct to the chalk mixture.

[When kept for some time, the tincture of kino gelatinizes owing to the oxidization and consequent conversion into an inert apotheme of its tannic acid. It undergoes this change much more readily than the tincture of catechu.—W.]

*Dose.*—Fl. dr. j to fl. drs. ij.

## ACACIA, *DC.*

Polygamia Monœcia, *Linn. Syst.*

*Generic Character.*—*Flowers* polygamous; yellow, white, or rarely red; capitate. *Calyx* 4–5-toothed. *Petals* 4–5, either free or cohering to form a 4–5-cleft corolla. *Stamens* varying in number, 10–200. *Legume* continuous, juiceless, 2-valved. *Shrubs* or *trees*. *Thorns* stipular, scattered, or none.

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## ACACIA ARABICA, *Willd.*

*Specific Character.*—A small *tree*. *Spines* in pairs. *Branches* and *petioles* pubescent. *Pinnæ* 4–6 pairs; *pinnules* 10–20 pairs, oblong-linear, with a gland beneath the inferior and often between the last pinnæ. *Flowers* in globose, stalked, axillary, subternate heads. *Legume* moniliform. *Flower-heads* yellow.

*Habitat.*—A native of Senegal, Egypt, Nubia, and Arabia.

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## ACACIA VERA, *Willd.*

Middling-sized *tree*. *Spines* in pairs. *Branches* and *leaves* smooth. *Pinnæ* 2 pairs; *pinnules* 8–10 pairs, oblong-linear; with a gland between the pinnæ. *Flowers* in globose heads; heads about two together, stalked, axillary, bright yellow. *Legume* moniliform.

*Habitat.*—A native of Arabia, and of Africa from Senegal to Egypt.

Fig. 172.

*Acacia arabica.*

### **Acacia**, *Gum Arabic.*
### [Mat. Med. List, U. S. P.]

A gummy exudation from the stem of one or more undetermined species of Acacia, *Linn.;* collected chiefly in Cordofan in Eastern Africa, and imported from Alexandria.

*Source and Commerce.*—[There is still a little uncertainty with respect to the species, but none with respect to the country, which produces the officinal gum arabic. Although this bears the name of Arabic and Turkey gum, "none is collected, and very little produced in Arabia" (*Malcomson*); and the name of Turkey gum can only have been given to it in consequence of its exportation from Turkish ports. Gum arabic, having the officinal characters, is not imported unmixed, but arrives in serons from Alexandria mixed with gum which is more or less brown, but agrees with it in all other respects (brown gum arabic), and with other gums, some of which may be the produce of the same tree collected at a different season, while others appear to be specifically distinct. From these the white officinal gum is separated by picking, and then constitutes the *Gummi electum* of druggists. While, therefore, the Alexandrian gum may be the produce of more than one species, there is every reason to conclude that the officinal gum, which is very constant and uniform in its characters, is the produce of a single species, which is most probably *A. arabica*, *Willd.* Adanson, indeed, calls this species, which he found growing by the river Senegal, *Gommier rouge*, and states that it yields a reddish, slightly bitter, transparent, gummy juice; but this difference in the produce of the west and east of Africa may arise from difference of climate, for Ehrenberg states that the characters of gum from the same species of Acacia are liable to considerable variation, and that *the same tree* may yield a transparent or an opaque, a light or a dark-colored gum. Part of the Alexandrian gum, as imported, is transparent, and has a pink tinge, yet, if exposed to a moderate heat, it becomes cracked and opaque and yellowish-brown, and then resembles brown gum arabic. At all events Adanson's name, even if it were given to the same variety of *A. arabica*, cannot outweigh the testimony of Figari and Pallme, who visited the countries where the gum is collected, and whence it is carried to Alexandria for exportation, and saw the trees which produce it. M. Figari, whose collections in Middle Egypt, Nubia, and in the provinces of Cordofan and Tarogli, have been described by Mr. Barker Webb, "found *A. nilotica*, Del. (*A. arabica*, Willd.) most abundant throughout all Nubia, where it produces true gum arabic. It grows," he says, "in all the valley of the Nile, but produces no gum in Egypt, on account of the climate." Pallme (*Travels in Kordofan*) states that "the gum tree of Kordofan (termed in books *Mimosa nilotica*) differs from the Mimosa nilotica (*A. vera*, Willd.) in the shape of the tree, the form of its leaves, and even in its spines; and thus, while the latter yields only ordinary gum, that obtained in Kordofan is of the finest quality. 10,000 to 14,000 cwt. of gum is annually conveyed on camels from Bara in Kordofan to Dongola on the Nile, whence it is carried to Cairo (and Alexandria) and thence distributed to Europe. Much is also conveyed to Aden and other ports on the Red Sea, whence it is exported to Bombay, and thence brought to this country." This is the most trustworthy information hitherto obtained, being commercial as well as botanical.—Ed.] According to other authorities, gum arabic is chiefly obtained from *A. tortilis* and *A. Ehrenbergii*, but these species are imperfectly known. The gum flows in the liquid state from the trunk and branches, and hardens by exposure to the air. It usually exudes spontaneously, but the discharge is stated to be sometimes facilitated by incisions.

*Officinal Characters.*—In spheroidal tears from half an inch to an inch in length, nearly white, and opaque from numerous minute cracks, or in shining fragments; brittle, bland, and mucilaginous in taste, soluble in cold water. The solution forms with subacetate of lead an opaque white jelly.

*Description.—Gum Arabic, Turkey, or Alexandrian Gum.*—This is imported from Leghorn, Malta, Trieste, Gibraltar, Smyrna, Alexandria, Beyrout, Constantinople, &c. *It is the only officinal kind of gum.* It occurs in rounded tears, or amorphous or angular pieces, varying in size from a pea to that of a walnut, or even larger than this; some of the pieces being transparent, others more or less opaque, from innumerable cracks extending through them. It has a glassy lustre, is white, yellow, or wine-yellow, and has no odor, or, if any, an acid one, and a slightly sweetish taste. It may be readily broken into small fragments. It is entirely soluble both in hot and cold water, the solution having the property of reddening litmus, and being feebly opalescent. The solution in water also yields, with subacetate of lead, a white precipitate, but none with acetate of lead. Alcohol added in excess precipitates the gum from it. When a concentrated solution of neutral perchloride of iron is dropped into a strong solution of gum, and the mixture stirred, the whole becomes, in a few minutes, a brown, semi-transparent jelly. Protonitrate of mercury, also, produces a precipitate.

*Adulteration.*—Several inferior and cheaper gums, chiefly obtained from other species of Acacia, are sometimes mixed with, or substituted for Turkey or Arabic gum; as Barbary, Senegal, Cape, East Indian, and Australian gums. These are, for the most part, readily distinguished by their brown color, the size of the tears, their want of brittleness, or their imperfect solubility in water. In the form of powder they are less easily detected, except by the imperfect solubility. Flour (or starch) is also sometimes mixed with powdered gum; the adulteration is readily recognized by the deep blue color produced on the addition of a solution of iodine to the cold decoction of suspected gum.

*Test.*—The powder does not become (purple, nor the cold decoction) blue on the addition of solution of iodine.

*Composition.*—The principal ingredient of gum arabic is arabin. *Arabin* or *soluble gum* is a colorless, inodorous, insipid, uncrystallizable solid, soluble in both hot and cold water, but insoluble in alcohol, ether, and oils. It combines with alkalies. Sulphuric acid converts it into a saccharine substance. 100 parts of arabin treated with 400 parts of nitric acid yield 16.88 of mucic acid, with a little oxalic acid. From *cerasin* or *prunin* it is distinguished by its solubility in cold water. The characters by which it is distinguished from *tragacanthin* have been pointed out under tragacanth. (See page 728.)

*Physiological Effects.*—The local action of a solution of gum is that of an emollient, and (by its sheathing properties) demulcent. It is supposed to have the power of diminishing irritation in the urinary organs.

*Therapeutics.*—Gum arabic is employed in medicine as an emollient and demulcent. It is sometimes slowly dissolved in the mouth, to allay troublesome cough, and to diminish irritation of the fauces, by diluting the acid secretions, and sheathing the parts from the action of the atmosphere. In inflammatory affections of the intestinal tube, as well as of the respiratory and urinary organs, gum is used as an emollient and demulcent. For these purposes it is combined with tragacanth and starch in the compound powder of tragacanth, and with almonds in the compound powder of almonds. As a sheathing substance, a solution of gum may be employed in acrid poisoning; but of course its efficacy is merely mechanical. Powdered gum is occasionally applied to check hemorrhage from leech bites.

*Administration.*—The dose of powdered gum is from thirty to sixty grains, or *ad libitum.*

*Pharmaceutic Uses.*—As a vehicle for the exhibition of other medicines, it is employed in the form either of powder or mucilage. The former is used to give bulk to active and heavy powders, as calomel, tartarated antimony, &c., and in the preparation of the officinal lozenges. The latter is employed to suspend insoluble powders (as oxide of zinc, chalk, guaiac, and musk) in water, as in the officinal chalk mixture and guaiac mixture, or to diffuse oily substances through aqueous fluids, and to give form and tenacity to pills.

### *Officinal Preparation.*

MUCILAGO ACACIÆ [U. S.], *Mucilage of Gum Arabic.*—Take of gum arabic, in small pieces, four ounces; distilled water, six fluidounces. Suspend the gum in a muslin bag under the surface of the water, in a deep vessel; after thirty-six hours squeeze out the fluid remaining in the bag, and mix. ["Take of gum arabic, in pieces, four troyounces; water, half a pint. Add the water to the gum arabic, agitate occasionally until it is dissolved, and strain." U. S.]

This mucilage should not be long kept, as by keeping it readily becomes sour by the development of acetic acid. The pharmaceutic uses of mucilage have been above referred to. To render different substances miscible with aqueous vehicles, different proportions of mucilage are required. "*Oils* will require about three-fourths of their weight, *balsams* and *spermaceti* equal parts, *resins* two parts, and *musk* five times its weight."

[Syrupus Acaciæ, U. S., *Syrup of Gum Arabic.*—"Take of gum arabic, in pieces, two troyounces; sugar, in coarse powder, fourteen troyounces; water, eight fluidounces. Dissolve in the water, first the gum arabic without heat, then the sugar with a gentle heat, and strain." U. S. This is a very elegant demulcent syrup, which may be used as the basis or vehicle in cough mixtures.—W.]

## ACACIA CATECHU, *Willd.*

### The Catechu Acacia.

Fig. 173.

*Acacia catechu.*

*Specific Character.*—*Tree* from fifteen to twenty feet high. *Bark* brown and scabrous. *Wood* hard and heavy; the *heart-wood* (*duramen*) brown, dark red, or blackish; the *sap-wood* (*alburnum*) white, one or two inches thick. *Branches* armed with stipulary thorns, or occasionally unarmed; *young shoots*, *petioles* and *peduncles*, more or less pubescent. *Leaves* bipinnate; *pinnæ* 10–30 pairs; *pinnules* 30—50 pairs. *Spikes* axillary, shorter than the leaves. *Flowers* numerous, whitish, or pale yellow. *Petals* united. *Stamens* distinct, numerous. *Legumes* flat, thin, straight, linear, glabrous, 4–8-seeded.—*Woodv.* page 183, plate 66 (*Mimosa Catechu*).

*Habitat.*—Various parts of the East Indies.

### Catechu Nigrum, *Black Catechu.*

### [Catechu. Mat. Med. List, U. S. P.]

An extract of the heart-wood; imported from Pegu.

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

*Description and Properties.*—This kind of catechu is distinguished from Catechu pallidum by its blackish color, hence the name. It is imported from Pegu in large masses, sometimes weighing a hundredweight each. These masses are made up of layers, composed of prismatic pieces, each from six to ten inches long, and two or three inches broad and deep. Each piece is enveloped in leaves. When fractured, these pieces present a dark blackish-brown shining surface, free from all impurities; some of the pieces, however, have a reddish tint. Black catechu dissolves very slowly in the mouth. The brown filtered decoction reddens litmus, yields a blackish-green color and precipitate with the ferruginous salts, and a brownish-white one with acetate of lead. A solution of gelatin renders the cooled decoction turbid. Alkalies deepen the color of the decoction, but cause no precipitate; sulphuric acid renders it slightly turbid.

*Composition.*—The essential constituents of this variety of catechu, as of pale catechu, are tannic acid and catechine. These have been already noticed (see **Catechu pallidum**).

*Physiological Effects, Therapeutics, and Officinal Preparations.*—(See **Catechu pallidum**.)

## HÆMATOXYLON CAMPECHIANUM.

### The Logwood Tree.

Decandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A *tree* 40 or 50 feet high. *Leaves* pinnate, or somewhat bipinnate by the conversion of the lowest pair of leaflets into two pairs of pinnæ; *leaflets* obovate or obcordate. *Flowers* racemose, yellow. *Calyx* composed of 5 sepals united at the base into a persistent

Fig. 174.


*Hæmatoxylon Campechianum.*

cup; the lobes deciduous. *Petals* 5, obovate, a little longer than the sepals. *Stamens* 10, hairy at the base. *Style* capillary. *Legume* flat, compressed, lanceolate, 1-celled, 2-seeded, the *sutures* indehiscent, the *valves* bursting in the middle longitudinally.—*Woodv.* page 48, plate 163.

*Habitat.*—Campeachy. Introduced into Jamaica, where it now grows in great abundance, wild.

### Hæmatoxylum, *Logwood.*

### [Hæmatoxylon. Mat. Med. List, U. S. P.]

The heart-wood sliced; imported from Campeachy in Central America, from Honduras, and Jamaica.

*Commerce.*—The stems of the logwood trees are cut into logs of about three feet long, the bark and white sap-wood (*alburnum*) of which are chipped off, and the red part or heart-wood (*duramen*) sent to England. That from Campeachy is of the best quality.

*Officinal Characters.*—The logs are externally of a dark color, internally they are reddish-brown; the chips have a feeble agreeable odor, and a sweetish taste; a small portion chewed imparts to the saliva a dark pink color.

*Description and Properties.*—The wood is dense, having a sp. gr. of 1.057. Large crystals of hæmatin are sometimes found in it. The decoction of logwood is deep red. Acids render it paler and brighter colored. The alkalies give it a purplish or violet-blue color. Acetate of lead causes a blue, alum a violet, precipitate. The salts of iron make it a dark violet-blue. Gelatin forms a reddish precipitate with it.

*Composition.*—Logwood contains volatile oil, hæmatin, resin, tannic acid, &c. *Hæmatin* or *Hæmatoxylin* is a red crystalline substance, of a slightly bitter, acrid, and astringent taste. It is soluble in alcohol and ether, and slightly so in water. Acids render the solution yellowish or red; alkalies give it a purple or violet color. Alum causes a violet precipitate, and several metallic solutions (as of tin and lead) a blue one. Gelatin produces a flocculent reddish precipitate.

*Physiological Effects.*—Logwood is a mild astringent. It does not constipate nor so readily disorder the digestive organs as some other astringents, and hence its use may be continued for a longer period. Its coloring matter becomes absorbed, and may be detected in the urine. Dr. Percival states that under the use of extract of logwood the urine of a female suddenly acquired a purplish-red color, which was deepened by sulphate of iron. After some hours the secretion returned to its natural color. The stools sometimes acquire a purplish-red color from the use of logwood.

*Therapeutics.*—Logwood is employed as an astringent in old diarrhœas and dysenteries, in hemorrhages (from the uterus, lungs, and bowels), and leucorrhœa. It is well adapted to the diarrhœas of children. Dr. Percival employed it to restrain profuse sweating in phthisis.

### *Officinal Preparations.*

Decoctum Hæmatoxyli [U. S.], *Decoction of Logwood.*—Take of logwood, in chips, one ounce; cinnamon, in powder, sixty grains; distilled water, one pint. Boil the logwood in the water for ten minutes, adding the cinnamon towards the end, and strain. The product should measure sixteen ounces. ["Take of logwood, rasped, a troyounce; water, a sufficient quantity. Boil the logwood in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint." U. S.]

Employed as an astringent in diarrhœa.

*Dose.*—For adults, fl. oz. j to fl. oz. ij; for children, fl. drs. ij to fl. drs. iv.

Extractum Hæmatoxyli [U. S.], *Extract of Logwood.*—Take of logwood, in fine chips, one pound; boiling distilled water, one gallon. Macerate the logwood in the water for twenty-four hours, then boil down to one-half, strain, and evaporate by a water-bath to a proper consistence, stirring with a wooden spatula. Iron vessels should not be used. ["Take of logwood, rasped, twelve troyounces; water, eight pints. Boil down to four pints, and strain the decoction while hot; then evaporate to dryness." U. S.]

Astringent. Employed in old diarrhœas and dysenteries.

*Dose.*—Gr. x to gr. xxx.

By keeping, extract of logwood becomes exceedingly hard, and pills made of it are said to have passed through the bowels undissolved. [It is therefore best administered in solution.—W.]

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## TAMARINDUS INDICA, *Linn.*

### The Tamarind Tree.

Monadelphia Decandria, *Linn. Syst.*

*Botanic Character.*—A *tree* 30 to 40 feet high. *Branches* spreading. *Leaves* abruptly pinnate; *leaflets* 10 to 15 pairs, small, oblong, obtuse, smooth. *Flowers* racemose, yellow variegated with red. *Calyx* with a bilabiate reflexed limb. *Petals* 3. *Stamens* 9 or 10; 7 very short and sterile, the others larger, monadelphous, and with anthers. *Style* subulate. *Legume* stalked, linear, more or less curved, 1-celled, 3–12-seeded; *sarcocarp* pulpy. *Seeds* compressed, bluntly 4-angled, smooth, hard, brown-colored.—*Woodv.* page 454, plate 166.

*Habitat.*—East and West Indies.

### Tamarindus, *Tamarind.* [Mat. Med. List, U. S. P.]

The preserved pulp of the fruit; imported from the West Indies.

*Preservation of the Fruit.*—The usual mode of preserving tamarinds in the West Indies is to remove the shell or epicarp from the ripe fruit, and to place alternate layers of the shelled fruit and powdered sugar in a cask or jar, and pour boiling water over them. The drier and darker-colored East Indian tamarinds are preserved without sugar. The former are alone officinal.

*Officinal Characters.*—A brown sweetish subacid pulp preserved in sugar, containing strong fibres. and brown shining seeds, each inclosed in a membranous coat.

*Description.*—Tamarind is imported in a preserved state. *Tamarind pods* are from three to six inches long, more or less curved. Composed of a dry, brittle, brown, external shell (*epicarp*), within which is the acidulous, sweet, reddish-brown pulp (*sarcocarp*), penetrated by strong fibres. Still more internal is a thin membranous coat (*endocarp*), inclosing the oval brown seeds. *Preserved tamarinds* consist of the same parts, the shell (*epicarp*) excepted. The *preserved pulp* is the officinal part.

*Composition.*—Tamarind pulp contains sugar, pectin, free citric, tartaric, and malic acids, acid tartrate of potash, &c.

*Test.*—A piece of bright iron left in contact with the pulp for an hour, does not exhibit any deposit of copper.

*Physiological Effects.*—Tamarind pulp allays thirst, is nutritive and refrigerant, and, in small doses, laxative. From this combination of refrigerant and laxative properties it is commonly denominated a *cooling laxative.*

*Therapeutics.*—Tamarinds are adapted for febrile and inflammatory cases; in the former they are often taken with the double purpose of acting as a refrigerant, and operating gently on the bowels. An infusion of tamarinds forms a very pleasant cooling drink, as does also tamarind whey, which is prepared by boiling two ounces of tamarinds with two pints of milk.

Tamarinds are contained in confection of senna.

## CASSIA, *Linn.*

Decandria Monogynia, *Linn. Syst.*

*Generic Character.*—*Sepals* 5, scarcely united at the base, more or less unequal. *Petals* 5, unequal. *Stamens* 10, free, unequal; the three lower ones longer, the four middle ones short and straight, the three upper ones with abortive anthers; *anthers* dehiscing at the apex. *Ovary* stalked. *Leaves* alternate, abruptly pinnate; *leaflets* opposite.

Some confusion still exists as to the species yielding the Alexandrian senna of commeree. The following are officinal.

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## CASSIA LANCEOLATA, *Lamarck.*

### Lanceolate-leaved Cassia.

*Specific Character.*—*Stem* suffruticose, about 2 feet high, erect, round, smooth. *Petiole* without glands; *leaflets* 5–8 pairs, shortly petiolate, smooth above, when young slightly pubescent beneath, ovate-lanceolate or lanceolate, acute. *Flowers* yellow, racemose, rather longer than the leaves. *Ovary* linear, downy, falcate, with a smooth recurved style. *Legumes* flat, but slightly swollen over the seeds, pendulous, with the upper margin a little curved. *Seeds* 5–8 in each legume.—*Lamarck Encyc.* pl. 345.

*Habitat.*—Egypt, in the valleys of the desert to the south and east of Assouan. The leaves are collected by the Arabs, and sold by them to merchants, who convey them to Cairo.

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## CASSIA OBOVATA, *Colladon.*

### Obovate-leaved Cassia.

*Specific Character.*—Perennial *herb*, 1–2 feet high. *Leaves* smooth; *petiole* without glands; *leaflets* 4–6 pairs, obovate, obtuse, somewhat mucronate, unequal at the base; *stipules* spreading. *Flowers* yellow, racemose. *Legumes* oblong, broad, curved (Fig. 175, *h*), smooth, rounded at each end, with an elevated crest along the middle of each valve.—*Nees, Plant. Med.* (*C. Senna*), pl. 347 and 348.

*Habitat.*—Egypt (Bassà-Tine at the entrance of the valley of Egaremont, two leagues from Cairo; Karnak; Thebes; on the eastern bank of the Nile, opposite Hermonthis; Esneh; Edfou; Daraou; Assouan); Nubia; Desert of Suez; Syria; India.

### Senna Alexandrina, *Alexandrian Senna.*

The leaves of Cassia lanceolata, and Cassia obovata, imported from Alexandria; carefully freed from the flowers, pods, and leafstalks of the same, and from the leaves, flowers, and fruit of Solenostemma Arghel, *Hayne.*

[The U. S. Pharmacopœia does not recognize the varieties of senna, but comprises under the head of **Senna** the leaflets of Cassia acutifolia (*Delile*), of Cassia obovata (*De Candolle*), and of Cassia elongata (Lemaire, *Journ. de Pharm.*, vii. 345).—W.]

*Collection and Commerce.*—Alexandrian senna is collected in Nubia and Upper Egypt, and is conveyed down the Nile to the great depot at Boulak. The Arabs make two crops annually; the most productive one is that after the rain in August and September, the second takes place about the middle of March. When cut the plants are spread out on the rocks, and dried in the sun. Assouan is the first entrepot for senna. It receives all that is gathered in the neighborhood. Esneh is another entrepot. It receives the lanceolate-leaved senna from Abyssinia, Nubia, and Senaar, from whence it arrives by the caravans which convey negroes to Egypt, and the obovate-leaved senna, gathered in Upper Egypt. Daraou, between Assouan and Esneh, is also an entrepot; but the great depot is at Boulak, the port of Cairo. The senna arrives at Boulak from Assouan, not only by the Nile, but also sometimes by way of Cosseir, the Red Sea, and Suez. Lastly, some senna is carried to Boulak by the caravans from Mount Sinai. The mixture of the different leaves takes place at the entrepots. Rouillure says that at Boulak 500 parts of acute (lanceolate) leaves are mixed with 300 of obtuse (obovate) leaves and 200 of Arghel leaves. From Boulak the senna is sent to Alexandria, and from thence is shipped to Europe.

[To this account of the author, taken from Delile, Burckhardt, and others, may be added the more recent statement of Ignatius Pallme, who travelled in the interior of Africa. He says "Senna is found in abundance in many parts of Kordofan, but the leaves are not collected on account of the existing monopoly. The government draws its entire supply from Dongola in Nubia, which is the true native country of senna, and sells them under the denomination of Alexandrian or Egyptian senna, though not one-fiftieth of the leaves are collected in Egypt, as they are first met with at Assouan in Nubia."—Ed.]

We also frequently find in Alexandrian senna, *as imported*, mixed with the leaflets of the two species of cassia, a variable proportion of the leaf-stalks, flowers, and legumes of the same plants, and also of the leaves, flowers and fruits of *Solenostemma* (*Cynanchum*) *Arghel*, and rarely, of the leaflets and legumes of *Tephrosia Apollinea*, besides other extraneous matters, as date-stones, rabbit-dung, &c. All these are directed in the Pharmacopœia to be carefully removed before the senna is fit for use; it then constitutes what is properly termed *picked Alexandrian senna*, to which the officinal characters apply.

*Officinal Characters.*—Lanceolate or obovate leaflets, about an inch long, unequally oblique at the base, brittle, grayish-green, of a faint peculiar odor, and mucilaginous sweetish taste.

*Description.*—The leaflets of Alexandrian senna present a more or less broken appearance. Alexandrian senna varies much in its constitution. When picked according to the directions of the British Pharmacopœia, it is generally composed chiefly of the lanceolate leaflets, mixed with a few obovate leaflets; but recently large importations of Alexandrian senna have taken place, composed almost entirely of obovate leaflets. It has a nauseous, mucilaginous taste, and a peculiar odor, somewhat resembling that of tea.

The senna *leaflets* are readily distinguished by being unequal-sided at the base, and by the veins or nerves of their under surface being very conspicuous. The lanceolate leaflets (Fig. 175, *a*) are very readily distinguished from those of the obovate (Fig. 175, *c*) species by their shape. The dried *flowers* of cassia may be easily detected; they are dull yellow. The *legumes* of the lanceolate and obovate cassia are also found; they are distinguished by the botanical characters before described (Fig. 175, *g*, *h*).

*Adulterations.*—Alexandrian senna, as imported, always contains, as noticed above, a variable proportion of extraneous matters, which are directed to be removed. The more serious admixture is that of the Arghel leaves, flowers, and fruits (*Solenostemma Arghel*), and of the leaflets and legumes of *Tephrosia Apollinea*. *Arghel leaves, flowers, and fruit.*—The Arghel plants are collected by the Arabs in the valleys of the desert to the east and south of Assouan. The *leaves* found in Alexan-

Fig. 175.


*a*. Leaflet of Cassia lanceolata. *b*. Leaf of C. obtusata. *c*. Leaflet of C. obovata. *d*. Leaflet of Tephrosia apollinea. *e*. Leaf of Solenostemma Arghel. *f*. Leaf of Coriara myrtifolia. *g*. Legume of C. lanceolata. *h*. Legume of C. obovata. *i*. Legume of Tephrosia apollinea. *k*. Fruit of Solenostemma Arghel.

drian senna are distinguished from the senna leaflets by their being equal-sided (Fig. 175, *e*), by the absence or imperfect development of their lateral nerves, by their paler color, thicker and more coriaceous texture, by a yellowish exudation frequently found on them, and generally, though not invariably, by their greater length. By careful picking the *flowers* may be detected; they are white, and in small corymbs. The *fruit* (Fig. 175, *k*), as found in Alexandrian senna, a little exceeds in size a large orange-pip. It is ovate-shaped, tapering superiorly, brown, shrivelled, and containing several seeds. *Tephrosia leaflets and legumes.*—The *Tephrosia Apollinea* grows in cultivated fields near the Nile, at Hermonthis, at Edfou, and in the Elephantine Islands, opposite Assouan. The *leaflets* have a silky or silvery aspect; they are obovate-oblong, somewhat cuneiform, emarginate, equal-sided, tapering towards the base, lateral veins parallel, regular, and oblique in the midrib (Fig. 175, *d*). These leaflets are usually folded longitudinally, and are very apt to be overlooked. The *legume* (Fig. 175, *i*) is from an inch to an inch and a half long, not exceeding two lines broad, linear, slightly ensiform, and contains six or seven brownish seeds.

*Tests.*—The unequally oblique base, and freedom from bitterness, distinguish the senna from the Arghel leaves, which are also thicker, stiffer, grayer, and more wrinkled.

## CASSIA ELONGATA, *Lemaire.*

### Long-leaved Cassia.

*Specific Character.*—Dr. Lindley thus describes this plant. "An *annual*, but with care it may be made to live through the year, and to assume a suffruticose habit. *Stem* erect, smooth. *Leaves* narrow, equal pinnated; *leaflets* 4–8 pairs, lanceolate, nearly sessile, slightly mucronulate, smooth above, rather downy beneath, with the veins turning inwards, and forming a flexuose intramarginal line; *petioles* without glands; *stipules* softly spinescent, semihastate, spreading minute. *Racemes* axillary and terminal, erect stalked, rather longer than the leaves; *pedicels* without bracts. *Sepals* linear, obtuse. *Petals* bright yellow. Of the *stamens*, the five lowest sterile and small, the two next large, curved, and perfect, the three uppermost minute and gland-like. *Ovary* linear, downy, falcate, with a smooth recurved *style*. *Legumes* pendulous, oblong, membranous, about an inch and a half long, and five-eighths broad, quite straight, tapering abruptly to the base, and rounded at the apex, deep-brown, many-seeded."—*Royle*, *Bot. Himal.* pl. 37.

*Habitat.*—Grows in India, but probably only naturalized. Yields *Tinnivelly*, and *Common East Indian* or *Mecca Senna.* The plants yielding Tinnivelly senna were raised from seeds picked out of common East Indian senna legumes.

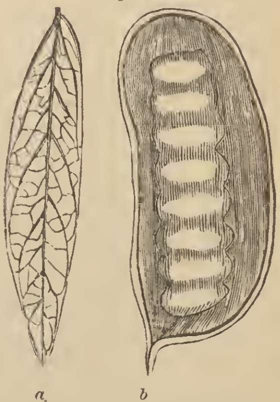
### Senna Indica, *Tinnivelly Senna.*

The leaves of Cassia elongata; from plants cultivated in Southern India.

*Officinal Characters.*—About two inches long, lanceolate, acute, unequally oblique at the base, flexible, entire, green, without any admixture; odor and taste those of Alexandrian Senna.

*Description.*—Tinnivelly senna is a very fine variety, being free from stalks, legumes, and any adulteration. It consists of large, thin, unbroken leaflets, of a fine green color, from one to two inches or more long, and sometimes half an inch broad at their widest part. When exposed to a damp atmosphere, they are apt to change color, and to become yellow, or even blackish.

Fig. 176.



a. Legume of Cassia elongata.
b. Leaflets of ditto.

Besides the above officinal cultivated variety of Indian senna, common Indian senna, which is not officinal, is also imported into England from India, under the name of East Indian senna or Mecca senna. It is the produce of Arabia, and finds its way into the interior of India by the ports of Surat and Bombay. It occurs in long narrow leaflets, of from an inch to an inch and a half long, narrower than those of Tinnivelly senna, and of a yellowish color; some of the leaflets being brownish, or even blackish. This change of color is probably the result of the action of a moist atmosphere. We generally find intermixed with the leaflets a variable proportion of legumes and stalks.

*Composition.*—The principal constituents of senna appear to be a volatile oil and cathartin. A yellow resin (chrysoretin) has also been found in senna. *Volatile Oil: Odorous Principle.*—Obtained by submitting the leaves with water to distillation. It has a nauseous odor and taste. The distilled water of senna, which contains some oil in solution, acts as a mild purgative only. *Cathartin; Purgative Principle?*—Yellowish-red, uncrystallizable, with a peculiar odor, and a bitter, nauseous taste; very soluble, both in water and alcohol, but insoluble in ether; it attracts water from the air. Its aqueous solution is precipitated by infusion of galls and subacetate of lead. The persulphate of iron and alkalies deepen the color of the infusion; chlorine decolorizes it; iodine, acetate of lead, gelatin, and tartarated antimony cause no precipitates with it. Three grains caused nausea, griping, and purging.

*Chemical Characteristics.*—The carbonated alkalies, lime water, nitrate of silver, the acetates of lead, sulphate of iron, &c., form precipitates with the infusion of senna.

*Physiological Effects.*—Taken by the stomach senna acts as a sure and safe purgative. Its ill effects are nausea, griping, flatulence, and, at first, depression, afterwards excitement of the pulse. It appears to stimulate the abdominal and pelvic vessels, thereby having a tendency to promote the hemorrhoidal and menstrual discharges. It is one of the mildest of the drastic purgatives. Unlike scammony, gamboge, jalap, and most other drastics, it does not rank among poisons, even when given in large doses. It is distinguished from the saline purgatives by its stronger and more irritant operation, by the heat, gripings, and increased frequency of pulse, which attend its purgative action. From rhubarb it differs in being more powerful and irritant in its operation, in being nearly or quite devoid of any tonic operation. It acts more speedily and powerfully than aloes, and in a less marked manner on the large intestines. In its operation it appears to rank between jalap and aloes. The legumes and stalks possess similar properties to the leaflets. Formerly the griping quality of senna was ascribed to the stalks, but both Bergius and Schwilgué have proved the error of this notion. The legumes are much milder in their operation than the leaflets. Good Indian senna is almost, if not quite, as active as the Alexandrian. The obovate senna appears to be milder than the lanceolate-leaved. Part of the acrid and griping qualities of Alexandrian senna are referable to the arghel leaves, which possess greater activity than the true senna leaves. If infusion of senna be given to the nurse, the suckling infant becomes purged, a satisfactory proof that the cathartic principle of senna becomes absorbed, and is thrown out of the system by the excretories. Furthermore, as purging results from the injection of infusion of senna into the veins, this cathartic would appear to exercise a specific influence over the bowels, independent of its local action on these when it is swallowed.

*Therapeutics.*—Senna is well adapted for those cases which require an active and certain purgative, with a moderate stimulus to the abdominal and pelvic viscera. Thus, *in constipation* and *inactivity of the alimentary canal*, requiring the continued or frequent use of purgatives; *in worms; in determination of blood to the head;* and many other cases which readily suggests themselves, senna answers very well. The circumstances contraindicating its use are, an inflammatory condition of the alimentary canal, a tendency to hemorrhoids or menorrhagia, threatening abortion, and prolapsus of the uterus and rectum. The objections to its use are, the large dose required, the nauseous and disgusting flavor, the tendency to gripe, and the irritant and stimulant operation. Thus, in inflammation of the mucous membrane of the bowels, the irritant action of senna makes it an objectionable purgative; while its tendency to increase the frequency of the pulse renders it less fit for exhibition in febrile disorder than the saline purgatives. It is a very safe purgative, and may be given to children, female, and elderly persons, with great security. Though it is not the most appropriate purgative to be employed after delivery, and operations about the abdomen or pelvis (as hernia and lithotomy), yet I have repeatedly seen it used, and rarely with any unpleasant consequences.

*Administration.*—Powder of senna may be given in doses of from 30 to 120 grains for adults. There are two objections to its use, the great bulk of the necessary dose, and the uncertainty of its operation, arising from its liability to decompose by keeping. Aromatics (especially coriander and ginger) are frequently added to prevent griping, and to improve the flavor.

### *Officinal Preparations.*

Confectio Sennæ [U. S.], *Confection of Senna.*—Take of senna, in fine powder, seven ounces; coriander, in fine powder, three ounces; figs, twelve ounces; tamarinds, nine ounces; cassia pulp, nine ounces; prunes, six ounces; extract of liquorice, three-quarters of an ounce; refined sugar, thirty ounces; distilled water, twenty-four fluidounces. Boil the figs gently in the water in a covered vessel for four hours; then express and strain the liquor; and having added more distilled water to make up the quantity to twenty-four fluidounces, put into it the prunes, and boil as before for four hours. Add the tamarinds and the cassia; macerate for a short time; and press the pulp through a hair sieve. Dissolve the sugar and the extract of liquorice in the mixture with gentle heat; and, while it is still warm, add to it gradually the mixed senna and coriander, and stir diligently until all the ingredients are thoroughly combined. The resulting confection should weigh sixty ounces. ["Take of senna, in fine powder, eight troyounces; coriander, in fine powder, four troyounces; purging cassia, finely bruised, sixteen troyounces; tamarind, ten troyounces; prune, sliced, seven troyounces; fig, bruised, twelve troyounces; sugar, in coarse powder, thirty troyounces; water, a sufficient quantity. Digest in a close vessel by means of a water-bath, the purging cassia, tamarind, prune, and fig in three pints of water for three hours. Separate the coarser portions with the hand, and pass the pulpy mass, by rubbing, first through a coarse hair sieve, and then through a fine one, or a muslin cloth. Mix the residue with a pint of water, and, having digested the mixture for a short time, treat it as before, and add the product to the pulpy liquid first obtained. Then, by means of a water-bath, dissolve the sugar in the pulpy liquid, and evaporate the whole until it weighs ninety-six troyounces, or until it has been brought to the consistence of honey. Lastly, add the senna and coriander, and incorporate them thoroughly with the other ingredients while yet warm." U. S.]

When properly prepared, it is a pleasant, mild, and very effectual purgative, and is frequently employed by pregnant women, and persons afflicted with hemorrhoids or diseases of the rectum. When given alone in a full dose it is apt to gripe. It is frequently employed as a vehicle for the exhibition of other cathartics; for example, acid tartrate of potash.

*Dose.*—Gr. lx to oz. ss.

INFUSUM SENNÆ, [U. S.], *Infusion of Senna.*—Take of senna, half an ounce; ginger, sliced, thirty grains; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for one hour, and strain. ["Take of senna, a troyounce; coriander, bruised, sixty grains; boiling water, a pint. Macerate for an hour in a covered vessel, and strain." U. S.]

An ordinarily used purgative, employed frequently in the maladies of children as well as of adults. A saline purgative is usually given in conjunction with it; manna and tincture of senna being frequently added. A compound of this kind is called the *black draught*. The dose of infusion of senna is from fl. oz. ij to fl. oz. iv.

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 fluidounces. Digest the senna in seventy ounces of the water for twenty-four hours; press and strain. Digest the marc in thirty ounces of the water for six hours; press and strain. Evaporate the mixed liquors to ten fluidounces, 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 fluidounces. 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 efficient cathartic, given to children in doses of fl. drm. j to fl drs. ij.

TINCTURA SENNÆ, *Tincture of Senna.*—Take of senna, broken small, two ounces and a half; raisins, freed from seeds, two ounces; caraway, half an ounce; coriander, half an ounce; proof spirit, one pint. Macerate the senna and the other ingredients for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.

Carminative, cordial, stomachic, and purgative. Useful in costiveness attended with flatulence. Usually employed as an adjunct to the infusion of senna. If given alone as a purgative, the dose should be fl. drm. j to fl. drs. iv.

[EXTRACTUM SENNÆ FLUIDUM, U. S., *Fluid Extract of Senna.*—"Take of senna, in moderately fine powder, sixteen troyounces; sugar, in coarse powder, eight troyounces; diluted alcohol, a sufficient quantity. Moisten the senna with six fluidounces of diluted alcohol, introduce it into a conical percolator, press it firmly, and gradually pour upon it diluted alcohol until a pint of tincture has passed. Set this aside in a warm place until reduced by spontaneous evaporation to half a pint. Continue the percolation, until two pints more of tincture have been obtained. To this add the sugar, and, having evaporated it, by means of a water-bath, to half a pint, mix it with the reserved tincture, and strain." U. S.

Fluid extract of sennæ is a dark reddish-brown liquid which possesses the odor, taste, and medical properties of senna. To counteract its tendency to gripe, oil of anise, fennel, or some similar volatile oil, should be exhibited with it, two or three drops to the dose. The dose is f℥j to f℥ss, administered in water.—W.]

## [CASSIA MARILANDICA, *Linn.*

*Specific Character.*—Leaflets 6–9 pairs, large, lanceolate obtuse; stipules deciduous; 3 upper anthers abortive; pods at first hairy, linear.

This is a tall, shrubby perennial, with a greenish stem, half an inch thick, whose rather large showy yellow flowers are crowded together in axillary racemes, often forming panicles above. It grows in moist alluvial soil, especially along streams, all through the Southern and Middle States, and attains a height of 4 to 6 feet, blossoming in July.

### Cassia Marilandica, *American Senna.* Mat. Med. List, U. S. P.

The leaves of Cassia Marilandica.

These leaves should be gathered after flowering in the early autumn. They have a feeble odor somewhat like that of senna. Their action on the system is similar to but more feeble than that of senna; for which they may be substituted in one-third larger dose. They may be given in infusion, or a fluid extract might be prepared from them.—W.]

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## CASSIA FISTULA, *Linn.*

### Purging Cassia.

*Specific Character.*—*Tree* from 20 to 30 feet high. *Leaves* alternate, pinnate, from 12 to 18 inches long; *leaflets* 4 to 6 pairs, ovate, somewhat acuminate, smooth; *petioles* without glands, from 2 to 6 inches long, and from $1\frac{1}{2}$ to 3 inches broad; *stipules* minute. *Racemes* 1 to 2 feet long, lax, without bracts, straight, smooth. *Flowers* large, bright yellow, fragrant, on long pedicels. *Legume* cylindrical, ligneous, 1 or 2 feet long, externally blackish-brown; with three longitudinal bands or seams extending the whole length, two of which by their contiguity appear to form a single one, the third being on the opposite side of the legume; internally divided into numerous cells by thin transverse dissepiments. *Seed* 1 in each cell, surrounded by a soft blackish pulp, which appears to be a secretion of the endocarp or inner coat of the pod. *Woodv.* pl. 163.

*Habitat.*—East Indies, Egypt. Introduced into the West Indies.

### Cassia, *Cassia Pulp.*

### [Cassia Fistula. Mat. Med. List, U. S. P.]

The pulp of the pods; imported from the East Indies; or recently extracted from pods imported from the East or West Indies.

*Officinal Characters.*—Blackish-brown, viscid, sweet in taste, and somewhat sickly in odor; usually containing the seeds and dissepiments.

*Description.*—The botanical description of the pods or legumes has been above given. Their *pulp* by exposure to the air, becomes acid, in consequence of undergoing the acetous fermentation. Those pods yield the most pulp which are heavy, and do not rattle when shaken.

*Composition.*—It contains sugar, pectin, gum, a substance analogous to tannin, &c.

*Physiological Effects.*—Cassia pulp in small doses is a mild laxative; in large doses a purgative; but it is apt to occasion nausea, flatulence, and griping.

*Therapeutics.*—It is rarely or never given alone; but the cases for which it is well adapted are febrile and inflammatory affections. On account of its pleasant taste it would be a convenient purgative for children.

*Administration.*—Dose, for an adult, as a mild laxative, gr. lx to gr. cxx; as a purgative, oz. j to oz. ij.

*Pharmaceutic Use.*—It is contained in confection of senna.

## COPAIFERA.

Decandria Monogynia, *Linn. Syst.*

*Generic Character.*—*Calyx* ebracteolate, of 4 spreading small equal sepals, which are united at the base. *Petals* 0. *Stamens* 10 distinct; nearly equal; *anthers* oblong. *Style* filiform. *Legume* stalked, obliquely elliptical, coriaceous, somewhat compressed, 2-valved, 1-seeded. *Seed* elliptical, inclosed in a baccate aril; *embryo* straight; *radicle* somewhat lateral.—*Trees.* *Leaves* abruptly pinnate; *leaflets* coriaceous, somewhat unequal, ovate. *Flowers* paniculate.

The following are the more important species from which copaiba is obtained:—

### COPAIFERA MULTIJUGA, *Hayne.*

*Specific Character.*—*Leaflets* 6 to 10 pairs, ovate-lanceolate, acuminate, mucronate, with pellucid dots; *petiole* slightly hairy. In the province of Para the greatest quantity of the copaiva is said to be furnished by this species.

### COPAIFERA LANGSDORFII, *Desf.*

*Specific Character.*—*Leaflets* 3 to 5 pairs, ovate or oval, blunt, equal-sided, with pellucid dots. *Petioles* and *peduncles* slightly downy. This and the following species furnish the copaiva collected by the natives of Santa Paulo.

### COPAIFERA CORIACEA, *Mart.*

*Specific Character.*—*Leaflets* 2 to 3 pairs, elliptical, equal-sided, emarginate, coriaceous, not dotted, reticulated, smooth on both sides, somewhat glaucous beneath. *Petioles* and *peduncles* almost smooth. Bahia. It yields copaiva in Santa Paulo.

### COPAIFERA OFFICINALIS, *Linn.*

*Specific Character.*—*Leaflets* two to five pairs, incurved, ovate, unequal-sided, obtusely acuminate, with pellucid dots. Venezuela, near Calaboso, West Indies. An inferior kind of copaiva is said to be obtained from this species.

**Copaiba,** *Copaiva.* [Mat. Med. List, U. S. P.]

The oleoresin, obtained from the trunk of Copaifera multijuga, and other species of Copaifera, by incision; chiefly from the province of Para in Brazil.

*Extraction.*—Copaiva is obtained by making incisions into the stems of the trees. It exudes so abundantly that, at the proper season, twelve pounds are sometimes obtained in the space of three hours. If, however, none should flow, the wound is immediately closed with wax or clay, and reopened in a fortnight, when an abundant discharge takes place. Old trees sometimes furnish copaiva two or three times in the year.

Figs. 177 to 188.


*Species of copaifera.*

*Commerce.*—Copaiva is principally obtained from Para and Maranham. This probably is yielded, for the most part, by *C. multijuga.* Carthagena, Maracaibo, and Savanilla, also furnish some. Is this from *C. officinalis?* Occasionally it is brought from Rio Janeiro, and is there probably procured from *C. Langsdorfii*, and *C. coriacea.* Some is imported from the West Indies; and a considerable quantity, at second hand, from New York.

*Officinal Characters.*—About the consistence of olive oil, clear, light yellow, with a peculiar odor, and an acrid aromatic taste.

*Description.*—Copaiva (improperly termed balsam of copaiba) is a transparent liquid, having a peculiar, not disagreeable odor, and a bitter, somewhat acrid, and nauseous taste. Its specific gravity is less than that of water, being about 0.95 or 0.96, but is not constant. By keeping, it becomes considerably denser, owing to the loss of volatile oil. Copaiva is insoluble in water, but is completely soluble in alcohol, ether, and the oils, both fixed and volatile. When acted on by alkalies it yields a kind of soap, which is insoluble in water. Considerable variation exists in the color, consistence, and specific gravity of, as well as in the relative quantities of volatile oil and resin yielded by, copaiva. Even the odor and taste vary somewhat. The differences doubtless depend in great part upon the copaiva being procured from different species. The smaller species, which grow in the interior of the Brazils, as in Bahia and Minas, yield, as we are told, less copaiva, but it is more resinous and sharper. *Brazilian Copaiva* is thin, clear, and pale-colored. *West Indian Copaiva* (produced probably by *C. officinalis*) is thick, golden-yellow, not transparent, and has a less agreeable smell, which is somewhat like that of turpentine.

*Adulteration.*—There is no evidence that copaiva is subject to adulteration in this country at the present time, but a few years since a substance very much resembling copaiva, of very dark color, was offered for sale in London under this name. Upon investigation, it was found to have been imported from India, where it is known under the name of *Wood Oil* or *Gurjun Balsam*, and used for similar purposes as copaiva. It is the product of *Dipterocarpus turbinatus*, and other species of *Dipterocarpus.* It may be distinguished from copaiva by the application of heat, as when heated in a close phial to about 266° Fahr. it coagulates so that the phial may be inverted without altering the position of its contents. This consistence is retained upon cooling, but it liquefies again by applying a gentle heat with agitation, but coagulates again when the temperature is raised to 266°. Copaiva displays no such changes. Another test is the following, first suggested to Dr. De Vry: When equal volumes of wood oil and benzole are mixed together the result is a turbid mixture, from which, ultimately, a resinous flocculent matter is deposited; but when benzole is mixed in like proportion with copaiva the result is a transparent solution.

*Tests.*—Perfectly soluble in rectified spirit. Dissolves one-fourth of its weight of carbonate of magnesia by the aid of heat, and remains transparent.

The latter test will at once distinguish the presence of castor and other fixed oils, if employed for adulterating copavia; and the first test as well as the latter that of most fixed oils as well as castor oil. Carbonate of magnesia will also distinguish between copaiva and wood oil. Turpentine, which is said to be sometimes added, may be recognized by its odor, especially if heat be applied, as by dropping the suspected copaiva on a heated spatula. Most of the tests of the purity of copaiva are liable to fallacy, and, according to Dr. Redwood, the only satisfactory test of its purity and strength is the quantity of volatile oil it yields by distillation. (See **Oleum Copaibæ**.)

*Composition.*—Copaiva is an oleoresin, although commonly characterized as a balsam. It contains neither benzoic nor cinnamic acid, the presence of one or the other of which is necessary to constitute a balsam. *Volatile Oil.* (See **Oleum Copaibæ**.) *Resin.*—After copaiva has been deprived of its volatile oil by distillation, a brownish resinous mass is left behind. This, when gently heated to expel the residual water, is sold as *resin of copaiva.* It is the least active part of copaiva. It consists of two resins—one called *copaivic acid*, the other *viscid resin of copaiva.* They are separated by rectified spirit, which dissolves the acid resin, but leaves the viscid one. *Copaivic Acid; Yellow brittle resin of copaiva.*—One hundred parts of copaiva yield, on an average, fifty parts of this acid. Copaivic acid is an amber-colored, brittle, crystallizable resin, soluble in alcohol, rectified spirit, ether, and the volatile and fixed oils. It is decomposed by sulphuric and nitric acids. Its acid properties are proved by its alcoholic solution reddening litmus, and by the definite compounds which it forms with bases. *Viscid resin of copaiva; Brown soft resin of copaiva.*—When a hot alcoholic solution of copaiva cools, it retains in solution the acid resin already described, but deposits a brown viscid substance, which is termed the *viscid resin of copaiva.* As it is more abundant in old than in recent copaiva, Gerber regards it as produced by some alteration of the acid resin. It is soluble in anhydrous alcohol and ether, and in the volatile and fixed oils. It has very little affinity for basic substances. One hundred parts of copaiva contain from 1.65 to 2.13 per cent. of this resin.

*Physiological Effects.*—Copaiva produces the general and topical stimulant effects of the oleoresins, already described. Taken in *moderate* doses, it creates a sensation of warmth in the stomach, gives rise to eructations having the odor of the copaiva, and not unfrequently occasions nausea, or even actual vomiting. The continued use of it often impairs the appetite and disorders the digestive functions. These may be regarded as the local effects on the stomach. The constitutional effects, or those which result from the absorption of the copaiva or of its active constituent, the oil, are those of a stimulant whose influence is principally directed to the secreting organs, more especially to the mucous membranes and to the urino-genital apparatus. The oil passes out of the system in part by the lungs, and the odor of its vapor is readily detectable in the breath of persons taking it. The urine is increased in quantity and altered in quality; thus its color is heightened, it acquires an odor of copaiva and a bitter taste; moreover, not unfrequently it is turbid, as if containing mucus. The influence of copaiva over the mucous membrane lining the urethra is shown, even in the healthy state, by the warmth and tickling sometimes experienced in this part, both before and after evacuating the urine, as observed by König, a medical student, in his experiments with this medicine; and also by the marked influence which this oleoresin has in mucous discharges from this membrane. Furthermore, it is said occasionally to have produced unpleasant irritation of the testicles, though I have never observed this. It also acts as a stimulant, but in a less marked manner, to other mucous membranes; namely, the bronchial and gastro-intestinal membranes. The greater influence of copaiva over the urethral than over other mucous membranes is by some explained thus: Besides the influence which this receives in common with the other membranes of the same class, by the general circulation, it is exposed to the local action of copaiva contained in the urine as this fluid is expelled from the bladder. If this hypothesis were correct the influence of copaiva over the mucous lining of the bladder would be greater than that over the urethral membrane. Not unfrequently it gives rise to an eruption, usually of a scarlet color, referable to either urticaria or erythema. *Large doses* of copaiva irritate the gastro-intestinal canal, and occasion a sensation of heat at the pit of the stomach, nausea, vomiting, loss of appetite and purging, with, not unfrequently, griping pains of the bowels. The whole system becomes powerfully stimulated; the pulse is fuller and more frequent, the skin hotter, and thirst and headache are produced. Occasionally hæmaturia and dangerous ischuria are brought on. "I saw," says Kraus, "a very dangerous case, of thirty-six hours' standing, almost instantaneously relieved by the application of a warm poultice, made of four ounces of the hyoscyamus plant, over the genital organs." When we compare the operation of copaiva with that of other agents possessing powers of a somewhat similar kind, we observe that both in local and constitutional effects it is more powerful than the balsams properly so called, while its operation on the urino-genital organs is much more marked. It forms an intermediate substance between the balsams and the turpentines, being less powerful but more aromatic than the latter; yet the turpentines are less successful in gonorrhœa.

*Therapeutics.*—The principal employment of copavia is in *mucous discharges from the urino-genital organs*, more especially in gonorrhœa. There are two methods of treating this disease by copaiva: one is, not to exhibit this remedy until the inflammatory symptoms have subsided; the other is to give it at the very outset, in order to cut short or suppress the disease. The *first* method is that followed by the best English and German surgeons. It consists of employing, during the violence of the inflammatory stage, antiphlogistic and soothing measures; and when the inflammation has quite or nearly subsided, or is of a very mild character, giving copaiva with the view of diminishing or stopping the discharge. It is undoubtedly the safest method of treatment; for although copaiva may sometimes, or even frequently, be exhibited during the acute or inflammatory stage of gonorrhœa, not only with impunity, but even with advantage, there is no denying the fact that it has, occasionally at least, aggravated the symptoms. Many practitioners judge of the propriety of exhibiting the copaiva by the quality of the discharge only, and refrain from administering this medicine until the discharge has acquired what is called a gleety character. I believe most prudent surgeons consider the existence of much pain or scalding in passing the water, an irritable condition of bladder, or violent chordee, as contraindicating the use of copaiva; while the absence of these symptoms may be regarded as permitting or indicating it.

The *second* method of treating gonorrhœa by copaiva consists in exhibiting this medicine in large doses at the commencement of the disease; that is, in its acute stage, usually without adopting any preliminary antiphlogistic or soothing measures. Ansiaux admits that in some cases the practice has been injurious; in one instance he saw it produce acute pain, irritable bladder, and discharge of blood by the urethra. Ribes seems to regard copaiva as a specific for gonorrhœa and all its consequences, including swelled testicle, dysury, ischury, cystitis, and nephritis! Delpech speaks of its use in a much more guarded manner: he employs leeches, and the usual antiphlogistic measures, when the inflammatory symptoms are very severe; but when the inflammation is not excessive, he commences at once with copaiva. In fact, his practice approximates very much to that usually followed in this country and Germany. The partisans of this second method of treating gonorrhœa say, that both copaiva and cubebs cure more easily and promptly, and with less chance of relapse, the sooner they are exhibited after the commencement of the disease; in other words, old claps are less readily cured by them than recent ones.

It has been stated by Delpech and Ricord—and I believe the experience of most practitioners bears out their statement—that copaiva is less successful in the gonorrhœa of females than in that of males. Velpeau employs lavements of copaiva in gonorrhœa. By this mode of exhibition the nausea and vomiting which it is apt to occasion, when taken by the mouth, are entirely obviated. Velpeau asserts, that by this mode of administration blennorrhagic discharges of both males and females are almost always diminished, and frequently completely stopped. He found the same practice useful in non-venereal puriform discharges from other mucous membranes. Indeed, he asserts that copaiva lavements may in all cases be substituted for the administration of this liquid by the mouth. In *chronic inflammation of the bladder* (commonly termed *cystirrhœa* or *catarrhus vesicæ*) copaiva has at times been found beneficial. Delpech relates a case of *acute* vesical catarrh cured by it. But catarrhus vesicæ is for the most part accompanied with considerable irritation, which is in general greatly increased by stimulants like copaiva. In *leucorrhœa* copaiva has been employed with some advantage. In *chronic pulmonary catarrh* its employment has been spoken of favorably. It is only adapted for chronic, or old-standing cases, and for torpid habits. Its stimulant influence is calculated to be very injurious where there is inflammation or febrile disorder. In *chronic inflammation of the mucous membrane of the bowels*, especially of the colon and rectum, copaiva has been used. Dr. Cullen spoke favorably of its use in *hemorrhoids*. "I have learned from an empirical practitioner," he says, "that it gives relief in hemorrhoidal affections; and I have frequently employed it with success. For this purpose it is to be given in doses of from twenty to forty drops, properly mixed with powdered sugar, once or twice a day."

*Administration.*—Dose, from min. xx to fl. drm. j, or even more. It is sometimes taken on sugar, and this is said to be the most efficacious method of giving it, in affections of the urinary organs; but its nauseous taste is a great objection to its employment in this way. Some take it *swimming on half a wineglassful of water*, to which a few drops of some bitter tincture have been added. Many persons employ it in the form of *emulsion* (made with mucilage, yelk of egg, or alkalies). If mucilage be employed, it should not be very thick, otherwise it will not mix well. Spirit of nitrous ether is frequently added to cover the unpleasant flavor. Opium is sometimes conjoined to counteract purging, and acids (especially the sulphuric) to check nausea. *Syrup of copaiva* (prepared by rubbing four ounces of copaiva with thirty-two grains of calcined magnesia, and then adding sixty-four drops of oil of peppermint and sixty-two ounces of simple syrup) has been recommended. Copavia has also been taken in the form of *pills;* various powders (starch, gum, rhubarb, magnesia, &c.) being employed to give it a proper consistence. If magnesia be employed, the copaivic acid unites with it, and thereby forms copaivate of magnesia, which has considerable consistence, and absorbs the volatile oil. The following formula for copaiva pills is taken from the United States Pharmacopœia: [PILULÆ COPAIBÆ, U. S.] Take of copaiva, 2 oz. (troy); magnesia, recently prepared, 60 grs. Mix them, and set aside until the mixture concretes into a pilular mass, which is to be divided into 200 pills.—Dose, two to six pills. Velpeau's *copaiva lavement* is thus prepared: Copaiva, 2 fl. drs.; yelk of one egg; distilled water, 8 fl. oz. Make an emulsion, to which add tincture of opium, min. xx or min. xxx.

A convenient form for administering copaiva is by inclosing it in *gelatin capsules*, a form for the preparation of which is given in the Prussian Pharmacopœia. The capsules sold in the shops of this country usually contain about ten grains of copaiva.

### Oleum Copaibæ [U. S.], *Oil of Copaiva.*

The oil distilled from Copaiva.

["Take of copaiba, twelve troyounces; water, sixteen pints. Add the copaiba to the water in a tinned still, and, having adapted a proper refrigeratory, distil twelve pints. Separate the oil which comes over from the water, return this to the still, and again distil twelve pints. Lastly, separate the oil procured in the second distillation, add it to that first obtained, and keep the whole in a well-stopped bottle." U. S.]

*Officinal Characters.*—Colorless or pale yellow, with the odor and taste of copaiva.

The following form for distilling the oil was formerly given in the Edinburgh Pharmacopœia. "Take of copaiva, *one ounce;* water, *one pint and a half.* Distil, preserving the water; when most of the water has passed over, heat it, return it into the still, and resume the distillation; repeat this process so long as a sensible quantity of oil passes over with the water." Mr. Whipple informs me that from 249 lbs. of copaiva he obtained 128 lbs. of volatile oil, and 120 lbs. of resin. The amount of volatile oil obtained in different specimens varies from one-third to one-half, or even more, of the copaiva.

*Description.*—When oil of copaiva has been rectified, and afterwards freed from water by digesting it on chloride of calcium, it has a specific gravity of 0.878. It is colorless, and has an acrid taste, and an aromatic, peculiar odor. Sulphuret of carbon and ether dissolve it in all proportions; absolute alcohol dissolves two-fifths its weight of it; ordinary rectified spirit takes up less than this. It dissolves sulphur, phosphorus, and iodine (by the latter it is colored), and absorbs chlorine, with which it becomes turbid and viscid. When dropped on iodine, heat and hydriodic acid are suddenly produced. Oil of copaiva is isomeric with oil of turpentine—that is, it consists of $C_{20}H_{16}$.

*Administration.*—For medicinal use I prefer the oil of copaiva to any other preparation of copaiba. The usual dose is from ten to twenty minims, which may be gradually increased; but I have known of two fluidrachms taken in one dose without any ill effects. It may be taken on a lump of sugar.

### [Physostigma Venenosum, *Balfour.*

This is a perennial creeper, which grows on the river banks of Western Africa. Its fruit is the Calabar bean; the ordeal bean which is used by the negroes of Western Africa to test the guilt or innocence of an accused person. The shell of the bean is said to act as a cathartic, but the bean itself is a powerful spinal depressant, producing paleness, weakness, and irregularity of the pulse, great muscular prostration, suspension of intestinal vermicular action, &c., without affecting the intellect. If taken in larger quantities it causes death generally by paralysis of the heart or muscles of respiration.

To the medical practitioner, the most interesting power of this drug, is that of contracting the pupil, and also of altering the power of accommodation of the eye, by causing contraction of the ciliary muscle. The eye under its influence is *near-sighted.* This action is probably not the result of its stimulating the muscle concerned, but rather of its paralyzing the counteracting nerve force, which tends to prevent such contraction. In its action, it appears to be directly antagonistic to belladonna. The best method of using the Calabar bean is in the form of a strong infusion of it or its extract. A few drops of this may be put in the eye; in which case only the eye in which it is placed will be affected, and no constitutional disturbance be produced. A solution of 3 grains of the alcoholic extract in a drachm of glycerine, has been recommended by Dr. Robertson. Paper impregnated with its active principles by repeated immersings in a concentrated tincture is also used; a small piece of this, about $\frac{1}{8}$ inch square, being introduced under the lower lid. The dose of the kernel, internally, would be about one to two grains, but it is very seldom or never used in this way. The minimum quantity, which will cause death is not known; 12 grains of it have produced alarming symptoms, and 15 of the beans have caused death in an hour.—W.]

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## AMYRIDACEÆ, *Lindl.* The Myrrh Order.

## BALSAMODENDRON MYRRHA, *Nees.*

### The Myrrh Tree.

*Botanic Character.*—*Stem* shrubby, arborescent; *branches* squarrose, spinescent; *bark* pale ash-gray, approaching white; *wood* yellowish-white, both it and the bark having a peculiar odor. *Leaves* on short stalks, ternate; *leaflets* obovate, obtuse. *Flowers* unknown. *Fruit* ovate, smooth, brown, somewhat larger than a pea, surrounded at the base by a 4-toothed calyx, and supported on a very short stalk, acuminate. *Nees, Plant. Med.* pl. 357.

Fig. 189.


*Balsamodendron Myrrha.*
*a.* A leaf. *b.* The fruit.

*Habitat.*—Gison, on the borders of Arabia Felix, where it appears as an underwood in Acacia, Moringa, and Euphorbia forests; and in Abyssinia.

**Myrrha,** *Myrrh.* [Mat. Med. List, U. S. P.]

A gum-resinous exudation from the stem; collected in Arabia Felix and Abyssinia.

*Exudation of Myrrh.*—Myrrh, according to Ehrenberg, exudes like cherry-tree gum, from the bark of the tree. It is at first soft, oily, and of a pale yellow color; but by drying becomes darker and redder.

*History.*—The earliest notice of myrrh occurs in the Old Testament, from which it appears that this gum-resin was an object of trade with the Eastern nations more than 3,500 years ago. Hippocrates employed it in medicine, and Dioscorides describes several kinds of it; but notwithstanding the early knowledge of, and acquaintance with, the uses of myrrh, we had no accurate account of the tree which yielded it until the return of Ehrenberg from his travels with Hemprich, during 1820–25, in various parts of Africa and Asia. Ehrenberg himself collected some very fine myrrh near Gison from the stem of this tree.

*Commerce.*—Myrrh is imported, at the present time, solely from the East Indies in chests, each containing from two to four hundred weight. It is originally procured from Arabia and the northeastern coast of Africa, and carried thence to Bombay. Formerly the finest kind was brought from Turkey, and hence called *Turkey myrrh*, and an inferior sort from the East Indies, and termed *East India myrrh.* Sometimes the same chest contains myrrh of all qualities, which is then termed *Myrrh in sorts*; but commonly it is brought over more or less sorted.

*Officinal Characters.*—In irregular-shaped tears or masses, varying much in size, somewhat translucent, of a reddish-yellow, or reddish-brown color, fractured surface irregular and somewhat oily; odor agreeable and aromatic, taste acrid and bitter.

*Description, and Qualities.—Myrrh of first quality; Turkey myrrh.*—This occurs in pieces, of irregular forms and of variable sizes, consisting of tears (either distinct or agglomerated), and usually covered with a fine powder or dust. In a chest of this kind a few pieces of fine quality may sometimes be met with, nearly as large as a man's fist. The color varies, being pale reddish-yellow, red, or reddish-brown. The pieces are fragile, semi-transparent, with a dull, in part splintery, fatty kind of fracture. In consequence of imperfect desiccation the largest and finest pieces often present, internally, opaque, whitish or yellow striæ, or veins, which have been compared by Dioscorides, Pliny, and many others, to the white marks on the nails. The odor of myrrh is aromatic and balsamic, peculiar, but to most persons pleasant; the taste is bitter, acrid, and aromatic. The purest, palest, and most odorous pieces are sold as *picked myrrh.*

*Myrrh of second quality; Myrrh in distinct small tears or grains.*—It consists of distinct tears or grains, which are rounded or irregular, and vary in size from that of a pin's head to a peppercorn, none of them in my specimens being so large as a small pea. They are somewhat shiny, more or less transparent, and vary in color from pale or whitish-yellow to reddish-brown. It consists of tears of myrrh intermixed with fragments of gum arabic, and of some resin very like mastic, or juniper.

*Myrrh of third quality; East India myrrh.*—Formerly this was the only kind imported from the East Indies. It occurs in pieces, which are darker colored than those of the so-called Turkey myrrh, and whose average size does not exceed that of a walnut. It is often mixed with other substances, particularly with *Indian Bdellium*, and with a substance of similar appearance to dark-red-colored Senegal gum.

Myrrh is only partially soluble in water, alcohol, or ether; the first of these liquids taking up the gum principally, the two latter the resin and oil. Water takes up more of the myrrh than alcohol does. It forms a milky-white emulsion with water, owing to the suspension of the resin by the dissolved gum. Alkaline solutions are good solvents for myrrh. A few drops of nitric acid dropped on a small fragment of myrrh, or on a concentrated tincture, develop a red color.

*Composition.*—Myrrh contains a volatile oil, resin, gum, &c. The proportions of the above are about 2.5 per cent. of volatile oil, 23 of resin, and 58 of gum. *Volatile Oil.*—Colorless, though by age it becomes yellowish. It is a thin fluid, heavier than water, having the odor and taste of myrrh, and being soluble in alcohol, ether, and the fixed oils. It readily distils over with water, but not with spirit. With sulphuric, nitric, and hydrochloric acids, it forms red solutions. *Resin.*—

According to Brandes, this is of two kinds, both of which are soluble in alcohol. α. *Soft resin.*—Odorous, soft at ordinary temperatures, and insoluble in ether. Unverdorben regards it as a mixture of hard resin and volatile oil. β. *Hard resin* (*Myrrhic acid?*).—Inodorous, hard, insoluble in ether, soluble in caustic alkalies, forming *myrrhates?* The myrrhate of baryta is soluble in water, but not in alcohol. *Gum.*—Is also of two kinds: α. *Soluble* in water; the solution forming precipitates with alcohol and the salts of lead, silver, the protosalts of tin, and of mercury. β. *Insoluble* in water.

*Physiological Effects.*—In *small* or *moderate doses*, myrrh promotes the appetite, creates an agreeable warmth in the stomach, and occasions slight constipation. Its continued employment in these quantities assists the assimilative functions, increases the muscular activity, gives greater firmness to the solids, and diminishes excessive secretion from the mucous membranes. In *large doses* (as from 30 to 60 grains) it excites a disagreeable sensation of heat in the stomach, and in irritable conditions of this viscus may even bring on a slight inflammatory state; it accelerates the frequency and increases the fulness of the pulse, gives rise to a febrile condition of the body, and creates a feeling of warmth in the mucous membrane (especially in the membrane lining the air-passages). It has been supposed to have a specific stimulant operation on the uterus, and has, in consequence, been termed emmenagogue; but it does not appear to have any title to this appellation. The local operation of myrrh is that of a mild astringent and a moderate stimulant. In its remote effects myrrh partakes of both the tonic and stimulant characters. Myrrh differs from the fetid gum-resins (assafœtida, galbanum, &c.) in not possessing that influence over the nervous system which has led to the use of the latter in various spasmodic diseases, and to their denomination of antispasmodics.

*Therapeutics.*—The employment of myrrh is indicated in diseases characterized by feebleness of the vascular action, by weakness of the muscular fibre, and by excessive secretion from the mucous membrane. Relaxed and leucophlegmatic constitutions best admit of its use. It is frequently associated with tonics, especially the chalybeates, or with aloes. Indeed it is rarely used alone. It is contraindicated in inflammatory diseases, and in plethoric individuals. It is used in the following cases: *In disordered conditions of the digestive organs* arising from or connected with an atonic condition of the alimentary canal, as in some forms of dyspepsia, apepsia, flatulence, &c. *In disordered states of the menstrual functions*, characterized by a lax and debilitated state of the system, as in many cases of amenorrhœa and chlorosis. *In excessive secretion from the mucous membranes* unconnected with inflammatory symptoms, and accompanied by marks of debility. In chronic pulmonary catarrh, for example, it is sometimes admissible and useful. It has also been used to check puriform expectoration in phthisis, though it is now rarely employed for this purpose, and in most cases it proves either useless or injurious. *As an external application*, myrrh is employed for various purposes. Thus it is used as a *dentifrice*, either alone or mixed with other substances; and in caries of the teeth and in a spongy or ulcerated condition of the gums is very serviceable. As a *gargle*, in ulcerations of the throat, tincture of myrrh, diluted with water, is frequently employed. In *foul ulcers*, myrrh has been used to destroy unpleasant odor, to promote granulations, and to improve the quality and diminish the quantity of the secreted matters; for these purposes it has been applied in a pulverulent form, as an ointment, or as a wash.

*Administration.*—*Dose*, gr. x to gr. xxx. It is given in the form of powder, pill, or emulsion.

*Pharmaceutic Uses.*—Myrrh is a constituent of the compound decoction of aloes, compound assafœtida pill, compound rhubarb pill, compound mixture of iron, and pill of aloes and myrrh.

### *Officinal Preparation.*

Tinctura Myrrhæ [U.S.], *Tincture of Myrrh.*—Take of myrrh, in coarse powder, two ounces and a half; rectified spirit, one pint. Macerate the myrrh for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient rectified spirit to make one pint. ["Take of myrrh, in moderately coarse powder, three troyounces; alcohol, a sufficient quantity. Introduce the powder into a conical percolator, press it moderately, and gradually pour alcohol upon it until two pints of tincture are obtained." U.S.]

Tonic and stimulant. Seldom employed internally, and then usually as an adjunct. It is applied as a stimulant to foul and indolent ulcers. Diluted with water (which renders it slightly milky by the separation of the resin, without any precipitate being formed), it is used as a wash for the mouth in ulceration and sponginess of the gums, and as a gargle in affections of the throat.

*Dose.*—Fl. drm. ss to fl. drm. j.

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## CANARIUM COMMUNE, *Linn.*

Polygamia Diœcia, *Linn. Syst.*

*Botanic Character.*—A small *tree*. *Leaves* compound; *leaflets* on long stalks, 7–11, ovate-oblong, acute, entire, smooth; *stipules* oval. *Flowers* 2–3 together, in terminal panicles, polygamous. *Calyx* 3-lobed, campanulate, lobes unequal, externally silky. *Petals* 3, inserted under the disk, twice as long as the calyx, oblong, concave. *Stamens* 6, inserted under the disk, shorter than the petals, unequal. *Ovary* sessile, ovate-globose, 3-celled; *stigma* 3-lobed. *Fruit* a drupe: *drupes* oblong, black. —*Rumph. Amb.* vol. ii. pl. 47.

### Elemi, *Elemi.*

Botanical source undetermined, probably from Canarium commune, *Linn.*

A concrete resinous exudation; chiefly imported from Manilla.

*Source, and Commerce.*—The origin of elemi is involved in great obscurity. The resinous products of various trees have been described under this name. Blanco (*Flora de Filipines*) says that elemi, which distils as a white liquid resin, is yielded by *Canarium album*, and is quite different from the resin of *C. commune*, which is blackish. M. Baup also considers that elemi, or a resin resembling it, is the produce of *C. album*, a tree common in the Philippines. Of late years it has been brought entirely, or almost entirely, from Manilla.

*Officinal Characters.*—A soft unctuous adhesive mass, becoming harder and more resinous by age; of a yellowish-white color, with a rather fragrant fennel-like odor; almost entirely soluble in rectified spirit.

*Composition.*—Elemi essentially consists of a *volatile oil* and *two resins*.

*Physiological Effects, and Uses.*—The physiological effects of elemi are similar to those of the turpentines. It is, however, never employed internally. Its principal or sole use is as a constituent of the ointment of elemi.

*Officinal Preparation.*

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.

It is applied as a stimulant to old and indolent ulcers, and to promote the discharge from issues and setons.

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## ANACARDIACEÆ, *R. Br.* THE MASTICH ORDER.

## PISTACEA LENTISCUS, *Linn.*

### The Mastich Tree.

Diœcia Pentandria, *Linn. Syst.*

*Botanic Character.*—A *shrub*, about 10 or 12 feet high. *Leaves* abruptly pinnate; *leaflets* about 8, lanceolate, somewhat linear, or ovate; *petiole* winged. *Flowers* diœcious, very small; in axillary racemes. *Males:* with 1-flowered bracts. *Calyx* 5-cleft. *Stamens* 5, with very short filaments. *Females: Stigmas* 3. *Fruit* small, roundish, of a brownish-red color when ripe.—*Steph.* and *Church.* pl. 130.

*Habitat.*—South of Europe, North of Africa, Levant.

Fig. 190.


*Pistacea lentiscus.*
*a.* The male plant.
*b.* The female plant.

### Mastiche, *Mastich.*
[Mat. Med. List, U. S. P.]

A resinous exudation from the stem, obtained by incision; imported from Turkey and the Levant.

*Extraction.*—Tournefort says that in Scio the bark is cut crosswise. The mastich exudes and hardens, partly on the stem, partly on the ground. The mastich which concretes on the stem is called *mastich in the tear;* while that which falls to the earth constitutes *common mastich.*

*Officinal Characters.*—Small irregular yellowish tears, brittle, becoming soft and ductile when chewed, having a faint agreeable odor.

*Description.*—Mastich occurs in small spherical, flattened, or irregular, pale-yellow tears, which are externally farinaceous, owing to their mutual attrition. Their fracture is vitreous. They have a mild agreeable odor, but very little taste.

*Composition.*—Mastich consists of a minute portion of volatile oil, about 90 per cent. of resin soluble in alcohol, and 10 per cent. of a resinous substance (masticin) insoluble in alcohol. *Soluble acid mastich resin; Mastichic acid.*—This resin is soluble in alcohol. It possesses the properties of an acid, and combines with bases. *Insoluble non-acid mastich resin; Masticin.*—This resin is insoluble in alcohol. It is white, elastic, tenacious, soluble in an alcoholic solution of acid mastich resin, as well as in ether and oil of turpentine. To this resin mastich owes its toughness.

*Physiological Effects.*—Analogous to common resin and the turpentines.

*Uses.*—Mastich is rarely employed as a medicine. Dentists employ it, dissolved in alcohol, ether, or chloroform, for filling up the cavities of carious teeth. From its agreeable odor, which it communicates to the breath, it is frequently employed as a masticatory, hence its name.

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## [RHUS GLABRA, *Linn.*

*Generic Character.*—*Sepals* 5. *Petals* 5. *Stamens* 5, inserted under the edge or between the lobes of a flattened disk in the bottom of the calyx. *Fruit* small, indehiscent; a dry drupe.

*Specific Character.*—Smooth, somewhat glaucous. Fruit clothed with acrid crimson hairs; stone striate.

A shrub growing 2–12 feet high in rocky places, flowering in midsummer.

*Habitat.*—United States.

### **Rhus Glabrum,** *Sumach.* Secondary List, U. S. P.

The fruit of Rhus glabrum.

Almost all parts of this plant contain a large amount of gallo-tannic acid. The bark is often used in tanning. The berries have a sour, astringent taste. They owe their acidity to malic acid, which exists in them combined with lime in the form of a bimalate. The infusion has been used as a detergent astringent gargle in common sore-throat, and has been especially recommended in mercurial sore-mouth.—W.]

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## [RHUS TOXICODENDRON, *Linn.*

*Specific Character.*—*Fruit* glabrous, whitish or dun color; stone striate. *Leaves* pinnate with an odd leaflet, trifoliate; *leaflets* angularly incised, pubescent. (*De Cand.*)

*Shrub*, 1–3 feet high. *Stems* many, branching, covered with a brown bark. *Flowers* greenish-white. *Fruit* a round drupe, about as large as a pea. *Juice* acrid, milky, becoming black by exposure to the air, and forming an indelible ink when applied to cotton or linen.

*Habitat.*—United States of America.

### **Toxicodendron,** *Poison Oak.* Secondary List, U. S. P.

The leaves of Rhus toxicodendron.

When not exposed to the sun's rays (as when it grows in shady places, and during the night), this plant evolves a hydrocarburetted gas, mixed with an acrid vapor, which acts most powerfully on certain individuals exposed to its influence, and produces violent itching, redness, and erysipelatous swelling of the face, hands, or other parts which have been subjected to its operation; these effects are followed by vesications, and desquamation of the cuticle. In some cases the swelling of the face has been so great as to have almost obliterated the features; but all persons are not equally susceptible of this poisonous operation; so that some peculiar condition of the cutaneous organ seems necessary for the effect to be produced.

The painful eruption often caused by the plant should be treated antiphlogistically; as local applications, weak alkaline solutions, and saturated tinctures of lobelia have been recommended. Lead water and laudanum would seem to be indicated. I (Wood) have known vinegar to be used with the happiest result.

According to Dr. Jos. Khittel toxicodendron contains gallo-tannic acid and a peculiar volatile alkaloid, to which it owes its medical properties. According to Prof. John M. Maisch, the plant owes its peculiar poisonous properties to a hitherto unknown volatile acid (toxicodendric acid.)

*Therapeutics.*—In the human subject, *small doses* of the leaves increase the secretions of the skin and kidneys, act slightly on the bowels, and, in paralyzed persons, are said to have produced a return of sensibility and of mobility, with a feeling of burning and pricking, with twitchings, in the paralyzed parts. *Large doses* occasion pain in the stomach, nausea, vomiting, giddiness, stupefaction, and an inflammatory swelling of the paralyzed parts. These effects show that the poison oak possesses the twofold operation of an acrid and a narcotic.

*Uses.*—It has been employed in old paralytic cases depending on a torpid condition of the nerves. It has also been given in chronic rheumatism, obstinate eruptive disorders, in some cases of amaurosis, and other nervous affections of the eyes.

*Administration.*—The *powder* of the leaves is given in doses of from half a grain to a grain, gradually increased until some obvious effect is produced.—W.]

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*Sub-class:* THALAMIFLORÆ.

## SIMARUBACEÆ, *Lindley.* The Quassia Order.

### [SIMARUBA OFFICINALIS, *De Cand.*

*Generic Character.—Flowers* unisexual. *Calyx* small, cup-shaped, 5-toothed or parted. *Petals* 5, longer, spreading. *Males:* stamens nearly equal to the petals, arranged around a receptacle bearing at its apex 5 very minute lobes (rudiments of ovaries), or sometimes none. *Females: ovaries* 5, placed on an even disk, surrounded at the base by 10 short hairy scales (rudiments of stamens). *Styles* the same number, short, distinct at the base; there united into 1, crowned by a broader 5-lobed stigma. *Fruit* 5 drupes. (*Lindley.*)

Fig. 191.


*Simaruba officinalis.*

*Specific Character.*—Male *flowers* decandrous. *Stigma* 5-partite. *Leaves* abruptly pinnate; *leaflets* alternate, somewhat stalked, pubescent beneath. (*De Cand.*)

A very tall *tree*. *Roots* long and creeping. *Stem* thick; *bark* bitter, internally white, fibrous and tough, externally blackish and furrowed in the old trees, but smooth and gray, with yellow spots, in the young ones. *Leaves* alternate; *leaflets* alternate, 2–9 on each side, oval, firm, mucronate. *Flowers* small, yellowish-white, some male, others female, mixed, in panicles. *Fruit* of 5 ovate, black, smooth capsules, placed on a fleshy disk.

*Habitat.*—Guayana, Cayenne, Jamaica.

**Simaruba.** Secondary List, U. S. P.

The bark of the root of Simaruba officinalis.

The simaruba bark of the shops is the bark of the root, and is brought from Jamaica in bales. It is odorless, but bitter, and occurs in broad, folded, very fibrous pieces, several feet long, which are externally rough, warty, and marked with transverse ridges. The epidermis is of a grayish or whitish-yellow color; beneath it, the bark is darker, and yellowish-brown. On the inner surface the bark is pale yellowish-white. It contains quassite, volatile oil, mucilage, and various unimportant substances.

*Therapeutics.*—In small doses, simaruba acts like the simple bitter tonics, whose effects have been already described. In full doses, however, it causes vomiting and purging, and is said also to promote perspiration and urine. Dr. Wright states that negroes are less affected by it than whites.

Simaruba may be employed in the same cases as other vegetable bitters. It has been principally celebrated in *dysentery* (whence the Germans call it *Ruhrrinde*, or *dysentery-bark*) by Dr. Wright and others. It is, of course, only applicable in the latter stages of the acute and the asthenic and chronic forms of the disease. More recently, Dr. O'Brien has borne testimony to its good effects, when given in conjunction with opium, in epidemic dysentery. It has also been employed in the advanced stages of *diarrhœa.* Like other vegetable tonics, it may be administered in *dyspepsia*, *anorexia*, and *intermittents.* It is a remedy, however, which is seldom used.—W.]

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## PICRÆNA EXCELSA, *Lindley.*

### The Bitter Wood Tree.

Polygamia Monœcia, *Linn. Syst.*

*Botanic Character.*—A *tree* sometimes 100 feet high. *Leaves* unequally pinnate; *leaflets* opposite, 4–8 pairs, stalked, oblong, acuminate, unequal at the base. *Flowers* polygamous, racemose, small, pale-yellowish green. *Sepals* 5, minute. *Petals* 5, longer than the sepals. *Stamens* 5, about as long as the sepals, rather shaggy; *anthers* roundish. *Males:* with a rudimentary pistil. *Females: Carpels* 3, on a round tumid thalamus; *style* 3-cornered, bifid; *stigmas* simple, spreading. *Drupes* 3, globose, 1-celled, only one coming to perfection, and this, when ripe, about the size of a pea, black, shining, round.—*Steph.* and *Church.* pl. 173 (*Quassia excelsa*).

*Habitat.*—Jamaica, and other West Indian islands.

**Quassia,** *Quassia.* [Mat. Med. List, U. S. P.

The wood of Simaruba excelsa (*De Candolle*).]

The wood; from Jamaica.

*Officinal Characters.*—Billets varying in size, seldom thicker than the thigh. Wood dense, tough, yellowish-white, intensely and purely bitter. Also chips of the same.

*Description.*—Quassia wood, sometimes called Jamaica quassia wood, in order to distinguish it from the wood of Quassia amara (the original source of quassia), is imported in billets of various sizes (sometimes a foot in diameter, and several feet in length), and covered externally with a smooth brittle dark-gray bark. The wood is tough and white, but by exposure to the air becomes yellowish; it has no odor. An efflorescence of nitrate of potash is frequently observed on it.

*Adulteration.*—Quassia wood in chips has been adulterated with the chips of other woods; but the intense bitterness of the genuine wood readily distinguishes it.

*Composition.*—Quassia owes its properties to a peculiar neutral principle, called quassin or quassite. *Quassin: bitter principle of quassia:*—Obtained by adding lime water to a concentrated aqueous decoction of quassia, evaporating and treating the residue with alcohol, which takes up the quassin, a brown coloring matter, and some salts. By repeated solution and evaporation in alcohol, with a little ether, the quassin is obtained pure. Quassin occurs in small, white, prismatic crystals, which are fusible, odorless, intensely bitter, readily soluble in alcohol, but very slightly so in water or ether. Its solubility in water is increased by several salts and vegetable principles. Its watery solution is precipitated white by tannin, but not by iodine, chlorine, corrosive sublimate, salts of iron, acetate, or subacetate of lead. It is a neutral body, though soluble in sulphuric and nitric acids.

*Physiological Effects.*—In the usual medicinal doses, quassia operates as a stomachic and tonic—that is, it is bitter to the taste, promotes the appetite, and assists the digestive functions. It is devoid of all irritant, stimulant, and astringent properties; and has been, therefore, sometimes taken as a type of the simple or pure bitters. It is more powerful than, but in other respects analogous to, gentian in its operation. Does it act as a narcotic? I have employed, and seen others administer quassia most extensively, but never had grounds for suspecting any effect of the kind alluded to. Yet some have observed effects which certainly seem to favor the notion that quassia possesses a specific influence over the cerebro-spinal system. In females endowed with extreme susceptibility, I have seen, says Barbier, involuntary movements of the arms and legs produced by the aqueous infusion of quassia. Kraus says that the continued use of quassia brings on amblyopia (dimness of sight); and Kurtz asserts that the long-continued use of quassia has brought on amaurosis.

*Therapeutics.*—Quassia is employed in the same cases as several other simple bitters, some of which have been already noticed. Though I am not disposed to place too much confidence in the above quoted statements of Barbier, Kraus, and Kurtz, yet a cautious practitioner would avoid employing it in amaurosis and cerebral affections. Quassia is principally employed in *dyspepsia*, *anorexia*, and other stomach disorders of a functional kind of an atonic character, more especially when occurring in a gouty subject.

*Administration.*—The best mode of administration is in the form of extract or infusion. The so-called *bitter-cup*, now frequently sold, is made from quassia wood.

### *Officinal Preparation.*

Extractum Quassiæ [U. S.], *Extract of Quassia.*—Take of quassia, in moderately fine powder, one pound; distilled water, a sufficiency. Macerate the quassia in eight fluidounces of the water for twelve hours; then pack in a percolator, and add distilled water, until the quassia is exhausted. Evaporate the liquor; filter before it becomes too thick; and again evaporate by a water bath to a proper consistence.—[" Take of quassia, in moderately fine powder, twelve troyounces; water, a sufficient quantity. Moisten the quassia with four fluidounces of water, pack it in a conical percolator, and gradually pour water upon it until the infusion passes but slightly impregnated with the properties of the quassia; boil down the liquid to three-fourths of its bulk; then strain, and, by means of a water-bath, evaporate to the proper consistence." U.S. The dose given below seems to me too large, at least for the U. S. extract. In many cases, 2 or even 1 grain, will oppress the stomach and cause nausea. The best effects of the remedy are obtainable by the employment of it in $\frac{1}{2}$ to $1\frac{1}{2}$ grain doses.—W.]

*Dose.*—Gr. iij to gr. v. It may be used as a vehicle for chalybeate tonics.

INFUSUM QUASSIÆ [U. S.], *Infusion of Quassia.*—Take of quassia, in chips, sixty grains; cold distilled water, ten fluidounces. Infuse in a covered vessel, for half an hour, and strain. [" Take of quassia, rasped, one hundred and twenty grains; water, a pint. Macerate for twelve hours in a covered vessel, and strain." U. S.]

Tonic. Generally employed in dyspeptic and other stomach affections. It has an advantage over some other vegetable bitter infusions, that chalybeates can be combined with it without changing its color. It is in common use as a fly-poison.

*Dose.*—Fl. oz. j to fl. oz. ij.

[TINCTURA QUASSIÆ, U. S., *Tincture of Quassia.*—" Take of quassia, in moderately fine powder, two troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S. Dose, f℥j, administered in water.—W.]

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## [MELIACEÆ, *Jurs.*

The bark of the root of MELIA AZEDARACH, or pride of China, is *officinal in the Secondary List, U. S. P.*, under the name of *Azedarach.* The tree is a native of Persia, but is largely planted in the southern United States. Azedarach is an emeto-cathartic, and in large doses narcotic. It is a vermicide, and is especially adapted to cases of the round-worm. It is best given in decoction, four ounces of the bark in a quart of water boiled to a pint. This may be given to a child in table-spoonful doses every two hours, until it purges.—W.]

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## RUTACEÆ, *DC.* THE RUE ORDER.

### RUTA GRAVEOLENS, *Linn.*

### Common or Garden Rue.

Fig. 192.

*Ruta graveolens.*
*a.* Its fruit.

Decandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A small branching *under-shrub*, with a strong, disagreeable odor. *Leaves* alternate, tripinnate or decompound, glaucous or bluish-green, dotted; *lateral leaflets* oblong, the *terminal* one obovate. *Calyx* 4–5-fid, permanent. *Petals* 4 or 5, entire, or somewhat toothed, concave, unguiculate, greenish-yellow. *Stamens* 8 or 10, inserted on a disk beneath the ovary. *Nectariferous pores* as many as the stamens. *Ovary* 4 or 5-lobed; *style* 1. *Fruit* roundish, warty, 4–5-lobed.—*Woodv.* pl. 37, page 108.

*Habitat.*—South of Europe. Commonly cultivated in gardens.

[**Ruta**, *Rue*. Secondary List, U. S. P.

The leaves of Ruta graveolens.

The whole plant is active, but the leaves are more generally employed. They have a very disagreeable odor, increased by bruising them, and a hot acrid taste. They depend on their volatile oil for their medical properties. When fresh, they greatly irritate, and even vesicate the skin if applied to it.

*Therapeutics.*—(See **Oleum Rutæ**.)

*Administration.*—They may be used in form of infusion made with boiling water in infantile colic, &c. Strength ℥j to Oj. The oil is, however, more eligible.—W.]

## Oleum Rutæ, *English Oil of Rue.*

The oil distilled in England from the fresh leaves and the unripe fruit.

*Officinal Characters.*—Color pale yellow, odor disagreeable, taste bitter and acrid.

*Description.*—From 12 lbs. of the leaves, gathered before the plant had flowered, Lewis obtained only about 3 fluidrachms of oil; but the same quantity of herb, with the seeds almost ripe, yielded above 1 fluidounce. It is pale yellow, has a bitter acrid taste, and a specific gravity of 0.911. It is somewhat more soluble in water than the other volatile oils.

*Physiological Effects.*—The topical action of oil of rue is that of an acrid. It causes redness, swelling, and vesication of the skin.

*Therapeutics.*—Rue formerly enjoyed great celebrity as an antispasmodic and emmenagogue; a celebrity which it still retains among the public, and which it owes to its volatile oil. *In flatulent colic*, especially of children, the oil is an exceedingly valuable remedy, and may be administered either by the stomach, or, in infants, by the rectum, in the form of a clyster. It may also be employed with benefit in some cases of *infantile convulsions*. It has been employed in *hysteria* and *amenorrhœa*, in which diseases it will probably at times prove serviceable, and in them it deserves further trials. It may be used externally as a rubefacient.

*Dose.*—From 2 minims to 6 minims, rubbed down with sugar and water.

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## BAROSMA, *Willd.*

Decandria Monogynia, *Linn. Syst.*

*Generic Character.*—*Calyx* 5-cleft or 5-partite, dotted. *Disk* lining the bottom of the calyx, generally with a short, scarcely prominent rim. *Petals* 5, with short claws. *Filaments* 10; the five opposite the petals sterile, petaloid, sessile, ciliated, obscurely glandular at the apex; the other five longer, smooth or hispid, subulate, with the anthers usually furnished with a minute gland at the apex. *Style* as long as the petals; *stigma* minute, 5-lobed; *ovaries* auriculate at the apex, usually glandular and tuberculated. *Fruit* composed of 5 cocci covered with glandular dots at the back.—*Shrubs. Leaves* opposite, smooth, dotted. *Flowers* stalked, axillary.

The following species are officinal:—

### 1. BAROSMA BETULINA, *Bartling and Wendland.*

*Specific Character.*—*Leaves* obovate, recurved at the apex, glandulose-serrate at the margin. *Pedicels* solitary, somewhat leafy. *Flowers* pink, terminal.—*Lodd. Cab.* (*Diosma crenata*) vol. v. pl. 404. Cape of Good Hope.

## 2. BAROSMA CRENULATA, *Willd.*

*Specific Character.—Leaves* ovate-oblong, obtuse, crenate. *Pedicels* solitary, with two bracts immediately under the flower.—*Bot. Mag.* vol. lxii. pl. 3413. Cape of Good Hope.

## 3. BAROSMA SERRATIFOLIA, *Willd.*

*Specific Character.—Leaves* linear-lanceolate, serrulate. *Pedicels* solitary, bearing two bracts above the middle. *Flowers* lateral, white.—*Bot. Mag.* vol. xiii. pl. 456 (*Diosma serratifolia*). Cape of Good Hope.

Fig 193.

*Barosma crenata.*
1. Calyx. 2. Styles and stigma. 3. Fruit. 4. Seeds. 5. Dots on leaf.

### **Bucco,** *Buchu.* [**Buchu.** Mat. Med. List, U. S. P.]

The dried leaves of the above species of Barosma; imported from the Cape of Good Hope.

*Officinal Characters.*—Smooth, marked with pellucid dots at the indentations and apex; having a powerful odor 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.

*Description.*—Commercial buchu consists of the leaves of one of the above described species of Barosma, commonly mixed with the fruit, flowers, and portions of the stalks. The leaves are somewhat shining, sharply or bluntly serrated or crenated, and beset both on the margins (especially between the teeth), and on the under surface, with glands filled with essential oil. Their consistence is coriaceous; their color pale or yellowish-green; their odor strong and rue-like, and their taste is warm and mint-like.

*Composition.*—Buchu leaves owe their properties to a powerfully scented and volatile oil and a peculiar bitter principle called barosmin or diosmin. *Volatile Oil of Buchu.*—Yellowish-brown, lighter than water; odor that of the leaves. The recent experiments of Mr. Bedford in the United States indicate that the leaves of *B. betulina* yield most volatile oil. *Bitter Extractive: Diosmin* or *Barosmin.*—Brownish-yellow, bitter, and somewhat pungent. Soluble in water; but neither in alcohol nor ether.

*Physiological Effects.*—Buchu is an aromatic stimulant and tonic. Taken in moderate doses it promotes the appetite, relieves nausea and flatulence, and acts as a diuretic and diaphoretic. Its constitutional effects appear referable, first, to its action on the stomach; and secondly, to the absorption of the volatile oil, which is subsequently thrown out of the system by the secreting organs, on which it appears to act topically in its passage through them. Buchu seems to have a specific influence over the urinary organs.

*Therapeutics.*—In this country buchu has been principally employed *in chronic maladies of the urino-genital organs.* It seems to be principally adapted to chronic cases attended with copious secretion. *In chronic inflammation of the mucous membrane of the bladder*, attended with a copious discharge of mucus, it frequently checks the secretion and diminishes the irritable condition of the bladder, thereby enabling the patient to retain his urine for a longer period; but I have several times seen it fail to give the least relief, and in some cases it appeared rather to add to the patient's sufferings. *In irritable conditions of the urethra*, as spasmodic stricture, and *in gleet*, it has occasionally proved serviceable. In *lithiasis*, attended with increased secretion of the uric acid, it has been given with considerable benefit, and has appeared to check the formation of this acid. For the most part it should be given in these cases in combination with alkalies, as solution of potash.

*Administration.*—The dose of buchu, *in powder*, is 20 or 30 grains. It is usually taken in wine. But the *infusion* and *tincture* are more eligible preparations.

## *Officinal Preparations.*

Infusum Bucco, *Infusion of Buchu.*—[Infusum Buchu, U. S.]—Take of buchu, bruised, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain. ["Take of buchu, a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S.]

Tonic, sudorific, and diuretic.

*Dose.*—Fl. oz. j to fl. oz. ij.

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

*Dose.*—Fl. drm. j to fl. drs. iv.

[Extractum Buchu Fluidum, *Fluid Extract of Buchu.*—"Take of buchu, in moderately fine powder, sixteen troyounces; alcohol, a sufficient quantity. Moisten the buchu with six fluidounces of alcohol, introduce it into a cylindrical percolator, press it firmly, and gradually pour alcohol upon it until twelve fluidounces of tincture have passed. Set this aside and continue the percolation until two pints more of tincture have been obtained. Evaporate this by means of a water-bath, at a temperature not exceeding 150°, to four fluidounces, and mix it with the reserved tincture. Allow the mixture to stand for twenty-four hours, and filter through paper." U. S. This is probably the most elegant of all the preparations of buchu, and is, in fact, only a highly concentrated tincture. It is of a dark reddish-brown color, with the taste and odor of buchu. One fluidounce of it is equivalent to a troyounce of the leaves. Dose, ♏ xx–f℥ss, in water.—W.]

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## GALIPEA CUSPARIA, *DC.*

### Cusparia or Angustura Bark Tree.

Monadelphia Pentandria, *Linn. Syst.*

*Botanic Character.*—A *tree* 20–80 feet high. *Leaves* trifoliate, 2 feet long, fragrant; *petioles* 1 foot long, or nearly so; *leaflets* sessile, unequal, ovate-lanceolate, acute, dotted. *Flowers* racemose. *Calyx* and *corolla* white, with fascicles of hairs seated on glandular bodies on the outside. *Stamens* monadelphous (*Kunth.*), varying in number, 2 fertile; *anthers* with two short appendages. *Stigmas* 5. *Seed* solitary.—*Steph.* and *Church.* pl 149 (*Bonplandia trifoliata*).

*Habitat.*—Tropical South America. Humboldt and Bonpland state that *Galipea cusparia* yields Angustura bark; whereas Dr. Hancock asserts that it is a species which he calls *Galipea officinalis.* But it appears to me not improbable that both species may yield a febrifuge bark. [As this statement has been repeated in several works on Materia Medica, I think it right to mention that Dr. Hancock requested me to examine his specimens of *Galipea officinalis*, in order to decide whether it was specifically distinct from *G. cusparia.* I carefully examined these specimens, with the assistance of the late Professor Don, and we came to the conclusion that notwithstanding the difference in the height of the tree, the odor of the leaves, and even, occasionally, in the number of barren stamens, both plants belonged to the same species.—Ed.]

### Cusparia, *Cusparia Bark.*

### [Angustura, *Angustura.* Mat. Med. List, U. S. P.]

The bark; from tropical South America. [" The bark of Galipea officinalis (Hancock, *Trans. of the Medico-Bot. Soc.*)." U. S.]

*Commerce.*—Cusparia bark is imported directly from South America, or indirectly by way of the West Indies.

*Officinal Characters.*—In straight pieces more or less incurved at the sides, from half a line to a line in thickness, pared away at the edges; epidermis mottled, brown or yellowish-gray; inner surface yellowish-brown, flaky; breaks with a short fracture; bitter and slightly aromatic. The cut surface examined with a lens usually exhibits numerous white points or minute lines.

*Description.*—Cusparia bark occurs in flat pieces and quills, of various sizes, the longest pieces being from six to ten inches in length, covered with a yellowish-gray or grayish-white spongy epidermis, easily scraped off by the nail. The internal surface is brownish, not quite smooth, somewhat fibrous or splintery, easily separable into laminæ; the fracture is short and resinous, the odor strong, but peculiar; the taste bitter, aromatic and slightly acrid.

*Test.*—The inner surface touched with nitric acid does not become blood-red.

*Substitution.*—Serious accidents have formerly occurred in consequence of the bark of the nux-vomica tree having been substituted, either from ignorance or commercial cupidity, for angustura bark. Hence arose the distinction into *true* or *West India angustura*, and *false*, *spurious*, or *East India angustura*. This substitution, having been detected, is not likely to occur again; but as the Pharmacopœia has provided against it in the test, it may still be useful to tabulate the principal distinctive characters of the true barks, as follows:—

*Composition.*—Cusparia bark appears to owe its medicinal properties to the conjoint action of the volatile oil, bitter principle, and resin. *Volatile Oil.*—Obtained by submitting the bark to distillation with water. It is yellowish-white, lighter than water, has the peculiar odor of the bark, and an acrid taste. To this, as well as to the resin, the bark owes its acrid, aromatic taste. *Angusterin* or *Cusparin; Peculiar bitter principle.*—A neutral principle obtained by Saladin in the form of tetrahedral crystals, by submitting the alcoholic tincture of the bark (prepared without heat) to spontaneous evaporation. It is insoluble in the volatile oils and in ether; but dissolves slightly in water, more so in alcohol. Alkaline solutions also dissolve it. Nitric acid renders it greenish-yellow; sulphuric acid reddish-brown. Tincture of galls precipitates it from its aqueous and alcoholic solutions. *Resin.*—The *hard* resin is brown, bitter, soluble in potash, alcohol, and acetic ether; but insoluble in sulphuric ether and oil of turpentine. The *soft* resin is acrid, greenish-yellow, soluble in alcohol, ether, oil of turpentine, and almond oil; but insoluble in a solution of potash. It is colored red by nitric acid.

| | Angustura Bark. | Nux Vomica (False Angustura) Bark. |
|---|---|---|
| *Form*.................... | Quills or flat pieces, straight or slightly bent. | Quills or flat pieces, short, often very much twisted like dried horn arched backwards. |
| *Epidermoid Crust*....... | Whitish or yellowish, insipid, unchanged or rendered slightly orange-red by nitric acid. | Variable; sometimes a spongy-rust-colored 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 in color by nitric acid. | Not separable into laminæ; rendered blood-red by nitric acid. |

*Physiological Effects.*—A powerful aromatic or stimulant tonic. Its aromatic or stimulant properties depend on the volatile oil and resin; its tonic operation on the bitter principle. In its tonic and febrifuge powers it approximates to cinchona bark, but is devoid of astringency. It is less likely to irritate the stomach or to cause constipation than cinchona; but usually keep the bowels gently open. In full doses it is capable of nauseating and purging. Dr. Hancock says the warm infusion causes sweating and diuresis. In its combination of tonic and aromatic properties it is most allied to cascarilla. In its stomachic qualities it approaches calumbo.

*Therapeutics.*—Cusparia bark may be administered as a febrifuge *in intermittents* and *remittents*, especially in the worst forms of the bilious remittents of tropical climates. Drs. Williams, Wilkinson, Winterbottom, and, more recently, Dr. Hancock, have spoken in the highest terms of its efficacy. *In adynamic continued fever*, especially when complicated with great disorder of the digestive organs (manifested by vomiting or purging), it has been used with good effect. As an aromatic tonic and stomachic, *in general relaxation and muscular debility*, and *in atonic conditions of the stomach and intestinal tube* (as some forms of dyspepsia and anorexia), it has been employed with great success. It has also been administered to *check profuse mucous discharges*, as in the latter stages and chronic forms of dysentery and diarrhœa, and in chronic bronchial affections attended with excessive secretion of mucus. In fine, cusparia bark is applicable to any of the purposes for which other vegetable tonics (especially cascarilla, calumbo, and cinchona) are commonly employed.

*Administration.*—It may be given *in powder* in doses of from ten grains to forty grains. But the *infusion* is a more eligible mode of administration.

### *Officinal Preparation.*

INFUSUM CUSPARIÆ, *Infusion of Cusparia* [INFUSUM ANGUSTURÆ, U. S., *Infusion of Angustura*].—Take of cusparia, in coarse powder, half an ounce; distilled water at 120°, ten fluidounces. Infuse in a covered vessel for two hours, and strain. ["Take of angustura, in moderately coarse powder, half a troyounce; water, a sufficient quantity. Moisten the powder with two fluidrachms of water, pack it firmly in a conical percolator, and gradually pour water upon it until the filtered liquid measures a pint. This infusion may also be prepared by macerating the angustura in a pint of boiling water, for two hours, in a covered vessel, and straining." U. S.]

Fig. 194.

*Xanthoxylum fraxineum.*

Tonic, stomachic, and stimulant. Used in low fever, bilious diarrhœas and dysenteries, muscular debility, dyspepsia, &c. Tincture of cinnamon is an agreeable addition to it.

*Dose.*—From fl. oz. j to fl. oz. ij.

[The bark of XANTHOXYLUM FRAXINEUM (*X. americanum*) is officinal in the U. S. Secondary List. This is a prickly shrub, with yellowish-green flowers in axillary clusters, appearing with the leaves in April, and a short stalked pod. It grows in rocky woods in the Northern United States, and is commonly known as the *northern prickly ash* or *toothache tree*. The bark is very pungent. It is a stimulant, diaphoretic, and alterative, and is said to resemble guaiac and mezereon in its therapeutic powers. It is given in chronic rheumatism and other diseases in which the latter drugs are commonly exhibited. It is best given in decoction made by boiling an ounce in three pints of water down to a quart. A pint to be taken in the course of twenty-four hours.—W.]

## ZYGOPHYLLACEÆ, *Lindley.* The Guaiacum Order.

## GUAIACUM OFFICINALE, *Linn.*

### Officinal Guaiacum.

Decandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A large *tree* thirty to forty feet high. *Stem* commonly crooked; *bark* furrowed; *wood* very hard, heavy, the fibres crossing each other diagonally. *Leaves* bijugate; *leaflets* obovate or oval, obtuse, evergreen. *Flowers* 6–10 in the axils of the upper leaves. *Peduncles* $1\frac{1}{2}$ inch long, unifloral. *Calyx* 5-partite; *segments* oval.

Fig. 195.


*Guaiacum officinale.*
1. Corolla and stamens. 2. Seeds. 3. Fruit.

*Petals* five, pale-blue, oblong. *Stamens* ten. *Style* and *stigma* single. *Fruit* capsular, somewhat stalked, 5-celled, 5-angled, or by abortion 2 or 3-celled. *Seeds* solitary in each cell, pendulous from the axis.—*Steph.* and *Church.* pl. 90.

*Habitat.*—West Indian Islands, and on the warmer parts of the neighboring continent.

*Commerce.*—Both wood and resin are imported from the West Indian Islands, especially St. Domingo and Jamaica.

**Guaiaci Lignum**, *Guaiac Wood.* [Mat. Med. List, U. S. P.]

The wood sliced or coarsely turned; imported from St. Domingo and Jamaica.

*Officinal Characters.*—Extremely hard, the young or outer wood is pale-brown, the old or central wood is greenish-brown.

*Description.*—Guaiac wood is commonly termed *lignum vitæ* by turners. It is imported in large logs or billets. The distinction between the young and old wood is remarkable. The young wood (*alburnum* or *sapwood*) is of a pale yellow color; while the old wood (*duramen* or *heartwood*) which forms the central and principal part of the stem, is of a greenish-brown color, in consequence of the deposition of guaiac resin.

*Shavings*, *turnings*, or *raspings of guaiac wood* are distinguished from the similar parts of other woods by consisting of a mixture of yellowish and greenish-brown portions, or of yellowish ones, which become green by exposure to light; and by nitric acid, which communicates to the greenish-brown portions a temporary bluish-green color.

*Test.*—Nitric acid applied to the dark wood produces a bluish-green color.

*Composition.*—The most important constituent of guaiac wood is a peculiar resin (*guaiac resin*), which is officinal.

**Guaiaci Resina**, *Guaiac Resin.* [Mat. Med. List, U. S. P.]

The resin obtained from the stem by natural exudation, by incisions, or by heat.

*Extraction.*—It is obtained from the stem of the tree by the following methods: 1. *By natural exudation.*—It exudes naturally from the stem. and may be seen on it at all seasons of the year. 2. *By incision.*—If the tree be incised at different parts, a copious exudation takes place from the wounds, which hardens by exposure to the sun. This operation is performed in May. 3. *By heat.*—The third method of obtaining it is as follows: The trunk and larger limbs being sawn into billets of about three feet long, an auger hole is bored lengthwise in each, and one end of the billet so placed on a fire that a calabash may receive the melted resin which runs through the hole as the wood burns. 4. *By boiling.*—It is also obtained in small quantities by boiling chips or sawings of the wood in water with common salt. The resin swims at the top and may be skimmed off. The salt is used to raise the boiling point of the water.

*Officinal Characters.*—In large masses of a brownish or greenish-brown color; fractured surface resinous, translucent at the edges.

*Description.*—Guaiac resin occurs in tears and in masses. *Guaiac in tears* is found in rounded or oval tears of varying size, some being larger than a walnut. Externally the tears are covered by a grayish dust. They are said to be produced by *Guaiacum sanctum. Lump guaiac* is the ordinary kind met with in the shops. The masses are of considerable size, and are ordinarily mixed with pieces of bark, wood, and other impurities. Thin laminæ are nearly transparent, and have a yellowish-green color. The odor is balsamic, but very slight, though becoming more sensible by pulverization. When chewed, guaiac resin softens under the teeth, but has scarcely any taste, though it leaves a burning sensation in the throat. Its specific gravity is 1.2289, and when heated it melts and evolves a fragrant odor.

*Composition.*—Guaiac resin is remarkable for the changes of color it undergoes by the influence of various agents. Thus its powder, and paper moistened with its tincture, become *green* in air or oxygen gas, but not in carbonic acid gas; gluten, but not starch, gives a *blue* tint to guaiac resin when in contact with air. Hence powdered guaiac resin has been proposed as a test for the goodness of wheaten flour (which contains gluten), and of the purity of starch. Gum arabic, dissolved in cold water, has the same effect as gluten, but tragacanth has not. Milk, and various fresh roots and underground stems (for example those of the horseradish, potato, carrot, and colchicum) also possess this property. Nitric acid colors the tincture green, then blue, and afterwards brown. If a piece of paper moistened with the tincture be exposed to the fumes of the acid, its color is immediately changed to blue. Spirit of nitrous ether usually gives a blue color to a tincture of guaiac resin. Brande has conjectured, and I think with great probability, that these different colored compounds are combinations of oxygen with guaiac resin—the green compound containing the least, the brown the most, while the blue is intermediate. Pagenstecher has shown that tincture of guaiac resin with hydrocyanic acid and sulphate of copper produces an intense blue color. According to Berzelius, that part only of the resin which is soluble in ammonia undergoes the changes of color. Other inorganic agents which produce the colors are, ozone, chlorine, hyponitrous ether, chlorides of iron, mercury, copper, and gold, and the alkaline hypochlorites. Dr. Schmidt takes advantage of this latter reaction to detect guaiac resin, when used for adulterating jalap or scammony. When hypochlorite of soda is added to a solution of the suspected resin, if guaiac resin be present only in the proportion of $\frac{1}{320}$ part, the liquid, according to him, will assume a green color. For the detection of this resin under ordinary circumstances, the following plan is recommended. Strips of very clean filtering-paper are soaked in a weak alcoholic solution of the resin, and immediately, while still moist, are introduced into a vessel half filled with solution of chlorine without touching it. The blue and white colors are produced. Guaiac resin contains resin of guaiac, guaiacic acid and extractive matter. About nine per cent. of it is soluble in water. *Resin of guaiac* is insoluble in water, in benzin, and in the light coal naphthas, but is readily dissolved by alcohol, and is precipitated from its alcoholic solution by water, sulphuric and nitric acids, and chlorine. Ether dissolves the resin but not so readily as alcohol. Solutions of the caustic alkalies (potash and soda) also dissolve it. The mineral acids precipitate it from its alkaline solution. Various salts (as acetate of baryta, acetate of lime, acetate of lead, nitrate of silver, and chloride of gold) occasion precipitates with the alkaline solution. Johnson says this resin consists of $C_{40}H_{23}O_{10}$. According to Unverdorben the resin of guaiac is of two kinds: one readily soluble in a solution of ammonia, and another which forms with ammonia a tarry compound. *Guaiacic Acid*, $HO,C_{12}H_7O_5$, forms white shining needles, soluble in alcohol, ether, benzin, and the light coal naphthas, but sparingly soluble in water. It exists only in small quantities, in guaiac resin. Jahn regards it merely as benzoic acid. *Extractive.* This is extracted from guaiac resin by the agency of water. The quantity obtained is liable to variation. It is a brown acrid substance.

*Test.*—A solution in rectified spirit strikes a clear blue color when applied to the inner surface of a paring of raw potato.

*Adulterations. Of the resin.*—Various adulterations are described as being practised on guaiac resin. Although I have found this substance in the shops of this country of unequal degrees of impurity, I have never had reason to suspect that sophistication had been practised on it. The presence of turpentine resin might be detected by the peculiar odor evolved when the suspected resin is heated. Another mode of detecting this fraud is to add water to the alcoholic solution of the suspected guaiac resin, and to the milky liquid thus formed a solution of caustic potash is to be added until the liquid becomes clear. If now an excess of potash cause no precipitate, no resin is present; for while *guaiacate of potash* is soluble in water, the salt produced by the union of potash and resin is not completely so.

*Of the wood.*—When it is suspected that the shavings of other woods are intermixed with guaiac wood, Heraut recommends that the wood should be treated with a solution of chloride of lime. Guaiac wood assumes a green color in a few seconds; other woods remain unchanged.

*Physiological Effects. Of the resin.*—Guaiac resin is an acrid stimulant. Its acridity depends in a great measure on the extractive with which the resin is mixed, or which resides in the fragments of bark contained in the resin. Under the use of *small* and *repeated doses* of guaiac resin, various constitutional diseases sometimes gradually subside, and a healthy condition of system is brought about with no other sensible effect of the remedy than perhaps the production of some dyspeptic symptoms, and a slight tendency to increased secretion. We designate this inexplicable, though not less certain influence over the system by the term *alterative*. When we give guaiac resin in *moderately large doses*, or to plethoric easily-excited individuals, we observe the combined operation of an acrid and stimulant. The local symptoms are, the dryness of the mouth, the sensation of heat at the stomach, nausea, loss of appetite, and a relaxed condition of bowels. The stimulant operation is observed partly in the vascular system, but principally in the exhaling and secreting organs, especially the skin and kidneys. Dr. Cullen justly observes that it seems to stimulate the exhalants more in proportion than it does the heart and great arteries. If diluents be exhibited, and the skin kept warm, guaiac resin acts as a powerful sudorific; whereas, when the surface is kept cool, perspiration is checked, and diuresis promoted. By continued use it has caused a mild salivation. The stimulant influence of guaiac resin is extended to the pelvic vessels, and thus the hemorrhoidal and menstrual discharges are somewhat promoted by it. But there is no reason for supposing that the pelvic organs are specifically affected by it. In *very large doses* guaiac resin causes heat and burning in the throat and stomach, vomiting, purging, pyrexia, and headache. In its operation on the system, guaiac resin is allied to the balsams. Dr. Cullen considered its resinous part to be very analogous to the balsams and turpentines.

*Of the wood.*—The operation of the wood is similar to, though milder than, that of the resin. Any activity which the wood communicates to boiling water must depend on the extractive, as the resin is not soluble in this fluid. Pearson says that the decoction excites a sensation of warmth in the stomach, produces dryness of the mouth, with thirst, increases the natural temperature of the skin, renders the pulse more frequent, and, if the patient lie in bed and take the decoction warm, it proves moderately sudorific; but if he be exposed freely to the air, it acts as a diuretic. Continued use occasions heartburn, flatulence, and costiveness.

*Therapeutics.*—In the employment of guaiac resin its acrid and stimulant properties are to be remembered. The first unfits it for use in cases of impaired digestion, where there is irritation or great susceptibility of, or inflammatory tendency in, the alimentary canal; the second renders it improper in plethoric individuals, in all states of excitement or acute inflammation, and in persons whose vascular system is easily excited, and who are disposed to hemorrhages. It is admissible and useful, on the other hand, in atonic or chronic forms of disease, with retained secretions, especially in relaxed and phlegmatic constitutions. The following are some of the diseases in which it has been employed: *In chronic rheumatism*, especially when occurring in scrofulous subjects, or in persons affected with venereal disease, guaiac resin may be administered with considerable advantage under the conditions before mentioned. In cases of great debility, with coldness of surface, and in old persons, the ammoniated tincture may be employed. *In chronic skin diseases*, where sudorifics and stimulants are indicated, guaiac resin may be serviceable, especially in scrofulous and syphilitic subjects. *In obstructed and painful menstruation* not arising from any plethoric, inflammatory, or congested state of system, the ammoniated tincture of guaiac has been employed with advantage. *As a remedy for venereal diseases*, guaiac wood was at one time in the greatest repute. Nicholas Poll tells us, that within nine years from the time of its introduction into Europe, more than three thousand persons had derived permanent benefit from its use. Experience, however, has taught us the true value of this remedy, and we now know that it has no specific powers of curing or alleviating syphilis. It is applicable, as an alterative and sudorific, for the relief of secondary symptoms, especially venereal rheumatism and cutaneous eruptions, more particularly in scrofulous subjects. Mr. Pearson found it serviceable after the patient had been subjected to a mercurial course. Under its use, thickening of the ligaments and periosteum subsided, and foul indolent sores healed. During its administration the patient should adhere to a sudorific regimen.

*Administration.*—The *powder* of guaiac resin may be given in doses of from 10 to 30 grains. It is best given in the form of ammoniated tincture.

*Pharmaceutic Uses.—The wood* is used in the preparation of compound decoction of sarsaparilla; and *the resin* is a constituent of compound pill of calomel.

### *Officinal Preparations of the Resin.*

Mistura Guaiaci, *Guaiac Mixture.*—Take of guaiac resin, in powder, half an ounce; sugar, half an ounce; gum arabic, powdered, a quarter of an ounce; cinnamon water, one pint. Triturate the guaiac with the sugar and the gum, adding gradually the cinnamon water.

*Dose.*—Fl. oz. ss to fl. oz. ij.

Tinctura Guaiaci Ammoniata [U.S.], *Ammoniated Tincture of Guaiac.*—Take of guaiac resin, in fine powder, four ounces; aromatic spirit of ammonia, one pint. Macerate for seven days in a well-closed vessel, and filter, then add sufficient aromatic spirit of ammonia to make one pint. ["Take of guaiac, in moderately coarse powder, six troyounces; aromatic spirit of ammonia two pints. Macerate for seven days, and filter through paper." U. S.]

A powerfully stimulating sudorific and emmenagogue.

*Dose.*—Fl. drm. ss to fl. drm. j.

[Tinctura Guaiaci, *Tincture of Guaiac.*—"Take of guaiac, in moderately coarse powder, six troyounces; alcohol a sufficient quantity. Mix the powder thoroughly with an equal bulk of dry sand, pack the mixture moderately in a conical percolator, and, having covered it with a layer of sand, gradually pour alcohol upon it until two pints of tincture are obtained." U. S. This is probably not so effective a preparation as the ammoniated tincture. Dose, fʒj t. d. in milk or water.—W.]

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## **VITACEÆ**, *Lindley.* The Vine Order.

## **VITIS VINIFERA**, *Linn.*

### **The Grape Vine.**

Pentandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A hardy, exceedingly variable *shrub. Branches* prostrate, climbing, or erect. *Leaves* lobed, sinuate-dentate, smooth or downy; *tendrils* opposite to each petiole, solitary, spiral. *Flowers* in loose or crowded panicles. *Calyx* obscurely 5-toothed. *Petals* 5, cohering at the apex. *Stamens* 5. *Style* absent. *Fruit* baccate, red, greenish, or white, globose, ovate, or oblong, sweet, musky, or austere. *Seeds* variable in number, or altogether wanting.—*Woodv.* pl. 195.

Fig. 196.

*Vitis vinifera, in fruit.*

*Habitat.*—Probably originally a native of Persia, but now cultivated extensively in the warmer parts of Europe.

**Uvæ**, *Raisins.* [**Uva Passa.** Mat. Med. List, U. S. P.]

The ripe fruit, dried in the sun or with artificial heat; imported from Spain.

*Officinal Characters.*—Fruits shrivelled and compressed, smooth, and free from sugary or saline incrustation, agreeably fragrant; pulp soft, very sweet.

*Composition.*—The more important constituents of both grapes and raisins are *grape sugar* $(C_{12}H_{14}O_{14})$, and *acid tartrate of potash.*

*Physiological Effects, and Uses.*—Raisins are agreeably demulcent. They are employed only as flavoring agents.

*Pharmaceutic Uses.*—Raisins are contained in compound tincture of cardamoms, and tincture of senna.

**Acidum Tartaricum**, *Tartaric Acid.* [Mat. Med. List, U. S. P.]

An acid, $2HO,\overline{T}(C_8H_4O_{10})$, obtained from the acid tartrate of potash.

*Natural History.*—It is peculiar to the vegetable kingdom. In the *free* state it exists in tamarinds, grapes, and mulberries. It is also found native in combination with bases: thus, *acid tartrate of potash* exists in tamarinds and grapes. It is abundantly contained in Argol, or the crude tartar which is deposited during fermentation from the juice of the grape. The purified Argol, or acid tartrate of potash, is the principal source of this acid.

*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 fluidounces. Boil the tartrate of potash with two gallons of the water, and add gradually the chalk, constantly stirring. When the effervescence has ceased, add the chloride of calcium dissolved in two pints of the water. When the tartrate of lime has subsided, pour off the liquid, and wash the tartrate with distilled water until it is rendered tasteless. Pour the sulphuric acid first diluted with three pints of the water on the tartrate of lime, mix thoroughly, boil for half an hour with repeated stirring, and filter through calico. Evaporate the filtrate at a gentle heat until it acquires the specific gravity of 1.21, allow it to cool, and then separate and reject the crystals of sulphate of lime which have formed. Again evaporate the clear liquor till a film forms on its surface, and allow it to cool and crystallize. Lastly, purify the crystals by solution, filtration (if necessary), and recrystallization.

The following is the *theory* of the process for making tartaric acid: By the mutual action of acid tartrate of potash and carbonate of lime (chalk), we obtain neutral tartrate of potash in solution, and tartrate of lime precipitated, while carbonic acid escapes. $2(KO,\overline{T})+2(CaO,CO_2)$

$=2KO,\bar{T}+2CaO,\bar{T}+2CO_2$. When to the solution of neutral tartrate of potash we add chloride of calcium, double decomposition ensues; tartrate of lime is precipitated, and chloride of potassium remains in solution. $2KO\bar{T}+2CaCl=2CaO\bar{T}+2KCl$. The tartrate of lime obtained in the above two operations is then decomposed by sulphuric acid, which forms the almost insoluble sulphate of lime, and sets tartaric acid free. $2CaO,\bar{T}+2(HO,SO_3)=2(CaO,SO_3)+2HO,\bar{T}$.

Fig. 197.


*Crystals of tartaric acid.*

*Officinal Characters.*—In colorless oblique rhombic prisms, of a strongly acid taste, readily soluble in water, and in rectified spirit. When to either solution a little acetate of potash is added, a white crystalline precipitate forms (acid tartrate of potash).

*Properties.*—Fifteen parts of cold water dissolve ten parts of crystallized tartaric acid: boiling water takes twice its own weight of the acid. Alcohol sparingly dissolves the acid. Heated with either nitric acid or potash it yields oxalic acid. By the action of sulphuric acid on it, acetic acid is formed. When heated with sulphuric acid it is strongly blackened. A solution of tartaric acid is very sour, and causes, with solutions of caustic lime, baryta, and strontia, white precipitates, soluble in excess of acid. Hydrochlorate of ammonia dissolves the precipitate (*tartrate of lime*) produced by lime water. With acetate of lead the solution of tartaric acid also forms a white precipitate (*tartrate of lead*), soluble in excess of nitric acid.

*Tests.*—Seventy-five grains dissolved in water require for saturation 100 measures of the volumetric solution of soda. Its aqueous solution is not affected by sulphuretted hydrogen, and gives no precipitate with the solution of sulphate of lime, or of oxalate of ammonia (showing its freedom from metallic impurities, oxalic acid, and lime). It leaves no residue, or only a mere trace, when burned with free access of air.

*Uses.*—Tartaric acid may be used as a cheap substitute for citric acid or lemon juice, in the formation of acidulous refrigerant drinks, for febrile and inflammatory disorders. It is, however, rarely employed for this purpose. Its common medicinal use is in the preparation of effervescing compounds, with the alkaline carbonates, especially with bicarbonate of soda. The following are the relative proportions of tartaric acid and alkaline carbonates for preparing effervescing draughts:—

20 *grains of the crystals of tartaric acid are saturated by*—

| | |
|---|---|
| Crystallized bicarbonate of potash . . . . | 27 grains. |
| Carbonate of ammonia . . . . . . . | $15\frac{1}{2}$ " |
| Bicarbonate of soda . . . . . . . | 22 " |

The most commonly used effervescing tartrate is that made with bicarbonate of soda.

*Officinal Preparation.*

Solution of Tartaric Acid (Appendix B. II.).—Take of tartaric acid, in crystals, one ounce; distilled water, eight fluidounces; rectified spirit, two fluidounces. Dissolve the tartaric acid in the water, add the rectified spirit, and preserve the solution in a stoppered bottle.

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## GUTTIFERÆ, *Jussieu.* The Gamboge Order.

## GARCINIA, *Linn.*

Diœcia Monadelphia, *Linn. Syst.*

*Generic Character.—Flowers* polygamous or diœcious. *Sepals* 4, persistent. *Petals* 4. *Stamens* numerous, more or less united; *anthers* ovate. *Fruits* succulent, 4–10-celled. *Trees* with ovate or elliptical leaves.

*Species.*—Although the exact species of Garcinia which yields our commercial gamboge is not exactly ascertained, the investigations of Dr. Christison, some years since, led him to the belief that it was one closely allied to the *Garcinia elliptica*, Wallich, but differing from it in having the male flowers *pedicellate* instead of *sessile.* Recently Mr. Daniel Hanbury examined specimens of the same plant, which were derived, like those of Dr. Christison's, from trees cultivated at Singapore, and he has pronounced them to be the produce of a variety of *Garcinia Morella*, Desrousseaux, which he has termed var. *pedicellata*, in allusion to the pedicellate male flowers. The origin of gamboge seems now settled, although some doubts are still entertained among botanists as to whether the plant yielding gamboge should be regarded as a variety of an old species, or should itself constitute a new species.

### Cambogia, *Gamboge.*

### [Gambogia, Mat. Med. List, U. S. P.]

The gum-resin of an undetermined species of Garcinia, *Linn.;* imported from Siam.

*Preparation.*—The only account which we possess of the method of obtaining Siam gamboge is that given to König by a Catholic priest residing at Cochin-China. According to this statement, when the leaves or branchlets are broken, a yellow milky juice issues, which is received either on the leaves of the tree or in cocoanut shells, and from thence is transferred into large flat earthen vessels, where it is allowed to harden during the summer season, and is afterwards enveloped with leaves. The cylindrical or pipe variety receives its form by being run into the joints of the bamboo while it is in the liquid state.

*Commerce.*—It is brought to this country sometimes direct from Siam; at other times indirectly by way of Singapore, Penang, or Canton.

*Officinal Characters.*—In cylindrical pieces, breaking easily with a smooth conchoidal glistening fracture; color tawny, changing to yellow when it is rubbed with water; taste acrid.

*Description.*—Gamboge is found in commerce in two forms: 1st, *In cylindrical pieces*, termed *pipe gamboge;* 2d, *In cakes* or *amorphous masses.* The former is commonly the best kind, and that described in the pharmacopœia.

1. *Pipe gamboge* consists of cylindrical pieces, varying from one to three inches in diameter. Some of them appear to have been formed by rolling; but many of them are striated from the impression of the

bamboo stems into the hollow of which the gamboge juice has been poured, and not unfrequently portions of the stems are still adherent. The gamboge cylinders are sometimes distinct, and covered externally with a dirty greenish-yellow dust; at others agglutinated or even folded, so as to form masses of varying sizes and forms. Pipe gamboge occurs in all qualities—the finest and the worst specimens of gamboge which I ever saw having this form. *Fine gamboge* is brittle and odorless; it has very little taste at first, but after some time it causes a sensation of acridity in the throat. Its fracture is conchoidal; its fractured surface is opaque, reddish-yellow, and glistening. It is completely dissolved by the successive action of ether and water. Mixed with a sufficient quantity of water, it forms a yellow emulsion. The powder of fine gamboge is bright yellow. *Inferior qualities* of pipe gamboge are harder, more earthy in fracture; the fractured surface is brownish or grayish-yellow, frequently with black spots, from the presence of foreign bodies which are intermixed. It is not completely dissolved by the successive action of ether and water. Iodine readily detects, in the cooled decoction, starch, by the green color which it gives rise to.

2. *Lump* or *cake gamboge* occurs in masses of several pounds weight. Its quality is inferior to the finest pipe kind. Internally we observe fragments of wood, twigs, and air-cells. In most of its characters it agrees with the inferior qualities of pipe gamboge, and like this contains starch.

*Test.*—An emulsion made with boiling water, and cooled, does not become green with the solution of iodine (showing the absence of starch).

*Composition.*—The principal constituent of gamboge is a resin, termed gambogic acid. It also contains soluble gum. The best gamboge yields from about 70 to 75 per cent. of resin, and from about 20 to 25 per cent. of soluble gum. *Gambogic Acid; Resin.*—Obtained by evaporating to dryness the ethereal tincture of the pure gum resin. It is brittle, in thin layers of a deep orange color, in thicker masses of a cherry-red tint. It is insoluble in water, but soluble in alcohol, and still more so in ether. It communicates an appreciable yellowness to 10,000 times its weight of spirit. It is soluble in the caustic alkalies, forming dark red solutions (*alkaline gambogiates*), which yield, with acids, a yellow precipitate (*gambogic acid*); with acetate of lead, a yellow (*gambogiate of lead*); with the salts of iron, a dark brown (*gambogiate of iron*); and with sulphate of copper, a brown one (*gambogiate of copper*). In doses of five grains gambogic acid occasions profuse watery discharges, without pain or other uneasiness. If the activity of gamboge depended solely on the resin, five or five and a half grains of the resin should be equal to seven of gamboge; but, according to Dr. Christison, this is not the case. Hence, either it is not the sole active ingredient, or it becomes somewhat altered in the process for procuring it; the latter supposition is the more probable. [The activity of the resin may be increased by the increased solubility communicated to it by the gum.—Ed.] *Gum (Arabine?).*—The gum of gamboge is soluble in cold water, like gum arabic.

*Chemical Characteristics.*—Gamboge emulsion becomes transparent and deep red on the addition of potash, forming *gambogiate of potash*. Digested in alcohol or ether, gamboge yields orange-red tinctures (*solutions of gambogic acid*). The detection of gamboge in pills has become, on some occasions, an important object of medico-legal research. Spurious compound extract of colocynth, and the *pill cochiæ* of the shops, sometimes contain gamboge. The mode of detection, in all these cases, is simple: Digest one portion of the substance in alcohol, and another in ether. Then subject the alcoholic and ethereal tinctures to the tests above mentioned.

*Physiological Effects.*—Taken in *small doses*, gamboge promotes the secretions of the alimentary canal and of the kidneys, and causes more frequent and liquid stools than natural. In *larger doses* it occasions nausea, oftentimes vomiting, griping pains of the bowels, watery stools, and increased discharge of urine. When the action is very violent, there is great depression of the vascular system. In *excessive doses* it acts as an acrid poison. A drachm caused horrible vomiting and purging, followed by syncope and death. The deaths which have occurred from the use of enormous quantities of Morison's pills are mainly attributable to the gamboge contained in these medicines. In these cases the symptoms were violent vomiting and purging, abdominal pain and tenderness, cold extremities, and sinking pulse. On *post-mortem* examination, inflammation, ulceration, and mortification of the intestines, were found. Gamboge belongs to the active hydragogues and drastic purgatives. In activity it is inferior to elaterium and croton oil. In acridity it exceeds jalap, scammony, and even colocynth. It is exceedingly apt to irritate the stomach, and to occasion nausea and vomiting. This arises from its ready solubility in the gastric juices. As this action on the stomach is exceedingly objectionable, we sometimes endeavor to lessen it by giving the medicine in the form of pill.

*Therapeutics.*—From the foregoing account of the effects of gamboge it is very evident that it is a remedy well adapted for acting as a stimulus to the abdominal and pelvic viscera, either to rouse them when in a torpid state, or to give them preternatural activity, and thereby to relieve some distant organ, on the principle of counter-irritation. On the other hand, the use of gamboge is highly objectionable when there is an irritable or inflammatory condition of the stomach or bowels, a tendency to abortion or to uterine hemorrhage, and also when we do not want to promote or increase the hemorrhoidal discharge. The following are some of the doses in which we employ it: *In constipation*, where an active cathartic of small bulk is required. It is, however, not given alone, as the necessary dose would be very apt to create nausea and vomiting. It is, therefore, usually conjoined with other and milder purgatives, the operation of which it increases and quickens, while they, by diminishing its solubility in the juices of the stomach, lessen its tendency to create nausea or vomiting. The compound pill of gamboge may be referred to as a preparation in which these objects have been kept in view. *In cerebral affections*, as apoplexy or a tendency thereto, gamboge, usually associated with other purgatives, as above stated, is a highly valuable counter-irritant purgative. By stimulating and rousing the nerves, bloodvessels, and secretory apparatus of the abdomen, it is often calculated to relieve determinations of blood to other parts. *In dropsies* gamboge has been employed on account of its hydragogue operation, where the use of drastic purgatives is indicated. To its efficacy numerous practitioners have borne testimony. It is usually given in combination with other and milder remedies of the same class, as jalap and the acid tartrate of potash. If it be desirable also to act on the kidneys, an alkaline solution of gamboge has been recommended. Gamboge has been thought more especially serviceable in those forms of dropsy which are connected with hepatic obstruction. *As an anthelmintic.*—Gamboge has been frequently applied as a remedy for tapeworm, and not unfrequently with considerable success. Several empirical anthelmintic remedies are said to owe their efficacy to this substance. It is an important constituent of Madame Nouffer's *specific.*

*Administration.*—On account of its tendency to occasion vomiting and griping, gamboge is usually given in *small doses*, as from one to three or four grains, in the form of pill, and repeated every four or six hours, In this way it may be given with safety and without inconvenience. The full dose of it is from ten to fifteen grains.

*Antidote.*—In poisoning by gamboge our chief reliance must be placed on the palliatives already mentioned for poisoning by elaterium. I am acquainted with no well ascertained antidote, though the alkalies (carbonate of potash, according to Hahnemann) have been said to diminish the violence of the topical action of gamboge.

*Officinal Preparation.*

Pilula Cambogiæ Composita, *Compound Pill of Gamboge.*—Take of gamboge, one ounce; Barbadoes aloes, one ounce; aromatic powder, one ounce; hard soap, in powder, two ounces; syrup, a sufficiency. Pulverize the gamboge and aloes separately, mix them with the aromatic powder, add the soap and afterwards the syrup; and beat the whole into an uniform mass.

Cathartic. Employed in obstinate constipation.

*Dose.*—Gr. x to gr. xv.

[Gamboge is one of the constituents of the compound cathartic pill. U. S.—W.]

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## AURANTIACEÆ, *Corrêa.* The Orange Order.

## CITRUS.

Polyadelphia Polyandria, *Linn. Syst.*

*Generic Character.*—*Flowers* usually with a quinary proportion of parts. *Calyx* urceolate, 3–5-cleft. *Petals* 4 to 8. *Stamens* 20 to 60; *filaments* compressed, more or less united at the base, polydelphous; *anthers* oblong. *Style* round; *stigma* hemispherical. *Fruit* baccate, 7–12-celled; cells many-seeded, pulpy. *Seeds* exalbuminous. *Trees* or *shrubs*, with axillary spines. *Leaves* reduced to one terminal leaflet, which is joined with the petiole; *petiole* often winged.

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## CITRUS LIMONUM, *DC.*

### The Lemon.

*Specific Character.*—A *shrub* from 10 to 15 feet high, much branched; the *young branches* flexible. *Leaves* oval or oblong, serrulate or somewhat dentate; *petiole* simply margined. *Flowers* white, tinged with red. *Fruit* yellow, ovoid, with a more or less nipple-shaped knob at the apex; *rind* with numerous convex receptacles of oil; *pulp* acid.—*Steph.* and *Church.* pl. 92 (*Citrus Medica*).

*Habitat.*—A native of Asia (Himalaya, *Royle*; Persia, *Risso*). Cultivated in the South of Europe.

**Limonis Cortex,** *Lemon Peel.* [Mat. Med. List, U. S. P.]

The fresh outer part of the rind of the ripe fruit; imported from Southern Europe.

*Commerce.*—Lemons are imported from Spain, Portugal, Italy, and the Azores. The Spanish lemons are most esteemed. The words of the Pharmacopœia *imported from Southern Europe* refer to the fruit, not to the rind or peel, which should be dried in this country.

Fig. 198.


*Citrus limonum.*

*a.* Flower. *b.* Fruit.

*Officinal Characters.*—In thin slices of a yellow color, dotted with numerous vesicles of oil, with a fragrant odor, and aromatic slightly bitter taste.

*Description.*—The fresh outer yellow portion of the rind (*flavedo*) is alone officinal. It is pale yellow and rough. By drying its color deepens. Its odor, which is owing to the volatile oil lodged in appropriate receptacles, is strong and peculiar. The inner portion of the rind is white, spongy, and almost both odorless and tasteless. The flavedo yields, both by distillation and expression, a volatile oil (see **Oleum Limonis**). A watery infusion of lemon peel becomes greenish-brown on the addition of the perchloride of iron.

*Composition.*—Lemon peel has not been regularly analyzed, though some of its constituents have been examined. It contains volatile oil, a bitter principle, gallic acid, and a neutral, crystalline tasteless principle called hesperidin.

*Physiological Effects and Uses.*—Lemon peel is a grateful stomachic and aromatic. It is also employed as a flavoring ingredient.

*Pharmaceutic Use.*—Lemon peel is an ingredient in syrup of lemons.

### *Officinal Preparation.*

Tinctura Limonis, *Tincture of Lemon Peel.*—Take of fresh lemon peel, sliced thin, two ounces and a half; proof spirit, one pint. Macerate the lemon peel for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint.

This tincture forms an agreeable addition to tonic and other medicines.

*Dose.*—Fl. drm. j to fl. drs. ij.

## **Oleum Limonis,** *Oil of Lemon.* [Mat. Med. List, U. S. P.]

The oil expressed or distilled from fresh lemon peel; imported chiefly from Sicily.

*Commerce.*—The greater part of the oil of commerce is brought from Italy and Portugal; but some is procured from France.

*Officinal Characters.*—Color pale-yellow, odor agreeable, taste warm and bitter.

*Description and Composition.*—This oil is usually procured by expression. as follows: The flavedo of the lemons is removed by rasping, and is afterwards pressed in hair sacks. The oil which is thus procured is received in flasks, where it deposits some of its impurities, and is then decanted and filtered. Baumé says the rasped flavedo is pressed between glass plates. Expressed oil of lemon is somewhat turbid, and liable to undergo change by keeping, owing to the mucilaginous matter which it contains in solution. Oil of lemon may be procured also by distillation; and the oil thus procured is pure, not disposed to undergo change by keeping, but its flavor is less pleasant and sweet. When quite pure it is colorless, limpid, and of a fragrant odor, like that of lemons. Its specific gravity at 70° F. is 0.847. It is soluble in all proportions in anhydrous alcohol, but less soluble in rectified spirit, and it boils at about 140° F. The composition of oil of lemon is $C_{20}H_{16}$—that is, it is isomeric with the oils of turpentine, savin, juniper, and copaiva. Like most other volatile oils it is composed of two isomeric oils.

*Physiological Effects and Uses.*—Oil of lemon possesses the stimulant properties of the milder volatile oils, and is denominated carminative and diaphoretic. In full doses it is said to be apt to occasion headache and giddiness. Its principal use is for communicating an agreeable odor and flavor to other medicines. It may be taken as a carminative, in the *dose* of a few drops, on sugar. As a perfume it is an exceedingly useful adjunct to sulphur ointment, and to evaporating lotions. To this, as to some other volatile oils, has been ascribed the power of promoting the growth of the hair, and, in consequence, it has been added to pomatum. More recently it has been employed as a stimulant application in various external inflammations of the eye.

*Pharmaceutic Use.*—Oil of lemon is an ingredient in aromatic spirit of ammonia.

[Spiritus Limonis, U. S., *Spirit of Lemon*, *Essence of Lemon.*—"Take of oil of lemon, two fluidounces; lemon peel, freshly grated, a troyounce; stronger alcohol, two pints. Dissolve the oil in the stronger alcohol, add the lemon peel, macerate for twenty-four hours, and filter through paper." U. S. Used principally as a flavoring extract.—W.]

**Limonis Succus,** *Lemon Juice.* [Mat. Med. List, U. S. P.]

The expressed juice of the ripe fruit.

*Officinal Characters.*—A slightly turbid yellowish liquor, possessing a sharp acid taste, and grateful odor.

*Description.*—A very sour liquor obtained from lemons by expression and straining. Owing to the mucilage and extractive which it contains, it readily undergoes decomposition, though various methods have been proposed of preserving it. The juice both of lemons and limes (the fruit of *Citrus Limetta*, Risso) is extensively imported.

*Adulteration.*—A large quantity of the so-called lemon juice, which is supplied to ships going on long voyages, is said to be manufactured in this country from tartaric and other acids, and afterwards flavored with oil of lemon.

*Composition.*—According to Proust, lemon juice consists of citric acid, 1.77; malic acid, gum, bitter extractive, 0.72; and water, 97.51. *Lime juice* contains the same ingredients, in somewhat different proportions; the quantity of citric acid in it is larger, while that of gum, &c., is less. *Citric Acid* (see **Acidum Citricum,** page 785).

*Physiological Effects and Uses.*—Lemon juice furnishes a most agreeable and refreshing beverage, and proves refrigerant and antiscorbutic. It is employed for several purposes, as follows: *In the preparation of refrigerant drinks.* It may be either added to barley-water, or mixed with sugar and water to form *lemonade.* The latter may be extemporaneously made, by adding two lemons sliced, and two ounces of sugar, to two pints of boiling water, and digesting until cold. These acidulated drinks are exceedingly useful for allaying thirst, and as refrigerants in febrile and inflammatory complaints, and in hemorrhages. In the latter maladies *iced lemonade* should be preferred. Where there is nausea or a tendency to sickness, *effervescing lemonade* is useful. *In the formation of the effervescing draught.*—The effervescing draught, made with lemon juice (or citric acid) and bicarbonate of potash, is one of the best remedies we possess for allaying sickness and vomiting. The citrate of potash, which is formed, is a mild diaphoretic and diuretic, and often allays restlessness and watchfulness in fever. It is adapted for lithic acid deposits; but, like other remedies of the same class, is sometimes objectionable in phosphatic deposits. When our object is to determine to the skin, an effervescing draught, composed of lemon juice or citric acid and carbonate of ammonia, is to be preferred. The relative proportions of the alkaline carbonates, and of lemon juice, and citric acid, for the formation of effervescing draughts, is as follows:—

| Citric Acid. | Lemon Juice. | Grs. 20 of the Alkali. |
|---|---|---|
| Grs. 14 | or fl. drs. iijss, | Bicarbonate of Potash. |
| Grs. 24 | or fl. drs. vj. | Carbonate of Ammonia. |

Effervescing draughts are exceedingly valuable vehicles for the exhibition of other remedies. *As an Antiscorbutic.*—Lemon juice has long been regarded as an invaluable antiscorbutic; but on account of the difficulty of preserving it, crystallized citric acid is usually substituted; though certainly much less, and in Dr. Garrod's opinion, not at all efficacious. *As an Antidote.*—In poisoning by the alkalies and their carbonates, the vegetable acids are the antidotes; and the most convenient, easily procurable acidulous substances are, in general, vinegar and lemon juice. *As an Antinarcotic.*—In poisoning by narcotic substances, as opium, lemon juice may be administered, after the poison has been removed from the stomach, to counteract the effects. *In Rheumatism.*—Lemon juice has been recommended as a remedy in acute rheumatism and gout by Dr. Owen Rees, and has been used with success by many practitioners, not only in this country, but in Italy, France, and America. Dr. Rees considers the citric acid to undergo changes in the stomach, and to supply oxygen to such elements as tend to produce uric acid, and thereby to induce the formation of urea and carbonic acid instead.

*Officinal Preparation.*

Syrupus Limonis [U. S.], *Syrup of Lemons.*—Take of fresh lemon peel, two ounces; lemon juice, strained, one pint; refined sugar, two pounds and a quarter. Add the sugar and the lemon peel to the lemon juice in a covered vessel, and dissolve the sugar with the aid of a steam or water bath, then strain. The product should weigh three pounds and a half, and should have the specific gravity 1.340. ["Take of lemon juice, recently expressed, and strain a pint; sugar, in coarse powder, forty-eight troyounces; water, a pint. Mix the lemon juice and water, and, having added the sugar to the mixture, dissolve it with the aid of a gentle heat, and strain the solution while hot." U. S.]

Refrigerant and somewhat stomachic. An agreeable adjunct to diluent drinks, as barley water, in febrile and inflammatory complaints, and to gargles.

*Dose.*—Fl. drm. j to fl. drs. iv.

[Lemon juice is one of the constituents of Mistura Potassæ Citratis, U. S.—W.]

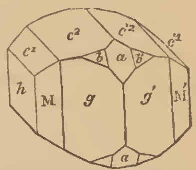
**Acidum Citricum,** *Citric Acid.* [Mat. Med. List, U. S. P.]

An acid, $3HO,\overline{C}(C_{12}H_5O_{11})+HO$, obtained from lemon juice or from the juice of the fruit of Citrus Limetta *Risso*, the Lime.

*Commerce.*—The juice of lemons and limes is imported in enormous quantities for citric acid manufacturers.

*Preparation.*—Take of lemon juice, four pints; beer yeast, two fluidounces; prepared chalk, four ounces and a half; sulphuric acid, two fluidounces and three fluidrachms; distilled water, a sufficiency. Mix the lemon juice with the yeast, and let it stand for two days, at a temperature between 60° and 70°. When fermentation has ceased, separate the clear liquid from the lees, boil it, and while hot add the chalk by degrees till there is no more effervescence. Collect the deposit on a calico filter, and wash it with hot water till the filtered liquor passes from it colorless. Mix the deposit with two pints of distilled water, and gradually add the sulphuric acid previously diluted with a pint and a half of distilled water, applying for half an hour sufficient heat to produce ebullition, and constantly stirring. Separate the acid solution by filtration, wash the insoluble matter with cold distilled water, and add the washings to the solution. Concentrate to the density of 1.21, cool, and after twenty-four hours decant the liquor from the crystals of sulphate of lime which have formed; concentrate further till a film forms on its surface, and set it aside to cool and crystallize. Purify the crystals if necessary by a second crystallization.

Fig. 199.



*Crystal of citric acid.*

*Officinal Characters.*—In colorless right-rhombic prisms with a strongly acid taste, readily soluble in water, sparingly in rectified spirit.

*Properties.*—Citric acid crystallizes in colorless, odorless, very sour, transparent, short, rhomboidal prisms. Crystallized citric acid becomes damp by exposure to a moist atmosphere. According to Vauquelin 100 parts are soluble in 75 parts of cold, and 50 of boiling water. The solution is strongly acid, and becomes mouldy by keeping. Crystallized citric acid is much less soluble in alcohol than in water. Its specific gravity is 1.617. Heated with caustic potash, it is converted into oxalic and acetic acids and water. Treated with sulphuric acid it evolves sulphurous acid, carbonic acid, carbonic oxide, acetic acid, and water. Heated with nitric acid, it becomes oxalic acid. When added in excess to lime water, no precipitate is produced. It does not yield a crystalline precipitate when added in excess to a solution of carbonate of potash. It forms, with a solution of baryta, a white precipitate (*citrate of baryta*). With a solution of acetate of lead it also furnishes a white precipitate (*citrate of lead*), soluble in ammonia, which forms it with a double salt (*ammoniacal citrate of lead*). Added to a solution of nitrate of silver it produces a white precipitate (*citrate of silver*), which, when heated, becomes brown, froths up, deflagrates, discharges white fumes, and leaves an abundant ash-gray residue, which by heat becomes pure silver.

*Composition.*—Citric acid is a tribasic acid; that is, it combines with three equivalents of base, which replace the three equivalents of water of composition.

*Adulteration.*—Powdered citric acid is sometimes adulterated with powdered tartaric acid. The fraud may be readily detected by dissolving the suspected acid in a small quantity of water, and adding cautiously to it a solution of carbonate of potash, taking care that the acid be in excess. If any tartaric acid be present, a white crystalline precipitate (*acid tartrate of potash*) is formed.

*Tests.*—Sixty-seven grains of the crystals dissolved in water are neutralized by 100 measures of the volumetric solution of soda. It leaves no ash when burned with free access of air. Its aqueous solution is not darkened by sulphuretted hydrogen, and gives no precipitate when dropped into solution of lime, or when added in excess to a solution of acetate of potash, or of chloride of barium.

*Physiological Effects.*—Orfila ranks citric acid among the irritant poisons; but Drs. Christison and Coindet gave 60 grains of it to cats without observing that the animals suffered any inconvenience therefrom. The effects of large doses of this acid on man I am not acquainted with. Small quantities of it, dissolved in water, form an agreeable beverage, which allays thirst, diminishes preternatural heat, checks profuse sweating, and promotes the secretion of urine. Vogt considers it to act more powerfully on the skin, and less so on the alimentary canal and urinary organs, than tartaric acid. In its action on the skin it agrees with acetic acid. The continued employment of it, as well as of other acids, disturbs the functions of the digestive organs.

*Therapeutics.*—Citric acid is employed in medicine, as a substitute for lemon juice in the preparation of refrigerant drinks and effervescing draughts, and as an anti-scorbutic, anti-narcotic, and anti-alkaline (see **Limonis Succus**). *Artificial Lemon Juice.*—This is prepared by dissolving 640 grains of citric acid in a pint of water, and flavoring with a few drops of essence of lemon. This is less apt to undergo decomposition than the genuine juice, for which the artificial juice may be substituted in the preparation of cooling beverages. *Effervescing Citrates.*—Citric acid, with the alkaline carbonates, is frequently employed in the preparation of effervescing draughts. The following are the relative proportions of acid and base required to form a neutral compound.

*Twenty grains of Crystals of Citric are saturated by about*—

| | |
|---|---|
| Crystallized Bicarbonate of Potash . . . . . | 29 grs. |
| Carbonate of Ammonia . . . . . . . | 17 " |
| Bicarbonate of Soda . . . . . . . | 24 " |

The most agreeable effervescing citrate is that prepared with bicarbonate of potash, flavored with tincture of orange-peel and syrup. Bicarbonate of soda is rarely employed with citric acid.

[Syrupus Acidi Citrici, U. S., *Syrup of Citric Acid.*—"Take of citric acid, in fine powder, one hundred and twenty grains; oil of lemon four minims; syrup, two pints. Rub the citric acid and oil of lemon with a fluidounce of the syrup; then add the mixture to the remainder of the syrup, and dissolve with a gentle heat." U. S. To be used instead of syrup of lemons, when the latter cannot be procured.—W.]

## CITRUS BIGARADIA, *Risso.*

### The Bitter Orange.

[*Syn.*—Citrus vulgaris, *De Candolle.*]

*Specific Character.*—*Leaves* elliptical acute or acuminate, slightly toothed; *petiole* more or less winged. *Flowers* large, white. *Fruit* orange-colored, roundish, or slightly elongated, or depressed; rind with concave receptacles of oil; pulp acid and bitter.—*Risso, Hist. Nat. des Orang.* pl. 30.

*Habitat.*—Asia. Cultivated in Europe.

Fig. 200.

*Citrus bigaradia.*

### Aurantii Cortex, *Bitter-Orange Peel.*

### [Aurantii Amari Cortex. Mat. Med. List, U. S. P.]

The outer part of the rind, dried; from the ripe fruit imported from the South of Europe.

*Officinal Characters.*—Thin, of a dark orange color, nearly free from the white inner part of the rind; having an aromatic bitter taste, and fragrant odor.

*Composition.*—Bitter or Seville orange peel contains a volatile oil, bitter extractive, &c.

*Physiological Effects, and Uses.*—Bitter orange peel is stomachic and tonic. Its principal value is as a flavoring agent.

*Pharmaceutic Uses.*—Bitter orange peel is a constituent of compound infusion of gentian, compound spirit of horseradish, compound tincture of cinchona, and compound tincture of gentian.

*Officinal Preparations.*

INFUSUM AURANTII, *Infusion of Orange Peel.*—Take of bitter-orange peel, cut small, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for fifteen minutes, and strain.

An agreeable stomachic. It is an excellent vehicle for the exhibition of various other medicines, as saline purgatives, ammonia, bitter tinctures, &c.

*Dose.*—Fl. oz. j to fl. oz. ij.

SYRUPUS AURANTII, *Syrup of Orange Peel.*—Take of tincture of orange peel, one fluidounce; syrup, seven fluidounces. Mix.

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## [CITRUS AURANTIUM, *De Candolle.*

### The Sweet Orange.

*Specific Characters.*—Those of C. bigaradia, except that the fruit is more perfectly globular, its rind smoother, less rugose, and the pulp sweet and pleasant to the taste.

*Habitat.*—With the last.

## **Aurantii Dulcis Cortex**, *Rind of Sweet Orange Peel.*
Mat. Med. List, U. S. P.

The rind of the fruit of Citrus aurantium.

The physical and medical properties of the orange peel are very similar to those of the bitter orange peel. It wants, however, the bitter taste of the latter, and is less stomachic.

Syrupus Aurantii Corticis, *Syrup of Orange Peel.*—Take of sweet orange peel, recently dried and in moderately fine powder, two troyounces; carbonate of magnesia, half a troyounce; sugar, in coarse powder, twenty-

Fig. 201.


*Citrus aurantium.*

eight troyounces; alcohol, water, each, a sufficient quantity. Moisten the orange peel with half a fluidounce of alcohol, introduce it into a conical percolator, and pour alcohol upon it until six fluidounces of tincture have passed. Evaporate this, at a temperature not exceeding 120°, to two fluidounces, add the carbonate of magnesia and a troyounce of the sugar, and rub them together, gradually adding half a pint of water during the trituration. Then filter, and, having added sufficient water to make the liquid measure a pint, dissolve in it the remainder of the sugar with the aid of a gentle heat, and strain." U. S.

Confectio Aurantii Corticis, U. S., *Confection of Orange Peel.*—"Take of sweet orange peel, recently separated from the fruit by grating, twelve troyounces; sugar, thirty-six troyounces. Beat the orange peel with the sugar, gradually added, until they are thoroughly mixed." U. S. Used as an aromatic vehicle.—W.]

Syrup of orange peel is stomachic, but its principal use is for flavoring. *Dose.*—Fl. drm. j to fl. drs. ij.

Tinctura Aurantii, *Tincture of Orange Peel.*—Take of bitter-orange peel, cut small and bruised, two ounces; proof spirit, one pint. Macerate the orange peel for forty-eight hours with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.

This tincture is an agreeable stomachic, and is principally employed as a flavoring adjunct to decoctions and infusions (tonic or purgative), effervescing mixtures, &c.

*Dose.*—Fl. drm. j to fl. drs. ij.

### [Aurantii Flores, *Orange Flowers.*

The flowers of Citrus aurantium and Citrus vulgaris.]

### Aurantii Aqua, *Orange-Flower Water.*

### [Aqua Aurantii Florum, U. S.]

Citrus Bigaradia, *Risso*, the Bitter-Orange tree; and Citrus Aurantium, *Risso*, plates 3, 4, The Sweet-Orange tree.

The distilled water of the flowers; prepared mostly in France. [" Take of orange flowers, forty-eight troyounces; water sixteen pints. Mix them, and distil eight pints." U. S.]

*Officinal Characters.*—Nearly colorless, fragrant.

*Description.*—Orange flower water is usually imported. That prepared from the flowers of the bitter orange possesses the most fragrant odor, but it is sometimes prepared from the flowers of the sweet orange.

*Composition.*—Orange flower water owes its odor to the presence of the following volatile oil: *Oil of Orange Flower; Oil of Neroli.* Procured from the flowers of both the bitter and sweet orange; but that from the former is preferred. It is obtained by submitting the flowers, with water, to distillation; and it is found floating on the water in the receiver. It has an aromatic and fragrant odor, somewhat different from that of the flower. "It appears to me," says Soubeiran, "to be a product of the alteration of the natural essential oil. The latter is more soluble than the neroli oil, and remains in solution in the water. Its presence may be demonstrated by agitating the distilled water with ether deprived of alcohol. By spontaneous evaporation the ethereal solution leaves behind an essential oil, which has absolutely the same odor as the flowers, and which dissolves in water." Orange flower water also contains *free acetic acid*, derived from the flowers; hence, if kept in a vessel of lead or copper, it acquires a metallic impregnation. Sulphuretted hydrogen produces, with either lead or copper, a dark-colored precipitate.

*Test.*—Not colored by sulphuretted hydrogen.

*Uses.*—Orange flower water is employed in medicine on account of its agreeable odor, and as a flavoring agent.

*Dose.*—Fl. oz. j to fl. oz. ij.

*Officinal Preparation.*

Syrupus Aurantii Floris, *Syrup of Orange Flower.* [Syrupus Aurantii Florum, U. S.]—Take of orange flower water, eight fluidounces;

refined sugar, three pounds; distilled water, sixteen fluidounces, 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. ["Take of orange flower water, five fluidounces; sugar, in coarse powder, thirty-six troyounces; distilled water, fifteen fluidounces. Dissolve the sugar in the distilled water, with the aid of a gentle heat, and raise the temperature to the boiling point. When the solution is nearly cold, mix thoroughly with it the orange flower water, and strain." U. S.]

It is used as a vehicle for the administration of other medicines, and as a flavoring agent.

*Dose.*—Fl. oz. j to fl. oz. ij.

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## [CITRAS LIMETTA, *De Cand.*

*Specific Character.*—*Leaves* oblong, more or less elongated, acute or obtuse, under side somewhat pale. *Petiole* more or less winged or margined. *Flowers* usually small, white. *Fruit* pale yellow, pyriform or depressed; rind with concave receptacles of oil; pulp more or less acid.

*Habitat.*—Cultivated in the South of Europe.

### Oleum Bergamii, *Oil of Bergamot.* Mat. Med List, U. S. P.

The *volatile oil* or *essenee of bergamot*, imported from the South of Europe, is procured from the rind of the fruit. It may be obtained either by expression (as the volatile oil of lemons) or by distillation. It is pale greenish-yellow, with a remarkable odor, and a sp. gr. of 0.885. Its composition is identical with that of oil of lemons, being $C_{10}H_8$.

*Uses.*—Oil of bergamot is employed as a perfume only. It is a useful odoriferous adjunct to unguents.—W.]

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## ÆGLE MARMELOS, *DC.*

### The Indian Bael Tree.

Polyandria Monogynia, *Linn. Syst.*

*Botanic Character.*—A large and erect *tree* with simple spines. *Leaves* ternate; *leaflets* oblong or broad-lanceolate, crenulated, inconspicuously dotted, the terminal one the largest. *Flowers* in small terminal and axillary panicles, large and white. *Calyx* four to five-toothed. *Petals* four to five, patent. *Stamens* numerous; *filaments* distinct. *Ovary* eight to fifteen-celled; *style* very short and thick; *stigma* capitate. *Fruit* baccate, large, sub-spherical, smooth, with a hard rind, ten to fifteen-celled; the cells contain, besides the seeds, a large quantity of an exceedingly tenacious transparent mucus, which on drying becomes very hard, but continues transparent; when fresh, it may be drawn out into threads of one or two yards in length, and so fine as to be scarcely perceptible to the naked eye, before it breaks. *Seeds* six to ten in each cell, oblong, a little compressed, woolly, attached to the inner angle of the cell.—*Pharm. Journ.*, vol. x. page 166.

*Habitat.*—It is a native of Malabar and Coromandel.

### Bela, *Bael.*

The half-ripe fruit, dried; from Malabar and Coromandel.

*Officinal 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 grayish epidermis, and internally, as well as the dried pulp, brownish-orange, or cherry-red. The moistened pulp is mucilaginous.

*Composition.*—No complete analysis has been made, but it has been ascertained to contain some astringent principle—a kind of tannin, to which its properties appear to be due.

*Uses and Administration.*—In India bael is declared to be a valuable and efficacious remedy in dysentery and all affections of the bowels accompanied by relaxation, and also in cases of irritation of the mucous membrane of the stomach and bowels. Although it relieves diarrhœa and dysentery, it does not constipate the bowels of those who are not troubled with these complaints. As tried in this country it does not appear to be at all superior, if equal to, some of the other officinal vegetable astringents in common use in diarrhœa. It is best administered in the form of the officinal extract.

*Officinal Preparation.*

Extractum Belæ Liquidum, *Liquid Extract of Bael.*—Take of bael, one pound, distilled water, twelve pints; rectified spirit, two fluidounces. 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 fluidounces; and, when cold, add the rectified spirit.

Astringent. Employed in diarrhœa and dysentery.

*Dose.*—Fl. drm. ss to fl. drs. ij.

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## MALVACEÆ, *R. Brown.* The Mallow Order.

## [ALTHÆA OFFICINALIS, *Linn.*

### Marshmallow.

*Generic Character.*—*Calyx* surrounded by six to nine-cleft, involucel. *Carpels* numerous, capsular, closely and circularly arranged round the axis (Wight and Arnott).

*Specific Character.*—*Leaves* softly tomentose on both sides, cordate or ovate, toothed, undivided, or somewhat three-lobed. *Peduncles* axillary, many flowered, much shorter than the leaf. (De Cand.)

*Root* perennial, tap-shaped, rather woody. *Stem* two or three feet high. *Leaves* hoary green, peculiarly soft and downy, with a fine starry pubescence. *Flowers* three or four together, on axillary stalks, large, pale rose-colored.

*Habitat.*—Indigenous in Europe; naturalized in the United States.

Fig. 202.


*Althæa officinalis.*

1. Styles. 2. Stamens. 3. Outer calyx. 4. Inner calyx.

**Althæa,** *Marshmallow.* Mat. Med. List, U. S. P.

**Althæa Radix,** Pharm. 1850.

The root of Althæa officinalis.

This root (*radix althææ*) is long, cylindrical, branched, about the thickness of the finger, plump, mucilaginous, white internally, and covered with a yellowish epidermis, or sometimes with the epidermis stripped off. Its odor is feeble; its taste sweet and mucilaginous. Iodine colors it dark blue. Sesquichloride of iron forms with the concentrated decoction, a brown, semi-transparent gelatinous mass. It contains a large amount of a peculiar mucilage.

*Therapeutics.*—Emollient and demulcent. It makes with boiling water an agreeable clear mucilaginous liquid, which may be used in pectoral and genito-urinary irritations, or whenever such a diluent is indicated. The powder is used in France to envelop pills.—W.]

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## GOSSYPIUM, *Linn.*

### Species yielding Cotton.

Fig. 203.

Monadelphia Polyandria, *Linn. Syst.*

*Generic Character.*—*Calyx* cup-shaped, obtusely five-toothed, surrounded by a three-leaved involucre, with the leaves united and cordate at the base, and deeply cut or toothed irregularly. *Stamens* numerous, monadelphous. *Style* simple, marked with three or five furrows towards the apex; *stigmas* usually three, sometimes five. *Capsules* three to five-celled, three to five-valved, loculicidal. *Seeds* numerous, imbedded in hairs. Young *branches* and *leaves* more or less conspicuously covered with little black dots; veins below usually with one or more glands.

*Habitat.*—Cultivated in warm and tropical regions.

### Cotton, *Cotton Wool.*

[**Gossypium.** Mat. Med. List, U. S. P.] (Appendix A.)

The hairs of the seeds of various species of Gossypium, carded.

*Description.*—The filamentous substance, called *cotton*, consists of tubular hairs, which arise from the surface of the seed-coat. By drying, they become flattened; and in this state, if they be immersed in water and examined by the microscope, they appear like distinct, flat, narrow ribands, with only occasional appearances of joints, which are indicated by a line at a right angle, or nearly so, to the side of the tube. Cotton is distinguished (under the microscope) from the vegetable fibre which constitutes linen by the tubes of the latter being in bundles, round, tapering at the extremities, and, when jointed, having oblique articulations. Cotton which has undergone no preparation is denominated *raw cotton.*

*Composition.*—Cotton is a modification of *lignin.* In all its essential chemical properties it agrees with ordinary woody fibre. It is completely insoluble in water, alcohol, ether, oils, and vegetable acids. Strong alkaline lyes dissolve it. The strong mineral acids decompose it. With nitric acid it yields oxalic acid.

*Uses.*—Raw cotton, or cotton wool, has been employed, with apparently good effect, in the treatment of burns. It allays pain and irritation, apparently by forming, with the discharges, a substitute for the epidermis, under the protection of which the process for the formation of the new cuticle takes place, undisturbed by external irritation. The exclusion of the air seems to be a most important part of the treatment; and, of course, to effect this, many other agents (as lint) will answer in the place of cotton. The following is the method of employing cotton: The cotton should be carded in narrow fleeces, thin enough to be translucent, and applied in successive layers, so as completely to protect the injured parts from the effects of motion and pressure. When the skin is severely scorched, a spirituous or turpentine wash may be applied previously to the application of the cotton. As complete repose of the part is necessary, the first dressing should be allowed to remain as long as possible undisturbed. Raw cotton has also been used as a topical application in erysipelas. Cotton-wool, impregnated with nitre or chlorate of potash, has been employed as a moxa. The well-known superiority of linen to cotton as a dressing for wounds and ulcers, is usually ascribed to the angular shape of the cotton fibres, the sharp angles of which are supposed to cut and irritate the flesh.

[**Gossypii Radix,** *Cotton Root.* Secondary List, U. S. P.

The root of Gossypium herbaceum, and of other species of Gossypium.

A number of practitioners of medicine in the Southern United States have claimed for this root the power of stimulating the uterus, so as to cause abortion, when administered to the pregnant female, or the return of the menses in cases of amenorrhœa. It has also been stated to equal ergot in its power of exciting uterine contractions during labors. The subject has not been as yet fully investigated. The virtues are supposed to reside in the bark of the root. It is administered in form of a decoction (four ounces of bark to a quart of water boiled to a pint—a wineglass every twenty minutes during labor till the desired effect is produced; as an emmenagogue, f℥j to ij t. d.).—W.]

**Pyroxylin,** *Gun Cotton.* (Appendix A.)

$$C_{36}\left.\begin{matrix} H_{22} \\ 8NO_4 \end{matrix}\right\} O_{30}.$$

*Preparation.*—Take of cotton, one ounce; sulphuric acid, five fluidounces; nitric acid, five fluidounces. 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. (The officinal nitric acid of specific gravity 1.5, makes a pyroxylin which is not entirely soluble in ether, but nitric acid of specific gravity 1.42, answers much better.)

*Tests.*—Readily soluble in a mixture of ether and rectified spirit; leaves no residue when exploded by heat.

*Properties.*—It is highly electric on friction. It is insoluble in water. It explodes at a heat of 300° F. and leaves no carbonaceous residue. If exploded on litmus paper, it reddens it; if on starch paper, moistened with iodide of potassium, the nitrous acid formed produces the blue iodized starch.

*Pharmaceutic Use.*—The only pharmaceutical use to which it is put is in the preparation of collodion.

### Collodium [U. S.], *Collodion.*

Pyroxylin dissolved in ether, mixed with one-third of its volume of rectified spirit.

*Preparation.*—Take of pyroxylin, one ounce; ether, thirty-six fluidounces; rectified spirit, twelve fluidounces. Mix the ether and the spirit, and add the pyroxylin. Set aside for a few days, and, should there be any sediment, decant the clear solution. Keep it in a stoppered bottle.

["Take of cotton, freed from impurities, half a troyounce; nitrate of potassa, in fine powder, ten troyounces; sulphuric acid, fifteen troyounces and a half; stronger ether, twenty-one fluidounces; stronger alcohol, a sufficient quantity. Add the sulphuric acid to the nitrate of potassa in a glass or porcelain vessel, and stir them together until they are uniformly mixed. When the temperature of the mixture is below 122°, add the cotton, and, by means of stout glass rods, imbue it thoroughly with the mixture. Then cover the vessel closely with a glass or porcelain lid, and allow it to stand for twenty-four hours. Transfer the cotton to a larger vessel, and wash it, first with cold water until the washings cease to have an acid taste, and then with boiling water. Press it as dry as possible with the hand, pack it tightly in a conical percolator, and pour upon it stronger alcohol, until the remaining water is displaced; then again press it as dry as possible with the hand. Mix the stronger ether with six fluidounces of stronger alcohol in a suitable bottle, and, having added the moist cotton to the mixture, agitate occasionally until it is dissolved. The cotton prepared for solution by this formula, and dried at 212°, weighs three hundred and thirty-six grains. Collodion may also be made by dissolving fifty-six grains of cotton, prepared as above, and dried at 212°, in a mixture of three fluidounces and a half of stronger ether and a fluidounce of stronger alcohol." U. S. In this process as much nitric acid is liberated by the action of the sulphuric acid on the nitrate of potash as is required for the conversion of the cotton into pyroxylin, or gun cotton. The gun cotton prepared in this way is said to be more soluble than when a simple mixture of nitric and sulphuric acids is employed, and for this reason the United States Pharmacopœia directs this method of manufacture.—W.]

*Officinal Characters.*—A colorless highly inflammable liquid with ethereal odor, which dries rapidly upon exposure to the air, and leaves a thin transparent film, insoluble in water or rectified spirit.

Collodion is a transparent solution of syrupy consistence, and should be kept in closely-stopped bottles previously well dried. [By long standing it deposits a layer of fibrous matter, and becomes more transparent. This layer should be reincorporated by agitation before the collodion is used. When applied it should form a colorless, transparent, flexible, and strongly contractile film. U. S. Ph.]

*Uses.*—Collodion is applied to many uses in medicine, surgery, and pharmacy. In chapped hands, chapped nipples, and fissures of the anus, it has been employed with great success as an adhesive, and for the protection of the affected parts. In chapped nipples, while it relieves the female it is not injurious to the infant. It has been used in various cutaneous diseases attended with excoriation; in ulcers; in erysipelas; in superficial burns and wounds; and as a stopping, applied on cotton, to carious teeth. Among its pharmaceutical uses may be mentioned the property of investing pills with a layer of cotton. Aloetic, colocynth, and other pills may be coated, by placing them on the point of a needle, and dipping them into the collodion twice, allowing the first coat to dry before the second is applied.

[Owing to the force with which the collodion film contracts in drying, it affords the most efficient as well as neatest method of accurately closing superficial flesh wounds, especially of the scalp. In order to give firmness to the dressing it is well to use a strip of strong coarse gauze. This should first be applied to the most movable side of the wound, and fastened to the skin by a plentiful coating of collodion. When this has dried sufficiently the lips of the wound should be accurately adjusted, and the gauze being drawn tightly across them, the free end should be firmly held by one finger until fastened down by the application and drying of the collodion. The whole of the gauze should now be thoroughly covered over with fresh collodion, and as this dries and contracts it will draw the lips of the wound very forcibly together, and at the same time hermetically seal the wound.—W.]

[*Officinal Preparation.*

Collodion cum Cantharide, U. S. (See Cantharis).]

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## [BYTTNERIACEÆ, *Lindley.*

## THEOBROMA CACAO, *Linn.*

*Botanic Characters.*—Calyx sepaled. Petals 5, vaulted at the base, ligulate above. Stamens 15, connected into an urceolus at the base; sterile filaments 5, alternate with the petals; fertile ones short, united into five filaments, each opposite to a petal and bearing two anthers. Style 5-cleft at the apex. Stigmas simple. Fruit indehiscent, 5-celled. Seeds imbedded in a buttery pulp. A handsome tree growing fifteen or twenty feet high. A native of South America, forming whole forests in Demerara. It is extensively cultivated.

### Oleum Theobromæ, *Oil of Theobroma. Butter of Cacao.* Mat. Med. List, U. S. P.

From the seeds of the Theobroma cacao is prepared by various processes the well-known chocolate. The beverage made from this is highly nutritious, and is a favorite substitute for tea and coffee with the invalid, as it does not produce any nervous disturbance. Oil of theobroma, or as it is more commonly called, cacao butter, is the fixed oil of the nut. It is obtained either by expression or by boiling the seeds in water and skimming off the oil as it rises. When expression is used the seeds should be previously gently warmed. Cacao butter occurs in the shops in flat, moulded, almost semitranslucent cakes, of a white color, and bland agreeable taste. It is solid at ordinary temperatures, but rapidly melts with the heat of the body. It contains stearine, palmitin, and olein. Its principal medicinal use is in making suppositories for which its blandness and consistency admirably fit it. It is rather too soft, and requires in most cases the addition of a little wax.—W.]

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## LINACEÆ, *Lindley.* The Flax Order.

## LINUM USITATISSIMUM, *Linn.*

### Common Flax.

Pentandria Pentagynia, *Linn. Syst.*

*Botanic Character.*—*Annual* plant. *Stem* erect, simple, smooth, one to two feet high. *Leaves* alternate, simple, lanceolate or linear, sessile, smooth. *Flowers* corymbose-panicled, large, purplish-blue. *Sepals* 5, ovate, acute, with membranous margins. *Petals* 5, somewhat crenated, much larger than the sepals, caducous. *Stamens* 5. *Styles* 5. *Capsule* roundish, containing ten seeds. *Flor. Lond.* Fasc. 5, pl. 22.

*Habitat.*—Indigenous; corn fields; not unfrequent. Extensively cultivated in this, as well as in other European countries, both for its fibre for making thread, and for its oil obtained from the seed. [Naturalized in the United States, growing in waste places along roadsides, &c.—W.]

Fig. 204.

*Linum usitatissimum.*

The substance termed *flax* is prepared from the fibrous portions of the bark. The short fibres which are removed in the process constitute *tow*, which is employed both in pharmacy and surgery. Of flax is made *linen*, which when scraped constitutes *lint*, an important agent to the surgeon.

## **Lini Semen,** *Linseed.*

### [**Linum.** Mat. Med. List, U. S. P.]

The seeds; cultivated in Britain.

*Officinal Characters.*—Small, oval, pointed, flat, with acute edges, smooth, shining, brown externally, yellowish-white within, of a mucilaginous oily taste.

*Adulterations.*—Linseed is frequently adulterated, and hence should be carefully examined to see if it agrees with the above description.

*Composition.*—The nucleus or kernel contains a fixed oil, and the seed-coats mucilage, &c. *Fixed Oils* (see **Oleum Lini**). *Mucilage of Linseed.*—This is extracted from the seed-coats by hot water. When the solution is mixed with alcohol, white mucilaginous flocks are precipitated. Subacetate of lead forms a precipitate in it. Neither infusion of galls nor chlorine has any effect on it. It is not colored blue by iodine. It reddens litmus (owing to the free acetic acid). It consists of two parts, one soluble, the other insoluble in water. The insoluble part contains nitrogen.

*Physiological Effects and Uses.*—Linseed is emollient and demulcent. It is employed to allay irritation in the form of *infusion*.

### *Officinal Preparation.*

Infusum Lini, *Infusion of Linseed* [Infusum Lini Compositum, U. S. *Compound Infusion of Flaxseed*].—Take of linseed one hundred and sixty grains; fresh liquorice root, sliced, sixty grains; boiling distilled water, ten fluidounces. Infuse in a covered vessel for four hours, and strain through calico. [" Take of flaxseed, half a troyounce; liquorice root, bruised, one hundred and twenty grains; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S.]

Employed as an emollient and demulcent in irritation and inflammation of the pulmonary and urinary organs, and of the mucous membranes generally, as gonorrhœa, dysentery, alvine irritation, and pulmonary affections. It is rendered more palatable by the addition of sliced lemon and sugar-candy.

*Dose.*—Fl. oz. ij to fl. oz. iv, or *ad libitum.*

## **Lini Farina,** *Linseed Meal.* [Mat. Med. List, U. S. P.]

The seeds ground and deprived of their oil by expression.

*Description.*—The *cake* left after the expression of the oil, is usually denominated *oil cake;* it forms when ground to a powder *linseed meal.* The best oil cake for the preparation of linseed meal is the English fresh made. Foreign cake is of inferior quality. The color of linseed meal is grayish-brown. It abounds in mucilage.

*Physiological Effects and Uses.*—Emollient, applied externally in the form of a *poultice* to inflamed and suppurating surfaces.

*Officinal Preparation.*

CATAPLASMA LINI, *Linseed poultice.*—Take of linseed meal, four ounces; olive oil, half a fluidounce; boiling water, ten fluidounces. Mix the linseed meal with the oil, then add the water gradually, constantly stirring.

The linseed poultice was ordered in the last London Pharmacopœia, to be prepared with *powdered linseed*, and hence it contained the oil of the seeds, but the *linseed meal* now ordered is described as "the seeds ground and *deprived of their oil* by expression," and the poultice is directed to be prepared from this with the addition of *olive oil.* The supposed advantage of the present formula is, that crushed linseed soon becomes rancid, and when applied in this state is apt to irritate the skin; and hence, as the seeds cannot be readily ground, when wanted, the powdered meal, as above, which keeps well, is directed to be used, and the oil added at the time the poultice is prepared.

Linseed meal also enters as an ingredient into several other poultices, in all of which it is directed to be used without the addition of any oil.

**Oleum Lini,** *Linseed Oil.* [Mat. Med. List, U. S. P.]

The oil expressed without heat from linseed.

*Officinal Characters.*—Viscid, yellow, with a faint color, and oleaginous taste.

*Description and Properties.*—To prepare this oil, the seeds are first bruised or crushed, then ground, and afterwards subjected to pressure in the hydraulic or screw press. *Cold drawn linseed oil* is paler colored, less odorous, and has less taste than linseed oil prepared by the aid of a steam heat of about 200° F.; but, according to Mr. Brande, it "soon becomes rancid and more disagreeable than that expressed at a higher temperature." The seeds yield by cold expression eighteen or twenty per cent. of oil; but by the aid of heat from twenty-two to twenty-seven per cent. Linseed oil is usually amber-colored; but it may be rendered quite colorless. Linseed oil has a peculiar odor and taste; it is soluble in alcohol, but more readily so in ether. When exposed to the air it dries into a hard transparent varnish. This change is greatly accelerated by boiling the oil, either alone, or with litharge, &c. Its proximate constituents are oleic acid, margaric acid, and glycerine.

*Physiological Effects and Uses.*—Emollient and laxative. It is rarely employed internally, but it is a valuable external application to burns or scalds, either alone, or mixed with an equal volume of solution of lime. [Officinal in Linimentum Calcis, U. S.]

## POLYGALACEÆ, *DC.* THE MILKWORT ORDER.

## POLYGALA SENEGA, *Linn.*

### The Senega Plant.

Diadelphia Octandria, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, branching. *Stems* several, annual, somewhat erect, smooth, simple, round, and leafy, 9–12 inches

Fig. 205.


*Polygala senega.*

high. *Leaves* alternate, sessile, or on very short petioles, paler beneath, ovate-lanceolate, the upper ones acuminate. *Flowers* small, terminal, white. *Sepals* 5, persistent, the two inner ones wing-like; *wing* orbiculate, white with green veins. *Petals* 3, small, with a beardless keel. *Stamens* 8, united in two equal bundles. *Capsule* elliptical, emarginate, small, with two blackish seeds.—*Steph.* and *Church.* pl. 103.

*Habitat.*—United States of America: most abundant in the southern and western parts.

## Senega, *Senega.*
## [Mat. Med. List, U. S. P.]

The dried root; from North America.

*Officinal 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, taste less, inert.

*Description.*—*Senega* or *Seneka* root, sometimes called *seneka-snake-root*, is imported from the United States in bales. It varies in size from the thickness of a writing-quill to that of the little finger; it is contorted, presents a number of eminences, and terminates superiorly in an irregular tuberosity, which exhibits traces of numerous stems; a projecting line or keel-shaped process, extends the whole length of the concave side of the root. The cortical portion is corrugated, transversely cracked, thick, and of a grayish-yellow color. The central portion is woody and white. The taste of the root is at first sweetish and mucilaginous, afterwards acrid and pungent, exciting cough and a flow of saliva; its odor is peculiar and nauseous.

*Adulterations.*—Ginseng root, derived from *Panax quinquefolium*, is sometimes found mixed with senega, but is readily distinguished by its commonly greater size, its more or less fusiform shape, and by the absence of the projecting line of senega. The roots of *Gillenia trifoliata and other species*, have also been found mixed with senega. They are readily distinguished by the absence of the projecting line running down them.

*Composition.*—Senega is said to owe its active properties to a peculiar principle, called polygalic acid or senegin. It also contains a peculiar volatile fatty acid, tannic acid, pectin, &c. *Polygalic acid* resides in the cortical part of the root. When pure, it is a white odorless powder, which is at first tasteless, but afterwards communicates an acrid feeling to the mouth, and a sense of constriction to the fauces. It irritates the nostrils and excites sneezing. It is volatile, and, when decomposed by heat in a glass tube, evolves no ammonia, and hence contains no nitrogen. It is soluble in water and in alcohol, especially when aided by heat; but it is insoluble in ether, acetic acid, and the oils. Given to dogs in doses of six or eight grains, it causes vomiting, embarrassed respiration, and death in three hours. Two grains thrown into the jugular vein caused vomiting, and, in two hours and a half, death.

*Physiological Effects.*—Senega possesses acrid and stimulant properties. In small doses it is diaphoretic, diuretic, and expectorant; in larger doses, emetic and purgative. It appears to excite moderately the vascular system, to promote the secretions (at least those of the kidneys, skin, uterus, and bronchial membrane), and to exert a specific influence over the nervous system. It has been principally celebrated for its expectorant effects. In its operation on the nervous system it has considerable resemblance to arnica; but its influence over the secreting organs is much greater.

*Therapeutics.*—In this country senega is comparatively but little employed. It is an exceedingly valuable remedy in the latter stages of *bronchial* or *pulmonary inflammation*, when this disease occurs in aged, debilitated, or torpid constitutions, and when the use of depletives is no longer admissible. I usually administer it in combination with ammonia, which appears to me to promote its beneficial operation. Frequency of pulse, and a febrile condition of the system, are by no means to be regarded as impediments to the use of this medicine. In *chronic catarrh* and *humoral asthma* it has also been used. It has been extravagantly praised by Dr. Archer, of Maryland, as a remedy for *croup*. He represents it as being capable, without the aid of any other means, of removing this alarming disease. Few practitioners, I suspect, would venture to trust it. Yet it might be a useful addition to emetics in this disease. It has also been used as an emetic, purgative, and diaphoretic in *rheumatism*, and as a diuretic, in *dropsy*. It was introduced into practice as a remedy against the bite of venomous animals—as the rattlesnake.

*Administration.*—The dose of the *powder* is from 10 to 30 grains. But the *infusion* or *tincture* is the best form of exhibition.

### *Officinal Preparations.*

INFUSUM SENEGÆ, *Infusion of Senega.*—Take of senega, bruised, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel for one hour, and strain.

Stimulating, expectorant, and diuretic. Ammonia is often a valuable addition to it.

*Dose.*—Fl. oz. j to fl. oz. ij.

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

*Dose.*—Fl. drm. ss to fl. drm. j.

[EXTRACTUM SENEGÆ ALCOHOLICUM, U. S., *Alcoholic Extract of Seneka.*—"Take of seneka, in moderately fine powder, twelve troy-ounces; diluted alcohol, a sufficient quantity. Moisten the powder with four fluidounces of diluted alcohol, pack it in a conical percolator, and gradually pour upon it diluted alcohol until three pints of tincture have passed. Evaporate this by means of a water-bath, to the proper consistence." U. S. Dose, 1–3 grains in pills.

SYRUPUS SENEGÆ, U. S., *Syrup of Seneka.*—"Take of seneka, in moderately fine powder, four troyounces; sugar, in coarse powder, fifteen troyounces; diluted alcohol, two pints. Moisten the seneka with two fluidounces of the diluted alcohol; then transfer it to a conical percolator, and gradually pour on it the remainder of the diluted alcohol. When the tincture has ceased to pass, evaporate it by means of a water-bath, at a temperature not exceeding 160°, to half a pint; then filter, and, having added the sugar, dissolve it with the aid of a gentle heat, and strain the solution while hot." U. S. This is a very elegant preparation, which is especially eligible when senega is used as a stimulating expectorant. It is frequently combined with carbonate of ammonia in cases of typhoid pneumonia or bronchitis, as, unlike the syrup of squill, it is not incompatible with that drug. Dose f℥ss–iss.—W.]

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## [POLYGALA POLYGAMA, *Walt.*

*Synonym.*—Polygala rubella.

*Specific Character.*—Root biennial; leaves oblanceoleate or oblong; flowers rose-purple, showy; raceme terminal, many-flowered; alæ inconspicuous, whitish, more fertile flowers on subterranean branches.

*Habitat.*—Dry sandy soil, United States.

### Polygala Rubella, *Bitter Polygala.* Secondary List, U. S. P.

The root and herb of Polygala rubella.

A bitter tonic, and, in large doses, diaphoretic. It is best given in infusion made with boiling water.—W.]

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## KRAMERIA TRIANDRA, *Ruiz and Pavon.*

## The Peruvian Rhatany.

Triandria Monogynia, *Linn. Syst.*

*Botanic Character.*—*Suffruticose. Root* long, branching. *Stems* many, branching, procumbent. *Leaves* alternate, sessile, simple, oblong-ovate, somewhat acute, silky. *Flowers* solitary, lake-colored. *Pedicels* bibracteate, somewhat longer than the leaf. *Calyx* of 4 sepals, silky externally, deciduous spreading. *Petals* 5, unequal. *Stamens* 3, *Fruit* globular, drupaceous, beset with stiff reddish hairs, 1-celled, 1-seeded.—*Steph.* and *Church.* pl. 72.

*Habitat.*—Peru and Bolivia, half way up the western slopes of the Cordilleras.

### Krameria, *Rhatany.* [Mat. Med. List, U. S. P.]

The root dried; imported from Peru.

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

*Description.*—Rhatany consists of woody, cylindrical, long, simple or branched pieces, varying in thickness from that of a writing-quill to two inches or more. The pieces are sometimes united above to a short thicker portion. They consist of a slightly fibrous, brittle, easily separable, reddish-brown bark, which is powdered with difficulty, and has an intensely astringent and slightly bitter taste; and of a very hard woody portion, of a yellowish or pale red color. The largest quantity of astringent matter resides in the bark, and therefore the smaller pieces (which have a larger proportion of bark) are to be preferred. Rhatany has no odor.

*Varieties.*—Besides the above officinal rhatany, which is commonly known in commerce as *Peruvian* or *Payta rhatany*, there is another kind now much more frequently met with, which is imported from New Granada, and known as *Savanilla* or *New Granada rhatany*. The recent investigations of Mr. Daniel Hanbury show that it is derived from *Krameria Ixina*, Linn. var. *granatensis* of Triana. This kind of rhatany bears a considerable resemblance to the officinal or Peruvian rhatany, but it may be readily distinguished by the firmer adherence of its bark, to the wood, by the even less fibrous fracture of its bark, by the greater facility with which the bark can be reduced to powder, and by its more astringent taste. It is equal if not superior to Peruvian rhatany in its medicinal value.

Fig. 206.

*Krameria triandra.*

*Composition.*—Rhatany contains a peculiar acid, called krameric acid, about 40 per cent. of tannic acid, &c. *Tannic Acid.*—To this, as well as in part to a minute portion of gallic acid, rhatany owes its astringent qualities. It is this acid which enables an infusion of rhatany to form, with a solution of gelatin, a precipitate, and with perchloride of iron, a brownish-gray precipitate. *Krameric Acid.*—Peschier ascribes the stypticity of rhatany to this acid, the properties of which are at present imperfectly known.

*Physiological Effects.*—A powerful astringent, and, like other agents of this class, tonic also.

*Therapeutics.*—Rhatany is adapted to all those cases requiring the employment of astringents: such as *profuse mucous discharges* (as humid catarrh, old diarrhœas, fluor albus, &c.), *passive hemorrhages*, and *relaxation* and *debility of the solids*. It is sometimes used as a *tooth powder* (as with equal parts of orris root and charcoal. Dentists sometimes employ tincture of rhatany diluted with water *as an astringent mouth wash.*

*Administration.*—The *powder* may be given in doses of from 10 to 30 grains. The *extract*, *infusion*, or *tincture*, is more commonly employed.

*Pharmaceutic Use.*—Rhatany is an ingredient in compound powder of catechu.

*Officinal Preparations.*

Extractum Krameriæ [U. S.], *Extract of Rhatany.*—Take of rhatany in coarse powder, one pound; distilled water, one gallon. Macerate the rhatany in a pint and a half of the water for twenty-four hours; then pack in a percolator, and add more distilled water, until twelve pints have been collected, or the rhatany is exhausted. Evaporate the liquor by a water-bath to a proper consistence. [" Take of rhatany, in moderately fine powder, twelve troyounces; water, a sufficient quantity. Moisten the powder with four fluidounces of water, pack it in a conical percolator, and gradually pour water upon it until the infusion passes impregnated with the astringent property of the rhatany. Heat the liquid to the boiling point, strain, and, by means of a water-bath, at a temperature not exceeding 160°, evaporate to the proper consistence." U. S.]

Astringent.

*Dose.*—Gr. v to gr. xx.

Infusum Krameriæ [U. S.], *Infusion of Rhatany.*—Take of rhatany, bruised, half an ounce; boiling distilled water, ten fluidounces. Infuse in a covered vessel, for one hour, and strain. [" Take of rhatany, in moderately coarse powder, a troyounce; water, a sufficient quantity. Moisten the powder with half a fluidounce of water, and, having packed it firmly in a conical glass percolator, gradually pour water upon it until the filtered liquid measures a pint." U. S.]

Astringent and tonic.

*Dose.*—Fl. oz. j to fl. oz. ij.

Tinctura Krameriæ [U. S.], *Tincture of Rhatany.*—Take of rhatany, bruised, two ounces and a half; proof spirit, one pint. Macerate the rhatany for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the two liquids, and add sufficient proof spirit to make one pint. [" Take of rhatany, in moderately fine powder, six troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it in a cylindrical glass percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

Used as an adjunct to cretaceous mixtures, or with tonics. It may be employed diluted with water as a gargle.

*Dose.*—Fl. drm. j to fl. drs. ij.

[Syrupus Krameriæ, U. S., *Syrup of Rhatany.*—" Take of rhatany, in moderately fine powder, twelve troyounces; sugar, in coarse powder, thirty troyounces; water, a sufficient quantity. Mix the rhatany with half a pint of water, and, having allowed the mixture to stand for two hours, introduce it into a glass percolator, and gradually pour water upon it until four pints of filtered liquid are obtained. Evaporate this, by means of a water-bath, to seventeen fluidounces, and, having added the sugar, dissolve it with the aid of a gentle heat, and strain the solution while hot. This syrup may also be prepared in the following manner: Take of extract of rhatany two troyounces; sugar, in coarse powder, thirty troyounces; water, a pint. Dissolve the extract in the water, and filter; then, having added the sugar, dissolve it with the aid of a gentle heat, and strain the solution while hot." U. S. This preparation is very well adapted for administration to children. For a child a year old the dose is from xv—xxx minims; for adults f℥ss—f℥j.—W.]

## CRUCIFERÆ, *Jussieu*. THE CRUCIFEROUS ORDER.

## COCHLEARIA ARMORACIA, *Linn.*

### Horseradish.

Tetradynamia Siliculosa, *Linn. Syst.*

*Botanic Character.*—*Root* perennial, long, cylindrical, white, very pungent, from which arise above erect annual stems 2 to 3 feet high, and bearing small sessile *leaves*, which are lanceolate, and toothed or incised. *Radical leaves* much veined, oblong, crenate. *Inflorescence* racemose. *Calyx* equal, spreading. *Petals* white, entire. *Stamens* 6, tetradynamous, not toothed. *Silicules* oval.—*Woodv.* pl. 150.

*Habitat.*—Scarcely wild in this country, but extensively cultivated.

Fig. 207.

*Cochlearia armoracia.*

1. Radical leaf. 2. Raceme. 3. Stamens and pistils. 4. Pistil. 5. Silicule.

**Armoracia,** *Horseradish Root.*

The fresh root; cultivated in Britain.

*Officinal Characters.*—Long, cylindrical, white, sweetish, hot and acrid, giving off when scraped a highly pungent odor.

*Composition.*—Horseradish root contains myrosin, myronic acid (see composition of seeds of **Sinapis nigra**, p. 804), in combination, water, &c. It owes its properties essentially to the formation of an acrid volatile oil, produced by the action of myrosin on the myronic acid in the presence of water. If the root be dried with care these principles can be retained. *Volatile Oil* ($C_8NH_5S_2$).—Obtained by distillation of the fresh root broken to a pulp without additional water. It is of a pale yellow color, heavier than water, and very volatile. Its odor is exceedingly powerful, and like that of horseradish. One drop is sufficient to infect a whole room. Its taste is at first sweetish, then burning and acrid. It causes inflammation and vesication when applied to the skin. It is slightly soluble in water, easily so in alcohol. The watery solution yields with acetate of lead a brown precipitate, with nitrate of silver a black one. It is identical with volatile oil of mustard.

*Physiological Effects.*—Horseradish is a well-known pungent, acrid stimulant, capable of producing vesication when applied to the skin, and of causing vomiting, when taken in the form of infusion into the stomach. Its odorous emanations readily excite a copious flow of tears. On the general system it operates as a stimulant, and promotes the secretion of urine and perspiration.

*Therapeutics.*—It is not much employed as a medicine. Chewed, it serves as an excellent masticatory. Taken in this way, it may be serviceable in some forms of hoarseness. An infusion of it may be taken to excite vomiting, or to promote the operation of other emetics, as in poisoning by narcotic substances. As a general stimulant, diaphoretic, and diuretic, it has been used in palsy, chronic rheumatism and dropsy.

*Officinal Preparation.*

Spiritus Armoraciæ Compositus, *Compound Spirit of Horseradish.*—Take of horseradish, sliced, twenty ounces; bitter orange peel, dried, twenty ounces; nutmeg, bruised, half an ounce; proof spirit, one gallon; water, two pints. Mix, and distil a gallon with a moderate heat.

Usually employed as a stimulating adjunct to other medicines, especially to diuretic infusions.

*Dose.*—Fl. drm. j to fl. drs. ij.

## SINAPIS, *Linn.*

### Mustard.

Tetradynamia Siliquosa, *Linn. Syst.*

*Generic Character.*—*Calyx* spreading, *Stamens* 6, tetradynamous. *Style* small, short, acute. *Silique* somewhat terete or angular, the valves nerved. *Seeds* in one row, somewhat globose.

## SINAPIS NIGRA, *Linn.*

### Black Mustard.

*Specific Character.*—*Annual.* *Stem* 3–4 feet high. *Lower leaves* lyrate, large, rough; *upper ones*, lanceolate, stalked, entire. *Flowers* yellow. *Siliques* smooth, even, pressed close to the floral axis, quadrangular; *beak* short, sterile, subulate (Fig. 208.)—*Eng. Bot.* pl. 969.

Fig. 208. Fig. 209.

208. *Sinapis nigra.* 209 *Sinapis alba.*

*Habitat.*—Indigenous; hedges and waste places. Cultivated in fields, especially in Durham and Yorkshire.

*Description of Seeds.*—Black mustard seeds are small and roundish. Externally they are beautifully veined, and of a reddish or blackish-brown color, though sometimes whitish. Internally they are yellow. They are inodorous when entire, but when rubbed down with water they exhale a strong pungent odor. They have an acrid, bitter, oleaginous taste.

*Composition.*—Black mustard seeds contain a fixed oil, myronate of potash, myrosin, a substance called, by Simon, sinapisin, &c. *Myronate of Potash.*—This is a neutral salt in colorless crystals, having a cooling bitter taste. The characteristic property of myronic acid is, to yield the *volatile oil of mustard* when mixed with myrosin and water. *Myrosin; Emulsin of Black Mustard.*—This substance yields, with the myronic acid of the myronate of potash, and water, the volatile oil of mustard. It has considerable resemblance to vegetable albumen and emulsin; but as it cannot be replaced by either of these substances, in the development of the volatile oil, it must be regarded as a compound *sui generis*. It is soluble in water; but is coagulated by heat, alcohol, and acids, and in this state it loses the power of acting on the myronates, and of yielding the volatile oil. *Sinapisin.*—This term has been given, by Simon, to a substance which he procured from *black* mustard seeds, and which he states possesses the following properties: It presents itself in the form of white, brilliant, micaceous, volatile crystals, which are soluble in alcohol, ether, and the oils, but are insoluble in acids and alkalies. Simon says sinapisin contains no sulphur. *Volatile Oil of Mustard* ($C_8NH_5S_2$).—This does not pre-exist in the seeds; but is formed when water at about 120° is added to the farina, by the mutual action of the contained myrosin and myronate of potash, just as the volatile oil of bitter almonds is generated by the mutual action of emulsin, amygdalin, and water. If the temperature be at 175°, or suddenly raised to 212°, no oil is formed. Alcohol extracts from the farina no volatile oil; but, by coagulating the myrosin, renders the farina incapable of developing the oil by the subsequent action of water. Sulphuric acid and the other mineral acids, as well as carbonate of potash, check the formation of the oil. Volatile oil of mustard is colorless or pale yellow; it has a most penetrating odor, and a most acrid and burning taste. Its sp. gr. at 68° F. is 1.010. It boils at 298° F; it is slightly soluble in water. but readily so in alcohol and ether. According to Wertheim this oil is the sulphocyanide of allyle; it is powerfully acrid, rubefacient, and vesicant. *Fixed Oil of Mustard.*—Usually procured by expression from the dressings or siftings left in the manufacture of mustard. It constitutes about 28 per cent. of the seeds. Its color is reddish or brownish-yellow. It has a faint odor of mustard, and a mild oily taste. It does not readily become rancid. It has been used as a purgative and anthelmintic.

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## SINAPIS ALBA, *Linn.*

### White Mustard.

*Specific Character.*—*Annual.* *Stem* 1–2 feet high. *Leaves* lyrate, and, as well as the *stem*, nearly smooth. *Flowers* large, yellow. *Siliques* hispid, spreading (Fig. 209), cylindrical, knotty, shorter than the sword-shaped beak.—*Eng. Bot.* pl. 1677.

*Habitat.*—Indigenous; in waste places. Cultivated in both fields and gardens. Flowers in June.

*Description of Seeds.*—White mustard seeds are much larger than the black ones. They consist of roundish-elliptical yellow grains, composed of a yellow nucleus enveloped in thin semi-transparent coats. They are inodorous when entire, and nearly so even when rubbed up with water. They have a similar, but less pungent taste than black mustard seeds.

*Composition.*—White mustard seeds contain a *similar fixed oil* to black mustard seeds; an acrid, thick, reddish *oily principle*, soluble in ether and alcohol, and which gives the sharp taste to the powder of the seeds; also *myrosin;* but they *do not* appear to contain *myronate of potash;* hence they do not yield when mixed with water any volatile oil of the nature of that developed in black mustard seeds under similar circumstances. The peculiarity of white mustard seeds is that they contain a principle called *hydrosulphocyanate of sinapin;* hence while perchloride of iron strikes a deep red color in an infusion of white mustard seeds, it merely communicates an orange tint to the infusion of black mustard seeds. They also contain a non-crystallizable yellowish white substance called *erucin*, insoluble in water, but soluble in ether.

## **Sinapis**, *Mustard.*

The seeds of Sinapis nigra, and Sinapis alba, reduced to powder mixed; cultivated in England.

[The U. S. Ph. recognizes in its Materia Medica List, the two mustard seeds under the names of **Sinapis Alba** and **Sinapis Nigra**.—W.]

*Officinal Characters.*—Greenish-yellow, of an acrid bitterish oily pungent taste, scentless when dry, but exhaling when moist a pungent penetrating odor, very irritating to the nostrils and eyes.

*Manufacture of Mustard.*—The following method of preparing *flour of mustard* was furnished me by a manufacturer: The seeds of both black and white mustard are first crushed between rollers, and then pounded in mortars. The pounded seeds are then sifted. The residue in the sieve is called *dressings* or *siftings;* what passes through is *impure flour of mustard.* The latter by a second sifting yields *pure flour of mustard*, and a second quantity of dressings.

*Adulteration.*—The *flour of mustard* of the shops is commonly adulterated with flour (wheaten), colored by turmeric, and rendered hot by capsicum.

*Test.*—A decoction cooled is not made blue by tincture of iodine (showing the absence of starch).

*Physiological Effects.*—Mustard holds an intermediate rank between horseradish and pepper. Its topical action is that of a powerful acrid, and depends on the volatile oil and acrid principle developed by the action of water. The irritant operation, on the eyes, of the vapor arising from a mixture of hot water and flour of mustard, is familiarly known. Mustard poultices cause redness and burning pain, which, if the application be continued, becomes almost insupportable. A prolonged application causes vesication, with even ulceration and gangrene. Compared with those of cantharides, the topical effects of mustard on the skin sooner subside when the application is discontinued. When swallowed, mustard evinces the same stimulant operation on the stomach and bowels. Taken *in moderate quantities*, with the food, it promotes the appetite, and assists the assimilation of substances which are difficult of digestion. *In somewhat larger doses* (as one or two teaspoonfuls), it rouses the gastric susceptibility, and operates as an emetic. *In excessive quantities*, it gives rise to vomiting, purging, and gastro-enteritis. The effects of mustard on the general system are those of a stimulant. It quickens the pulse, and promotes the secretions (especially the urine), and the exhalations.

*Therapeutics.*—As a *medicinal* agent, mustard is employed for several purposes. As an *emetic* it is useful where we want to rouse the gastric sensibility, as in narcotic poisoning, malignant cholera, and some forms of paralysis. As a *stimulant* to the digestive organs it is applicable in atonic or torpid conditions of these parts, with dyspepsia, loss of appetite, and hepatic torpor. As a *diuretic* it has been employed with some benefit in dropsy. But the principal use of mustard is as a *rubefacient* (see **Cataplasma Sinapis**). Flour of mustard, or bruised mustard seed, is sometimes added to pediluvia.

*Administration.*—As an *emetic*, the dose is from a teaspoonful to a tablespoonful of the flour of mustard in a tumblerful of water. As a *diuretic* in dropsies, and for some other purposes, *mustard whey* is a convenient form of exhibition. It is prepared by boiling half an ounce of the bruised seeds or powder in a pint of milk, and straining. Half this quantity may be taken in the course of the day. [The volatile oil of mustard, diluted with 15–20 times its bulk of alcohol, is a very convenient form of application, when the rubefacient action of mustard is desired. It should be dropped on a piece of paper, which is to be immediately applied to the skin, and covered with oiled silk to prevent evaporation. Its action is more rapid than that of the ordinary mustard plaster. By varying the strength of the solution any effect desired may be obtained. Care should be taken to prevent the excessively acrid vapor from coming in contact with the mucous membrane of the eyes or nose.—W.]

*Officinal Preparation.*

Cataplasma Sinapis, *Mustard Poultice.*—Take of mustard, in powder, two ounces and a half; linseed meal, two ounces and a half; boiling water, ten fluidounces. Mix gradually the linseed meal with the water, and add the mustard, constantly stirring.

The mustard poultice is a powerful local irritant. It readily excites inflammation, and, when allowed to remain applied sufficiently long, causes vesication. It proves, in many cases, a most painful application. In various affections of the brain (as in the stupor and delirium of low fever, in apoplexy, and in poisoning by opium), it is a most valuable application to the feet and ankles. In pulmonary and cardiac diseases it is occasionally applied to the chest with excellent effects. Of course, in all these cases, it operates on the principle of a blister, over which its speedy effect gives a great advantage. It is applied spread on linen or calico. Great caution is necessary in its application to persons who are insensible to pain; for if it be continued too long it may occasion ulceration and sloughing, though no pain be manifested. Hence its effects should be examined at short intervals. In one case death nearly resulted from the neglect of this caution.

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## PAPAVERACEÆ, *Jussieu.* The Poppy Order.

## PAPAVER, *Linn.*

### Poppy.

Polyandria Monogynia, *Linn. Syst.*

*Generic Character.—Sepals* 2, deciduous. *Petals* 4, crumpled in the bud. *Stamens* numerous. *Style* 0; *stigmas* 4–20, radiating upon the top of the ovary. *Capsule* roundish or obovate, 1-celled, composed of from 4–20 carpels united together, dehiscing by pores under the stigmas, or indehiscent; *placentas* numerous, projecting internally and forming more or less complete dissepiments. *Herbs*, with a white juice. *Peduncles* inflexed at the apex before flowering.

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## PAPAVER RHŒAS, *Linn.*

### Common Red or Corn Poppy.

*Specific Character.—Annual. Stem* many-flowered, with spreading stiff hairs. *Leaves* pinnatipartite, with oblong inciso-dentate acute partitions. *Peduncles* usually with spreading hairs or rarely adpressed ones. *Flowers* large. *Sepals* hairy. *Petals* deep scarlet, often nearly black at the base. *Filaments* subulate. *Capsule* obovate, smooth, with the margin of the stigma with incumbent lobes.—*Woodv.* pl. 186.

*Habitat.*—Indigenons, and throughout Europe. Very common in fields and on roadsides.

### Rhœas, *Red Poppy Petals.*

The petals, dried; from indigenous plants.

*Officinal Characters.*—When fresh, scarlet, and of a heavy poppy odor; when dry, scentless, and more dingy red.

*Composition.*—Red poppy petals contain about 40 per cent. of a red coloring matter, for which they are principally employed in medicine. According to Chevalier, they also contain a trace of morphia. *Red coloring matter.*—This is deliquescent in the air, soluble in alcohol and in water, but insoluble in ether. Acids diminish the intensity of its color; while alkalies blacken it. By the last character it is distinguished from the coloring matter of the red cabbage, &c., which becomes green by alkalies. Perchloride of iron gives it a dark violet or brown tinge. According to Leo Meier, the coloring principles of the petals are two acids, which he has termed *rhœadic* and *papaveric.*

*Use.*—The red poppy is valued as a coloring ingredient only.

*Officinal Preparation.*

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 fluidounces and a half. Add the petals gradually to the water heated in a water-bath, frequently stirring, and afterwards, the vessel being removed, macerate for twelve hours. Then press out the liquor, strain, add the sugar, and dissolve by means of heat. When nearly cold, add the spirit, and as much distilled water as may be necessary to make up for loss in the process, so that the product shall weigh three pounds ten ounces, and should have the specific gravity 1.330.

Employed only as a coloring agent. It readily ferments and spoils.

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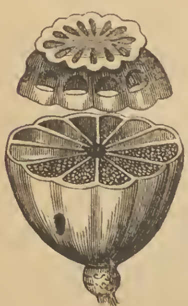
## PAPAVER SOMNIFERUM, *Linn.*

### The Opium Poppy.

*Specific Character.*—An annual *herb. Stem* 2–4 feet high, erect, round, glaucous green, smooth, or with a few hairs towards its upper extremity. *Leaves* oblong, large, amplexicaul, smooth, glaucous green, margins wavy, incised and toothed; *teeth* sometimes tipped with a rigid hair. *Peduncles* with a few stiff spreading hairs. *Flowers* large. *Calyx* smooth. *Filaments* dilated upwards. *Capsule* globose, or ovate-globose, large, smooth. *Seeds* numerous, reniform.—*Woodv.* pl. 185.

Fig. 210.



*Capsule of the opium poppy.*

There are two well-marked varieties of this species:—

α. *nigrum.*—*Capsules* globose, opening by pores under the stigma. *Seeds* black. *Peduncles* many. *Flowers* usually violet or red, of different tints, though sometimes white.

β. *album.*—*Capsules* ovate-globose; pores under the stigma either none or obliterated. *Peduncles* solitary. *Seeds* and *petals* white.

*Habitat.*—Asia and Egypt. Grows apparently wild in some parts of Europe, and in England, but has probably escaped from gardens. Cultivated in Asia Minor, Egypt, Persia, and India, on account of the opium obtained from it. According to Dr. Royle, var. *album* is cultivated in the plains of India; and var. *nigrum* in the Himalayas. In Europe, the opium poppy is principally cultivated for the capsules, or for the oil obtained from the seeds; but occasionally for the opium. Homer speaks of this poppy growing in gardens, so that it appears to have been cultivated at an early period.

### **Papaver**, *Poppy Capsules.*

The nearly ripe capsules, dried and deprived of the seeds; cultivated in Britain.

The London market is principally supplied with poppy capsules, which are commonly termed poppy heads, from the neighborhood of Mitcham, in Surrey; but also, to some extent, from Banbury, Market Deeping, &c.

*Officinal Characters.*—Globular, two or three inches in diameter, crowned by a sessile stellate stigma; of an opiate taste.

*Description.* — Poppy capsules are most active as medicinal agents when gathered before they are ripe, as directed in the Pharmacopœia. They vary in size from that of a hen's egg to that of the fist. Their texture is papyraceous: on the top of them is the star-like stigma. (See Fig. 210.) They are yellowish or yellowish-brown, and, if they have been collected before they were quite ripe, have a bitterish taste. When fresh, they have a slightly opiate odor, which they lose by drying. The seeds, called *maw seeds*, have an oily, sweetish taste, and are altogether destitute of narcotic properties.

Fig. 211.


*Papaver somniferum.*

1. Capsule of P. officinale. 2. Do. of P. somniferum. 3, 4. Seeds.

*Composition.*—Poppy capsules contain a small quantity of the principles found in opium, which they yield to boiling water. The presence of some of the principles is readily indicated as follows: A decoction of poppy capsules is rendered, by the perchloride of iron, brownish-red (*meconate of iron*). Nitric acid makes the decoction transparent, and communicates a slightly orange-red tinge, indicative of the presence of morphia.

*Physiological Effects, and Administration.*—Their effects are similar, but much weaker and less to be depended upon than opium. The syrup of poppies is the best preparation for internal use, and the decoction as an external anodyne and slightly emollient application.

#### *Officinal Preparations.*

Decoctum Papaveris, *Decoction of Poppies.*—Take of poppy capsules, bruised, and freed from the seeds, four ounces; distilled water, three pints. Boil for ten minutes, and strain. The product should measure thirty-two ounces.

Anodyne and slightly emollient. This preparation forms a common fomentation, which is applied to bruised, inflamed, excoriated, tender, or swollen parts; to the eye in ophthalmia, to the abdomen in enteritis and peritonitis, to tender ulcers, &c. In cancer and other painful affections of the uterus it is thrown into the vagina as a soothing remedy.

Syrupus Papaveris, *Syrup of Poppies.*—Take of poppy capsules, bruised and freed from seed, thirty-six ounces; boiling distilled water, twenty pints; rectified spirit, sixteen fluidounces; refined sugar, four pounds. Macerate the poppy capsules in the water, in a water-bath, kept hot, for twelve hours. Then evaporate all the water, except that absorbed by the capsules, press strongly, and strain. Reduce the strained liquor to three pints; and, when quite cold, add the spirit. Mix and filter. Distil off the spirit, evaporate the remaining liquor to two pints, and then add the sugar. The product should weigh six pounds and a half, and should have the specific gravity 1.320.

Syrup of poppies, especially if too thin, is very liable to ferment, and then contains spirit or acetic acid, or both, and is of course ill adapted for medicinal use. To check these changes, it should be carefully made with spirit, according to the directions of the Pharmacopœia, taking care that it has the proper consistency, and by keeping it in a cool place. Occasionally a mixture of treacle and laudanum, or syrup and extract of poppies, has been substituted for it; but this fraud is highly dangerous, and has on several occasions proved fatal to children. Syrup of poppies is narcotic, sedative, and anodyne, and is commonly, though not wisely, employed as the infant's opiate. It mitigates pain, allays spasm and troublesome cough, and promotes sleep. Even in the adult it is sometimes used for these purposes. It forms a useful adjunct to pectoral tinctures. Over ordinary opiates it has the positive advantage of a less disagreeable taste, and the supposed one of being less likely to create nausea and headache. Even when properly prepared, its administration to infants requires the greatest caution, on account of their known susceptibility to the influence of opiates, and the varying strength of the preparation.

*Dose.*—For an infant of three or four months old, from 10 to 15 minims; for adults, from 1 to 4 fluidrachms.

### **Opium**, *Opium.* [Mat. Med. List, U. S. P.]

The inspissated juice; obtained by incision from the unripe capsules grown in Asia Minor.

*Extraction and Collection.*—The mode of extracting opium is to a certain extent similar in all countries, and consists in making incisions into the half ripe capsules, and collecting the exuded juice when concreted into tears. After collection, the masses of tears are either worked up into a homogeneous mass in a mortar or otherwise, as in Egypt and India; or the separate portions are merely put together, as in Asia Minor and Persia. In the latter case, opium when examined by means of a magnifier is seen to be composed of agglutinated tears, and may be termed *granular opium;* in the former the opium appears perfectly homogeneous, and is called *homogeneous opium.*

A full account of the cultivation and preparation of opium in India has been published by Dr. Eatwell, and will be found in the eleventh and twelfth volumes of the *Pharmaceutical Journal.* As the opium obtained in Asia Minor is, however, alone officinal, we subjoin the mode of preparation, &c., adopted there, as published by Messrs. Maltass & Wilkin in the fourteenth volume of the *Pharmaceutical Journal.* It is as follows: About the end of May the plants arrive at maturity, and the flowers expand. A few days after the petals have fallen, the capsule is ready for incision. This operation is performed in the afternoon of the day, and in the following manner: a transverse incision is made with a knife in the lower part of the capsule, the incision being carried round until it arrives nearly at the part where it commenced; sometimes it is continued spirally to half-way beyond its starting point. The greatest nicety is required to avoid cutting too deep, and penetrating the interior coating of the seed vessel, as this would cause the exuding milky juice to flow into the inside. The following morning those engaged in collecting the opium lay a large poppy leaf on the palm of the left hand, and, having a knife in the right hand, they scrape the opium which has exuded from the incision in each capsule, and then transfer it from the knife to the leaf, until a mass of sufficient size has been formed, when a second poppy leaf is placed over the top of the mass. If the dew has been heavy during the night the yield is greater, but the opium is dark in color; if, on the contrary, there has been no dew, the yield is less, but the opium is of a lighter color. A high wind is prejudicial, as the dust raised from the pulverized soil adheres to the exudation, and cannot be separated. The poppy capsules are cut but once, but as each plant will from one stem produce several branches, and each branch produce a flower, it is usual to pass over the field a second or a third time, to cut such capsules as were not ready at the first cutting. After the opium is collected, it is dried in the shade.

*Officinal Characters.*—Irregular lumps, weighing from four ounces to two pounds; enveloped in a poppy leaf, and generally covered with rumex seeds; when fresh, plastic, tearing with an irregular slightly moist chestnut-brown surface, shining when rubbed smooth with the finger, having a most peculiar odor and nauseous bitter taste.

*Description, and Varieties.*—Several varieties of opium have been described by pharmacologists, as Smyrna, Constantinople, Egyptian, Persian or Trebizond, Indian, English, French, and German. Of these, only Smyrna, Constantinople, and Egyptian opium are commonly found in commerce; and as only the first two are collected in Asia Minor, they are alone officinal, and should be exclusively employed in the preparations ordered in the Pharmacopœia. Although Smyrna and Constantinople opiums are commonly regarded by European pharmacologists as distinct varieties, according to Maltass, there is no real difference between them, both being the produce of the same districts, from which they are forwarded to either Smyrna or Constantinople for sale, according to circumstances. The Smyrna variety is that most commonly imported into this country.

*Smyrna Opium.*—This is the *Turkey* or *Levant opium* of commerce. It occurs in irregular rounded or flattened masses, of various sizes, rarely exceeding two pounds in weight, enveloped in poppy leaves, and usually surrounded with the reddish fruits of some species of *Rumex.* After the opium has been much handled the Rumex fruits become more or less divested of their pericarps, and the seeds are then found, to a corresponding degree, upon the surface, instead of the fruits. Some of the flat cakes are without these fruits, and somewhat resemble Constantinople opium. When first imported, the masses, which are made up of agglutinated tears (*granular opium*), are soft, and of a reddish-brown color internally; but, by keeping, they become hard and blackish. Its lustre is waxy; its odor strong and unpleasant; its taste bitter, acrid, nauseous, and persistent. Notwithstanding occasional adulterations (see *Impurities and Adulterations*, page 816), Smyrna opium is the best commercial opium. It yields more *morphia* and *meconic acid* than either

Constantinople or Egyptian opium. The quantity of *morphia* which can be obtained from it is, perhaps, on the average, about 8 per cent. Hydrochlorate of morphia, prepared by Gregory's process from Smyrna opium, contains, according to Dr. Gregory, one-twelfth of codia. Merck examined five kinds of Smyrna opium: from the worst he procured 3 to 4 per cent. of morphia; from the best 13 to 13.5 per cent. In the latter variety he found 0.25 per cent. of codia.

*Constantinople Opium.*—There are two sorts of this kind of opium: one in very large irregular cakes, which are flattened like the Smyrna opium. This is of very good quality. The other is in small, flattened, regular cakes, of a lenticular form, from two to two and a half inches in diameter, and covered with a poppy leaf, the midrib of which divides the cake into two parts. It has an odor similar to the preceding kind, but more feeble; it blackens and dries in the air. It is more mucilaginous than Smyrna opium. The cakes are never covered with the Rumex fruits, like those of Smyrna opium. Constantinople opium is inferior to the Smyrna kind. Professor Guibourt says that this kind of opium yields only half the morphia procurable from the Smyrna opium. Berthemot also states that it gives less than the Smyrna kind. This, however, does not agree with the experience of Mr. Duncan, of Edinburgh, who has never failed to obtain an extraordinary quantity of hydrochlorate of morphia from it. From an experiment of Dr. Christison's he calculates the quantity of hydrochlorate of morphia obtainable from it at 14 per cent. Merck procured 15 per cent. of pure morphia, but scarcely a trace of codia. It is obvious, therefore, that Constantinople opium is of unequal quality. It is probable that opium of unequal qualities, and produced in several parts of the Turkish empire, is carried to the capital, and, being exported thence, bears the name of Constantinople opium.

*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 dilute hydrochloric acid, evaporate it to the bulk of half an ounce, and let it cool. Neutralize cautiously with solution of ammonia, carefully avoiding an excess; remove by filtration the brown matter which separates, wash it with an ounce of hot water, mix the washings with the filtrate, concentrate the whole to the bulk of half an ounce, and add now solution of ammonia in slight excess. After twenty-four hours collect the precipitated morphia on a weighed filter, wash it with cold water, and dry it at 212°. It ought to weigh at least from six to eight grains. [If a piece of good opium be drawn across a sheet of writing paper it will leave behind it an interrupted black line, if the latter be continuous the opium is not good.—W.]

*Egyptian Opium.*—Though not officinal, this is sometimes of good quality, and therefore deserves notice. It occurs in round flattened cakes of about three inches in diameter, covered externally with the vestiges of some leaf, which Professor Bentley believes to be that of the Oriental Plane (*Platanus orientalis*). It is usually very dry. It is distinguished from the two preceding varieties by its reddish color, analogous to that of Socotrine or hepatic aloes. Some very inferior qualities are sometimes offered for sale, and which appear to the sight and touch to be largely adulterated. By keeping, it does not blacken like the other kinds; its odor is less strong, and somewhat musty. Guibourt says that by exposure to the air it becomes soft. Egyptian opium is, for the most part, inferior to either of the preceding kinds; but its quality is by no means uniform. Some kinds become damp by keeping. Guibourt tells us it yields only five-sevenths of the morphia obtained from Smyrna opium. Berthemot also states that it contains less morphia than either of the preceding kinds of opium, and that the morphia is more mixed with narcotia. He further adds that the morphia which it yields is purified with great difficulty. The watery infusion of Egyptian opium has a distinct odor of acetic acid. Dr. Christison obtained about $10\frac{1}{4}$ per cent. of pure white hydrochlorate of morphia from it, which, he says, is about the quantity procured from good Smyrna opium. Merck procured only from 6 to 7 per cent. of morphia, but much meconic acid. Hence it is evident that Egyptian opium varies much in quality. During the last year some very fine Egyptian opium has been imported into this country.

*Composition.*—The following substances may be regarded as the principal constituents of opium: Morphia, codia, narcotia, thebaia, narcein, meconin, meconic acid, extractive, and volatile odorous principle.

1. *Morphia.*—(This will be described hereafter.)

2. *Codia* (*Codein* [*Codeia*].)—So called from κώδεια, *a poppy head* ($C_{35}H_{20}NO_5+2HO$). A white crystalline solid, soluble in cold, and still more so in boiling water; soluble in alcohol and ether; insoluble in a cold weak solution of potash. If more codia be added to boiling water than this liquid can dissolve, the excess melts and forms an oily layer at the bottom of the vessel; and, by cooling, a crystalline mass is obtained. It reacts as an alkali on test papers, and unites with acids to form crystalline salts. From morphia codia is distinguished by its not becoming blue on the addition of a persalt of iron; it is also said not to redden nitric acid like morphia (Turner). All the specimens of codia which I have met with become orange yellow on the addition of nitric acid. Moreover, ammonia does not precipitate it from its very diluted solution in hydrochloric acid, on account of its solubility in water; and this affords a means of separating morphia from codia. The separation may be more easily effected by ether, which readily dissolves codia, or by alkalies (potash or soda) which dissolve morphia, but leave codia. From meconin it is distinguished by its aqueous solution possessing marked alkaline properties, as manifested by its action on test papers. Tincture of galls produces a copious precipitate (*tannate of codia*) in solutions of codia.

3. *Narcotia* (*Narcotine*, *Narcotina*).—So called from ναρκωτικὸς, *narcotic* ($C_{46}H_{25}NO_{14}$). The greater part of the narcotia of opium is in a free state, as it is removable by ether without the aid of either acids or alkalies. It is a white, inodorous substance, crystallizing in prisms, which are fluted or striated; distinguished from morphia by being insipid, very soluble in ether, insoluble in alkalies, by its not becoming blue on the addition of perchloride of iron, by its not decomposing iodic acid, and, when quite pure, by its not yielding a brown color when treated by chlorine and ammonia. Heated on paper over a candle, it gives a greasy-looking stain to the paper. Nitric acid dissolves it, and acquires an orange tint. It does not affect vegetable colors, and by this character is readily distinguished from both morphia and codia. It is insoluble in cold water, but dissolves in 400 parts of boiling water, in 100 parts of cold alcohol,

or in 24 parts of boiling alcohol. The volatile oils also dissolve it; it is soluble in ether. It combines with acids, and forms salts. The *salts of narcotia* have been but little examined. They are more bitter than those of morphia, redden litmus, and are precipitated from their solutions by infusions of galls, and by the alkalies. The *hydrochlorate* is crystallizable. Both this and the *sulphate* are very soluble in water. Narcotia is extracted from the residue of the opium which has been subjected to the action of cold water. This is treated with water acidulated with either acetic or hydrochloric acid, and to the filtered solution ammonia is added. The precipitate treated with boiling alcohol yields narcotia, which is deposited as the liquor cools. It may be separated from morphia by ether, which dissolves the narcotia but leaves the morphia, or by a solution of potash, which dissolves the morphia but leaves the narcotia, or by the cautious addition of weak acetic acid, which dissolves the morphia, and, unless the acid be greatly in excess, does not dissolve the narcotia. Narcotia possesses but little activity. Dr. Roots gave gradually increased doses of it, up to a scruple, without the least injury. The bitterness of its sulphuric solution led him to employ it in intermittents as a substitute for sulphate of quinia. More recently attention has been drawn to it in India by Dr. O'Shaughnessy, as an Indian indigenous substitute for quinia; and nearly 200 cases of intermittent and remittent fevers treated by it with success, have been published.

4. *Thebaia* (*Paramorphia*).—So called from *Thebes*, an ancient city of Egypt ($C_{25}H_{14}NO_4$). It is a white, crystalline, fusible solid, having an acrid, styptic taste, very soluble in alcohol and ether, but hardly at all soluble in water. It possesses alkaline properties, and dissolves in weak acids. From these solutions it is precipitated by alkalies. An excess of alkali cannot dissolve it, unless, indeed, the alkaline solution be very concentrated. It fuses at 302°, but does not volatilize at any temperature. It is distinguished from morphia by not becoming blue on the addition of the perchloride of iron, and by not forming crystallizable salts with acids. From codia it differs in not crystallizing in large crystals, and in not forming crystallizable salts. With meconin and narcein it has no analogy, and from them it is distinguished by the want of the peculiar properties which characterize these bodies. It resembles narcotia more than any other substance, but is distinguished by the crystals being shorter or granular, and wanting the pearly brilliancy possessed by those of narcotia; by its acrid taste; by its fusibility at 302°; by its greater solubility in alcohol, and by nitric acid, when dropped on it, converting it into a substance like a soft resin before dissolving it. Pelletier considered it to be isomeric with morphia—hence called it *paramorphia*. Magendie states that one grain injected into the jugular vein, or placed in the pleura, acts like brucia or strychnia, and causes tetanus, and death in a few minutes.

5. *Narcein.*—So called from νάρκη, *stupor* ($C_{28}H_{20}NO_{12}$). It is a white, inodorous solid, crystallized in long, fine, silky needles, radiating in tufts from a centre, with a slightly bitter, and even somewhat metallic taste. It dissolves in 230 parts of boiling water, or 375 parts of water at 60°. It fuses at about 198°, and at a higher temperature is decomposed. Narcein has several very striking properties by which it is distinguished from other substances. The sulphuric, nitric, and hydrochloric acids, so diluted with water that they cannot alter the elementary composition of narcein, give to this substance a fine light-blue color, immediately on coming in contact with it. This alteration of color does not appear to depend on any change in the elementary composition of

narcein, since, by saturating the acids with ammonia, it is precipitated unchanged. When much water is added, the blue color disappears. Another peculiar trait of narcein is, that it forms a bluish compound (*iodide of narcein*) with iodine; heat and alkalies destroy the color. These characters are sufficient to distinguish narcein from all other known substances. In addition, I may add that it does not form a blue color with the perchloride of iron, as morphia does. Narcein was at first supposed to be an alkaloid; but as it does not affect vegetable colors, nor combine with nor saturate acids, it is now regarded as a neutral principle. Two grains have been several times thrown into the jugular vein of a dog, without producing any appreciable effect. It is presumed, therefore, to be inert.

6. *Meconin.*—So called from μήκων, *a poppy* ($C_{10}H_5O_4$). It was discovered by Pelletier, and its properties were examined by Couerbe. It is a white, crystalline, odorless solid. Its taste, which is at first scarcely perceptible, is afterwards sensibly acrid. The crystals are six-sided prisms, with dihedral summits. It fuses at 194°, and becomes a colorless, limpid fluid. At a higher temperature it may be distilled. It dissolves in 265 parts of cold water, or in 18 parts of boiling water. It is soluble in alcohol and in ether. It is distinguished from morphia and codia by not possessing alkaline properties. From morphia it is further distinguished by its great fusibility, its greater solubility in water, and its not becoming blue on the addition of perchloride of iron. Cold sulphuric acid dissolves meconin, the solution being limpid and colorless. Meconin is remarkable for not containing nitrogen. A grain dissolved in water, and injected into the jugular vein of a dog, produced no remarkable effect. Further experiments, however, are required before we can positively declare it to be an inert substance.

7. *Meconic Acid* ($C_{14}HO_{11},3HO+6HO$).—This is usually procured from meconate of lime, by acting on it, in hot water, with hydrochloric acid. The meconic acid crystallizes on cooling. It is a tribasic acid. When pure, it is in the form of white, transparent, micaceous scales, which are soluble in four times their weight of boiling water. But at this temperature water decomposes it; carbonic acid is evolved, and a solution of *komenic acid* is obtained. Cold water dissolves a smaller quantity of meconic acid. Alcohol is also a solvent for meconic acid. *It reddens the neutral persalts of iron*, forming the *meconate of the peroxide of iron.* Alkalies, protochloride of tin, and nitric acid, assisted by heat, destroy this red color. A solution of corrosive sublimate, which destroys the red color of sulphocyanide of iron, does not decolorize a red solution of meconate of iron. It forms, with a weak solution of *ammonio-sulphate of copper*, a green precipitate (*meconate of copper*). It yields white precipitates (*meconates*), which are soluble in nitric acid, with *acetate of lead*, *nitrate of silver*, and *chloride of barium.* The alkaline acetates which, like meconic acid, redden the persalts of iron, and might, therefore, be confounded with it, do not occasion precipitates with the salts of lead and of barium. Besides, the meconate of lead is insoluble in acetic acid; and if a solution of an alkaline acetate be first boiled with a few drops of diluted sulphuric acid, it is not reddened by a persalt of iron. It is not reddened by *chloride of gold*, which reddens hydrosulphocyanic acid and the sulphocyanides. Meconic acid is believed to be an inert substance. Sertürner swallowed five grains of it without observing any effect. Sömmering gave ten grains to a dog; Feneglio and Blengini gave eight grains to dogs, cows, and frogs, and four grains to various men; in all cases no effects were observed. Com-

bined with bases, it doubtless modifies their action. Meconate of soda, however, is not active, as Sertürner asserted. It is supposed that the effect of the morphia in opium is modified by its combination with meconic acid.

8. *Extractive.*—The substance usually denominated the extractive of opium is probably a heterogeneous body. It is brown and acid, and has been supposed to be one of the active principles of opium. The reasons for this opinion are the following: In the *first* place, it has been asserted that after the morphia has been separated from an infusion of opium by magnesia, the filtered liquor gives, by evaporation, an extract which produces the same kind of narcotic effect that opium does. *Secondly*, the effects of the known active principles of opium are not sufficiently powerful to authorize us to refer the whole of the active properties of opium to them.

9. *Volatile Odorous Principle* (*Volatile Oil?*).—The distilled water of opium has the peculiar odor of this drug, and by keeping deposits a ropy substance. Hitherto, however, all attempts to isolate the volatile odorous principle of opium have failed, and its nature, therefore, is as yet unknown. Nysten swallowed two ounces of the distilled water without any sensible effect; and Orfila injected a like quantity of it into the jugular vein of a dog without apparently causing any inconvenience to the animal. The volatile principle cannot, therefore, possess much activity; but Nysten concludes "that the distilled water of opium, strongly saturated with the aromatic principle, is capable of producing drunkenness and sleep, when taken in a strong dose."

*Chemical Characteristics.*—Litmus paper is reddened by a watery infusion of opium (or tincture of opium diluted with water), owing to a free acid (*meconic*). Perchloride of iron gives it a deep red color (*meconate of iron*). Acetate and subacetate of lead occasion a copious gray precipitate (*meconate and sulphate of lead, with coloring matter*), which, treated by sulphuric acid or sulphuretted hydrogen, yields free meconic acid. Chloride of barium also causes a precipitate (*meconate and sulphate of baryta*). Ammonia renders the infusion turbid (*precipitated morphia and narcotia*). Tincture of galls causes a precipitate (*tannates of morphia and codia*). Nitric acid communicates to the infusion a red color (*oxidized? morphia*). Chloride of gold causes a deep fawn-colored precipitate.

*Impurities and Adulterations.*—Opium is brought into the market of very unequal degrees of purity, in consequence of its having been subjected to adulteration; and partly, perhaps, from the employment of different methods of preparation. Moreover, its consistence is by no means uniform; that of some kinds being quite soft, and of others hard; the Smyrna opium being generally much softer than the Constantinople. As this difference depends on the presence of unequal quantities of water, an obvious variation of strength is the consequence. Moreover, the quantity of morphia in good opium of different or even of the same localities, is by no means constant. Furthermore, opium, from which the morphia has been extracted, has been fraudulently introduced into commerce. *The Water* in opium will be readily judged of by the consistence, but still better by observing the loss on drying a given weight of the opium at 212°; and a physical examination of opium will frequently detect impurities (as leaves, bullets, stones, fruits, &c.). If a decoction of the suspected opium be made and strained, various foreign matters are left on the sieve. In this way I obtained 600 grains of small stones and gravel from 10 ounces of opium. A decoction of opium, when cold, should not give a blue precipitate (*iodide of starch*) on the addition of tincture of iodine; if it do, the presence of starch or flour is obvious.

*Physiological Effects.*—I propose to examine the effects of opium under three heads or subdivisions: *first*, the effects of one or a few doses employed medicinally; *secondly*, the effects of the habitual employment of opium; and *thirdly*, its effects on the different systems of organs.

1. *Effects of one or a few doses.*—We may consider these under three degrees of operation. *First degree of operation.*—In *small doses*, as from a quarter of a grain to one grain, opium generally acts as a stimulant, though in this respect the symptoms are not uniform. Usually the vascular system is somewhat excited, and a sensation of fulness is experienced about the head. The excitement in the cerebral vascular system is accompanied by alterations in the conditions of the nervous functions. The mind is usually exhilarated; the ideas flow more quickly; a pleasurable or comfortable condition of the whole system is experienced, difficult to describe; there is a capability of greater exertion than usual. These symptoms are followed by a diminution of muscular power, and of susceptibility to the impression of external objects; a desire of repose is experienced, with a tendency to sleep. While these effects are taking place, the mouth and throat become dry, and hunger is diminished, though the thirst is increased; and slight constipation usually follows. Such are the ordinary effects of a small dose of opium on persons unaccustomed to its use. By repetition, however, its influence becomes considerably diminished. *Second degree of operation.*—Given in a *full medicinal dose* (as from two to five grains), the stage of excitement is soon followed by that of depression. The pulse, which at first is increased in fulness and frequency, is afterwards reduced below the natural standard. The skin becomes hot; the mouth and throat dry; the appetite diminished; the thirst increased; and frequently nausea, or even vomiting is induced. The symptoms of excitement soon pass away, and a state of torpor succeeds; the individual seems indisposed to exertion; the muscular system appears enfeebled; the force of external impressions on the organs of the senses is diminished; and the ideas become confused. This state is followed by an almost irresistible desire to sleep, which is frequently attended by dreams—sometimes of a pleasing, at others of a frightful nature. These effects are usually succeeded by constipation (which may continue for several days), by nausea, furred tongue, headache, and listlessness. *Third degree of operation. Poisonous effects of opium.*—Dr. Christison has so briefly summed up the effects of a poisonous dose of opium, that I cannot do better than quote his statement: "The symptoms of poisoning with opium, when it is administered at once in a dangerous dose, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person becomes motionless and insensible to external impressions; he breathes very slowly, generally lies quite still, with his eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances, the features become ghastly, the pulse feeble and imperceptible, the muscles exceedingly relaxed, and, unless assistance is speedily procured, death ensues. If the person recovers, the sopor is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food." There is also a smell of opium in the breath, although this may be concealed in some instances by other odors.

2. *Habitual Use of Opium.*—Numerous instances of the enormous quantities of opium which, by habit, may be taken with impunity have been published. Dr. Chapman tells us that he knew a wineglassful of laudanum to be given several times in the twenty-four hours. "But what is still more extraordinary," says this author, "in a case of cancer of the uterus, which was under the care of two highly respectable physicians (Drs. Monges and La Roche) of Philadelphia, the quantity of laudanum was gradually increased to three pints, besides a considerable quantity of solid opium in the same period. Pinel mentions a lady who required 120 grains of opium to give her ease in cancer of the uterus Some doubt has been entertained as to the alleged injurious effects of opium-eating on the health, and its tendency to shorten life; and it must be confessed that in several known cases which have occurred in this country no ill effects have been observable. Dr. Christison has given abstracts of eleven cases, the general result of whose histories 'would rather tend to throw doubt over the popular opinion.' In those cases of disease (usually cancerous) in which enormous doses of opium are taken to alleviate pain, I have usually observed constipation produced; but Dr. Christison says, 'constipation is by no means a general effect of the continued use of opium. In some of the cases mentioned above, no laxatives have been required; in others, a gentle laxative once a week is sufficient.'"

3. *Action of Opium on the Different Organs.*—In discussing this subject, it will be convenient to consider the organs arranged in groups or systems devoted to some common functions.

*a. On the cerebro-spinal system.*—Taken in small or moderate doses, opium first produces excitement of the vascular system of the brain, accompanied with corresponding excitement in the cerebro-spinal functions. This state, however, is succeeded by that of depression. In large or poisonous doses the leading symptom is sopor; that is, a state analogous to profound sleep, from which the patient *can* be roused, though with difficulty. In the latter stage of poisoning this symptom is succeeded by coma—that is, profound sleep, from which the patient *cannot* be roused. Sopor is usually accompanied either with actual paralysis of the muscular fibres, or with a diminished power almost amounting to it; both of which states doubtless arise from the same condition of the cerebro-spinal system which produces sopor or coma. This state is commonly supposed to be sanguineous (venous) congestion. The pupil is usually contracted, a circumstance deserving of especial notice. In some cases there is delirium in the place of sopor or coma, and convulsions instead of paralysis. These are to be regarded as exceptions to the general rule, and are accounted for pathologically, by supposing that they depend on a state of irritation or excitement set up in the nervous centres, and which usually, though not invariably, terminates in congestion. Another effect of opium is diminished sensibility. Thus the whole body becomes less susceptible of painful impressions; in dangerous and fatal cases, the eyes are insensible to light, and the ears to sound. This state has been accounted for by supposing that the functions of the sensitive nerves are diminished or suspended by the congested condition of the brain. From these effects of opium on the cerebro-spinal system the following inferences may be drawn: 1. That it is an objectionable agent in apoplexy, phrenitis, and in paralyais. 2. That under proper regulations it is a remedy which may be used to stimulate the cerebro-vascular system, to promote sleep, to diminish inordinate muscular contraction, to diminish the sensibility of the body, and thereby to alleviate pain.

*b. On the digestive system.*—The usual effects of opium on the organs of digestion are the following: It diminishes secretion and exhalation from the whole canal; thus it causes dryness of the mouth and throat, and diminishes the liquidity of the stools; it excites thirst, lessens hunger, checks the digestive process, and in some cases it excites vomiting. In a case of poisoning by opium, in which a female remained eighteen hours in a state of insensibility, farinaceous food was found still unchanged in the stomach. Mr. Kerr tells us, that in the famine which prevailed in the East Indies in the year 1770, opium was purchased by the unhappy sufferers, at extraordinary prices, to allay the cravings of hunger, and to banish the dreadful prospect of death. The Tartar couriers, who travel immense distances in a short period of time, take opium only during the journey, to support them. It diminishes the sensibility and contractility of the digestive organs; hence the difficulty, in severe cases of poisoning, of producing vomiting. The constipation which follows the use of opium depends partly on the same cause, and in part also on the diminished excretion of bile, and diminished secretion from the gastro-intestinal mucous membrane. Sprœgel found the choledic ducts of animals, to which opium had been given, filled with bile; yet it had not passed into the intestines, for the feces were scarcely tinged by it, but had the same appearance which we observed them to have in jaundiced patients. From these effects of opium on the digestive organs, we may draw the following inferences: 1. That in diminished secretion from the gastro-intestinal membrane, in extreme thirst, in loss of appetite and weak digestion, in obstinate costiveness and in diminished excretion of bile, opium is an objectionable remedy. 2. That under proper regulations opium is an admissible remedy for the following purposes. To diminish excessive hunger; to allay pain, when unaccompanied by inflammation; to diminish the sensibility of the digestive organs, in cases of acrid poisoning, and in the passage of biliary calculi; to produce relaxation of the muscular fibres of the alimentary canal in colic and diarrhœa, and of the gall ducts in the passage of calculi; and to diminish excessive secretion from the intestinal canal in diarrhœa. By continued use (as by opium-eaters) this drug frequently ceases to cause dryness of the mouth, to pall the appetite, or to confine the bowels.

*c. On the vascular system.*—Opium certainly influences the movements of the heart and arteries; but the effect is by no means uniform, since in some cases we see the pulse increased, in others diminished in frequency; and a like variation is noticed in its fulness. Moreover, these variations occur in the same case at different stages. From Dr. Crump's experiments, it appears that, after the use of a moderate dose of opium, the frequency of the pulse is first increased, then decreased. The diameter of the artery, and the force and regularity with which the pulsations are effected are properties of the pulse, readily, but by no means uniformly, affected by opium. To a certain extent we perceive a relation between the condition of the pulse and that of the cerebro-spinal functions. Thus, when convulsions occur, we usually have a hurried pulse, whereas when sopor or coma supervenes, the pulse becomes weaker or slower, or both, than natural. But these conditions are by no means uniform. A frequent pulse, with a feverish condition of the body, are common consequences of the use of small or moderate doses of opium; and in poisoning by this drug, a quick pulse, even though no convulsive movements are observed, is by no means rare. A poisonous dose of opium usually enfeebles the pulse, sometimes makes it fuller, often renders it irregular, and towards death always renders it feeble, and often imperceptible.

We can easily believe that the muscular fibres of the heart must experience from the use of a large dose of opium, a diminution of power in common with other muscular fibres, and hence the contractions become weaker. It is also probable that the contractile coat of the arteries and capillaries equally suffers. The accumulation of blood observed in the large venous trunks and cavities of the right side of the heart is supposed to arise from the obstruction experienced to its passage through the pulmonary vessels. In attempting to lay down indications and contra-indications for the use of opium as a remedy for morbid conditions of the circulation, two difficulties present themselves: *first*, the same condition of the vascular system may be produced by various and even opposite causes, for some of which opium may be an appropriate remedy, while for others it may prove an injurious agent; *secondly*, the effects of opium on the circulation are not uniform, and hence not to be relied on. The following conclusions, therefore, are submitted, with considerable hesitation as to the universality of their application: 1. That in increased activity of the vascular system with diminished secretions and exhalations, and in morbid conditions of the vascular system with a tendency to sopor or coma, opium is an objectionable remedy. 2. That in vascular excitement with great diminution of power, as after hemorrhage, and in various morbid conditions of the pulse attended with acute pain, spasm, or profuse secretion and exhalation, but without visceral inflammation, opium often proves a serviceable agent.

*d. On the respiratory system.*—In studying the effects of opium on the respiration, we must remember that the mechanical part of this function is effected by muscular agency; and as the contractility of the muscular fibre is powerfully influenced by opium, so the respiratory movements are also necessarily modified. Occasionally the primary effect is a slight increase in their frequency; but the secondary effect is almost always of an opposite kind, the respiration being slower than usual; and when coma is present, the breathing is usually gentle, so as scarcely to be perceived; but in some cases it is stertorous. In fact, a paralytic condition of the respiratory muscles takes place, in consequence of which inspiration becomes gradually more and more difficult, until eventually asphyxia is induced, which is usually the immediate cause of death. Another effect ascribed to opium is, that it checks the arterialization of the blood, by diminishing the supply of nervous agency, without which the decarbonization or oxygenization of this fluid cannot take place. It is difficult, however, to distinguish the consequence of this effect from those of asphyxia produced by paralysis of the respiratory muscles. The third point of view under which we have to examine the influence of opium on the respiratory system is, its effects on the membrane lining the trachea and bronchial tubes and cells. In the first place it diminishes the sensibility of this, in common with other parts of the body; and, secondly, it checks exhalation and mucous secretion. A knowledge of these effects of opium on the organs of respiration leads to the following conclusions: 1. That this agent is contra-indicated in difficulty of breathing arising from a deficient supply of nervous energy, as in apoplectic cases; that it is improper where the venous is imperfectly converted into arterial blood; and, lastly, that it is improper in the first stage of catarrh and peripneumony, both from its checking secretion, and from its influence over the process of arterialization. 2. That in cases of poisoning by opium, artificial respiration is indicated to prevent asphyxia. 3. That opium may, under proper regulations, be useful to diminish the sensibility of the bronchia, in the second stage of catarrh, and thereby to allay cough by lessening the influence of cold air; and lastly, to counteract excessive bronchial secretion.

*e. On the urinary system.*—Authors are not agreed as to the effect of opium on the kidneys; some asserting that it increases, others that it diminishes, the quantity of urine secreted. It cannot be doubted that in most cases a moderate quantity of opium diminishes the excretion, while at the same time it makes this fluid turbid and thick. This does not, however, prove that the kidneys are the parts affected. Sprœgel tells us that when he gave 40 grains of opium to dogs, no urine was passed for two days; and, under the influence of 120 grains of this medicine, the urine was retained for three days. But dissection showed that the kidneys had not ceased to secrete urine, since the bladder was found distended with this secretion, and its parietes without the least sign of contractility on the application of nitric acid; so that it would appear that the non-evacuation of the urine was referable to the insensible and paralyzed condition of the vesical coats, and not to the diminished urinary secretion. Welper, of Berlin, always found the bladder filled with urine both in man and animals. In some morbid conditions of system opium certainly checks the urinary secretion. This is decidedly the case in diabetes. The ureters and bladder have their sensibility and contractility diminished by opium. With respect to the effect on the first of these parts the statement seems proved by the well-known beneficial influence of opium in cases where calculi are descending along these tubes. The acute pain is frequently relieved, and the ureters relaxed, so that large calculi are sometimes allowed to descend from the kidneys along them. Besides the observations of Sprœgel, before referred to, we have other evidence of the paralyzing and benumbing effect of opium on the bladder. In some cases of poisoning by this substance the bladder has been found to be unable to contract on its contents. In some other instances the sphincter of the bladder has been paralyzed, and in consequence the urine was voided involuntarily. The effect of morphia on the bladder is more marked than that of opium. These remarks on the effects of opium on the urinary organs lead to the following conclusions: 1. That in diminished sensibility or contractility, or both, of the ureters or bladder, the use of opium is objectionable. 2. That, under proper regulations, opium may be a valuable remedy to dull the sensibility of the pelvis of the kidney, in cases of renal calculi; to allay pain and produce relaxation of the ureters when calculi are passing along these tubes; and, lastly, to diminish irritation of the bladder, whether produced by cantharides or other causes.

*f. On the sexual system.*—We have little positive information as to the effects of opium on the reproductive organs of women. It is said that the catamenia, lochia, and secretion of milk are unaffected by it. Under its use the milk acquires a narcotic property. Furthermore, at times it has appeared to have an injurious effect on the fœtus *in utero*. Opium appears to act on the uterus as on most other contractile parts of the body; that is, it diminishes the contractility and sensibility of this viscus. From these observations it follows—1. That wet-nurses and pregnant women must employ opium with great caution, as its use by them may endanger the life of the child. 2. That opium may be employed to allay pain, spasm, and morbid irritation of the sexual organs; and that its use in the female is not likely to be attended with retention of the uterine or mammary secretions.

*g. On the cutaneous system.*—Considered as an organ of sense, the cutaneous system is affected by opium in an analogous way to the other organs of sense; that is, its sensibility is diminished. But the skin has another function, that of excretion, which does not appear to be at all diminished, nay, to be increased, by the use of opium; one of the usual effects of this medicine being perspiration, which is in some cases attended with a pricking or itching of the skin, and occasionally with an eruption. In fact, taken medicinally, opium is a powerful sudorific, and often proves so even when acting as a poison. "In a fatal case, which I examined judicially," says Dr. Christison, "the sheets were completely soaked to a considerable distance round the body." From these remarks it follows—1. That opium is not likely to relieve loss of feeling or excessive perspiration; but may, on the other hand, under some conditions of the system, prove injurious. 2. That opium is adapted to the relief of pain or excessive sensibility of the skin, and for provoking perspiration; but the propriety of its use for these purposes must be determined by reference to the condition of the system generally. Experience proves that when the skin is very hot, and especially if it be also dry, opium is seldom beneficial, but often hurtful.

*h. Topical Effects.*—The local effects of opium are, compared with its general effects, very slight. Applied to the eye, the internal membrane of the nose, urethra, cutis vera, wounds or ulcers, it first causes pain, a sense of heat, and inflammation; but these effects subside, and are followed by a weakened or a paralytic condition of the sensitive and motor nerves. Several physiologists have proved that opium causes a local paralysis of the nerves; and Müller has shown that the narcotic action is not propagated from the trunk of a nerve to its branches. Scarcely any obvious effect results from the application of opium to the ordinary integument, on account of the barrier presented by the cuticle. Employed endermically, the effects are much more powerful.

*Pot-mortem Appearances.*—The most important appearances are those observed in the nervous system; such as turgescence of vessels, effusion of water or of coagulable lymph, and occasionally, though rarely, extravasation of blood. Whenever redness of the digestive canal is observed, I believe it is referable to the use of some irritants (such as alcohol, ammonia, or emetics) taken either with, or after the use of, opium.

*Modus Operandi of Opium.*—Under this head I propose to examine several points not hitherto noticed, which involve the theory of the operation of opium on the system. 1. *The Odorous and Active Principles of Opium are absorbed.*—This assertion is proved by the following facts: *a.* The odor of opium is sometimes recognizable in the secretions and exhalations: thus it is well known that the opiate odor is frequently detected in the breath of persons poisoned by this drug; and Barbier states it may be also noticed in the urine and sweat. *b.* The secretions, in some cases, appear to possess narcotic properties. Barbier mentions the case of an infant that was thrown into a state of narcotism of several hours' duration in consequence of having been suckled by a nurse who had previously swallowed a dose of laudanum to relieve cramp of the stomach. 2. *The Constitutional Effects of Opium depend in great part, if not wholly, on the absorption of its active principles.*—The facts on which this assumption rests are: $\alpha$. The active principles of opium are absorbed. $\beta$. The constitutional effects of it are found to be proportionate to the absorbing powers of the part. $\gamma$. The effect of opium, when thrown into the jugular vein, is similar to, though more powerful than, that produced by its application to other parts of the body. $\delta$. The narcotic action does not react from a particular point of a nerve on the brain. 3. *The Essential and Primary Operation of Opium is on the Nervous*

*System (the Brain and Spinal Cord chiefly).*—This is proved by reference to the already described effects of opium. An examination of them shows that—α. The most important effects of opium are direct and obvious lesions of the nervous functions. β. The other effects of opium appear, for the most part, to be secondary; that is, they arise out of the nervous lesions just referred to. 4. *Opium acts on the Nervous System as an Alterative.*—There are but three kinds of changes, compatible with life, which medicines can effect in the vital actions of an organ, viz., an increase, a diminution, or an alteration of activity. A change in the intensity or energy merely of the vital actions of the nervous system would not give a satisfactory explanation of the effects of opium. We are obliged, therefore, to assume that opium changes the quality of the actions. This is what is meant by the term *alterative.* The inquiry into the nature and kind of influence exercised by opium over the system presents an extensive field for speculation and hypothesis. Dr. Cullen considered opium to be a sedative, and referred its effects to its power of "diminishing the mobility, and in a certain manner suspending the motion of the nervous fluid." Several later writers, Barbier for example, also call opium a sedative. Brown declared it to be a stimulant, and his opinion has been adopted by Crumpe, Murray, and Dr. A. T. Thomson, in this country, and of course by the continental Brunonians, as well as by the partisans of the Italian theory of contra-stimulus. Fontana ascribed the operation of opium to changes which it induces in the blood. Mayer declared opium to be both stimulant and sedative—viz., stimulant to the nerves and vascular system, but sedative to the muscles and digestive organs. Lastly, Orfila asserts that "opium, employed in strong doses, ought not to be ranked among the narcotics or the stimulants; it exerts a peculiar mode of action which cannot be designated by any of the terms at this moment employed in the Materia Medica." These examples, selected out of many opinions, will be sufficient to prove how little is really known of the real action of opium; and I believe we shall save ourselves much time and useless speculation by at once confessing our ignorance on this point. 5. *The operation of Opium, compared with that of other cerebro-spinants or narcotics, is distinguished by both positive and negative characteristics.*—The symptoms constituting the *positive* characters are, relaxation or paralysis of the contractile tissues, a tendency to sleep or stupor, a contracted pupil, and constipation. The symptoms whose absence furnishes the *negative* characters are, tetanic convulsions, delirium or inebriation, dilated pupil, syncope, gastro-intestinal irritation, and topical numbness. These are the general characteristics of the opiate medication. To some of them occasional, or perhaps frequent, exceptions exist. I have already pointed out the distinguishing effects of hyoscyamus, belladonna, stramonium, and conium. The topical numbness caused by aconite distinguishes its operation from that of opium. Moreover, in three cases of poisoning by this substance, which came under my notice, there was no stupor. Tobacco and foxglove enfeeble the vascular system, causing syncope; and they also produce gastro-intestinal irritation. Furthermore, they have not that tendency to induce sleep which we observe after the use of opium. The speedy operation, short period of influence, and, usually, the presence of convulsions, distinguish the operation of hydrocyanic acid. Indian hemp induces a cataleptic state. Vinous liquids cause their well-known peculiar inebriation. Their effects in small doses agree to a certain extent with those of small doses of opium; but they are not equally available as antispasmodics.

*Therapeutics.*—Opium is undoubtedly the most important and valuable remedy of the whole Materia Medica. For other medicines we have one or more substitutes; but for opium, none—at least in the large majority of cases in which its peculiar and beneficial influence is required. Its good effects are not, as is the case with some valuable medicines, remote and contingent, but they are immediate, direct, and obvious; and its operation is not attended with pain or discomfort. Furthermore, it is applied, and with the greatest success, to the relief of maladies of every day's occurrence, some of which are attended with the most acute human suffering. These circumstances, with others not necessary here to enumerate, conspire to give to opium an interest not possessed by any other article of the Materia Medica. We employ it to fulfil various indications, some of which have been already noticed. Thus we exhibit it, under certain regulations, to mitigate pain, to allay spasm, to promote sleep, to relieve nervous restlessness, to produce perspiration, and to check profuse mucous discharges from the bronchial tubes and gastro-intestinal canal. But experience has proved its value in relieving some diseases in which not one of these indications can be at all times distinctly traced.

1. *In fevers.*—The consideration of the use of opium in fever presents peculiar difficulties. Though certain symptoms which occur in the course of this disease are, under some circumstances, most advantageously treated by opium, yet, with one or more of these symptoms present, opium may, notwithstanding, be a very inappropriate remedy. The propriety or impropriety of its use, in such cases, must be determined by other circumstances, which, however, are exceedingly difficult to define and characterize. It should always be employed with great caution, giving it in small doses, and carefully watching its effects. The symptoms for which it has been resorted to are, *watchfulness, great restlessness*, *delirium*, *tremor*, and *diarrhœa*. When watchfulness and great restlessness are disproportionate, from first to last, to the disorder of the vascular system or of the constitution at large, or when these symptoms continue after excitement of the vascular system has been subdued by appropriate depletives, opium frequently proves a highly valuable remedy; nay, the safety of the patient often arises from its judicious employment. The same remarks also apply to the employment of opium for the relief of delirium; but it may be added that in patients who have been addicted to the use of spirituous liquors, the efficacy of opium in allaying delirium is greatest. Yet I have seen opium fail to relieve the delirium of fever, even when given apparently under favorable circumstances; and I have known opium restore the consciousness of a delirious patient, and yet the case has terminated fatally. If the skin be damp and the tongue moist, it rarely, I think, proves injurious. The absence, however, of these favorable conditions by no means precludes the employment of opium; but its efficacy is more doubtful. Sir Henry Holland suggests that the condition of the pupil may serve as a guide in some doubtful cases; where it is contracted, opium being contraindicated. A similar suggestion with respect to the use of belladonna was made by Dr. Graves, to which I have offered some objections. When sopor or coma supervenes in fever, the use of opium generally proves injurious. The combination of opium and tartarated antimony has been strongly recommended in fever with much cerebral disturbance, by Dr. Law and Dr. Graves.

2. *In inflammatory diseases.*—Opium has long been regarded as an objectionable remedy in inflammation; but it is one we frequently resort to, either for the purpose of palliating particular symptoms, or even as a powerful auxiliary antiphlogistic remedy. The statement of Dr. Young,

"that opium was improper in all those diseases in which bleeding was necessary," is, therefore, by no means correct in a very considerable number of instances. The objects for which opium is usually exhibited in inflammatory diseases are to mitigate excessive pain, to allay spasm, to relieve great restlessness, to check excessive secretion, and to act as an antiphlogistic. In employing it as an anodyne, we are to bear in mind that it is applicable to those cases only in which the pain is disproportionate to the local vascular excitement; and even then it must be employed with considerable caution; for to "stupefy the sensibility to pain, or to suspend any particular disorder of function, unless we can simultaneously lessen or remove the causes which create it, is often but to interpose a veil between our judgment and the impending danger." As an antiphlogistic, it is best given in conjunction with calomel, as recommended by Dr. R. Hamilton, of Lynn. This practice, however, does not prove equally successful in all forms of inflammation. It is best adapted for the disease when it affects membranous parts; and is much less beneficial in inflammation of the parenchymatous structure of organs. In *gastritis* and *enteritis* the use of opium has been strongly recommended by the late Dr. Armstrong. After bleeding the patient to syncope, a full opiate is to be administered; and if the stomach reject it, we may give it by injection. It acts on the skin, induces quiet and refreshing sleep, and prevents what is called the hemorrhagic reaction. If the urgent symptoms return when the patient awakes, the same mode of treatment is to be followed, but combining calomel with the opium. In *peritonitis*, the same plan of treatment is to be adopted; but warm moist applications are on no account to be omitted. Of the great value of opiates in *puerperal fever* abundant evidence has been adduced by Dr. Ferguson. In *cystitis*, opium, preceded and accompanied by bloodletting and the warm bath, is a valuable remedy; it relieves the scalding pain, by diminishing the sensibility of this viscus to the presence of the urine, and also counteracts the spasmodic contractions. In *inflammation of the walls of the pelvis of the kidney, and also of the ureters*, especially when brought on by the presence of a calculus, opium is a most valuable remedy; it diminishes the sensibility of these parts, and prevents spasm: furthermore, it relaxes the ureters, and thereby facilitates the passage of the calculus. In *inflammation of the gall-ducts*, produced by calculus, opium is likewise serviceable; but, as in the last-mentioned case, bloodletting and the warm bath should be employed simultaneously with it. In *inflammation of the mucous membranes*, attended with increased secretion, opium is a most valuable remedy. Thus, in *pulmonary catarrh*, when the first stage of the disease has passed by, and the mucous secretion is fully established, opium is frequently very beneficial: it diminishes the sensibility of the bronchial membrane to cold air, and thereby prevents cough. In severe forms of the disease, bloodletting ought to be premised. Given at the commencement of the disease, Sir Henry Holland says that twenty or thirty drops of laudanum will often arrest it altogether. In *diarrhœa*, opium, in mild cases, is often sufficient of itself to cure the disease; it diminishes the increased muscular contractions and increased sensibility, thereby relieving pain, and at the same time checks excessive secretion. Aromatics and chalk are advantageously combined with it. *Mild or English cholera*, the disease which has been so long known in this country, and which consists in irritation or inflammation of the mucous lining of the stomach, is generally most successfully treated by the use of opium: two or three doses will in slight cases be sufficient to effect a cure. In *dysentery*, opium has been found very serviceable: it is best given in combination with either ipecacuan or calomel. I have already stated that in *inflammation of the parenchymatous tissues of organs* the use of opium is less frequently beneficial, but often injurious. Thus in *inflammation of the cerebral substance* it is highly objectionable, since it increases the determination of blood to the head, and disposes to coma. In *pneumonia* it is for the most part injurious; partly by its increasing the febrile symptoms, partly by its diminishing the bronchial secretion, and probably also by retarding the arterialization of the blood, and thereby increasing the general disorder of the system. It must be admitted, however, that there are circumstances under which its use in this disease is justifiable. Thus, in acute pneumonia, when bloodletting has been carried as far as the safety of the patient will admit, but without the subsidence of the disease, I have seen the repeated use of opium and calomel of essential service. Again, in the advanced stages of pneumonic inflammation, when the difficulty of breathing has abated, opium is sometimes beneficially employed to allay painful cough, and produce sleep. In *inflammation of the substance of the liver*, opium is seldom beneficial: it checks the excretion, if not the secretion, of bile, and increases costiveness. In *rheumatism*, opium frequently evinces its happiest effects. In acute forms of the disease it is given in combination with calomel, as recommended by Dr. R. Hamilton and Dr. Hope—bloodletting being usually premised. From half a grain to two grains of opium should be given at a dose. In some cases Dover's powder will be found the best form of exhibition. This plan of treatment is well adapted for the diffuse or fibrous form of acute rheumatism; but it does not prove equally successful in the synovial forms of the disease. It is also valuable in chronic rheumatism.

3. *In diseases of the brain and spinal cord.*—In some cerebro-spinal diseases great benefit arises from the use of opium; while in other cases injury only can result from its employment. The latter effect is to be expected in inflammation of the brain, and in apoplectic cases. In other words, in those cerebral maladies obviously connected with, or dependent on, an excited condition of the vascular system of the brain, opium acts injuriously. But there are many disordered conditions of the cerebro-spinal functions, the intensity of which bears no proportion to that of the derangement of the vascular system of the brain; and there are other deviations from the healthy functions in which no change in the cerebral circulation can be detected. In these cases opium or morphia frequently evinces its best effects. In *insanity* its value has been properly insisted on by Dr. Seymour. He, as well as Messrs. Beverley and Phillips, employed the acetate of morphia. Its good effects were manifested rather in the low, desponding, or melancholic forms of the disease, than in the excited conditions; though I have seen great relief obtained in the latter form of the disease by full doses. In *delirium tremens* the efficacy of opium is almost universally admitted. Its effects, however, require to be carefully watched; for large doses of it, frequently repeated, sometimes hasten coma and other bad symptoms. If there be much fever, or evident marks of determination of blood to the head, it should be used with great caution, and ought to be preceded by loss of blood, cold applications to the head, and other antiphlogistic measures. Though opium is to be looked on as a chief remedy in this disease, yet it is not to be regarded as a specific. Dr. Law speaks in high terms of its association with tartarated antimony. I have before noticed the use of opium in alleviating some of the *cerebral symptoms which occur during fever*. In *spasmodic and convulsive diseases* opium is a most important remedy.

In *local spasms produced by topical irritants*, it is a most valuable agent, as I have already stated; for example, *in spasm of the gall-ducts* or *of the ureters*, brought on by the presence of calculi; in *colic*, and in *painful spasmodic contractions of the bladder*, or *rectum*, or *uterus*. In *spasmodic stricture* opium is sometimes useful. In genuine *spasmodic asthma*, which probably depends on a spasmodic condition of the muscular fibres investing the bronchial tubes, a full dose of opium generally gives temporary relief; but the recurrence of the paroxysms is seldom influenced by opium. There are several reasons for believing that one effect of narcotics in dyspnœa is to diminish the necessity for respiration. Laennec states, that when given to relieve the extreme dyspnœa of mucous catarrh, it frequently produces a speedy but temporary cessation of the disease; and if we explore the respiration by the stethoscope, we find it the same as during the paroxysm—a proof that the benefit obtained consists simply in a diminution of the necessity for respiration. That the necessities of the system for atmospheric air vary at different periods, and from different circumstances, is sufficiently established by the experiments of Dr. Prout; and it appears that they are diminished during sleep, at which time, according to Dr. Edwards, the transpiration is increased. Moreover, the phenomena of hybernating animals also bear on this point; for during their state of torpidity or hybernation, their respiration is proportionally diminished. In the *convulsive diseases* (*chorea*, *epilepsy*, and *tetanus*), opium has been used, but with variable success; in fact, the conditions of system under which these affections occur, may be, at different times, of an opposite nature, so that a remedy which is proper in one case is often improper in another. In *tetanus*, opium was at one time a favorite remedy, and is undoubtedly at times a remedy of considerable value. But it is remarkable that the susceptibility of the system to its influence is greatly diminished during tetanus. I have already referred to the enormous quantities which may at this time be taken with impunity. In 128 cases noticed by Mr. Curling, opium in various forms, and in conjunction with other remedies, was employed in 84 cases; and of these, 45 recovered. Notwithstanding, however, the confidence of the profession in its efficacy is greatly diminished. Lastly, opium occasionally proves serviceable in several forms of *headache*, especially after the loss of blood. I have seen it give great relief in some cases of what are commonly termed nervous headaches; while in others, with apparently the same indications, it has proved injurious. Chomel applied, with good effect, opium cerate to a blistered surface of the scalp, to relieve headache.

4. *In diseases of the chest.*—In some affections of the heart and of the organs of respiration opium is beneficial. I have already alluded to its employment in *catarrh*, *pneumonia*, and *spasmodic asthma*. In the first of these maladies caution is often requisite in its use. "In an aged person, for example, suffering under *chronic bronchitis* or *catarrhal influenza*—and gasping, it may be, under the difficulties of cough and expectoration—an opiate, by suspending these very struggles, may become the cause of danger and death. The effort here is needed for the recovery of free respiration; and if suppressed too long, mucus accumulates in the bronchial cells, its extrication thence becomes impossible, and breathing ceases altogether."

5. *In maladies of the digestive organs.*—I have already referred to the use of opium in *gastritis*, *enteritis*, *peritonitis*, *diarrhœa*, *dysentery*, *colic*, *the passage of gall-stones*, and *in hepatitis*. With respect to the use of opium *in hepatic affections*, I am disposed to think with Sir Henry Hol-

land, that with the exception of the painful passage of a gall-stone through the ducts, there is scarcely a complaint of the liver and its appendages "where opium may not be said to be hurtful, though occasionally and indirectly useful when combined with other means." *In poisoning by acrid substances*, opium is used with advantage to lessen the susceptibility of the alimentary canal, and thereby to diminish the violence of the operation of these local irritants. Cantharides, all the drastic purgatives, when taken in excessive doses (as elaterium, colocynth, gamboge, scammony, and croton oil or seeds), may be mentioned as examples of the substances alluded to. Besides the above-mentioned beneficial operation, opium allays the spasmodic contractions of the bowels, relieves pain, and checks inordinate secretion and exhalation. *In poisoning by corrosives* (the strong mineral acids and alkalies, for example), opium diminishes the sensibility of the alimentary canal; it cannot, of course, alter the chemical influence of poisons, but it may prove useful by allaying the consequences of inflammation. In poisoning by the preparations of arsenic, of lead, and of copper, opium is sometimes found useful. It has been used in poisoning by strychnia. It has had, to a certain extent, the effect of masking the symptoms, but not of preventing the fatal action of the poison.

6. *In maladies of the urino-genital apparatus* opium is a most valuable remedy. It mitigates pain, allays spasmodic action, checks copious mucous secretion, and diminishes irritation. Its use for one or more of these purposes in *nephritis*, *cystitis*, *the passage of urinary calculi*, and *spasmodic stricture*, has been already pointed out. *In irritable bladder* it is an invaluable remedy, especially in conjunction with solution of potash. *In irritation* and *various painful affections of the uterus*, and in *chordee*, the value of opium is well known. In the treatment of the *phosphatic diathesis* it is the only remedy that can be employed, according to Dr. Prout, to diminish the unnatural irritability of the system. Of all remedies for that hitherto intractable malady, *diabetes*, opium has been found to give the greatest relief. Under its use the specific gravity, saccharine quality, and quantity of urine, have been diminished. Dr. Prout has also found it serviceable when there is an *excess of urea in the urine.*

7. *As an anodyne.*—To relieve pain by dulling the sensibility of the body, opium is, of all substances, the most useful, and the most to be relied on for internal exhibition. We sometimes use it to alleviate the pain of inflammation, as already mentioned; to diminish spasm and the sensibility of the parts in calculi of the gall-ducts, in the ureters, and even when in the urinary bladder; to relieve pain in the various forms of scirrhus and carcinoma, in which diseases opium is our sheet-anchor; to allay the pain arising from the presence of foreign bodies in wounds; to prevent or relieve after-pains; to diminish the pain of menstruation; and, lastly, as an anodyne in neuralgia. As a *benumber* or *topical anodyne* it is greatly inferior to aconite. Hence in neuralgia the latter is much more successful than opium.

8. *In hemorrhages.*—Opium is at times serviceable to obviate certain *ill effects of hemorrhages;* as when there is great irritability attended with a small and frequent pulse, and also to relieve that painful throbbing about the head so often observed after large evacuations of blood. In or immediately after *uterine hemorrhage* the use of opium has been objected to, on the ground that it might prevent the contraction of the womb; but where the employment of opium is otherwise indicated, this theoretical objection deserves no weight. In *bronchial hemorrhage* it is

at times a valuable remedy, and may be associated with acetate of lead (notwithstanding the chemical objections to the mixture) with good effect.

9. *In mortification.*—When mortification is attended with excessive pain, opium is resorted to. In that kind of mortification called *gangræna senilis*, Mr. Pott strongly recommended opium, in conjunction with a stimulating plan of treatment, and experience has fully proved its great efficacy.

10. *In venereal diseases.*—Opium is frequently employed in venereal diseases to prevent the action of mercurials on the bowels during salivation; also to allay the pain of certain venereal sores and venereal diseases of the bones. Although opium possesses no specific anti-venereal powers, it has appeared to me on several occasions to promote the healing of venereal sores.

11. In various forms of *ulcers* and in *granulating wounds* the efficacy of opium has been satisfactorily established by Mr. Skey. Richter and others had already noticed its good effects, but their statements had attracted little attention. Mr. Grant, in 1785, pointed out the efficacy of opium in the treatment of foul ulcers, attended with a bad discharge, and much pain. He ascribed these symptoms to "morbid irritability," which the opium removed. Its use is prejudicial in ulcers attended with inflammation, in the florid or sanguineous temperament, and in childhood. But in the chronic or callous ulcer, in the so-called varicose ulcer, in recent ulcers from wounds, in which granulation proceeds slowly, or in other cases, the efficacy of opium, administered in small doses (as ten drops of laudanum three times daily), is most manifest, especially in elderly persons, and in those whose constitutions have been debilitated by disease, labor, spirituous liquors, &c. It appears to promote the most genial warmth, to give energy to the extreme arteries, and thereby to maintain an equal balance of the circulation throughout every part of the body, and to animate the dormant energies of healthy action. [It is by means of these properties that, as Mr. Skey has pointed out to me, it restores the circulation and warmth in fingers that are liable to become cold and bloodless.—Ed.]

12. *In poisoning by belladonna or stramonium.*—[Dr. C. C. Lee, of the Pennsylvania Hospital, has published in the American "Journal of Medical Science," some interesting cases showing that opium on the one hand, and belladonna and stramonium on the other, are mutually antagonistic, counteracting their respective poisonous effects. One of these is the case of a child, six years old, who took by mistake a drachm of concentrated juice of belladonna. The face became rapidly scarlet, deepening to violet, and the pupils dilated to the utmost. No stomach-pump being at hand, 20 drops of laudanum were given by the rectum, and the same quantity by the mouth, the latter being repeated every half hour till 120 drops were taken. After the third dose the pupils began to contract, the purple complexion faded, and in three hours the child was well and playing about the room.—Ed.]

13. The *external application* of opium is comparatively but little resorted to, and for two reasons: in the first place, its topical effects are slight; and, secondly, its specific effects on the brain and general system are not readily produced through the skin. Aconite and belladonna greatly exceed opium in their topical effects. The following are some of the local uses of opium: In *ophthalmia*, the wine of opium is dropped into the eye when there is much pain and lachrymation (see **Vinum Opii**). Opiate *frictions* have been employed as topical anodynes, and

to affect the general system. Thus in *chronic rheumatism and sprains*, the opium liniment proves a useful application. In *maniacal delirium*, as well as some other cerebral disorders, Mr. Ward employed, with apparently beneficial effects, opiate frictions; for example, half an ounce of opium, mixed with 4 grains of camphor, 80 grains of lard, and 1 drachm of olive oil. In *neuralgic affections*, an opiate of ointment, or finely powdered hydrochlorate of morphia, applied to a blistered surface, occasionally gives relief. In *gastrodynia*, it may be applied in the same way to the epigastrium. In *gonorrhœa and gleet*, opium injections have been used. In *spasmodic stricture*, *diseases of the prostate gland*, and in *gonorrhœa to prevent chordee*, an opiate suppository is a useful form of employing opium, especially where it is apt to disagree with the stomach. In *nervous and spasmodic affections* (as some forms of asthma), the endermic application of opium or morphia, applied along the course of the spine, is often singularly beneficial, when all methods of depletion and counter-irritation have proved utterly unavailing (Holland). In *toothache*, opium is applied to the hollow of a carious tooth. Dr. Bow speaks in the highest terms of the efficacy of the external application of opium *in inflammatory diseases*, especially *bronchitis* and *croup*. Warm opium fomentations, *freely* applied to the spine and abdomen, greatly relieved the *cramps of cholera*.

*Administration.*—Opium is given, *in substance*, in the form of pill, powder, or lozenge. The dose is subject to great variation, depending on the age and habits of the patient, the nature of the disease, and the particular object for which we wish to employ it. In a general way we consider from a quarter of a grain to half a grain a *small dose* for an adult. We give it to this extent in persons unaccustomed to its use, when we require its stimulant effects, and in mild catarrhs and diarrhœas. From half a grain to two grains we term a *medium dose*, and employ it in this quantity as an ordinary anodyne and soporific. From two to five grains we denominate a *full* or *large dose*, and give it to relieve excessive pain, violent spasm, in some inflammatory diseases after bloodletting, in tetanus, &c. These are by no means to be regarded as the limits of the use of opium. *Opium pills* may be prepared either with crude or powdered opium. The latter has the advantage of a more speedy operation, in consequence of its more ready solution in the gastric secretions. Employed as a *suppository*, opium is used in larger doses than when given by the stomach. Five grains, made into a cylindrical mass with soap, may be introduced into the rectum, to allay irritation in the urino-genital organs; although in some cases such a dose has produced injurious effects.

*Antidotes.*—In a case of poisoning by opium, the first indication is to remove the poison from the stomach, the second is to neutralize any of it which may be retained in the system, and the third is to obviate its injurious effects. 1. *Use of Evacuants.*—Until other and more powerful evacuant means can be obtained, we should have recourse to tickling the throat with the fingers, or with a feather dipped in oil. As domestic emetics, mustard or salt may be exhibited. A dessert-spoonful of flour of mustard, or a tablespoonful of salt, may be taken, stirred up in a tumblerful of water. The stomach-pump is, however, the best means of evacuating the contents of the stomach, and when it can be procured, should always be preferred. The emetics usually resorted to are the sulphates of zinc and copper: the first is preferred. It should be given in doses of from twenty to forty grains. The dose of sulphate of copper is less—from five grains to fifteen. Ipecacuan or tartarated antimony may be resorted to when the other means are not at hand. Clysters containing fifteen or twenty grains of tartarated antimony may be administered; or, in extreme cases, a solution of one or two grains of this salt may be injected into the veins, taking care to prevent the introduction of air. 2. *Use of Chemical Antidotes.*—There are no known agents which completely destroy the activity of opium by their chemical properties, and which can be resorted to in these cases. Infusion of galls, however, is regarded as the best, though an imperfect antidote. 3. *Use of Therapeutic Means to obviate the Effects.*—The following are the principal means which have been found efficacious: *Rousing the patient*, by exercising him up and down the room between two men. It may sometimes be necessary to continue this for several hours. *Cold affusion.*—Cold water dashed over the head and chest is an exceedingly valuable agent. It often assists the operation of emetics. *Irritants.*—The application of irritants to the body is also sometimes a useful practice: thus blisters and mustard poultices to the feet. *Stimulants.*—Ammonia, camphor, musk, strong coffee, and other stimulants, are sometimes used with advantage. *Vegetable acids.*—Orfila has found the vegetable acids to be the best anti-narcotic. For this purpose, drinks of vinegar and water, lemon-juice, or the acid tartrate of potash and water, should be given every ten minutes. These agents, however, should not be resorted to till the poison has been evacuated from the stomach.—[In one of Dr. Lee's cases (see *Therapeutics*, p. 829) laudanum had been given to a child two years old, apparently for the purpose of destroying life. The child was in a state of profound coma, the pupils strongly contracted, and the pulse beating feebly, 40 in the minute. *No means were used to remove the poison from the stomach*, but fifteen minims of tincture of belladonna were administered every twenty minutes. Four doses were sufficient, not only to remove the symptoms of opium-poisoning, and to raise the pulse to 86, but to dilate the pupil widely, and to produce the excitement peculiar to belladonna. In an hour the new symptoms had subsided, and the child was apparently well.—Ed.] *Artificial respiration.*—As a last resource this is on no account to be omitted. Death has on several occasions been apparently averted by it. *Electricity* and *electro-magnetism* have also been successfully employed of late years in several cases of poisoning by opium. These agents have been found effectual in keeping roused, children that are laboring under the effects of narcotic poison.

*Pharmaceutic Uses.*—Opium is an ingredient of aromatic powder of chalk and opium, camphorated tincture of opium, ointment of galls and opium, pill of lead and opium, powder of ipecacuan and opium, and powder of kino and opium.

## *Officinal Preparations.*

Emplastrum Opii, *Opium Plaster.*—Take of opium in very fine powder, one ounce; resin plaster, nine ounces. Melt the resin plaster by means of a steam or water-bath; then add the opium by degrees, and mix thoroughly.

Employed as a tonic anodyne in rheumatism, lumbago, and neuralgia. Its powers are very slight, or even equivocal.

Enema Opii, *Enema of Opium.*—Take of tincture of opium, half a fluidrachm; mucilage of starch, two fluidounces. Mix.

In the passage of renal and biliary calculi, in nephritis, irritation or inflammation of the bladder, uterus, or prostate gland, in dysentery, and painful affections of the large intestine, the opium enema is most valuable.

Extractum Opii, *Extract of Opium.*—Take of opium, in thin slices, one pound; distilled water, six pints. Macerate the opium in two pints of the water for twenty-four hours, and express the liquor. Reduce the opium to a uniform pulp; macerate it again in two pints of the water for twenty-four hours, and express. Repeat the operation a third time. Mix the liquors, strain through flannel, and evaporate by a water-bath to a proper consistence.

When opium is digested in water, this fluid takes up the *odorous principle*, the *salts of morphia and codeia*, the *narcotia*, the *gum*, the *extractive*, and some of the *resin* and *oil*. A portion of morphia is frequently found in the dregs. By concentration, the odorous principle is dissipated, and the resin and the oil, combined with and in part saturating, the narcotia, are separated. The removal of these inert principles, as well as the impurities of opium, and the consequent concentration of the active constituents of this substance, must, of course, render the extract a more powerful preparation than ordinary opium. Good opium yields from 50 to 60 per cent. of extract. It is usually believed to operate with less disturbance to the general system than the ordinary preparations of opium. It is employed as an anodyne, sedative, and soporific, in cases where crude opium or its extract disagrees.

*Dose.*—From gr. $\frac{1}{4}$ to gr. ij or more.

Extractum Opii Liquidum, *Liquid Extract of Opium.*—Take of extract of opium, one ounce; distilled water, seventeen fluidounces; rectified spirit, three fluidounces. Digest the extract of opium in the water for an hour, stirring frequently; filter, and add the spirit. The product should measure one pint.

This preparation is apparently intended to be of the same strength as tincture of opium, 22 minims containing 1 grain of extract. Warington finds that 10 parts of good fresh Smyrna opium yield 8 parts of dried opium and 5 of extract. Hence 1 grain of extract is equal to 1.6 grains of dried opium, and 1 grain of dried opium is contained in 14 minims of the liquid extract, so that the difference in strength is extremely slight. Mr. Squire says that there is not sufficient spirit to keep it unchanged. Probably sixteen ounces of water, and four of spirit, would make a more stable preparation. It represents *Battley's Sedative Solution of Opium*, which that gentleman assured both the author and the editor was prepared from opium solely by cold water and heat, and preserved by the subsequent addition of spirit. According to Mr. Wilkinson, two fluidrachms of Battley's solution yielded 5.4 grains of dry extract, which corresponded to 8.55 grains of powdered opium, and 13 minims were equivalent to 1 grain of powdered opium. It was, therefore, *a little* stronger than the liquid extract.

*Dose.*—Min. x to min. xl.

Linimentum Opii, *Liniment of Opium.*—Take of tincture of opium, two fluidounces; liniment of soap, two fluidounces. Mix.

Employed as an anodyne in rheumatism, neuralgic pains, sprains, &c.

Pilula Opii, *Opium Pill* (*Pilula Saponis Composita*, Lond.; Dub.) —Take of opium, in fine powder, half an ounce; hard soap, two ounces; distilled water, a sufficiency. Reduce the soap to a fine powder, add the opium with the water, and beat into a uniform mass.

Employed as an anodyne and soporific. Five grains contain about one grain of opium. The soap enables the pills to dissolve readily in the juices of the stomach.

*Dose.*—From 3 to 10 grains. From 5 grains to 20 grains are sometimes used as a suppository.

Tinctura Opii, *Tincture of Opium.*—Take of opium, in coarse powder, one ounce and a half; proof spirit, one pint. Macerate the opium for seven days, strain, express, and filter; then add sufficient proof spirit to make one pint.

Tincture of opium (*laudanum*) is of a deep brownish-red color, with the peculiar odor and taste of opium. Its specific gravity is 0.942. It is nearly one-eighth weaker than the London tincture, in consequence of the use of the avoirdupois ounce, and the addition of proof spirit to make up the pint. Proof spirit dissolves the same constituents as water, but it takes up a large proportion of narcotia, resin, and oil. I have repeatedly prepared morphia from the insoluble residue left behind in the preparation of the tincture. Dr. Garrod, however, did not find any morphia in the insoluble residue, but it yielded abundance of narcotia and meconic acid. When the residue was given internally, in doses of from one to thirty grains, it was found to be quite inert. He therefore believes that the *Tinctura opii* contains the active matter of the whole of the drug used in its formation. One grain of dry opium is contained in fourteen minims of tincture of opium. Tincture of opium is a powerful and valuable iodine and soporific. Its employment is to be preferred to that of solid opium where a more immediate effect is required. Moreover, in administering opiates to children, the facility of adjusting small doses of it presents a great advantage over solid opium. The dose of it, like that of solid opium, must vary according to several circumstances. For an adult it varies from ten minims to forty minims, or more. To children it must be given with the greatest caution. In infants exhausted by illness and of a delicate constitution one minim has been known to cause death.

Trochisci Opii, *Opium Lozenges.*—Take of extract of opium, seventy-two grains; tincture of tolu, half a fluidounce; refined sugar, in powder, sixteen ounces; gum arabic, in powder, two ounces; extract of liquorice, six ounces; boiling distilled water, a sufficiency. Add the extract of opium, first softened by means of a little water, and the tincture of tolu, to the extract of liquorice heated in a water-bath. When the mixture is reduced to a proper consistence, remove it to a slab, add the sugar and gum, previously rubbed together, and mix thoroughly. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one-tenth of a grain of extract of opium.

Opium lozenges are used to allay troublesome cough.

*Dose.*—One to five.

Vinum Opii, *Wine of Opium.*—Take of opium, in powder, one ounce and a half; sherry, one pint. Macerate for seven days, strain, express, and filter; then add sufficient sherry to make one pint.

If sherry were as good a solvent as proof spirit, the wine would be of the same strength as the tincture, for one grain of dried opium is contained in 14½ minims of the wine. Its effects are similar to those of the tincture, from which, indeed, it scarcely differs except in the smaller quantity of alcohol, and perhaps of opium, the aromatics which rendered the London wine more agreeable in odor and taste having been omitted.

*Dose.*—Ten minims to forty minims for an adult.

Dropped into the eye in ophthalmia, it soon relieves pain, lachrymation, and intolerance of light.

The following table shows the strength of each preparation of opium.

| Quantity. | Preparation of Opium. | Equivalent to of dried Opium. |
|---|---|---|
| 2 fluidounces. | Enema Opii | 1 grain. |
| About $\frac{6}{10}$ of a grain. | Extractum Opii | " |
| About 14 minims. | Extractum Opii liquidum | " |
| 8 grains. | Pilula Plumbi cum Opio | " |
| 5 grains. | Pilula Opii | " |
| 40 grains. | Pulvis Cretæ aromaticus cum Opio | " |
| 10 grains. | Pulvis Ipecacuanhæ cum Opio | " |
| 20 grains. | Pulvis Kino cum Opii | " |
| ½ fluidounce. | Tinctura Camphoræ cum Opio | " |
| 14½ minims. | Tinctura Opii | " |
| 10 minims. | Trochisci Opii | " |
| About 14½ minims. | Vinum Opii | " |

[*The following are the Preparations of Opium officinal in the U. S. P.*

Pilulæ Saponis Compositæ, U. S., *Compound Pills of Soap.*—"Take of opium, in fine powder, sixty grains; soap, in fine powder, half a troyounce. Beat them together with water so as to form a pilular mass." U. S. Dose, 5 grs. in pill.

Pilulæ Opii, U. S., *Pills of Opium.*—"Take of opium, in fine powder, sixty grains; soap, in fine powder, twelve grains. Beat them together with water so as to form a pilular mass, to be divided into sixty pills." U. S. Dose, 1–2 pills.

Confectio Opii, U. S., *Confection of Opium.*—"Take of opium, in fine powder, two hundred and seventy grains; aromatic powder, six troyounces; clarified honey, fourteen troyounces. Rub the opium with the aromatic powder; then add the honey, and beat the whole together until thoroughly mixed." U. S. This preparation is sometimes used to administer opium to children; for a child 3 years old the dose would be from 4–6 grains.

Emplastrum Opii, U. S., *Plaster of Opium.*—"Take of extract of opium, a troyounce; Burgundy pitch, three troyounces; plaster of lead, twelve troyounces; water, a sufficient quantity. Mix the extract with three fluidounces of water, and evaporate, by means of a water-bath, to a fluidounce and a half. Add this to the Burgundy pitch and plaster, melted together by means of a water-bath, and continue the heat for a short time, stirring constantly, that the moisture may be evaporated." U. S.

Pulvis Ipecacuanhæ Compositus, U. S., *Compound Powder of Ipecacuanha.* Pulvis Ipecacuanhæ et Opii, *Pharm.*, 1850. *Dover's Powder.*—"Take of ipecacuanha, in fine powder, opium, dried and in fine powder, each, sixty grains; sulphate of potassa, a troyounce. Rub them together into a very fine powder." U. S. For the especial uses of this preparation, see Pulvis Ipecacuanhæ cum Opio. Dose, x grains=1 grain of opium.

Extractum Opii, U. S., *Extract of Opium.*—"Take of opium, twelve troyounces; water, five pints. Cut the opium into small pieces, macerate it for twenty-four hours in a pint of the water, and reduce it to a soft mass by trituration. Express the liquid, and treat the residue with each of the four remaining pints of water successively in the same manner. Having mixed the liquids, filter the mixture, and evaporate, by means of a water-bath, to the proper consistence." U. S. Dose, grain $\frac{1}{2}$=1 grain of opium.

Trochisci Glycyrrhizæ et Opii, U. S., *Troches of Liquorice and Opium.*—"Take of opium, in fine powder, half a troyounce; liquorice, in fine powder, gum arabic, in fine powder, sugar, in fine powder, each, ten troyounces; oil of anise, a fluidrachm. Rub the powders together until they are thoroughly mixed; then add the oil of anise, and incorporate it with the mixture. Lastly, with water form a mass, to be divided into troches, each weighing six grains." U. S. These troches are demulcent and anodyne. In Philadelphia they are much used under the name of Wistar's lozenges. One troche contains about the tenth of a grain of opium.

Tinctura Opii Camphorata, U. S., *Camphorated Tincture of Opium, Paregoric.*—"Take of opium, dried, and in moderately fine powder, benzoic acid, each, sixty grains; camphor, forty grains; oil of anise, a fluidrachm; clarified honey, two troyounces; diluted alcohol, two pints. Macerate for seven days, and filter through paper." U. S. For the particular uses of this preparation, see Tinctura Camphoræ cum Opio. Dose, f℥j—f℥ss.

Tinctura Opii, U. S., *Tincture of Opium, Laudanum.*—"Take of opium, dried, and in moderately fine powder, two troyounces and a half; water, alcohol, each, a pint; diluted alcohol, a sufficient quantity. Macerate the opium with the water for three days, with frequent agitation; then add the alcohol, and continue the maceration for three days longer. Introduce the mixture into a percolator, and, when the liquid has ceased to pass, pour diluted alcohol upon it until two pints of tincture are obtained." U. S. Dose, gtt. xxv, about equal to one grain of opium.

Tinctura Opii Deodorata, U. S., *Deodorized Tincture of Opium.*—"Take of opium, dried, and in moderately fine powder, two troyounces and a half; ether, alcohol, each, half a pint; water, a sufficient quantity. Macerate the opium with half a pint of water for twenty-four hours, and express; then repeat the operation twice with the same quantity of water. Mix the expressed liquids, and, having evaporated the mixture to four fluidounces, shake it when cold, in a bottle, repeatedly with the ether. Pour off the ethereal solution when it has separated by standing, and evaporate the remaining liquid until all traces of ether have disappeared. Mix this with twenty fluidounces of water, and filter the mixture through paper. When the liquid has ceased to pass, add sufficient water, through the filter, to make the filtered liquid measure a pint and a half. Lastly, add the alcohol, and mix them together." U. S. This preparation, although it has received the name of tincture, is in reality an infusion of opium, which has been deprived of the little narcotina, and odorous principle, oil, &c., taken up by the water, by being washed with ether, and has had sufficient alcohol added to preserve it. It is said to produce less headache, nausea, and other unpleasant after effects than laudanum." U. S. Dose, xxv drops, about equal to one gr. of opium.

Tinctura Opii Acetata, U. S., *Acetated Tincture of Opium.*—"Take of opium, dried, and in moderately fine powder, two troyounces; vinegar, twelve fluidounces; alcohol, half a pint. Rub the opium with the vinegar; then add the alcohol, and, having macerated for seven days, express, and filter through paper." U. S. Dose, xv–xx drops.

Vinum Opii, U. S., *Wine of Opium.*—"Take of opium, dried, and in moderately fine powder, two troyounces; cinnamon, in moderately fine powder, cloves, in moderately fine powder, each, sixty grains; sherry wine, a sufficient quantity. Mix the powders with fifteen fluidounces of sherry wine, and macerate for seven days, with occasional agitation; then transfer the mixture to a conical percolator, and, when the liquid has passed the surface, gradually pour on sherry wine until a pint of filtered liquid is obtained." U. S. Dose, x–xv drops.

Acetum Opii, U. S., *Vinegar of Opium, Black Drop.*—"Take of opium, dried, and in moderately coarse powder, five troyounces; nutmeg, in moderately coarse powder, a troyounce; saffron, in moderately coarse powder, one hundred and fifty grains; sugar, eight troyounces; diluted acetic acid, a sufficient quantity. Macerate the opium, nutmeg, and saffron with a pint of diluted acetic acid for twenty-four hours. Put the mixture into a conical glass percolator, and return the liquid which first passes until the filtrate becomes clear. Then gradually pour on diluted acetic acid until the filtered liquid measures twenty-six fluidounces. In this dissolve the sugar, and, having strained the solution, add sufficient diluted acetic acid to make the whole measure two pints." U. S. This preparation is widely known as *black drop*, and must not be confounded with *black draught*, an infusion of Epsom salts and senna. Dose, v–x drops.

The following table shows the strength of all the officinal U. S. preparations:—

| QUANTITY. | PREPARATION. | AMOUNT OF OPIUM REPRESENTED BY |
|---|---|---|
| f℥j. | Tinctura Opii Camphorati | gr. 2 |
| " | Tinctura Opii | gr. 37½ |
| " | Tinctura Opii deodorata | gr. 37½ |
| " | Tinctura Opii Acetata | gr. 48 |
| " | Vinum Opii | gr. 60 |
| " | Acetum Opii | gr. 75 |
| gr. x | Pulvis Ipecacuanhæ Compositus | gr. 1 |
| gr. 35 | Confectio Opii | gr. 1 |
| gr. v | Pilulæ Saponis Compositæ | gr. 1 |
| 1 pill | Pilulæ Opii | gr. ·1 |
| gr. 1 | Extractum Opii | gr. 2 |
| gr. 1 | Morphiæ Sulphas | gr. 4 |
| gr. 1 | Morphiæ Murias | gr. 4 |
| gr. 1 | Morphiæ Acetas | gr. 4 |
| f℥j. | Liquor Morphiæ Sulphatis | gr. 4—W.] |

### Morphiæ Hydrochloras, *Hydrochlorate of Morphia.*

*Synonym.*—Morphiæ Murias, *Ed.*, *Dub.*

The hydrochlorate of an alkaloid, $C_{34}H_{19}NO_6,HCl+6HO$, prepared from opium.

*Preparation.*—Take of opium, sliced, one pound; distilled water, a sufficiency; chloride of calcium, three-quarters of an ounce; solution of ammonia, a sufficiency; purified animal charcoal, a quarter of an ounce; dilute hydrochloric acid, two fluidounces, or a sufficiency. Macerate the opium for twenty-four hours with two pints of the water, and decant. Macerate the residue for twelve hours with two pints of the water, decant, and repeat the process with the same quantity of the water, subjecting the insoluble residue to strong pressure. Unite the liquors, evaporate on a water-bath to the bulk of one pint, and strain through calico. Pour in now the chloride of calcium previously dissolved in four fluidounces of distilled water, and evaporate until the solution is so far concentrated that upon cooling it becomes solid. Envelop 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 colored, repeat this process a third time, the expressed liquids being always preserved. Dissolve the pressed cake in six fluidounces 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 fluidounces of boiling distilled water placed in a porcelain capsule kept hot, and add, constantly stirring, the dilute hydrochloric acid, proceeding with caution, so that the morphia may be entirely dissolved, and a neutral solution obtained. (Filter this, and) 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.

Water extracts from opium the *meconate and sulphate of morphia and codia;* a part of the *narcotia* of the *meconin*, of the *narcein*, and of the *thebaia;* the brown acid *extractive;* and a part of the *resin*, and of the *fat oil.* When chloride of calcium is added to infusion of opium, meconate with a little sulphate of lime, and some resinous coloring matter, are precipitated, while the hydrochlorates of morphia and of codia are left in solution. A watery solution of the impure crystals obtained by evaporation is then decomposed by ammonia, by which the morphia is precipitated, while codia and hydrochlorate of ammonia are left in solution. The morphia is dissolved in hydrochloric acid, and the solution of the hydrochlorate decolorized by charcoal.

*Officinal Characters.*—In white flexible acicular prisms of a silky lustre, not changed by exposure to the air, and soluble in water and spirit. The aqueous solution gives a white curdy precipitate with nitrate of silver, and a white one with potash, which is redissolved when an excess of the alkali is added. Moistened with strong nitric acid it becomes orange-red, and, with solution of perchloride of iron, greenish-blue.

*Tests.*—Entirely destructible by heat, leaving no residue. Twenty grains of the salt dissolved in half an ounce of warm water, with ammonia added in the slightest possible excess, give on cooling a crystalline precipitate which, when washed with a little cold water, and dried by exposure to the air, weighs 15.18 grains.

Hydrochlorate of morphia has been retained in preference to acetate of morphia, in consequence of its greater stability of composition.

*Physiological Effects.*—The precise relation which the effects of morphia and its salts bear to those of opium, is a point on which the profession is by no means agreed. Some recent writers declare that, after having carefully compared the effects of the morphia salts with those of opium, they can discover no difference between them; but my own limited observation of the effects of these salts induces me to agree with those who admit the similarity, but not the identity, of the effects of these substances. The effects of morphia are in several respects different from those of opium, but they appear to want uniformity; that is, the same results have not been arrived at by different experimenters. This may, in some cases at least, be ascribed to the employment of morphia contaminated with some other principles of opium. *In small doses*, as from a quarter of a grain to one grain, acetate of morphia causes a feeling of distension or fulness about the head, some disturbance of vision, oftentimes headache, giddiness, and somnolency, or actual sleep, which, however, differs from ordinary sleep, and is often more or less disturbed. The pupils are usually contracted. Orfila says this occurs in nineteen out of twenty cases. However, in some instances dilatation has been observed, in others the pupil was natural; and in others one pupil has been found contracted and the other dilated. The pulse is generally slow and small, though sometimes it is more frequent, and occasionally is soft and full. Itching of the skin is frequently noticed, and even a cutaneous eruption is by no means uncommon. Grain doses readily excite gastric uneasiness, nausea, and vomiting. One remarkable symptom often caused by acetate of morphia, especially in men, is a difficulty in voiding the urine, and which appears to depend on a weakened or paralytic condition of the bladder. Bally lays great stress on this last-mentioned symptom, especially when a full dose of morphia has been taken. When these effects subside, loss of appetite, muscular feebleness, and constipation, are left behind. When the dose is increased, the effects become somewhat alarming. Great cerebral excitement is produced, vision is disordered and obscured, there is singing in the ears, and the patient, when lying horizontally, experiences sudden convulsive movements, like those produced by an electric shock. When a fatal dose has been swallowed, the stomach sometimes manifests irritation, but this is soon followed by great disorder of the cerebro-spinal system, which ultimately assumes an apoplectic character. The sight becomes dim, excessive weakness is experienced, gradually all consciousness is lost, and coma supervenes, attended usually with contracted, though sometimes with dilated pupils, coldness of the surface, frequent and small pulse, hurried stertorous respiration, and occasionally with convulsions. Before insensibility comes on, as well as when it is subsiding, there is itching of the skin. Difficulty in passing the water is also experienced, in consequence of the paralyzed state of the bladder. Not unfrequently, lividity of skin is observed. In comparing the morphia salts with opium, we observe that they are less stimulant, and less disposed to cause sweating, constipation, headache, and dryness of the tongue. The feelings which they excite are less agreeable, and hence they are not adapted to be substituted for opium by the eaters of that drug. They more readily affect the bladder than opium. These effects, though mentioned as those of acetate of morphia, are equally produced by the hydrochlorate. The effects of morphia and its salts appear to be identical in their nature; but the soluble salts, as the hydrochlorate, are more constant and certain in their operation than uncombined morphia, in consequence probably of the difficult solubility of the latter.

*Therapeutics.*—We employ morphia or its salts in preference to opium when our object is to make applications *endermically*, *i. e.* to the denuded dermis; or, *hypodermically*, *i. e.* by injecting a solution under the skin. They are employed in this way *externally* for the purpose of alleviating violent neuralgic pains, and to relieve tetanus and the effects of strychnia. To relieve neuralgia it is not necessary to inject in the seat of the pain. Gastrodynia and obstinate vomiting are sometimes relieved by the endermic application of morphia to the epigastrium; and violent headache by the application of this remedy to the temples. Occasionally this mode of administration is adopted when we wish to bring the general system under the calming and sedative influence of morphia, and where from some cause its exhibition by the mouth is objectionable. Some cases of maniacal delirium may be treated with advantage this way. The acetate of morphia, though not officinal, appears to be best adapted for hypodermic use. The morphia salts are given *internally* in cases where we wish to obtain the anodyne, soothing, sedative, soporific, and antispasmodic qualities of opium, and where this drug is objectionable on account of its tendency to excite certain injurious effects already referred to. In all cases where both opium and the morphia salts are equally admissible, I prefer the former, its effects being better known and regulated: moreover, opium is to be preferred as a stimulant and sudorific, and for suppressing excessive mucous discharges.

*Administration.*—Hydrochlorate of morphia is given internally in substance or solution, in doses from one-eighth to one-half of a grain, or even beyond this. I have given in insanity two grains at a dose. For endermic use it should be finely powdered, and applied to the extent of a grain or a grain and a half at a time.

*Officinal Preparations.*

Liquor Morphiæ Hydrochloratis, *Solution of Hydrochlorate of Morphia.*—Take of hydrochlorate of morphia, four grains; dilute hydrochloric acid, eight minims; rectified spirit, two fluidrachms; distilled water, six fluidrachms. Mix the hydrochloric acid, the spirit, and the water, and dissolve the hydrochlorate of morphia in the mixture. This solution contains half as much morphia as Liquor Morphiæ Hydrochloratis, *Lond.*

One fluidrachm of this solution contains half a grain of hydrochlorate of morphia.

*Dose.*—Min. xx to fl. drm. j.

Suppositoria Morphiæ, *Morphia Suppositories.*—Take of hydrochlorate of morphia, three grains; refined sugar, thirty grains; prepared lard, a sufficiency; white wax, a sufficiency. Melt thirty grains of the lard and the same quantity of the wax in a water-bath, and, having removed the vessel, mix them thoroughly with the hydrochlorate of morphia and the sugar previously rubbed together. When the mixture has solidified, divide the mass into twelve equal portions, to be formed into cones, which are to be allowed to stand till they acquire sufficient firmness. Dip each cone into a mixture of three parts of wax and eight of lard, melted together in the water-bath, and set aside in a cool place that the coating may become hard.

Each suppository contains a quarter of a grain of hydrochlorate of morphia.

Trochisci Morphiæ, *Morphia Lozenges.*—Take of hydrochlorate of morphia, twenty grains; tincture of tolu, half a fluidounce; refined sugar, in powder, twenty-four ounces; gum arabic, in powder, one ounce; mucilage of gum arabic, two fluidounces, or a sufficiency; boiling distilled water, half a fluidounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and with the gum and the sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia.

*Dose.*—One to four, or more.

Trochisci Morphiæ et Ipecacuanhæ, *Morphia and Ipecacuan Lozenges.*—Take of hydrochlorate of morphia, twenty grains; ipecacuan, in fine powder, sixty grains; tincture of tolu, half a fluidounce; refined sugar, in powder, twenty-four ounces; gum arabic, in powder, one ounce; mucilage of gum arabic, two fluidounces, or a sufficiency; boiling distilled water, half a fluidounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with the mucilage; and, with the ipecacuan, the gum, and the sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one thirty-sixth part of a grain of hydrochlorate of morphia, and one-twelfth of a grain of ipecacuan.

*Dose.*—One to four, or more.

[As the morphia preparations of the U. S. Pharmacopœia are so essentially different in manufacture from those of the British Pharmacopœia, it seems expedient to give them entirely separate from and independent of the latter.

### Morphia, U. S., *Morphia.*

"Take of opium, sliced, twelve troyounces; water of ammonia, six fluidounces; animal charcoal, in fine powder, alcohol, distilled water, each, a sufficient quantity. Macerate the opium with four pints of distilled water for twenty-four hours, and, having worked it with the hands, again macerate it for twenty-four hours, and strain. In like manner, macerate the residue twice successively with the same quantity of distilled water, and strain. Mix the infusions, evaporate to six pints, and filter; then add five pints of alcohol, and afterwards three fluidounces of the water of ammonia, previously mixed with half a pint of alcohol. After twenty-four hours, pour in the remainder of the water of ammonia, mixed as before with half a pint of alcohol, and set the liquid aside for twenty-four hours, that crystals may form. To purify these, boil them with two pints of alcohol until they are dissolved, filter the solution, while hot, through animal charcoal, and set it aside to crystallize." U. S. In this process the water dissolves out of the opium the meconates of morphia and codeia, together with the coloring matter, gum, and some other impurities. Most of the narcotina and the resin are left behind, owing to their insolubility in the menstruum; it is this circumstance that makes pure water the best menstruum in obtaining morphia. If water of ammonia were now alone added, the coloring matter would be precipitated with and contaminate the morphia. This is obviated by the addition of the alcohol, which dissolves the coloring matter as fast as the ammonia precipitates it from its watery solution. The meconate of codeia is decomposed by the ammonia as well as the meconate of morphia, but the codeia remains in solution, because it is soluble in water. Care must be taken not to have an excess of ammonia, since morphia is soluble in a solution of that alkali. The aqua ammoniæ should be precisely the officinal strength. If any narcotina should contaminate the product, it should be treated with ether.

*Officinal Characters.*—Morphia thus prepared is in colorless crystals, which are inflammable, and wholly dissipated by a red heat. It is scarcely soluble in cold water, slightly soluble in boiling water, and freely so in boiling alcohol. Nitric acid first reddens it, and afterwards renders it yellow. With solution of sesquichloride of iron it assumes a deep-blue color. Its solution restores the color of litmus, previously reddened by an acid.

*Therapeutics.*—Morphia is rarely, if ever, administered; its salts being preferred, on account of their greater solubility. Its action on the economy is the same as that of its salts, and it may be administered in the same dose.

*Pharmaceutical Uses.*—In making the officinal salts of morphia.

### **Morphiæ Sulphas**, U. S., *Sulphate of Morphia.*

"Take of morphia, in fine powder, a troyounce; distilled water, half a pint; diluted sulphuric acid, a sufficient quantity. Mix the morphia with the distilled water; then carefully drop in diluted sulphuric acid, constantly stirring until the morphia is saturated and dissolved. Evaporate the solution by means of a water-bath, so that on cooling it may crystallize. Lastly, drain the crystals, and dry them on bibulous paper." U. S. The sulphate of morphia is formed by the direct union of the morphia and sulphuric acid.

*Officinal Characters.*—In snow-white, feathery crystals, which are wholly soluble in water. Potassa, added to the solution, throws down a precipitate, which is dissolved by an excess of the alkali. With chloride of barium (sulphate of baryta), it yields a white precipitate, insoluble in nitric acid. It is affected by heat, nitric acid, and sesquichloride of iron in the same manner as morphia.

*Therapeutics.*—The therapeutic properties of this salt are the same as those of the hydrochlorate. Dose, gr. $\frac{1}{8}$ to $\frac{1}{2}$, in pill or solution.

Liquor Morphiæ Sulphatis, U. S., *Solution of Sulphate of Morphia.*—"Take of sulphate of morphia, eight grains; distilled water, half a pint. Dissolve the sulphate of morphia in the distilled water." U. S. The officinal strength of this preparation is one grain to the ounce, and apothecaries should never vend it of any other strength, except when called for by special prescription. *Magendie's solution* contains *sixteen* grains to the fluidounce, and yet I have known of an apothecary putting it up when solution of morphia had been called for; fatal effects were averted by a mere accident. Dose, f ʒj to f ℥ss.

### **Morphiæ Acetas**, U. S., *Acetate of Morphia.*

"Take of morphia, in fine powder, freed from narcotina by the action of ether, a troyounce; distilled water, half a pint; acetic acid, a sufficient quantity. Mix the morphia with the distilled water; then carefully drop in acetic acid, constantly stirring until the morphia is saturated and dissolved. Evaporate the solution, by means of a water-bath, to the consistence of syrup, and set it aside until it concretes. Lastly, dry the salt with a gentle heat, and rub it into powder." U. S. In this process the acetate of morphia is the result of the direct union of the acetic acid and the morphia.

*Officinal Characters.*—A white powder, wholly soluble in water and in alcohol. From its solution potassa throws down a precipitate, which is dissolved by an excess of the alkali. It is affected by heat, nitric acid, and sesquichloride of iron in the same manner as morphia. When sulphuric acid is added to the salt, acetous vapors are evolved.

*Therapeutics.*—Some practitioners are of the opinion that this salt of morphia is less irritant than the others, and therefore prefer it for hypodermic and endermic use. Dose, gr. $\frac{1}{8}$ to $\frac{1}{2}$, in pill or solution.

In giving morphia salts hypodermically, a strong solution should be used, say grains xvj to f ℥j (Magendie's solution), and of this x to xx minims should be thrown into the cellular tissue beneath the skin by means of a small syringe provided with a sharp, needle-like tube.

**Morphiæ Murias,** U. S., *Muriate of Morphia.*

"Take of morphia, in fine powder, a troyounce; distilled water, half a pint; muriatic acid, a sufficient quantity. Mix the morphia with the distilled water; then carefully drop in muriatic acid, constantly stirring, until the morphia is saturated and dissolved. Evaporate the solution, by means of a water-bath, so that on cooling it may crystallize. Lastly, drain the crystals, and dry them on bibulous paper." U. S. The muriate (or hydrochlorate) of morphia is in this process made by the direct union of the muriatic acid and the morphia.

*Officinal Characters.*—In snow-white, feathery crystals, wholly soluble in water and in alcohol. Potassa, added to the solution, throws down a precipitate, which is dissolved by an excess of the alkali. With nitrate of silver it yields a precipitate, insoluble in nitric or muriatic acid, but soluble in an excess of ammonia. It is affected by heat, nitric acid, and sesquichloride of iron in the same manner as morphia.

*Therapeutics.*—See Morphia Hydrochloras.—W.]

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## [SANGUINARIA CANADENSIS, *Linn.*
## Bloodroot.

Fig. 212.

*Sanguinaria Canadensis*

*Generic Character.* — Petals eight to twelve, not crumpled in the bud. Pod oblong, turgid, one-celled, two-valved.

*Specific Character.*—*Root* tuberous, horizontal, giving out a reddish and a very acrid lactescent sap. *Leaves* solitary, radical, reniform and lobed. *Scape* naked, one-flowered, sheathed at base. *Petals* variable in number. April. Perennial.

This plant is called *Bloodroot*, from the red color of its rhizome, which, when wounded, pours out a quantity of red viscid juice. The same issues from the stalks of the leaves and flowers, but to a less amount. It is also known by the name of *Puccoon*. It grows throughout the United States, appearing in open woods at an early period of the spring, which it highly ornaments by its handsome white flowers.

### Sanguinaria, *Bloodroot.*
### Mat. Med. List, U. S. P.

The rhizoma of Sanguinaria Canadensis.

The rhizome is horizontal, from an inch to two inches in length, and half an inch in diameter, thicker at the summit, terminating abruptly as if bitten off (*præ-*

*morse*), fleshy, succulent, and beset with slender red fibres or radicles. It is taken from the ground during the summer, and when dried becomes dark-brown externally, contracted, wrinkled, somewhat twisted. It breaks with a short, waxy fracture, presenting an orange-red color upon the fractured surfaces. Its odor is feebly narcotic, disagreeable, but lost in a measure by drying. Its taste is acrid and bitter. The powder is grayish red.

*Therapeutics.*—Bloodroot must be regarded as a stimulant, acrid emetic, and narcotic; a diaphoretic effect when produced must be accessory to these effects. In large doses, the "emesis is volent, there is a burning sensation in the stomach, faintness, vertigo, dimness of vision, and alarming prostration." (*United States Dispensatory.*) The diseases in which it has been employed are those of the lungs, as pneumonia, catarrh, phthisis, croup, &c. The leaves are endowed with similar powers, and the seeds exert a marked power over the brain and nervous system, occasioning torpor, languor, disordered vision, and dilatation of the pupils.

Dose, gr. v to xv.

Tinctura Sanguinariæ, U. S., *Tincture of Bloodroot.*—"Take of bloodroot, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.

Dose, as an expectorant, gtt. xx to xl; as an emetic, f℥ss.

Acetum Sanguinariæ, U. S., *Vinegar of Bloodroot.*—"Take of bloodroot, in moderately coarse powder, four troyounces; diluted acetic acid, a sufficient quantity. Moisten the powder with two fluidounces of diluted acetic acid, pack it firmly in a conical glass percolator, and gradually pour upon it diluted acetic acid until the filtered liquid measures two pints. Vinegar of bloodroot may also be prepared by macerating the powder with two pints of diluted acetic acid for seven days, expressing the liquid, and filtering through paper." U. S. By the addition of sugar, a syrup may be prepared, to be used in cough mixtures. Dose, as an expectorant, gtt. xv to fʒss; emetic, f℥ss.—W.]

## [VIOLACEÆ.

The herb of *Viola pedata* is officinal in the Secondary List, U. S. P. The bird's-foot violet is readily distinguished by its many-parted, often pedate leaves, and large, pale blue flowers. It, with other species of the genus, is mucilaginous and slightly laxative. It is a native of North America.—W.]

## MENISPERMACEÆ, *DC.* The Calumbo Order.

## COCCULUS PALMATUS, *Wallich.*

### The Calumbo Plant.

Diœcia Hexandria, *Linn. Syst.*

*Botany.*—The recent investigations of Miers prove that our officinal calumbo is not derived, as stated in the *British Pharmacopœia*, from the *Cocculus palmatus*, DC., but from the *Cocculus palmatus*, Wallach; the *Menispermum Calumba*, Roxb.; and the *Jateorhiza Calumba*, Miers.

Fig. 213.


*Cocculus palmatus.*

*a.* Male flowers. *b.* Calyx. *c.* Stamen. *d.* Petal. *e.* Bract.

*Botanic Character.*—*Root* perennial, of several fasciculated, fusiform, fleshy tubercles, which are brown externally, and deep yellow internally, odorless, and very bitter. *Stems* annual, herbaceous, twining, beset at the lower part with long glanduliferous hairs; of the males, simple; of the females, branching. *Leaves* alternate, nearly orbicular, wavy on the margins, with long, hairy petioles. *Racemes* axillary, solitary; in the male plants compound. *Flowers* small, green, diœcious. *Calyx* of six sepals. *Petals* six. *Stamens* six, opposite to the petals. *Fruit* drupaceous or berried, about the size of a hazel-nut, densely clothed with long spreading hairs, tipped with a black oblong gland.

*Habitat.*—Thick forests on the shores of Oibo and Mozambique in Eastern Africa, as well as inland for fifteen or twenty miles.

**Calumba,** *Calumbo.* [Mat. Med. List, U. S. P.]

The root, sliced transversely, and dried; from Mozambique.

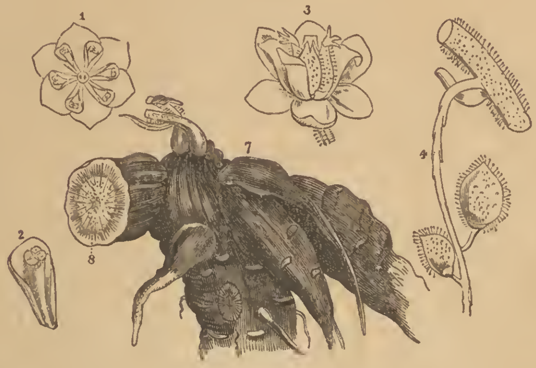
*Preparation of the roots.*—The natives never cultivate the plant, the spontaneous produce being sufficient. The roots are dug up in March (the hot season), the offsets from the main root are separated and cut into transverse slices, and then dried in the shade. It is deemed fit for commerce when, on exposure to the sun, it breaks short; and of a bad quality when it is soft or black.

*Commerce.*—Calumbo is exported by the Portuguese from their territories in the southeast of Africa. It is sent direct to India, and from thence forwarded to Europe. The root was at first supposed to come from Columba, the capital of Ceylon, and from which it was said to derive its name; but its English name is derived from the Portuguese word Kalumbo, the *o* in which is mute.

*Officinal Characters.*—Slices flat, circular or oval, about two inches in diameter, and from two to four lines thick, softer and thinner towards the centre, grayish-yellow, bitter. A decoction when cold is blackened by the solution of iodine.

*Description.*—Calumba is usually met with in pieces of from half an inch to three inches, or sometimes more, in diameter, and from one to three or four lines, or, in some cases, nearly an inch thick. It occurs also in cylindrical pieces from one to two inches long. The epidermis

Fig. 214.




*Cocculus palmatus.*

1. Flowers showing sepals, petals, and stamens. 2. Petals and stamen. 3. Flowers, showing ovaries. 4. Fruit. 7. Root.

is of a yellowish-gray or brownish color, and smooth or irregularly rugous. The transverse surfaces are of a greenish or grayish-yellow color, depressed in the middle from shrinking in the drying process, and marked with concentric circles and radiating lines. The outer or cortical portion varies in thickness, but is usually about two or three lines thick. It is separated from the ligneous portion by a dark-colored layer, not exceeding a hair in thickness. The internal portion is light, spongy, and shrunk. The odor of calumbo is faint, but somewhat aromatic; the taste very bitter, more especially that of the cortical portion. On account of the starch which it contains, the root is readily attacked by insects, and hence may be often seen perforated with small holes. The root is brittle, and hence easily reduced to powder.

*Composition.*—If the root be moistened with water, and then touched with tincture of iodine, it becomes black. A decoction of the root, when cold, forms, with a solution of iodine, a blue color, indicating starch. Sulphate of iron, tartarated antimony, and gelatin, produce no obvious change in an infusion of calumbo, showing the absence of tannic and gallic acids. Litmus detects no free acid. Infusion of galls causes in the infusion of calumbo a precipitate. The principal constituents of calumbo are calumbin, the alkaloid beberia combined with calumbic acid and starch. The latter constitutes almost one-third by weight of the root. *Calumbin.*—A crystallizable, odorless, very bitter, neutral substance, extracted from calumbo by Wittstock. Its crystals are rhombic prisms. It is fusible; very slightly soluble in water, alcohol, and volatile oils. Boiling rectified spirit dissolves about $\frac{1}{40}$th of its weight. It dissolves in acids and alkalies; its best solvent being acetic acid. It is unaffected by metallic solutions, and by infusion of galls. Sulphuric acid dissolves it, assuming first a yellow, then a red color. *Berberia* ($C_{42}H_{17}NO_8$).—This alkaloidal base, which was discovered by Buchner and Herberger in the common barberry (*Berberis vulgaris*), has been found in calumbo, combined with calumbic acid, by Bödecker. Berberia is in fine stellated prisms of a yellow color, is without smell, has a strong bitter taste, and manifests no reaction on test-paper. When heated to 212° it acquires a red color, but becomes again yellow on cooling. At a much higher temperature it is decomposed, and gives off yellow vapors. It is very soluble in alcohol, but is precipitated from its alcoholic solution by water. The alcoholic solution is green by reflected light. At 60° it is soluble in one hundred parts of water, forming a clear yellow solution. It is destroyed by concentrated sulphuric or nitric acid. It forms saline combinations, more or less soluble, with the mineral acids. Calumbo owes its yellow color to salts of berberia. *Calumbic Acid.*—As described by Bödecker is in the form of an amorphous powder of a pale straw yellow color, it reddens moistened litmus paper, is nearly insoluble in water, slightly soluble in ether, but readily dissolved by alcohol and acetic acid.

*Physiological Effects.*—Calumbo is an excellent tonic, promoting the appetite, assisting the digestive process, and improving the quality of the secretions from the gastro-intestinal mucous membrane. It is not a stimulant; for Dr. T. Percival took twenty grains of it on an empty stomach, but he did not observe that it had the least effect on the regularity, fulness, or velocity of the pulse. In consequence of the quantity of starch which it contains, it is sometimes termed a *mucilaginous* or *demulcent tonic.* It agrees with Iceland moss in this circumstance. But from this, as well as from quassia, it is distinguished by its aromatic properties. In some respects (*i. e.* in is tonic and aromatic qualities) it approximates to rhubarb, but it is devoid of the purgative and astringent properties of the latter. Its want of astringency distinguishes it from the astringent tonics (as cinchona). It does not appear either to constipate or relax the bowels.

*Therapeutics.*—Calumbo is one of our most useful stomachics and tonics. Its great value consists in its not being apt, like other and more powerful tonics, to create nausea, sickness, febrile disorder, or headache, so that it is tolerated when other remedies of this class would be immediately rejected. Indeed, on many occasions it evinces a positive power of checking vomiting. Probably it owes these valuable properties to a combination of circumstances; such as its freedom from acidity and astringency, the large quantity of starch which it contains (from which it acquires demulcent properties), and the peculiar operation of its bitter principle. The following are the principal uses to which it has been applied: *In a languid state of the stomach, with general debility*, attended with want of appetite, indigestion, nausea, and flatulence, experience has fully established the value of calumbo. It is of all tonics the least likely to disagree with the stomach. In the stage of convalescence after an attack of fever, the infusion of calumbo is an excellent preparative for the more powerful tonics (infusion and sulphate of quinia). In those forms of dyspepsia attended with great acidity of stomach, it may be given with advantage in combination with carbonate of potash. *To allay vomiting*, when not dependent on inflammatory conditions of the stomach, calumbo is often highly serviceable; as in bilious vomiting, in the sickness which so frequently attends pregnancy, and dentition. Even vomiting arising from renal calculi or diseased kidney has been somewhat palliated by calumbo. I have seen the most satisfactory results from the combined use of the infusion of calumbo and effervescing draughts (composed of citric acid and bicarbonate of potash) in those occasional attacks of vomiting especially observed in delicate females, and which are commonly termed bilious attacks. *In diarrhœa and dysentery*, where tonics are admissible, as in the latter periods of these diseases, when the inflammatory symptoms have subsided, and in habitual diarrhœa, calumbo often proves serviceable.

*Administration.*—Calumbo is administered in the form of *powder*, *extract*, *infusion*, or *tincture*. The dose of the *powder* is from ten to thirty grains. The infusion is the most eligible form of exhibition.

*Officinal Preparations.*

EXTRACTUM CALUMBÆ, *Extract of Calumbo.*—Take of calumbo, in powder, one pound; proof spirit, four pints. Macerate the calumbo in two pints of the spirit for twenty-four hours; pack in a percolator, and pass the remainder of the spirit slowly through it; distil off the spirit; and evaporate the residue to a proper consistence.

This is a new preparation.

*Dose.*—Gr. iij to gr. x.

INFUSUM CALUMBÆ [U. S.], *Infusion of Calumbo.*—Take of calumbo, in coarse powder, half an ounce; cold distilled water, ten fluidounces. Macerate for one hour, and strain. ["Take of columbo, in moderately coarse powder, half a troyounce; water, a sufficient quantity. Moisten the powder with two fluidrachms of water, pack it firmly in a conical percolator, and gradually pour water upon it until the filtered liquid measures a pint. The infusion may also be prepared by macerating the columbo in a pint of boiling water, for two hours, in a covered vessel, and straining." U. S.]

It may be conjoined with alkalies or chalybeates, without injury or obvious change, as it contains neither tannic nor gallic acid.

*Dose.*—Fl. oz. j to fl. oz. ij.

TINCTURA CALUMBÆ [U. S.], *Tincture of Calumbo.*—Take of calumbo, bruised, two ounces and a half; proof spirit, one pint. Macerate the calumbo for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. ["Take of columbo, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, transfer it to a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.]

An excellent adjunct to bitter infusion and effervescent medicines, when given to check vomiting.

*Dose.*—Fl. drm. ss to fl. drs. ij.

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## **ANAMIRTA COCCULUS**, *Wight and Arnott.*

### The Cocculus Indicus Plant.

Diœcia Monadelphia, *Linn. Syst.*

*Botanic Character.*—A strong climbing *shrub*. *Bark* deeply cracked, ash-colored. *Leaves* stalked, large, cordate-ovate; *petiole* a little shorter than the leaves. *Flowers* panicled, diœcious. *Calyx* of 6 sepals arranged in a double series, with 2 close-pressed bractlets. *Corolla* none. *Male: Stamens* united into a central column dilated at the apex; *anthers* numerous, covering the whole globose apex of the column. *Drupes* 1 to 3, 1-celled, 1-seeded. *Seed* globose, deeply excavated at the hilum; *albumen* fleshy; *cotyledons* very thin, diverging.—*Wallich Asiat. Res.* (*Menispermum Cocculus*) vol. xiii. plates 15 and 16.

*Habitat.*—Malabar, and Eastern Islands, &c. of India.

## **Cocculus,** *Cocculus Indicus.*

The fruit, dried; produced in Malabar and the Eastern Archipelago.

*Commerce.*—Cocculus indicus is imported from Bombay, Madras, and Ceylon. Formerly it was imported into Europe entirely from the Levant, from whence it obtained the name of Levant Shell, by which it was formerly exclusively known.

Fig. 215.

*Anamirta cocculus.*

*Officinal Characters.*—Somewhat larger than a full-sized pea, slightly ovate, blackish-brown, wrinkled, containing a yellowish oily bitter reniform seed, inclosed in a two-valved shell.

*Description.*—As met with in commerce, *Cocculus indicus* is somewhat reniform or kidney-shaped. It consists of a dried, thin, rugous, acrid and bitter layer, which envelops a thin, bivalved, white, ligneous shell. In the middle of this shell arises the placenta, which is contracted at its base, but enlarged and divided into two superiorly. Upon this placenta is placed an oleaginous, yellowish, very bitter seed, of a reniform or somewhat semilunar outline. This seed never wholly fills the cavity of the shell, at least in the Cocculus indicus of commerce; for, by keeping, it gradually becomes atrophied, and in old samples it is not uncommon to find the shell almost empty.

*Test.*—The seed should fill at least two-thirds of the shell.

*Composition.*—The seed (the only part used) owes its activity to the presence of a neutral principle termed picrotoxin, and an alkaloid menispermia. *Picrotoxin* ($C_{20}H_{12}O_8$) is a white, intensely bitter substance, usually crystallizing in needles, but sometimes in silky flexible filaments, transparent plates, or granular crystals. It is soluble in 150 parts of water at 57° F., in 25 parts of boiling water, in a third of its weight of alcohol, and in less than half its weight of ether. It is insoluble in the fixed and volatile oils, but is soluble in acetic acid, and in alkaline solutions. It does not combine with acids to form salts. The poisonous properties of the seed of Cocculus indicus depend on picrotoxin. *Menispermia* ($C_{18}H_{12}O_2$).—Menispermia is a white, crystalline, fusible compound, insoluble in water, soluble in alcohol and ether. It forms salts with the acids, the sulphate being crystallizable.

*Physiological Effects.*—Its effects on man have not been accurately ascertained. Hill says three or four grains of it have brought on nausea and faintings. It is frequently added to malt liquors, for the purpose of increasing their intoxicating powers; but, from some accounts which I have received from an excise officer, who has been repeatedly subjected to the influence of beer thus adulterated, its action appeared to be rather on the voluntary muscles than on the intellectual powers. The operation of picrotoxin is analogous to, though stronger than, that of Cocculus indicus. A case has been reported in America, where death was produced in a child of six years old, with previous tetanic spasms, and with contracted pupil, by applying a strong tincture of the fruit to the scalp. Other cases have been published, in which its external application has produced injurious effects.

*Therapeutics.*—Cocculus indicus is rarely employed in medicine. It is, however, sometimes used as an external application, in the form of powder or ointment, to destroy pediculi; and has also been employed in some obstinate skin diseases, as porrigo; but its use requires caution, especially where the skin is not entire, on account of the danger of absorption, and it appears to be a needless addition to the Pharmacopœia.

*Antidote.*—In poisoning by Cocculus indicus, or picrotoxin, remove the poison from the stomach as quickly as possible. No chemical antidote is known, though acetic acid has appeared to give relief. The symptoms must be combated on general principles, no peculiarities in the treatment being known. As a last resource, try artificial respiration.

*Administration.*—It is only used as an external application.

### *Officinal Preparation.*

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.

Used to destroy pediculi, and occasionally in porrigo.

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## CISSAMPELOS PAREIRA, *Linn.*

### Pareira Brava, or Velvet Leaf.

Diœcia Monadelphia, *Linn. Syst.*

*Botanic Character.*—A climbing *shrub.* *Root* woody, branching. *Stem* round, smooth or downy. *Leaves* roundish, peltate, subcordate, aristate, smooth above when full grown, covered underneath with silky pubescence. *Flowers* small, diœcious. *Male: Sepals* 4. *Petals* 4, united into a cup-shaped corolla. *Stamens* monadelphous, bearing two 2-celled anthers opening horizontally at the top. *Female: Calyx* of 1 lateral sepal. *Corolla* of 1 petal in front of the sepal. *Ovary* solitary; *stigmas* 3. *Drupe* roundish or somewhat reniform, scarlet, hispid, compressed and wrinkled round its margin. *Seed* solitary, uncinate.—*Woodv.* plate 82, page 227.

*Habitat.*—West India Islands, and Spanish Main.

### Pareira, *Pareira.* [Mat. Med. List, U. S. P.]

The dried root; from Brazil.

*Officinal 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 grayish-brown, longitudinally wrinkled, crossed transversely by annular elevations; interior woody, yellowish-gray, porous, with well-marked often incomplete concentric rings and medullary rays. Taste at first sweetish and aromatic, afterwards intensely bitter.

*Description.*—*Pareira* is sometimes imported under the name of *abuta* or *butua root.* It occurs in more or less cylindrical pieces, sometimes flattened or bluntly angular. They have frequently irregular rootlets attached to them. Some are as thick as a child's arm, their length often a foot or more. The surface of the transverse section of the root presents a number of concentric circles, traversed by numerous radiating lines; between these lines are wedge-shaped bundles of woody fibres and vessels; the latter are large, and, being cut transversely, constitute the numerous holes or apertures presented by the surface. The layers occasionally assume a very eccentric appearance, and frequently form only portions of circles, the organic centre being at or near the circumference. The number of concentric circles varies with the age of the root. The fracture of the root is coarsely fibrous. It has no odor.

*Adulteration and Substitution.*—Portions of the stem of this, or of allied species, are frequently found mixed with the root, or substituted for it. These may be known by their smoother appearance, frequent presence of lichens, evident pith, absence of irregular rootlets or branches, and less bitter taste. Generally, also, the pieces of stem are of a darker color (blackish-brown) than those of the root, their internal structure more uniform, and their texture less compact. The stem is less efficacious than the root.

*Composition.*—It contains resin, starch, and a bitter principle termed cissampelia or pelosia. *Cissampelia* or *pelosia* ($C_{36}H_{21}NO_6$).—This alkaloid has been examined by Bödecker. It forms about four or five per cent. of the dried root. It is an uncrystallizable alkaloid, insoluble in water, hot or cold, but soluble in alcohol and ether. It melts when heated, burns with a smoky flame, and leaves a carbonaceous residue. It forms a hydrate with three equivalents of water, which becomes yellow and is decomposed when exposed to the action of air and light. It combines with most acids, forming salts, which, with the exception of the hydrochlorate, are not crystallizable. They are, however, very soluble in water. The properties of the plant are owing to this alkaloid.

*Physiological Effects.*—From its taste, botanical affinities, and effects in diseases, it appears to possess a tonic power, and occasionally to act as a diuretic. Furthermore, its efficacy in certain maladies of the urinary organs induces us to ascribe an almost specific influence to this root over the mucous membranes lining the urinary passages, It certainly does appear to have the power of altering the quality of the urinary secretion. Large doses prove aperient.

*Therapeutics.*—It was originally introduced into medicine as a lithontriptic. We now employ it almost wholly *in discharges from the urino-genital mucous membrane.* It has been used in gonorrhœa, leucorrhœa, and chronic inflammation of the bladder. In the latter of these diseases Sir B. Brodie states that he has seen more good done by this root than by uva ursi. He recommends it to be taken in the form of a concentrated decoction, to which may be added some tincture of hyoscyamus; and in those cases in which there is a deposit of the triple phosphates, dilute hydrochloric or nitric acid may be added.

*Administration.*—The *powder* has been given in doses of from thirty to sixty grains. But the *decoction* or *liquid extract* is to be preferred.

## *Officinal Preparations.*

DECOCTUM PAREIRÆ, *Decoction of Pareira.*—Take of pareira, sliced, one ounce and a half; distilled water, one pint and a half. Boil for fifteen minutes, and strain. The product should measure a pint.

*Dose.*—Fl. oz. j to fl. oz. ij.

EXTRACTUM PAREIRÆ LIQUIDUM, *Liquid Extract of Pareira.*—Take of pareira, in coarse powder, one pound; boiling distilled water, one gallon, or a sufficiency; rectified spirit, three fluidounces. Macerate the pareira in a pint of the water for twenty-four hours, then pack in a percolator, and add distilled water until the pareira is exhausted. Evaporate the liquor by a water-bath to thirteen fluidounces, and, when it is cold, add the spirit, and filter through paper.

*Dose.*—Fl. drm. ss to fl. drs. ij.

[INFUSUM PAREIRÆ, U. S., *Infusion of Pareira Brava.*—"Take of pareira brava, bruised, a troyounce; boiling water, a pint. Macerate for two hours in a covered vessel, and strain." U. S. Dose, f℥j to f℥ij. —W.]

## MAGNOLIACEÆ, *DC.* The Magnolia Order.

### [MAGNOLIA GLAUCA, *Linn.*

### Sweet Bay.

*Generic Character.*—Stamens with very short filaments, and long anthers opening inwards. Pistils aggregated on the long receptacle, cohering together, and forming a fleshy and rather woody cone-like red fruit; each carpel at maturity opening on the back, from which the 1–2 berry-like seeds hang by an extensile thread.

*Specific Character.*—Leaves oblong, obtuse, white beneath, scattered along the branches; buds silky; petals white.

This plant is abundant along the Atlantic coast, from Massachusetts to Florida, where it frequents thick swamps and morasses; it does not grow spontaneously in dry and argillaceous ground unless transplanted. It is readily detected when in bloom by the rich perfume of its handsome white flowers; this occurs in May and June. It is rather a shrub than a tree, as it does not grow more than 20 feet high.

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### MAGNOLIA ACUMINATA.

### Cucumber Tree.

*Specific Character.*—Leaves oblong, pointed, green beneath, scattered along the branches, petals glaucous, green, tinged with yellow.

This is a large tree, sometimes reaching the height of nearly 100 feet. It grows in rich woods from western New York southward. It flowers in May and June.

Fig. 216.

*M. acuminata.*

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### MAGNOLIA UMBRELLA, *Lam.*

*Synonym.*—M. tripetala, *Michaux.*

*Specific Character.*—Leaves crowded on the ends of the flowering branches in an umbrella-like cluster, obovate-lanceolate, pointed at both ends, 1–2 feet long; buds glabrous. Flowers white, 7–8 inches in diameter.

A small tree, inhabiting the Alleghanies, flowering in May.

### Magnolia. Secondary List, U. S. P.

The bark of Magnolia glauca, M. acuminata, M. tripetala.

The bark is taken off during the spring and summer. When dried, it is in pieces several inches in length, and an inch or two broad, somewhat rolled, light; ashen, smooth and silvery externally, white and fibrous internally. It has an aromatic odor, which is impaired by time, and a taste warm, pungent, and bitterish. The bark of the root has similar sensible properties, and is regarded as being superior to that of the trunk and branches; it is rough externally. No detailed account has been given of its chemical composition.

*Therapeutics.*—Magnolia is tonic and diaphoretic in its effects on the animal economy, and may be used in cases where these effects are available. Its employment has been beneficial in the treatment of chronic rheumatism, and has proved serviceable in arresting the paroxysms of intermittent fever. The dose is ʒss to ʒj, in powder; or a decoction may be made in the proportion of ℥j to Oj.—Dose, ℥j to ℥ij. An infusion in brandy is sometimes used in rheumatism.—W.]

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## [LIRIODENDRON TULIPIFERA, *Linn.* *Tulip Tree; Tulip Poplar.*

*Generic Character.*—Anthers linear, opening outwards. Pistils flat, scale-like, dry, imbricated, coherent, when ripe falling away whole, like a samara or key fruit.

Fig. 217.

*Liriodendron tulipifera.*

*Specific Character.*—Leaves three to five inches long, and four to six inches broad, nearly quadrangular in their outline, smooth, shining green above, paler beneath, rounded or subcordate at base, with a short diverging, acuminate lobe (sometimes two) on each side, and the broad central lobe emarginately truncated. Petioles two to three inches long. Flowers large, campanulate, each with two caducous bracts at base.

This tree is one of the handsomest peculiar to the United States. Its height varies from 60 to 100 feet, and it is often four or five feet in diameter. In the old trees the branches are spreading at the summit, and the trunk frequently of great height without branches, especially when growing in woods; in the young trees the branches are in the form of a cone.

**Liriodendron**, *Tulip Tree Bark.* Secondary List, U. S. P.

The bark of Liriodendron tulipifera.

This bark occurs in the market in pieces of three or four inches long, deprived of epidermis, and of a yellowish-white color, light, fibrous, and easily broken. It has a somewhat aromatic odor, and warm, bitter, slightly camphorous taste. The bark of the root is similar, but browner and rougher externally. It contains a peculiar principle, Liriodendrine, which is a crystalline solid, bitter, inodorous, at 40° F., fusible at 180°, and volatile at 290° F. It is neither acid nor alkaline. Its discoverer (Prof. Emmet) regarded it as a camphor.

The medical properties of Liriodendron are those of a stimulant and tonic.—W.]

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## ILLICIUM ANISATUM, *Linn.*

### The Star Anise.

Polyandria Octogynia, *Linn. Syst.*

*Botanic Character.*—A *shrub*, about 8 feet high. *Leaves* evergreen, obovate, obtuse, entire, smooth, dotted. *Flowers* solitary, stalked. *Sepals* 6, petaloid. *Petals* numerous, yellow, the outer oblong, the inner subulate. *Stamens* numerous. *Carpels* 8 or more, coherent by their inner edge, and arranged in a star-like manner; when ripe hard and woody, and opening near their upper end. *Seeds* 1 in each carpel, ovate, compressed, reddish-brown.—*Nees' Plant. Med.* plate 369.

*Habitat.*—China and Japan.

### **Oleum Anisi**, *Oil of Aniseed.*

The oil distilled from the fruit in China. (See **Oleum Anisi**.)

*Commerce.*—This oil is imported from China and Singapore in tins, packed in cases holding about sixty pounds.

*Officinal Characters.*—Colorless or pale yellow; with the odor of anise, and a warm, sweetish taste. Concretes at 50°.

*Description.*—By far the greater part of the oil of aniseed consumed in this country is obtained from star anise fruit. It is generally regarded as a superior oil to that obtained in Europe from the fruit of *Pimpinella Anisum*, Linn.

(For *Properties*, *Physiological Effects*, *Therapeutics*, &c., see *Oleum Anisi.*)

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## [**CORNACEÆ**, *De Candolle.* The Dogwood Family.

### **CORNUS FLORIDA**, *Linn. Dogwood.*

*Generic Character.*—Limb of the *calyx* four-toothed, minute. *Petals* oblong, spreading. *Filaments* filiform. *Style* subclavate; *stigma* obtuse or capitate. *Drupes* not connate into a syncarpium. *Leaves* entire, minutely scabrous, with the appressed bicuspidate hairs. *Flowers* white, rarely yellow. (T. and G.)

Fig. 218.

*Cornus Florida.*

*Specific Character.*—*Leaves* of the involucre four, obcordate, or with a callous notch at the apex; drupes oval; *leaves* ovate acuminate.

Dogwood is a small tree, varying in height from fifteen to twenty or thirty feet, rarely attaining more, with an irregular growth. The branches are numerous and expanded. It is a conspicuous ornament of the forest in the spring of the year, when the large leafy involucres are expanded and resemble showy white flowers diffused in every direction. Within the involucres are the flowers, in clusters, rather inconspicuous, greenish-yellow. The leaves are developed after the flowers. In the fall of the year they become deep red. The drupe or berry is bright red when mature.

*Habitat.*—This plant is common throughout the United States, growing in open woods in moist soil from Canada to Florida and Louisiana. Its growth is modified by the climate; to the south it attains its extreme size. In the northern sections of the country the time of flowering is May, but in the southern it is during March and April.

**Cornus Florida,** *Dogwood.* Mat. Med. List, U. S. P.

The bark of Cornus Florida, *Linn.*

The bark from the root is regarded as the most efficacious. It is brought into the market in pieces slightly quilled, several inches long, half an inch to two broad, and two or three lines thick, of a grayish-red color, breaking with a short fracture, and exposing lighter-colored surfaces, mottled with red and white. The pieces from the root are rougher externally and more frequently destitute of epidermis. The odor is feeble; the taste bitter and astringent, with a little aroma. In the fresh state the taste is a little acrid. The bark contains gum, tannin, gallic acid, bitter extractive, fatty matters, and numerous other unimportant substances. Its active principle has not yet been isolated.

*Medical Properties.*—The article under consideration is a decided roborant, and hence has been placed by systematic writers in the list of tonics. By Dr. Walker it was found to augment the force and frequency of the pulse and to increase the heat of the body. It also has an astringent effect. An analogy has been supposed to exist between its mode of operation and that of cinchona, but it does not seem to be possessed of more than a general invigorating effect. As a substitute for bark or its preparations, dogwood has been employed in the treatment of intermittent fever, and in domestic practice is much used. Advantage has also been derived from it in the hands of regular practitioners. The objection to its use, however, is the large doses required, which disorder the stomach. As a mere tonic, it is applicable to the same range of cases as other of its congeners. The recent bark is apt to disagree with the stomach and produce pain.

Dose, gr. xx to ʒj.

Decoctum Cornûs Floridæ, U. S., *Decoction of Dogwood.*—"Take of dogwood, bruised, a troyounce; water, a sufficient quantity. Boil the dogwood in a pint of water for fifteen minutes, strain, and add sufficient water, through the strainer, to make the decoction measure a pint." U. S. Dose, f℥ij.—W.]

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## [CORNUS CIRCINATA, *Linn.*

*Specific Character.*—Flowers white, in open and flat-spreading cymes. Involucre none. Branches greenish. Leaves opposite, round, oval, abruptly pointed, woolly underneath. Fruit spherical, light-blue. A shrub.

### C. SERICEA, *L. Hev.*

*Specific Character.*—Flowers and involucre as in C. circinata. Branches purplish; branchlets, stalks, and the lower surfaces of the narrowly ovate or elliptical pointed leaves silky, downy. Fruit spherical, light blue.

The barks of these species are officinal in the U. S. Secondary List. They occur in small quills, and have remedial powers similar to those of C. florida.—W.]

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## [BERBERIDACEÆ.[1] THE BARBERRY FAMILY.

### BERBERIS VULGARIS, *Linn.*

*Generic Character.*—Petals 6, each 2-glandular at the base. Embryo large; cotyledons flat. Berries acid and innocent.

*Specific Character.*—Racemes many-flowered; flowers yellow, with entire petals; berries oblong, scarlet.

*Habitat.*—Europe. Thickets and waste grounds in E. New England.

#### Berberis, *Barberry.* Secondary List, U. S. P.

The bark of the root of Berberis vulgaris.

This bark is yellow on the inside, and imparts its color to water, saliva, &c. Its active principle is the alkaloid berberina. This is yellow, bitter, crystallizable, freely soluble in hot water and alcohol, scarcely so in either when cold. Concentrated nitric acid produces with it and its salts a dark red color. It exists largely in Hydrastis Canadensis and many other plants.

Barberry bark is tonic, and, in large doses, cathartic. It is best administered in decoction. The alkaloid is said to be antiperiodic. It may be given in doses of from five to ten grains.—W.]

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## RANUNCULACEÆ, *Lindley.* THE CROWFOOT ORDER.

### ACONITUM NAPELLUS, *Linn.*

#### Common Wolfsbane or Monkshood.

Polyandria Trigynia, *Linn. Syst.*

*Botanic Character.*—Perennial *herb.* *Root* tapering, and in the summer months having one or two lateral roots attached to it (Fig. 219, *a*). *Stem* simple, *Leaves* with commonly 5 wedge-shaped segments, which are further incised in a pinnatifid manner. *Flowers* blue, racemose, or somewhat panicled below. *Calyx* of 5 petaloid sepals, irregular, upper one helmet-shaped; *helmet* semicircular, or rarely boat-shaped. *Petals* 5, 3 small and often abortive, 2 superior on long stalks, each expanded at the apex into a bag hidden beneath the helmet-shaped sepal; *bag* somewhat conical. *Stamens* with hairy filaments. *Ovaries* 3, or rarely 5; when young, diverging.—*Woodv. Med. Bot.* plate 6.

This species is subject to great variation in the dense or loose condition of the inflorescence, in the form of the helmet, the color and size of the flower, the breadth and the number of segments of the leaves, the downiness of the parts of the plant, and the condition of the stem.

[1] [Podophyllum peltatum belongs to this family, although included under the Ranunculaceæ by the English editors of this work.—W.]

*Habitat.*—Europe. It is placed among indigenous plants, but it is a doubtful native.

**Aconitum,** *Aconite.* [**Aconiti Folium,** *Aconite Leaf.* Mat. Med. List, U. S. P. Aconiti Folia, *Pharm.* 1850.]

The fresh leaves and flowering tops; gathered, when about one-third of the flowers are expanded, from plants cultivated in Britain. [The leaves of Aconitum Napellus. Mat. Med. List, U. S. P.]

*Officinal Characters.*—Leaves smooth, palmate, divided into five deeply cut, wedge-shaped segments; exciting, when chewed, a sensation of tingling. Flowers numerous, irregular, deep blue, in spikes.

*Description.*—The leaves and flowers are far less active than the root. If carefully dried, they retain their color and active properties.

**Aconiti Radix,** *Aconite Root.* [Mat. Med. List, U. S. P.]

The root, dried; imported from Germany or cultivated in Britain, and collected in the winter or early spring, before the leaves have appeared. —*Pharm. Journ.* vol. xv. plate, page 452.

*Officinal Characters.*—From one to three inches long, not thicker than the finger at the crown, tapering, wrinkled, blackish-brown, internally whitish. A minute portion, cautiously chewed, causes prolonged tingling and numbness.

*Description.*—Aconite root, when fresh, consists of a short, rapidly tapering rootstock, placed perpendicularly, or nearly so, in the earth, and of numerous cylindrical fleshy fibres arising from it. At its upper and thickest part it is, on an average, about the thickness of the middle finger; inferiorly it is attenuated and filiform. Sometimes two or three roots are conjoined. In the latter case the root has a somewhat palmated appearance. Its total length is three or four or more inches. Its color, as well as that of the rootlets, is externally coffee-brown; its odor is earthy. Internally it is white and fleshy. Its taste is bitter; but after a few minutes a remarkable numbness and tingling is perceived on the lips, tongue, and fauces. By drying, the root shrivels, and becomes darker colored. It should be gathered in the spring, just before the leaves appear. It is said to have six times the activity of the leaves and the other parts of the plant.

Notwithstanding the marked difference in appearance, &c., between aconite root and horseradish root, several deaths have of late years occurred from the latter having been mistaken for the former. The aconite root is most virulent in the winter months and early spring, when the leaves are absent, and it is only at such periods that horseradish root is likely to be substituted for that of aconite. In a paper published in the fifteenth volume of the *Pharmaceutical Journal*, Professor Bentley has fully described the differences between the two roots, and given figures of them. He has tabulated their distinctive characters as follows:—

*Aconite.*

*Form.*—Conical, and tapering gradually and rapidly to a point.
*Color.*—Coffee-colored, or more or less brownish, externally.
*Odor.*—Merely earthy.
*Taste.*—At first bitter, but afterwards producing a disagreeable tingling and numbness.

*Horseradish.*

*Form.*—Slightly conical at the crown; then cylindrical, or nearly so, and almost of the same thickness for many inches.

*Color.*—Externally white, or with a yellow tinge.

*Odor.*—Especially developed upon scraping, when it is very pungent and irritating.

*Taste.*—Bitter or sweet according to circumstances, and very pungent. The difference in color and form are so marked that these characters should alone suffice as distinctive characters.

*Composition.*—All parts of the plant, and more especially the root, contain the alkaloid aconitia, to which its activity is due. Aconitia is united with aconitic acid. (See **Aconitia**, p. 862.) Several chemists

Fig. 219.


*Aconitum napellus* (*Wolfsbane or Monkshood*).
The Root.

have admitted the existence of a volatile acrid principle in aconite, but it has not hitherto been isolated. It may be a product of the decomposition of aconitia. There appear to exist in aconite root two distinct substances which possess, in different degrees, the physiological properties of this substance. One is amorphous aconitia, the other is a substance which is presented in the form of well-defined crystals, and which, after three successive crystallizations and when evidently chemically pure, caused the same symptoms as amorphous aconitia, though in a much weaker degree. Recently, Messrs. T. & H. Smith, of Edinburgh, have isolated a new crystallizable alkaloid in aconite root, which they have termed aconella. It has a great resemblance to narcotia, indeed would appear to be that substance.

*Physiological Effects of Aconite and Aconite Root.*—The *topical effects* are peculiar, and most remarkable. If a leaf or a small portion of the root be chewed, or a few drops of the alcoholic tincture of the root be applied to the lips, there are produced in a few minutes numbness and a remarkable tingling sensation. These effects endure for many hours. If the quantity taken into the mouth be somewhat larger, the palate and throat are affected. To me the sensation appears as if the velum and soft palate were elongated, and rested on the dorsum of the tongue. To relieve this, frequent attempts are made to swallow.

Fig. 220.


*Aconitum napellus.*

When *small and repeated doses* of the tincture are taken *internally*, they cause a sensation of heat and tingling in the extremities, and occasionally a slight diuresis.

In *poisonous doses* the effects of aconite are most remarkable. The following details of the effects produced on a family of three persons were furnished me, a few days after the accident, by one of the sufferers (Mrs. Prescott), and her account was confirmed by a very intelligent neighbor who witnessed the progress of the symptoms: In December, 1836, Mr. Prescott, aged 57, residing in the City Road, planted in his garden a few pieces of horseradish. On February 5th, 1837, he observed some green shoots which he supposed to be those of horseradish. He dug up three of them. The roots (samples of which were given, and have yielded me thriving plants of Aconitum napellus) were tap-shaped and small. Perhaps a very small walnut would exceed in bulk that of the whole root. These roots were washed, scraped, placed on a plate with some vinegar, and eaten at dinner (at two o'clock) with roast-beef, by Prescott, his wife (aged 57), and a child (aged 5). It was remarked at dinner that the root was very mild, and had not the pungency of horseradish. After the family had dined, about one root was left; so that two had been eaten at dinner, the greater part (perhaps one or one and a half roots) by the husband. About three-quarters of an hour after dinner, Mr. Prescott complained of burning and numbness of the lips, mouth, and throat, and which soon extended to the stomach, and was accompanied with vomiting. The matters ejected were first his dinner, and afterwards a frothy mucus; but at no time was any blood brought up. The vomiting was very violent and constant for an hour, and continued more or less until within half an hour of his death. An emetic was swallowed at a quarter past four o'clock; and therefore the subsequent vomiting may be ascribed, in part at least, to this. His extremities were cold, but his chest was warm; the head was bathed in a cold sweat. His eyes, to use the expression of his neighbor, were "glaring." He complained of a violent pain in the head, and trembled excessively. The last symptom might, perhaps, be in part owing to his terror of the mistake he had committed. The lips were blue. His mental faculties were not disordered: on this point I made particular inquiry, and I was assured that he was neither delirious nor sleepy, but was quite conscious until within two minutes of his death. He had no cramp, spasm, or convulsion; the only approach to it was trembling. He frequently put his hand to his throat. Though exceedingly weak, he did not lose his power over the voluntary muscles; for within a few minutes of his death he was able, with the assistance of his neighbor, to walk to the water-closet. His bowels were acted on once only after dinner, and that on the occasion just mentioned, which was about an hour after he had taken the emetic and some castor oil. His breathing was apparently unaffected. On his return from the water-closet he was put to bed, and within a few minutes expired, apparently in a fainting state. Death occurred about four hours after dinner. Mrs. Prescott was affected in a similar way. She had the same burning and numbness of the lips, mouth, throat, and stomach, and violent vomiting. She experienced a curious sensation of numbness in the hands, arms, and legs; and she lost the power of articulating, so that she was unable to tell the address of her son. Her attempts to speak were attended with unintelligible sounds only. She experienced great muscular debility, and was unable to stand. In this respect her condition differed from that of her husband, who could both stand and walk. She felt stiffness of, and difficulty in moving, her limbs. She had no cramps, spasms, or convulsions. The only approach thereto was the stiffness of the muscles when she attempted to put them in action, as in her attempts to wipe her face. Some of the external senses were disordered: thus, to use her own expression, though her eyes were wide open, her sight was very dim, and surrounding objects were seen indistinctly. The hearing was unaffected. The sensibility of the body was greatly impaired; her face and throat were almost insensible to touch. She felt very giddy, but was neither delirious nor sleepy. For the most part she was conscious, but at times scarcely knew what was passing around her. Her body and extremities were cold. She was frequently pulling her throat about, but she knew not why. Five or six hours after dinner she began to recover, and her natural warmth returned. The remedies employed were an emetic, castor oil, pediluvia, rum and water, and some "warm" medicine given her by a neighboring practitioner. The child was similarly but more slightly affected, except that she evinced a slight tendency to sleep. Like the others, she was constantly putting her hands to her throat. Mr. Sherwen has published a most interesting case of a female poisoned by the alcoholic tincture of the root. About five minutes after swallowing it, she was seized with a prickling and tingling down her arms and fingers, and a painful numbness across the wrists; the tongue and mouth next felt the same, then the legs and feet; and in less than ten minutes her face seemed to her feelings to be swelling, and the throat growing tight. She felt sick, and made many efforts to vomit. Her legs failed, she was almost blind, but was conscious of her condition. When seen by Mr. Sherwen her eyes were fixed and protruded, with *contracted* pupils; countenance livid; jaws and fauces rigid; arms and hands quite cold and pulseless; the legs and trunk much in the same state; breathing short, imperfect, laborious; while the heart fluttered feebly. She was sufficiently sensible to tell how the accident occurred. In an attempt to administer an emetic a strong convulsion occurred. Copious vomiting afterwards took place. Five hours after she had taken the poison the pulse was becoming full, only 58 per minute, and intermitting. There was less oppression at the præcordia, and the pupils were larger. She eventually recovered. These cases agree with the one detailed in the *Philosophical Transactions*. Pallas (quoted by Christison) and Delgland have published cases in which violent vomiting, purging, colic, and abdominal tenderness are said to have been produced by aconite [?].

In comparing the operation of aconite with that of other cerebro-spinants, we observe that its most characteristic topical effect is *numbness and tingling*. Applied to the eye, it causes *contraction of the pupil*. When the root or its tincture is swallowed, the most marked symptoms are *numbness and tingling of the parts about the mouth and throat, and of the extremities, vomiting, contracted pupil, and failure of the circulation*. The heart appears to be weakened or paralyzed, and a state approaching to asphyxia is produced. *Convulsion* or *spasm* is not constantly present, and, when it does take place, is probably a secondary effect arising from the incipient asphyxia. In neither of the cases which I have above detailed, nor in that of Mr. Sherwen, did *stupor* occur. Yet in some recorded instances it has happened. In such it probably depends, as Mr. Sherwen suggests, on the congested condition of the venous system of the brain brought on by the failure of the heart's action, and the consequent accumulation of blood on the right side of the heart. According to M. Scroff, the pupil is not commonly contracted in cases of poisoning by this plant. In a paper from which we have already made a quotation, this experimentalist states that aconite in general, but especially aconitia, applied to the exterior of the eye, or given internally in sufficient quantity, produces a *dilatation of the pupil*, a result which is opposed to the opinion generally entertained by pharmacologists. Further, he remarks that aconite as well as aconitia appears to have an elective and special action upon the trigeminal nerve. They produce in all the sensorial ramifications of this nerve peculiar sensations, often of a painful kind. Aconite and aconitia produce an extraordinary increase in the secretion of urine. Aconite, as well as aconitia, exerts a strongly depressive influence on the action of the heart and large vessels. This is observed either immediately, or after a short acceleration of the heart's action. This depressing effect is persistent, and consequently differs from the effects produced by atropia and daturia. These alkaloids, given in a much larger dose than aconitia, cause an acceleration of the pulse beyond the normal condition, although this is preceded by a short interval in which the pulsations are diminished.

[In poisoning from aconite, the indications are to evacuate the stomach and bowels, if there be any suspicion of any of the drug still remaining in them, and to stimulate powerfully so as to overcome the depressing effect of the poison. For the latter purpose brandy and ammonia should be exhibited, and external dry heat and friction may be employed. In a case which occurred in the Philadelphia Hospital during my residency, Dr. Girvin exhibited laudanum in large doses, combined with brandy, with the happiest effect.—W.]

*Therapeutics.*—A knowledge of the physiological effects of aconite suggests the therapeutical uses of this medicine. A benumber is obviously the physiological remedy for increased sensibility (pain) of the nerves. As a *topical remedy*, aconite is most valuable for the relief of neuralgic and rheumatic pains. In *neuralgia*, no remedy, I believe, will be found equal to it. One application of the tincture produces some amelioration, and, after a few times' use, it frequently happens that the patient is cured. In some cases the benefit seems almost magical. In others, however, the remedy entirely fails to give any permanent relief. I do not think that in any it proves injurious. The causes of neuralgia are, however, usually obscure, and therefore we are in most cases not able to determine *à priori* the probability or the reverse of the beneficial agency of aconite. Hence its employment must be, for the most part, empirical. I have observed, that when it succeeds, it gives more or less relief at the first application. When the disease depends on inflammation, aconite will be found, I think, an unavailing remedy. In a painful affection of the nerves of the face, arising from inflammation of the socket of a tooth, it gave no relief. In *rheumatic pains*, unaccompanied with local swelling or redness, aconite is frequently of great service. In painful conditions of the intercostal and other respiratory muscles, occurring in rheumatic individuals, I have found this remedy most valuable. In one case of *sciatica* it gave partial relief; but in most cases in which I have tried it, it has failed. In *acute rheumatism* its application has not proved successful in my hands; but I have been informed of cases occurring to others in which it has been of great service. Aconite has been administered *internally* in various diseases, principally on the recommendation of Störck. It has been employed with most success in *rheumatism* and *dropsies*.

*Administration.*—The *powder* is given in doses of one or two grains, gradually increased, until some effects are produced; but no reliance can be placed on it. When of good quality, it causes numbness and tingling of the lips and tongue a few minutes after its application to these parts. The *tincture* is the most reliable preparation

*Officinal Preparations.*

1. *Of Aconitum:*—

[Tinctura Aconiti Folii, U. S., *Tincture of Aconite Leaf.* Tinctura Aconiti Foliorum, *Pharm.*, 1850.—"Take of aconite leaf, recently dried and in fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with two fluidounces of diluted alcohol, pack it firmly in a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S. Dose, gtt. xv–xxv, administered in water.—W.]

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 coloring 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 coloring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence.

When of good quality, it causes numbness and tingling, within a few minutes after its application, in the mouth and lips.

*Dose.*—One or two grains at the commencement, to be gradually increased until some obvious effect is produced.

[Extractum Aconiti Alcoholicum, U. S., *Alcoholic Extract of Aconite.*—"Take of aconite leaf, recently dried and in fine powder, twelve troyounces; alcohol a pint; diluted alcohol, a sufficient quantity. Introduce the powder, previously mixed with one-third of the alcohol, into a conical percolator, and pour upon the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour on diluted alcohol until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol until two pints more of tincture have passed, or until the powder is exhausted; then evaporate, by means of a water-bath, at a temperature not exceeding 160°, to the consistence of syrup, and add the three fluidounces of tincture first obtained. Lastly, continue the evaporation, at a temperature not exceeding 120°, until the whole is reduced to the proper consistence." U. S. Dose, gr. $\frac{1}{2}$ to $\frac{3}{4}$.—W.]

2. *Of Aconiti Radix:—*

Linimentum Aconiti, *Liniment of Aconite.*—Take of aconite root, in powder, twenty ounces; camphor, one ounce; rectified spirit, thirty fluidounces, or a sufficiency. Moisten the aconite root with a portion of the spirit, and macerate for seven days; then percolate into a receiver containing the camphor, until the product amounts to one pint.

A new and valuable preparation of aconite for external use. When intended to be used in a diluted form it may be mixed with soap liniment. It is invaluable in rheumatism and neuralgia.

Tinctura Aconiti, *Tincture of Aconite.*—Take of aconite root, in fine powder, two ounces and a half; rectified spirit, one pint. Macerate the aconite root for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. This tincture has one-fourth of the strength of Tinctura Aconiti, *Dub.*, and about one-third of the strength of Tinctura Aconiti, *Lond.*

*Dose.*—From five minims to fifteen minims or more, gradually increased, as its use requires great caution.

[Tinctura Aconiti Radicis, U. S., *Tincture of Aconite Root.*—"Take of aconite root, in fine powder, twelve troyounces; alcohol, a sufficient quantity. Moisten the powder with six fluidounces of alcohol, pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it until two pints of tincture are obtained." U. S. This preparation is a saturated tincture, about three times the strength of the British tincture of aconite. In prescribing the tincture of aconite root or leaves, physicians should be careful to give the name in full, so that the dispenser cannot mistake which they desire. Dose, gtt. ij—v, administered in water.—W.]

## **Aconitia** [U. S.], *Aconitia.*

An alkaloid, $C_{60}H_{47}NO_{14}$, obtained from aconite root.

*Preparation.*—Take of aconite root, in coarse powder, fourteen pounds; rectified spirit, a sufficiency; distilled water, a sufficiency; solution of ammonia, a sufficiency; pure ether, a sufficiency; dilute sulphuric acid, a sufficiency. Pour upon the aconite root three gallons of the spirit, mix them well, and heat until ebullition commences; then cool and macerate for four days. Transfer the whole to a displacement apparatus. and percolate, adding more spirit, when requisite, until the root is exhausted. Distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water-bath until the whole of the alcohol has been dissipated. Mix the residual extract thoroughly with twice its weight of boiling distilled water, and when it has cooled to the temperature of the atmosphere, filter through paper. To the filtered liquid add solution of ammonia in slight excess, and heat them gently over a water-bath. Separate the precipitate on a filter, and dry it. Reduce this to coarse powder, and macerate it in successive portions of the ether with frequent agitation. Decant the several products, mix, and distil off the ether until the extract is dry. Dissolve the dry extract in warm distilled water acidulated with the sulphuric acid; and, when the solution is cold, precipitate it by the cautious addition of solution of ammonia diluted with four times its bulk of distilled water. Wash the precipitate on a filter with a small quantity of cold distilled water, and dry it by slight pressure between folds of filtering paper. [" Take of aconite root, in moderately fine powder, forty-eight troyounces; diluted sulphuric acid, a fluidounce and a half; alcohol, stronger water of ammonia, stronger ether, distilled water, each, a sufficient quantity. Digest the powder in eight pints of alcohol, in a close vessel, at the temperature of 120°, for twenty-four hours. Introduce the mixture into a cylindrical percolator, and gradually pour alcohol upon it until twenty-four pints of liquid have slowly passed. Distil off the alcohol from the filtered liquid until this is reduced to the measure of a pint. Then add to the concentrated liquid a pint of distilled water, to which has been added the diluted sulphuric acid, and mix thoroughly. Remove from the liquid the fixed oil and resin which separate on standing, and evaporate it to four fluidounces. When the liquid has cooled, pour it into a glass-stoppered pint bottle, and wash it, by agitation and decantation, with six fluidounces of stronger ether, to remove the remainder of the fixed oil and resin. Now add stronger water of ammonia until, after agitation, it remains in slight excess. Next, treat the resulting mixture with six fluidounces of stronger ether, and, having closed the bottle, agitate briskly for a few minutes. Allow the liquid to stand until it separates into two layers, the lighter being an ethereal solution of aconitia. Decant this carefully, and treat what remains, twice successively, with the same quantity of stronger ether, decanting each time as before. Mix the several ethereal solutions in a porcelain capsule, and allow the mixture to evaporate spontaneously to dryness. Lastly, reduce the dry residue to powder, and keep it in a well-stopped bottle." U. S.]

*Officinal Characters.*—A white usually amorphous solid, soluble in 150 parts of cold, and 50 of hot water, and much more soluble in alcohol and in ether; strongly alkaline to reddened litmus, neutralizing acids, and precipitated from them by the caustic alkalies, but not by carbonate of ammonia or the bicarbonates of soda or potash. It melts with heat, and burns with a smoky flame. When rubbed on the skin it causes tingling, followed by prolonged numbness. It is a very active poison.

*Description.*—Aconitia is extremely light, is in the state of hydrate, and contains 20 per cent. of water; at 187° F. it melts and becomes anhydrous, and is then a transparent amber-colored substance; at a higher temperature it is decomposed, without being sublimed; vapors of ammonia only being given off. It has no smell, but a bitter followed by a pungent taste; not, however, producing the strong and durable tingling hot sensation perceived when the plant itself is masticated—a fact which has led Geiger to believe that the peculiar taste is derived from some substance like ammonia combined with aconitia in the plant. [" It requires 150 parts of cold and 50 of boiling water for solution, and is readily dissolved by alcohol, ether, and chloroform." U. S.] It is soluble in alcohol, ether, and the acids. From its acid solution it is precipitated by ammonia. A minute portion of it mixed with lard, and applied to the eye, causes *contraction* of the pupil. It is the most virulent poison known, not excepting hydrocyanic acid. Aconitia is dissolved by concentrated nitric acid without change. Strong sulphuric acid colors it at first yellow and then of a dirty violet red. It is more soluble in ether than in alcohol. A diluted solution of it is precipitated by tincture of iodine, tincture of galls, the chlorides of gold and mercury, but not by chloride of platinum. Iodohydrargyrate of potassium gives a curdy yellowish-white precipitate, picric acid produces a dense yellowish precipitate insoluble in ammonia. Aconitia is completely neutralized by acids forming salts soluble in water and alcohol, but not procurable in a crystalline state. In a dry state they have a gummy consistency, a slightly bitter taste, and present in solution the same reactions as the pure alkaloid. Aconitia is precipitated from them by potash and ammonia, but not by bicarbonate of soda or carbonate of ammonia. They are poisons of tremendous power.

*Tests.*—Dissolves entirely in pure ether; leaves no residue when burned with free access of air.

*Physiological Effects and Uses.*—The effects of this alkaloid are similar to those of aconite root, but of course much more powerful. If the ointment be rubbed on the skin, it causes intense heat, tingling, and numbness, which continue for more than twelve or eighteen hours. A minute portion of the ointment applied to the eye, causes almost insupportable heat and tingling, and contraction of the pupil. In very minute doses it has caused heat and tingling upon the surface of the body, and sometimes diuresis; but it cannot be administered internally with safety. In one case (an elderly lady), one-fiftieth of a grain had nearly proved fatal. I believe that the tincture of aconite is a perfect substitute for it, and the experience of others confirms my own observation. Of the great efficacy of aconitia, used externally, in neuralgic and rheumatic affections, no one can entertain any doubt who has submitted the remedy to trial.

*Administration.*—It is used as an external application.

### *Officinal Preparation.*

UNGUENTUM ACONITIÆ, *Ointment of Aconitia.*—Take of aconitia, eight grains; rectified spirit, half a fluidrachm; prepared lard, one ounce. Dissolve the aconitia in the spirit, add the lard, and mix thoroughly.

A valuable application in rheumatic and neuralgic pains. Care must be taken not to employ it where the skin is abraded.

## PODOPHYLLUM PELTATUM, *Linn.*

### May-Apple.

Polyandria Monogynia, *Linn. Syst.*

*Botanic Character.*—Perennial *herb.* *Rhizome* creeping, usually some feet in length, enlarged at intervals into irregular more or less rounded tuberosities, from which the rootlets arise. *Stem* erect, annual, smooth, 8–12 inches high, bearing at its summit two dichotomously arranged leaves which are placed on petioles from 2–4 inches long, and a solitary flower in the fork thus produced. *Leaves* peltate, 5–7-lobed; *lobes* wedge-shaped, oblong, 2-toothed or bifid at the apex. *Flower* white; *peduncle* recurved. *Calyx* with 3 sepals. *Stigma* large, sessile. *Fruit* about the size of an egg, yellow, nearly oval, and crowned by the persistent peltate stigma, 1-celled, fleshy, indehiscent, and containing about 12 seeds.—*Bot. Mag.* pl. 1819.

*Habitat.*—May-apple is common throughout the United States of America, extending from New England to Georgia, growing in low moist shady woods, or in low newly-cleared ground, and generally in marshy situations.

**Podophyllum,** *Podophyllum.* [Mat. Med. List, U. S. P.]

The root, dried; imported from North America.

*Officinal 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-gray, sweetish in odor, bitterish subacrid and nauseous in taste.

Fig. 221.

*Podophyllum peltatum.*

The root (rhizome) is introduced into the pharmacopœia solely for the preparation of the resin of Podophyllum.

*Description.*—The following description is abridged from a detailed account of Podophyllum peltatum, by Professor Bentley, in the *Pharmaceutical Journal*, vol. iii. 2d ser. p. 457. Podophyllum root, as it is commonly termed, is in reality a rhizome, from which the true rootlets arise below. In commercial specimens these rootlets are sometimes absent altogether, but more commonly they are present in varying proportions, in which case they are either separated from and mixed in a loose state with the rhizomes, or firmly attached to them at the tuberosities. The *rhizome*, as imported, is either simple or branched. In length it varies from about an inch to six or eight inches, or even more. It is from two to four lines thick, averaging about that of a common goose-quill. At intervals, when not much broken up, the rhizome presents large irregular more or less flattened tuberosities, from the lower surface of which the rootlets arise, or, when they are detached, their position is marked by whitish more or less projecting scars. In form the rhizome presents a rounded or more or less flattened appearance. The rounded portions are firm in texture, reddish or blackish-brown in color externally, interspersed with lighter colored markings, and nearly smooth. The flattened portions are more or less spongy in texture, lighter colored, being of a reddish yellow-brown, and much wrinkled longitudinally. The rhizome breaks short, smooth, and close. The *rootlets* vary in length, in some cases being two or more inches; and in size averaging about that of a common knitting-needle. Externally they present a nearly smooth appearance, and are lighter colored than the rhizomes, being yellowish-red rather than reddish-brown. Their fracture is short and smooth. Both the rootlets and rhizome are easily reduced to powder, which is of a yellowish-gray color, not very unlike that of jalap. The taste of both the rhizome and rootlets is at first somewhat sweetish, but afterwards, by chewing, nauseous, slightly acrid, narcotic, and bitter. The odor is somewhat narcotic (in some specimens very strongly so), more especially when moistened with warm water.

*Composition.*—Podophyllum has been frequently analyzed, but with somewhat conflicting results. The most important constituents are two resinous principles (see **Podophylli Resina**). Besides these resinous principles, the alkaloid berberia, together with another alkaloid, and saponine, have been recently discovered by Mayer in Podophyllum.

[Extractum Podophylli, U. S., *Extract of May-apple.*—"Take of May-apple, in moderately fine powder, twelve troyounces; alcohol, four pints; water, a sufficient quantity. Introduce the powder, previously mixed with three fluidounces of alcohol, into a conical percolator, and pour upon it the remainder of the alcohol. When the tincture ceases to pass, pour gradually upon the powder sufficient water to keep its surface covered, until four pints of tincture have passed. Set this aside, and continue the percolation until six pints of infusion have been obtained. Distil off the alcohol from the tincture, and evaporate the infusion, until the liquids respectively have been brought to the consistence of thin honey; then mix them, and evaporate to the proper consistence." U. S. Dose, gr. iv to viij.—W.]

## **Podophylli Resina.** [**Resina Podophylli**, U. S.]
*Resin of Podophyllum.*

A resin obtained from podophyllum, by means of rectified spirit.

*Preparation.*—Take of podophyllum, in coarse powder, one pound; rectified spirit, three pints, or a sufficiency; distilled water, a sufficiency; hydrochloric acid, a sufficiency. Exhaust the podophyllum with the spirit by percolation; place the tincture in a still, and draw off the spirit. Acidulate the water with one twenty-fourth of its bulk of hydrochloric acid, and slowly pour the liquid which remains after the distillation of the tincture into three times its volume of the acidulated water, constantly stirring. Allow the mixture to stand for twenty-four hours to deposit the resin. Wash the resin on a filter with distilled water, and dry it on a stove. ["Take of May-apple, in fine powder, sixteen troyounces; alcohol, water, each, a sufficient quantity. Moisten the May-apple with four fluidounces of alcohol, pack it firmly in a cylindrical percolator, and gradually pour alcohol upon it until four pints have passed, or until the filtered liquid ceases to occasion turbidness when dropped into water. Reduce the tincture to half a pint by distilling off the alcohol, mix the residue with four pints of water, separate the precipitate formed, wash it thoroughly with water, and dry it with a gentle heat." U. S.]

*Officinal Characters.*—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.

*Properties.*—The resin is said to be composed of two resinous substances, one of which, according to Lewis, is soluble in alcohol and insoluble in ether, and the other, constituting four-fifths of the whole, soluble in both alcohol and ether. There is some difference of opinion in North America as to the relative medicinal activity of these two resins, for while Lewis found both to possess purgative properties, the experiments of Mr. Harvey Allen led him to regard the resin which was soluble in both alcohol and ether as alone possessing active purgative properties. In the British Pharmacopœia, as the resin obtained from podophyllum by means of rectified spirit is alone officinal, if the presence of two resinous principles be confirmed of different degrees of activity, the Pharmacopœia preparation will contain them both, as they are both soluble in alcohol.

*Test.*—Almost entirely soluble in pure ether.

[Resin of May-apple is partly soluble in ether, and the residue, when dissolved in officinal solution of potassa, is precipitated by the addition of dilute muriatic acid in excess. U. S. Ph.]

*Physiological Effects and Uses.*—In America, podophyllum and its preparations, and more especially that of the resin under the name of *podophyllin*, have long established their reputation as active and certain cathartics. Wood and Bache describe podophyllum resin as an "active and certain cathartic, producing copious liquid discharges without much griping, or other unpleasant effect. In some cases it has given rise to nausea and even vomiting, but the same is occasionally experienced from every active cathartic. Its operation resembles that of jalap, but is rather slower, and is thought by some to be more drastic. It is applicable to most inflammatory affections which require brisk purging, and is much employed in various parts of the country, especially combined with calomel, in bilious fevers and hepatic congestions. It is also frequently used in connection with acid tartrate of potash, in dropsical, rheumatic, and scrofulous complaints. In minute doses, frequently repeated, podophyllum is said to diminish the frequency of the pulse, and to relieve cough; and for these effects is sometimes given in hæmoptysis, catarrh, and other pulmonary affections." Many American physicians consider that they can use it with perfect safety and confidence, in all cases where mercury is indicated, as they say it produces all the good and none of the evil effects of mercurial preparations. The resin of podophyllum has also been very extensively employed for some years in this country and in other parts of the world, and is now, by almost universal testimony, regarded as a most valuable cathartic and cholagogue. In many cases it is applicable with perfect safety where mercury has been hitherto indicated and alone used. The griping effects which are frequently experienced by its use may be readily prevented by combining it with small doses of extract of hyoscyamus. In America, the resin dissolved in alcohol has been employed as a counter-irritant. Resin of podophyllum should be handled with care, as, should any particles come in contact with the interior of the eyes or nose, it will cause severe inflammation.

*Administration.*—Podophyllum has been given in powder, in doses of from twenty grains to thirty grains; but the resin is by far the best mode of administration. The *dose* of the latter is from a quarter of a grain to half a grain or one grain.

[One-eighth of a grain of good podophyllin will generally act decidedly; one-half of a grain acts violently.—W.]

## [HELLEBORUS NIGER.

### Black Hellebore.

*Generic Character.*—*Calyx* persistent, of five sepals; sepals roundish, obtuse, large, usually green. *Petals* eight to ten, very short, tubular, narrow, and nectariferous beneath. *Stamens* thirty to sixty-four. *Ovaries* three to ten. *Stigmas* terminal, orbicular. *Capsules* coriaceous. *Seeds* in a double row, elliptical, umbilicated. (De Cand.)

Fig. 222.

*Helleborus niger.*

*Specific Character.*—*Leaves* radical, pedatisect, quite smooth. *Scape* leafless, one to two-flowered, bracteated. (De Cand.)

*Rhizome* several inches long, tuberculated, horizontal, scaly, blackish-brown externally, white internally, with many dependent, long, simple root-fibres. *Leaves* on cylindrical stalks from four to eight inches long; lobes ovate-lanceolate, serrate near the point. *Scape* shorter than the petiole. *Sepals* ovate or roundish, large, white, slightly tinged with pink, eventually becoming green. *Petals* green, tubular, shorter than the stamens. *Follicles* many-seeded. *Seeds* black, shining.

*Habitat.*—Sub-alpine, woodland regions in the midland and southern parts of Europe.

### **Helleborus.** Mat. Med. List, U. S. P.

The root of Helleborus niger.

The root met with in commerce under the name of black hellebore root (*radix hellebori nigri*, seu *radix melampodii*) consists of two parts —the rhizome or rootstock, and the fibres which arise from it. The rhizome is half an inch or less thick, several inches long, horizontal or contorted, knotty, with transverse ridges and slight longitudinal striæ. The fibres are numerous, cylindrical, dark-brown externally, internally whitish or yellowish-white, with a central paler cord. The odor is very feeble, and scarcely perceptible, but has been compared to that of senega root. Its taste is slight at first, then bitterish, acrid, and nauseous.

It is probable that the roots of *Helleborus viridis* and *fœtidus* are sometimes substituted for, or intermixed with, black hellebore root. This practice certainly occurs on the continent. The root of *Actæa spicata* (sometimes called *radix hellebori nigri falsi*) is also said to be occasionally substituted for the genuine root; its stronger fibres, when cut transversely, present the form of a cross. As far as I have observed, the roots sold in this country as black hellebore have a very uniform appearance, and from this I have not had reason to suspect any intermixture of other roots.

It is not entirely certain upon what constituent the hellebore depends for its therapeutic powers. There have been obtained from it, beside several unimportant substances, a volatile oil, an acrid fixed oil, various resins, bitter extractive, and a peculiar crystalline nitrogenous, neutral principle, to which the name of *helleborin* has been given. The root yields its virtues to both water and alcohol.

*Therapeutics.*—In over-dose, black hellebore acts as a very irritating emeto-cathartic, producing great irritation and even fatal inflammation of the gastro-intestinal mucous membrane. At the same time it affects the nervous system, causing cramps, convulsion, paralysis, and insensibility. Given in *small doses*, it increases the secretion and peristaltic motion of the intestines, and acts as a stimulant to the pelvic circulation, thereby promoting the menstrual and hemorrhoidal discharges, and, by its influence over the portal circulation, contributing probably to increase the hepatic secretion. *Large doses* act as a drastic purgative, and frequently also occasion sickness. They produce a more manifest influence over the pelvic vessels, often cause cold sweats, and lower the strength of the pulse.

The fresh root, when applied to the skin, produces vesication and inflammation. Black hellebore has been extensively used in melancholia, epilepsy, dropsy, various cutaneous diseases, verminous affections, and amenorrhœa. It has, however, almost entirely gone out of use except as a stimulant emmenagogue, in cases of torpid, phlegmatic females in whom the pelvic circulation is languid.

The dose of the powdered root, as an alterative and emmenagogue, is from two to five grains; as a drastic purge, ten to fifteen grains. The extract is, however, a preferable form for exhibition.

Extractum Hellebori Alcoholicum, *Alcoholic Extract of Black Hellebore.* Extractum Hellebori, *Pharm.*, 1850.—"Take of black hellebore, recently dried and in fine powder, twelve troyounces; alcohol, a pint; diluted alcohol, a sufficient quantity. Introduce the powder, previously mixed with one-third of the alcohol, into a conical percolator, and pour upon it the remainder of the alcohol. When the liquid has all been absorbed by the powder, pour on diluted alcohol until a pint of tincture has been obtained. Set this aside in a warm place, and allow it to evaporate spontaneously until reduced to three fluidounces. Continue the percolation with diluted alcohol until two pints more of tincture have passed, or until the powder is exhausted; then evaporate, by means of a water-bath, at a temperature not exceeding 160°, to the consistence of syrup. To this add the three fluidounces of tincture first obtained, and continue the evaporation, at a temperature not exceeding 120°, until the whole is reduced to the proper consistence." U. S.

Dose, as an emmenagogue, gr. j to ij, in pill t. d.; as a purgative, gr. v to viij.

TINCTURA HELLEBORI, U. S., *Tincture of Black Hellebore.*—"Take of black hellebore, in moderately fine powder, four troyounces; diluted alcohol, a sufficient quantity. Moisten the powder with a fluidounce of diluted alcohol, pack it in a cylindrical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S.

Dose, gtt. xxv to f℥j.—W.]

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## [COPTIS TRIFOLIA, *Salisb.*

### Gold Thread.

*Generic Character.*—*Sepals* five to six, petaloid, deciduous. *Petals* five to six. *Stamens* fifteen to twenty-five. *Follicles* five to ten, on long stipes, somewhat stellately diverging, membranaceous, ovate oblong,

Fig. 223.

*Coptis trifolia.*

pointed with the style, four to eight-seeded. *Herbs* with radical, divided, subcoriaceous leaves, and very slender, extensively creeping roots.

*Specific Character.*—*Leaves* three-foliate; *leaflets* cuneiform-obovate, crenately and mucronately toothed, obscurely three-lobed; *scape* one-flowered. *Roots* consisting of long bright-yellow fibres, intensely bitter. *Leaves* evergreen; *leaflets* about an inch long. *Scape* slender, three to five inches high. *Sepals* five to seven, oblong, obtuse, white. *Petals* much shorter than the sepals, yellow at base. *Carpels* acuminated with the persistent style. *Seeds* oblong, black, and shining; *raphe* very indistinct. (Torry and Gray, *Flor. of North Amer.* i. 28.)

*Habitat.*—This plant is found in mountain bogs, from Greenland and Labrador to Pennsylvania.

**Coptis,** *Gold Thread.* Mat. Med. List, U. S. P.

The root of Coptis trifolia.

The root is brought into the market in the dried state. It is filamentous, threadlike, and of a deep golden-yellow color, very brittle. The fibres are usually commingled with the leaves of the plant. By the Shakers, the whole plant appears to be compressed into the square form. It has no odor; the taste is bitter without astringency.

*Therapeutics.*—This article of the Materia Medica is ranked among the pure bitters, as its medicinal properties appear solely to depend upon a bitter extractive matter. It may be employed as a tonic under circumstances calling for the exhibition of such remedies, and may be ranked with *sabattia* and that class of articles, acting as a stomachic, improving the appetite, &c. It is not as powerful as gentian, quassia, and other pure bitters. In the treatment of aphthous sore mouths of children, it has been used as a local application in New England.

The mode of employment may be in the form of *infusion*, which may be made in the proportion of ℥ss to Oj of water. Dose, f℥j to f℥ij.

A *tincture* is made by macerating ℥j of the root in Oj of alcohol. Dose, fʒj to fʒij.

The dose of the powder is gr. xx to ʒj. An extract might be prepared.—W.]

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## [CIMICIFUGA RACEMOSA.

### Black Snakeroot.

*Generic Character.*—Sepals 4 or 5, falling off soon after the flower expands. Petals, or rather transformed stamens, 4–8, small on claws, 2 horned at the apex. Stamens numerous, with slender white filaments. Pistils 1–8, forming dry dehiscent pods in fruit. Perennials.

*Specific Character.*—Racemes very long; pistils 1–3; seeds smooth, flattened and packed horizontally in the pod in two rows; pods ovoid, sessile; stigma broad, flat.

*Habitat.*—This plant is known by the names of *Tall Snakeroot*, *Black Snakeroot*, and *Rich Weed.* It often attains the height of 7 feet. Its size and the long white racemes of flowers make it a conspicuous ornament of our woods.

It is abundant in open woods and on hillsides throughout the United States, from Canada to Florida. It flowers in June and July.

**Cimicifuga,** *Cimicifuga.* Mat. Med. List, U. S. P.

The root of Cimicifuga racemosa (Torrey & Gray).

The root as found in the shops is composed of a rough tuberculated head and numerous radicles, seven inches long, of a black color externally, white internally. The radicles are extremely brittle and liable to be separated. The odor is feeble and earthy; the taste bitter and astringent, leaving an impression of acrimony upon the palate. The sensible properties depend upon the time when the root is collected, and the mode of drying and preserving it. It should be collected late in the summer, or in the autumn.

Analysis has detected in black snakeroot, fatty matter, gum, starch, resin, sugar, tannic and gallic acid, and various unimportant substances. Prof. Geo. B. Wood thinks that the active principle is some unknown

Fig. 224.

*Cimicifuga racemosa.*

volatile substance, since the dried root is not nearly so efficacious as the fresh; and, indeed, a volatile oil has been found in it by Mr. George H. Davis.

*Therapeutics.*—A nervous stimulant tonic and rather feeble antispasmodic. Very numerons and diverse remedial powers have been claimed for cimicifuga. According to the late Prof. Barton, it is astringent, but this does not seem to be confirmed by later investigators. Dr. Chapman states that he has never been able to discover the astringent action in any great degree, but that it is "expectorant, narcotic, antispasmodic, diaphoretic, and in large doses emetic. Given so as to affect sensibly the system, we find, first, some nausea, followed by greater freedom of expectoration, and more or less relaxation of surface, with slight nervous tremors and vertiginous affection. The pulse during this state is considerably lowered, and is apt to remain so for some time." (*General Therapeutics.*) Most experimenters agree in its producing a decided impression on the nervous system, when taken in large doses; but some state that it increases the force and frequency of the pulse. It probably occasionally proves serviceable in chronic catarrh of the bronchi, by stimulating the mucous membrane and promoting healthy expectoration. The evidence of a favorable action in rheumatism is of a decided character. In the wards of Professor Dunglison, at the Philadelphia Hospital, it has been used with benefit. He states that when pushed so as to produce catharsis, and even slight narcosis, it certainly appeared to be of service in the acute forms.

Dr. Young was the first to call attention to its value in chorea, and his statements have been fully confirmed by Prof. George B. Wood. There can be no doubt that it is an exceedingly valuable medicine in this disease, sometimes curing patients on whom other remedies have failed. It is best administered along with iron and other tonics, but often suffices of itself. Care should always be taken to have a good article, as much of it, as kept in the shops, is probably inert. The taste of its goodness is to be looked for in its freshness, taste, and odor. It is at present very rarely used in any other affection.

Dose, gr. xx to ʒj.

Extractum Cimicifugæ Fluidum, U. S., *Fluid Extract of Cimicifuga.*—"Take of cimicifuga, in fine powder, sixteen troyounces; stronger alcohol, a pint and a half; diluted alcohol, a sufficient quantity. Moisten the cimicifuga with four fluidounces of the stronger alcohol, introduce it into a conical percolator, pour upon it the remainder of the stronger alcohol, and, when the whole of this has entered the powder, gradually add diluted alcohol until a pint and a half of tincture have passed. Set this aside, in a shallow vessel, in a warm place, until reduced by spontaneous evaporation to twelve fluidounces. Continue the percolation with diluted alcohol, until two pints more of tincture have been obtained. Evaporate this, by means of a water-bath, at a temperature not exceeding 150°, to four fluidounces; then add the tincture first obtained very gradually so as to avoid the precipitation, allow the mixture to stand for twenty-four hours, and filter through paper." U. S.

This is an excellent preparation, a fluidounce of which represents very thoroughly a troyounce of the root. Dose, fʒss to fʒj.

There are several other plants belonging to the Ranunculaceæ, which are officinal in the Secondary List of the U. S. Ph., but are of so little importance—are so seldom used—as to deserve only a passing notice. Under the name of *Delphinium*, the seeds of the *Delphinium consolida*, or European larkspur, are recognized. These are an acrid emetocathartic, with some tendency to act on kidneys. They have been used in dropsy. They may be given in tincture (℥j–Oj). Dose, gtt. x, gradually increased till some effect is produced.

Most of the species of the genus *Ranunculus*, the buttercups. are pervaded by an acrid, volatile principle, which irritates and even vesicates the skin when brought in contact with it. The U. S. Ph. recognizes in its secondary list the common field buttercup, (*R. bulbosus*) under the name of *ranunculus*. The plant may be recognized by the bulbous base of its stem, its bright yellow petals, globular head of carpels, and its thrice divided leaves with the lateral division sessile, the terminal stalked. *R. acris*, which wants the bulbous base, and has its leaf divisions all sessile, is probably just as active. Both the herb and root are officinal; they are not used internally, but externally, as counter-irritants and vesicants. They must be in the fresh state, and even then their action is very uncertain; sometimes they produce no impression, sometimes they speedily excite an obstinate, severe form of inflammation; for this reason they are very rarely employed.

Fig. 225.

*Ranunculus acris.*

Fig. 226.

*Hepatica triloba.*

The leaves of the *Hepatica triloba*, or liverwort, are also officinal under the name of *Hepatica*. The plant is abundant in our woods, and is easily recognized by its smooth, thick cordate leaves, which are green above and purplish beneath, and are supported on long hairy petioles, which, with the scapes, or flower-stalks, spring directly from the ground, the plant being stemless or acaulescent. The flowers appear very early in the spring, are small, and of a whitish or purplish color. The leaves are mucilaginous and very slightly astringent; they were formerly much used in domestic practice in chronic coughs, but have fallen into entire neglect. Their infusion may be taken *ad libitum*.

The root of the *Hydrastis Canadensis*, or yellow puccoon, is also recognized under the name of hydrastis. It is said to be much employed by the Indians as a yellow dye. If it has any medicinal powers, they do not appear as yet to have been determined. The plant may be distinguished by its knotted yellow rhizome, its single radical leaf, its short hairy stem with two large cordate, rounded, 5–7-lobed leaves and single greenish-white flower.

Fig. 227.

*Hydrastis Canadensis.*

The root of *Xanthorrhiza apiifolia*, or yellow-root, is also recognized under the name of *xanthorrhiza*. It is a shrubby plant, with long yellow roots, and bitter yellow bark. Its flowers are in compound drooping racemes, of a dull purple color, and appear early in the spring. It is a simple bitter tonic.—W.]

# PRODUCTS OF FERMENTATION.

## Cerevisiæ Fermentum, *Beer Yeast.*

**[Fermentum,** *Yeast.* Mat. Med. List, U. S. P.]

The ferment obtained in brewing beer. ["A peculiar insoluble product of the fermentation of malt liquors." U. S.]

*Officinal Characters.*—Viscid, semifluid, frothy, exhibiting under the microscope numerous round or oval confervoid cells.

Yeast, or ferment, is generally considered to consist essentially of the sporules of Torula cerevisiæ, whose vegetation is the immediate cause of the metamorphosis of the sugar.

*Therapeutics.*—As a medicine, yeast has been used both internally and externally. Internally it has been administered as a tonic and antiseptic in typhoid fevers. Dr. Stoker states that it usually acts as a mild laxative, improves the condition of the alvine evacuations, and is more effectual in removing petechiæ and black tongue than any other remedy. The dose of it is two tablespoonfuls every third hour, with an equal quantity of camphor water. Enemata of yeast and assafœtida are said by the same writer to be efficacious against typhoid tympany. Externally it is used in the form of poultice.

*Pharmaceutic Use.*—Used in the preparation of citric acid.

*Officinal Preparation.*

Cataplasma Fermenti, *Yeast Poultice.*—Take of beer yeast, six fluidounces; flour, fourteen ounces; water, heated to 100°, six fluidounces. Mix the yeast with the water; and stir in the flour. Place the mass near the fire till it rises.

It is applied, when cold, to fetid and sloughing sores as an antiseptic and stimulant; it destroys the fetor, often checks the sloughing, and assists the separation of the dead part. It should be renewed twice or thrice a day. I have frequently heard patients complain of the great pain it causes. The carbonic acid is supposed to be the active ingredient.

## ALCOHOL.

*Preparation.*—The preparation of alcohol may be divided into three stages: the production of a fermented vinous liquor; the preparation from this of an ardent spirit by distillation; and lastly, rectification or purification.

1. *Vinous Fermentation.*—To produce a vinous liquid it is necessary that there be present sugar (or some substance capable of forming sugar, as starch), a certain quantity of water, a proper temperature, and a ferment, usually yeast. Both grape and cane sugar yield alcohol by fermentation. It is highly probable, however, that cane sugar, before it undergoes vinous fermentation, is converted into grape sugar by contact

with the ferment; and that, consequently, it is grape sugar alone which yields alcohol and carbonic acid. $C_{12}O_{12}H_{12}=4CO_2+2(C_4H_5O,HO)$. Vinous fermentation, then, is the metamorphosis of sugar into alcohol and carbonic acid by means of ferment.

[**Vinum Portense**, *Port Wine.*

Vinum Xericum, *Pharm.*, 1850. Mat. Med. List, U. S. P.]

**Vinum Xericum**, *Sherry.* [Mat. Med. List, U. S. P.

Vinum album, *Pharm.*, 1850.]

A Spanish wine.

*Manufacture of Wine.*—The expressed juice of the grape, called *must*, readily undergoes the vinous fermentation when subjected to a temperature of between 60° and 80° F. It becomes thick, muddy, and warm, and evolves carbonic acid gas. After a few days this process ceases; the thick part subsides, the liquid becomes clear, and is then found to have lost its sweet taste, and to have become vinous. The wine is now drawn off into casks, where it undergoes further changes. It is then racked off into other casks, where it is subjected to the operation of *sulphuring* (*i. e.* exposed to sulphurous acid, either by burning sulphur matches in the cask, or by the addition of wine impregnated with this acid), to render the glutinous matter incapable of re-exciting fermentation. After this, the wine is usually clarified, or *fined* (*i. e.* deprived of those matters which render the wine turbid, and dispose it to undergo deteriorating changes). Isinglass or white of egg (*i. e.* gelatin or albumen) is commonly employed for this purpose. The first forms with the tannic acid, the second with the alcohol, reticulated coagula, which envelop and carry down the solid particles that endanger the safety of the wine.

*Officinal Characters.*—Pale yellowish-brown; containing about 17 or 18 per cent. of alcohol.

*Physiological Effects.*—Wine, taken in moderate quantities, acts as a stimulant to the nervous or vascular systems and the secreting organs. It quickens the action of the heart and arteries, diffuses an agreeable warmth over the body, promotes the different secretions, communicates a feeling of increased muscular power, excites the mental faculties, and banishes unpleasant ideas. Intoxication, in its various forms (see **Alcohol**, *Physiological Effects*, p. 880), is the effect of excessive quantities of wine. It is remarkable that though the effects of wine depend mainly on the alcohol contained in this liquor, yet they differ in several circumstances from those of the latter. Wine possesses a tonic influence not observed after the use of ardent spirits. The stimulant effect communicated by wine is slower in its production and subsidence than that developed by spirit; and the intoxicating influence of wine is not equal to that of a mixture of ardent spirit and water of compounding strength. The habitual use of spirit has also a greater tendency to induce disease of the liver.

*Therapeutics.*—Wine is used as a stimulant to the nervous system and to the heart, when depressed or exhausted; and to enable the enfeebled stomach to digest. [At the present time it is generally given both in *typhus* and *typhoid fever*, though some physicians, as Dr. Gairdner, think that it is not nearly so well borne in the latter disease as in the former, and that patients are often injured by it. Certainly it may be given, as Dr. Tweedie observes, when the pulse is soft and compressible, and the skin cool and damp, and there is a feeling of exhaustion. Nor do sensorial disturbance, low muttering delirium, subsultus tendinum, and a dry black tongue contraindicate it. On the contrary, these *typhoid* symptoms, whether occurring in continued fever or in other febrile diseases, denoting as they do great nervous exhaustion, not only justify but demand its use; and its beneficial effects are often seen in the diminution of the delirium and the greater disposition to sleep, in the decrease of frequency of the pulse, and in the improved condition of the tongue. In scarlatina, idiopathic erysipelas, diphtheria, influenza, anæmia, and pyæmia, and in the second and third stages of consumption, in extensive ulceration, copious suppuration, gangrene of the extremities, and after extensive injuries, severe operations, or profuse hemorrhages, when the powers of life appear to be failing, wine is administered, often with the best effects. In chronic inflammation it must be given more cautiously, but in chronic bronchitis and the asthenic pneumonia of the old and feeble, it is frequently, perhaps generally, beneficial. When there is no local pain or acute inflammation, the pulse will generally afford sufficient indication of the fitness of the remedy, especially if the patient is raised from the horizontal to the sitting posture; but if wine causes a dryness of the tongue, thirst, restlessness, or a quicker pulse, it should be discontinued. Even in *acute rheumatic carditis*, when the heart is disabled by inflammation, and the pulse is irregular and feeble, I do not hesitate to give wine rather freely. In convalescence from debilitating diseases there is little difference of opinion respecting its use.—Ed.]

*Pharmaceutic Use.*—As a *pharmaceutical agent*, sherry is employed for the preparation of the wines.

*Wines.*—Are solutions of mineral and vegetable substances in sherry. The efficacy of wine as a solvent resides essentially in the alcohol which it contains. But as this is variable, and as wine is more liable to undergo decomposition than a tincture containing the same proportion of spirit, the wines are objectionable preparations. Sherry, however, is better adapted for the purpose than other wines, on account of the rather large quantity of alcohol and the small quantity of free acid which it contains.

2. *Production of Alcohol.*—By the distillation of a vinous liquid we obtain *ardent spirit.* Fermented infusions of barley (raw grain and malt), prepared by the distillers of this country for the production of ardent spirit, are technically denominated *washes.* The liquid obtained by vinous fermentation consists of *water*, *alcohol coloring*, and *extractive matters*, *œnanthic ether*, *volatile oil* (*e. g.* amylic alcohol, called fusel oil, or oil of grain, &c.), *various acids* and *salts.* When the liquid is a fermented infusion of grain (*wash*), the spirit is denominated *corn spirit.*

3. *Rectification.*—By repeated distillations, and by the use of pearl-ash (carbonate of potash), which, by its powerful affinity for water, checks the rise of this fluid in distillation, is procured the liquid called *rectified spirit.*

### **Spiritus Rectificatus**, *Rectified Spirit.*

Alcohol, $C_4H_5O,HO$, with 16 per cent. of water, obtained by the distillation of fermented saccharine fluids, and by the rectification of the product, if it be not of the proper density.

*Officinal Characters.*—Colorless, transparent, very mobile and inflammable, of a peculiar pleasant odor, and a strong spirituous burning taste. Burns with a blue flame without smoke.

*Tests.*—Specific gravity 0.838. Remains clear when diluted with distilled water. Odor and taste purely alcoholic. Four fluidounces with three measures of the volumetric solution of nitrate of silver exposed for twenty-four hours to bright light, and then decanted from the black powder which has formed, undergoes no further change when again exposed to light with more of the test.

Pure spirit of wine has no reducing action upon nitrate of silver, but it ordinarily contains traces of fusel oil (amylic alcohol), and sometimes of aldehyde and aldehydic acid, all of which decompose nitrate of silver when exposed to bright light, the former producing a red color followed by a reddish-black precipitate, the two latter a black precipitate. This test is used, therefore, to show that the spirit does not contain an excessive quantity of any of these impurities. The presence of such foreign matters may also be detected by allowing a small portion of the spirit to evaporate at ordinary temperatures, when their peculiar odor will be perceived in the part *last* passing into vapor. Rectified spirit should be neutral to test-papers; it contains 84 per cent. by weight, or 89 by volume, of alcohol.

### *Officinal Preparations.*

Spiritus Tenuior, *Proof Spirit.*—Take of rectified spirit, five pints; distilled water, three pints. Mix.

*Test.*—Specific gravity 0.920.

Proof spirit contains 49 per cent. by weight, or 58 by volume, of alcohol.

[The U. S. Pharmacopœia, in its Materia Medica List, recognizes the three following officinal alcohols:—

### "**Alcohol Fortius,** *Stronger Alcohol.*

Spirit of the specific gravity 0.817.

### **Alcohol,** *Alcohol.*

Spirit of the specific gravity 0.835.

### **Alcohol Dilutum,** *Diluted Alcohol.*

Alcohol mixed with an equal measure of distilled water.

The specific gravity of diluted alcohol is 0.941." U. S.]

### **Alcohol,** *Absolute Alcohol* (Appendix B. 1).

Hydrate of oxide of ethyl, $C_4H_5O,HO=46$.

*Preparation.*—Take of rectified spirit, one pint; lime, recently burned, eighteen ounces. Having introduced the lime and the spirit into a matrass connected with a Liebig's condenser, apply heat until the lime begins to slake; and when this process is completed, distil by means of a chloride of zinc bath, until the liquid which comes over, together with that obtained during the slaking, measures one ounce and a half. Reject this, and continue the distillation into a fresh receiver, until the product measures sixteen ounces.

*Properties.*—Alcohol is a limpid, colorless, inflammable liquid, having a peculiar and penetrating odor, and a burning taste. It boils at 172° Fahr. It has a strong affinity for water: hence it abstracts this fluid from the atmosphere, and precipitates from their watery solutions those salts (*e. g.* sulphate of potash) which are not soluble in spirit; while, on the other hand, water precipitates from their alcoholic solution those substances (*e. g.* resin and oil) which are not soluble in water. By the mixture of alcohol and water heat is evolved, while air bubbles are so copiously developed, that for a few moments the liquid appears turbid. When cold, the resulting compound is found to possess a greater density than the mean of its constituents; but as the condensation varies with the proportions of alcohol and water employed, the specific gravity of the resulting compound can be ascertained by experiment only. Its attraction for water, and its power of coagulating albuminous substances, are properties which probably assist in rendering it an antiseptic. Alcohol and rectified spirit of wine give greater firmness to, and whiten the animal tissues. Alcohol dissolves camphor and resin.

*Tests.*—Specific gravity 0.795. It is entirely volatilized by heat, is not rendered turbid when mixed with water, and does not give rise to a blue color when in contact with anhydrous sulphate of copper (showing its freedom from water).

*Physiological Effects.*—The effects of alcoholic liquors vary with the strength of the liquid, the substances with which the alcohol is combined, the quantity taken, and the constitution of the patient. *The local effects of alcohol* or *rectified spirit* are those of a powerfully irritant and caustic poison. To whatever part of the body this agent is applied it causes contraction and condensation of the tissue, and gives rise to pain, heat, redness, and other symptoms of inflammation. These effects depend partially or wholly on the chemical influence of alcohol over the constituents of the tissues; for the affinity of this liquid for water causes it to abstract the latter from the soft living parts with which alcohol is placed in contact; and when these are of an albuminous or fibrinous nature, it coagulates the liquid albumen or fibrin, and increases the density and firmness of the solid albumen or fibrin. The irritation and inflammation set up in parts to which alcohol is applied, depend in part on the resistance which the living tissue makes to the chemical influence of the poison; in other words, it is the reaction of the vital powers brought about by the chemical action of the alcohol. But, besides the local influence of this liquid, dependent on its affinity, we can hardly refuse to admit a dynamical action, in virtue of which it sets up local irritation and inflammation, independent of its chemical agency. *The remote effects of ardent spirits* may be conveniently considered in the order of their intensity; and for this purpose we may divide them into three degrees or stages. *First* or *mildest degree. Excitement.*—This is characterized by excitement of the vascular and nervous systems. The pulse is increased in frequency, the face flushed, the eyes animated and perhaps red, the intellectual functions are powerfully excited, the individual is more disposed to joy and pleasure; cares disappear; the ideas flow more easily, and are more brilliant. *Second degree. Intoxication* or *drunkenness.*—The essential character of this stage is a disordered condition of the intellectual functions and volition; manifested by delirium, varying in its characters in different individuals, and by an incapability of governing the action of the voluntary muscles. This state is accompanied with excitement of the vascular system, and frequently with nausea and vomiting; it is followed by an almost irresistible desire for sleep, which usually continues for several hours, and is attended with copious perspiration. When the patient awakes he complains of headache, loathing of food, great thirst, and lassitude; the tongue is furred, and the mouth clammy. *Third degree. Coma* or *true apoplexy.*—This condition is usually observed when excessive quantities of spirit have been swallowed in a short time. The pulse is generally slow, the pupils are usually dilated, and the breathing is for the most part slow; but exceptions exist to all these statements. In some cases actual apoplexy (with or without sanguineous extravasation) is brought on. The immediate cause of death appears to be either paralysis of the muscles of respiration, or closure of the glottis.

The effects of spirit agree, in a considerable number of circumstances, with those of wine, but present some peculiarities. Spirit more speedily induces excitement, which, however, is of shorter duration, being more rapidly followed by collapse, relaxation, or debility. Death is by no means an unfrequent consequence of deep intoxication from spirit. The effects of opium are readily distinguished from those of spirit when insensibility has not come on. The sleep which both these agents commonly induce is not usually preceded, in the case of opium, by delirium, thickness of voice, and peculiar difficulty of articulation. When delirium is produced by this drug (opium), it is rather of the ecstatic kind. "There is more poetry in its visions—more mental aggrandizement—more range of imagination." But when insensibility is present, the diagnosis is not always easy. The odor of the breath is in these cases an important diagnosis. Moreover, the pupil is usually (though not invariably) dilated by spirit, whereas it is contracted by opium.

*Modus operandi.*—That alcohol becomes absorbed is proved by the fact that it has been found in the blood, in the urine, the breath, the bile, the fluid of the serous membranes, the brain, and the liver.

*Therapeutics.*—Spirit is used both internally and externally:—

*Internally.*—Rectified spirit is rarely administered internally; for when ardent spirit is indicated, brandy, gin, or whiskey is generally employed. I may observe, however, that brandy is the ardent spirit usually administered for medicinal purposes; and, unless otherwise stated, is the spirit referred to in the following observations. As a *stomachic stimulant*, spirit is employed to relieve spasmodic pains and flatulency, to check vomiting (especially sea-sickness), and to give temporary relief in some cases of indigestion attended with pain after taking food. As a *stimulant and restorative*, it is given with considerable advantages in the latter stages of fever. As a *powerful excitant*, it is used to support the vital powers, to prevent fainting during a tedious operation, to relieve syncope and languor, and to assist the restoration of patients from a state of suspended animation. In *delirium tremens* it is not always advisable to leave off the employment of spirituous liquors at once, since the sudden withdrawal of the long-accustomed stimulus may be attended with fatal consequences. In such cases it is advisable to allow, temporarily, to the patient the moderate use of the particular kind of spirit which he has been in the habit of employing. In *poisoning by digitalis and tobacco*, spirit and ammonia are used to rouse the action of the heart. In *mild cases of diarrhœa*, attended with griping pain, but unaccompanied by any inflammatory symptoms, a small quantity of spirit and water, taken warm, with nutmeg, is often a most efficacious remedy.

*Externally.*—Rectified spirit is used externally for several purposes, of which the following are the principal: *As a styptic*, to restrain hemorrhage from weak and relaxed parts. It proves efficacious in two ways: it coagulates the blood by its chemical influence on the liquid albumen and fibrin, and it causes the contraction of the mouths of the bleeding vessels by its stimulant and astringent qualities. Sponge or soft linen, soaked in spirit and water, has been applied to the mouth of the uterus in uterine hemorrhage. *Spirit is employed to harden the cuticle over tender and delicate parts.* Thus, brandy is sometimes applied to the nipples several weeks before delivery, in order to prevent the production of sore nipple from suckling in individuals predisposed to it. Spirit is also applied to the feet when the skin is readily blistered by walking. The efficacy of spirit in hardening the cuticle depends, in part, on its chemical influence. Spirit gargles have been found serviceable in checking the tendency to inflammation and swelling of the tonsils. *As a stimulant application*, warm rectified spirit has been applied to burned or scalded parts, on the principles laid down for the treatment of these cases by Dr. Kentish. Properly diluted, spirit has been employed as a wash *in various skin diseases*, and *in ulcers of bedridden persons*. *Frictions with rectified spirit* have been used in the abdominal region, to promote labor pains; on the chest, to excite the action of the heart in fainting or suspended animation; on the hypogastric region, to stimulate the bladder, when retention of urine depends on inertia, or a paralytic condition of this viscus; on various parts of the body, to relieve the pain arising from bruises, or to stimulate paralyzed parts. Diluted spirit has been used *as an injection for the radical cure of hydrocele*. A mixture of wine and water, however, is commonly employed in this country. *Spirit has been used to form cold lotions*. As the efficacy of it depends on its evaporation, it should be applied by means of a single layer of linen, and not by a compress. Evaporating lotions are applied to the head in cephalalgia, in phrenitis, in fever, and in poisoning by opium; to fractures of the extremities; also to parts affected with erysipelatous inflammation.

*Pharmaceutic Uses of Alcohol. Rectified and Proof Spirit.*—Alcohol is not employed in the preparation of any officinal substances; but it is a valuable agent in chemical analysis, and is used in determining the purity of certain medicinal substances; as iodine, the vegetable alkaloids, croton, and castor oil. Rectified and proof spirits are most extensively employed in officinal pharmacy; as in the formation of *tinctures*, *spirits*, *ethers*, and *resinous extracts*, and in the manufacture of the *vegetable alkaloids*. Lastly, spirit is added to various preparations to assist in preserving them (*e. g.* the liquid extracts), or to precipitate albuminous matter, as in syrup of poppies.

*Tinctures.*—Are solutions of vegetable, animal, or mineral substances, in proof or rectified spirit. They are preparations of substances whose active principles are imperfectly or not at all soluble in water, or whose aqueous solutions readily undergo decomposition. [*Tinctures* (U. S. P.) are alcoholic solutions of NON-VOLATILE substances.—W.] Some are prepared by *solution* merely, as the *tincture of iodine;* some by mixture, as the *tincture of perchloride of iron*. The ordinary method of preparing tinctures is by *maceration* or *percolation*.

1. *Maceration.*—The solid ingredients are reduced to small fragments, coarse or fine powder, and macerated for seven days or upwards, in proof spirit or rectified spirit; the solution is strained through linen or calico, and the residuum strongly expressed to obtain what fluid is still retained in the mass. The process should be conducted in stoppered glass vessels, which should be frequently shaken. The tinctures which are made with resinous substances cannot in general be well prepared in any other way than by maceration. This remark applies to *tincture of aloes*, *assafœtida*, *compound tincture of benzoin*, *tincture of castor*, *kino*, *opium*, and *tolu*.

2. *Percolation.*—This process, which has been used in brewing and coffee-making for many years, has lately been employed for the preparation of tinctures and infusions. It differs from the method of displacement proposed by Dr. Burton, inasmuch as the material in that process was suspended in a bag or filter just below the surface of the fluid solvent, so that a continued downward current of the dissolved matters, from the increased specific gravity of the solvent, was established, while the weaker and lighter portions of the liquid flowed in to occupy its place,

and this continued until all the soluble matter was abstracted. In percolation, on the other hand, fresh fluid is sprinkled or flooded, at short intervals, on the upper surface of the comminuted material, and passing through the mass becomes more or less saturated until the soluble matter is exhausted and no further solution is effected. With many substances time is required to allow the solvent to permeate the particles, which is also frequently attended with considerable swelling; and it is therefore very advantageous to subject them to maceration before the percolation commences. This may, in many cases, be done in the percolator itself, particularly where either ether or alcohol is the solvent, but it is more efficiently performed in another vessel, as a mortar. The percolator is to be packed evenly and closely with the swollen and moistened material, and, the exit cock being shut, the solvent gently poured on until the upper surface is covered with fluid. The whole is then allowed to remain for a short time, that all the air may be displaced. The exit pipe is then opened, to a limited degree, and if the first runnings are not perfectly clear they are returned to the upper surface until the solution passes off bright. Fresh solvent is then added in small quantities, at short intervals, until the mass is exhausted. The best form of apparatus is a cone made of glass, porcelain, or well tinned copper or iron, having a small stopcock on the exit pipe to regulate the flow. For small operations a stoppered funnel will answer every purpose. In many cases it will be found advantageous to place a small linen or thick paper filter within the conical bottom of the percolator. When alcohol or ether is employed, the top should be carefully covered to prevent loss by evaporation.

*Spirits.*—Are alcoholic solutions of volatile substances (usually of a vegetable nature), generally obtained by distillation. The spirits which owe their peculiar flavor and odor to volatile oil are prepared by dissolving the oil in spirit, without the aid of distillation; and, for all therapeutical purposes, they are equally effective.

## **Æther** [U.S.], *Ether.*

*Synonym.*—Æther Sulphuricus, *Ed.*, *Dub.*

Oxide of Ethyl, $C_4H_5O = 37$, with about 8 per cent. by volume of alcohol.

*Preparation.*—Take of rectified spirit, fifty fluidounces; sulphuric acid, ten fluidounces; chloride of calcium, ten ounces; slaked lime, half an ounce; distilled water, thirteen fluidounces. Mix the sulphuric acid and twelve ounces of the spirit in a glass matrass capable of containing at least two pints, and, without allowing the mixture to cool, connect the matrass by means of a bent glass tube with a Liebig's condenser, and distil with a heat sufficient to maintain the liquid in brisk ebullition. As soon as the ethereal fluid begins to pass over, supply fresh spirit through a tube into the matrass in a continuous stream, and in such quantity as to equal the volume of the fluid which distils over. This is best done by using a tube furnished with a stopcock to regulate the supply, connecting one end of the tube with a vessel containing the spirit raised above the level of the matrass, and passing the other end through a cork fitted into the matrass. When the whole of the spirit has been added, and forty-two fluidounces have distilled over, the process may be stopped. Dissolve the chloride of calcium in the water, add the lime, and agitate the mixture in a bottle with the impure ether. Leave the mixture at rest for ten minutes, pour off the light supernatant fluid, and distil it with a gentle heat until a glass bead of specific gravity 0.735 placed in the receiver begins to float. The ether and spirit retained by the chloride of calcium and by the residue of each distillation may be recovered by distillation and used in a subsequent operation. ["Take of stronger alcohol, six pints; sulphuric acid, thirty-six troyounces; potassa, three hundred and sixty grains; distilled water, three fluidounces. To two pints of the alcohol, contained in a six-pint tubulated retort, gradually add the acid, stirring constantly during the addition. By means of a cork fitted to the tubulure, adapt a long funnel-shaped tube, with the lower end drawn out so as to form a narrow orifice, and reaching nearly to the bottom of the retort, and also a thermometer tube, graduated from 260° to 300°, with its bulb reaching to the middle of the liquid. Having placed the retort on a sand-bath, connect it with a Liebig's condenser, and this with a well-cooled receiver. Then raise the heat quickly until the liquid boils, and attains a temperature between 266° and 280°. By means of a flexible tube, connected with the stopcock of an elevated vessel containing the remainder of the alcohol, introduce that liquid into the retort, through the funnel-shaped tube, in a continuous stream; the quantity supplied being so regulated that the temperature of the boiling liquid shall continue between the degrees mentioned. After all the alcohol has been added, proceed with the distillation until the temperature rises to 286°, when the process should be discontinued. To the distilled liquid add the potassa, previously dissolved in the distilled water, and shake them occasionally together. At the end of twenty-four hours pour off the supernatant liquid, introduce it into a retort, and, with a gentle heat, distil into a well-cooled receiver three pints, or until the liquid attains the specific gravity 0.750. Lastly, keep the ether in a well-stopped bottle." U. S.]

*Theory of Etherification.*—In order to convert one equivalent of alcohol into one equivalent of ether, we must abstract one equivalent of water, $C_4H_6O_2 = HO + C_4H_5O$. Assuming that ethyl is represented by $C_4H_5$, then ether is an oxide of this compound radical and alcohol is a hydrated oxide, containing in addition the elements of one equivalent of water. On the addition of sulphuric acid, two equivalents of anhydrous sulphuric acid combine with one equivalent of oxide of ethyl (*ether*), contained in the alcohol, and form one equivalent of bisulphate of oxide of ethyl (*bisulphate of ether*). The water of the alcohol and of the sulphuric acid unites with the bisulphate. By the heat which is subsequently applied to the mixture, the hydrated bisulphate is resolved into ether, water, and sulphuric acid. During the distillation of ether the relative proportions of the ingredients are constantly varying; for the absolute quantity of hydrated bisulphate of ethyl is continually diminishing, and thereby the relative quantity of sulphuric acid is increasing. In consequence of this, the boiling-point of the liquid gradually rises. When it arrives at about 320°, new reactions take place between the oxide of ethyl and the sulphuric acid. Mitscherlich has shown how a given quantity of sulphuric acid may be made to convert an unlimited quantity of alcohol into ether; the whole of the alcohol which enters the retort passing off as ether and water. According to this chemist, ether is produced only so long as the liquid has a temperature between 284° and 302°. The *rectification* of ether is intended to free it from alcohol, water, sulphurous acid, and ethereal oil.

*Officinal Characters.*—A colorless very volatile and inflammable liquid, emitting a pungent and very characteristic odor, and boiling below 105°. A little of it poured upon the hand evaporates rapidly, producing a sensation of cold.

*Tests.*—Specific gravity 0.735. 50 measures agitated with an equal volume of water are reduced to 41, by an absorption of 18 per cent. (8 per cent. being attributable to alcohol, and 10 per cent. to the solubility of pure ether in water). It evaporates without residue. [Ether is a very inflammable liquid, having the specific gravity 0.750. It wholly evaporates in the air, and does not redden litmus. When shaken with an equal bulk of water, it loses from one-fifth to one-fourth of its volume. U. S. Ph.]

### **Pure Ether.** (Appendix A.)

### [**Æther Fortior,** U. S., *Stronger Ether.*]

*Ether free from Alcohol and Water.* $C_4H_5O$.

*Preparation.*—Take of ether, two pints; distilled water, two pints; lime recently burned, a quarter of an ounce; chloride of calcium, perfectly dry, four ounces. Shake the ether with one pint of the water, and, after separation has taken place, decant the ether, and again shake it with the remainder of the water. Decant again, and put the washed ether into a retort with the lime and the chloride of calcium, and, after digestion for twenty-four hours, distil with the aid of a gentle heat. ["Take of ether, water, each three pints; chloride of calcium, in fine powder, lime, in fine powder, each a troyounce. Shake the ether and the water thoroughly together, and, when the water has subsided, separate the supernatant ether. Agitate this well with the chloride of calcium and the lime in a well-stopped bottle, and allow the mixture to stand for twenty-four hours. Then decant the ether into a retort, and, having adapted thereto a Liebig's condenser, distil a pint and a half of stronger ether into a receiver refrigerated with ice-cold water. Lastly, keep the liquid in a well-stopped bottle. By continuing the distillation, a portion of weaker ether may be obtained." U. S.]

By agitation with water, the alcohol contained in ordinary ether is removed, and at the same time a portion of water absorbed; the latter is held back by the lime and chloride of calcium, and anhydrous ether distilled off.

*Test.*—Specific gravity not exceeding 0.720. [Stronger ether has a specific gravity not exceeding 0.728. U. S. Ph.]

*Properties.*—Pure and recently prepared ether possesses neither acid nor alkaline properties; but, by exposure to air and light, it absorbs oxygen, by which acetic acid and water are produced. The acetic acid is not immediately observed, because it combines with some undecomposed ether to form acetic ether. Ether is very combustible; it burns in atmospheric air with a yellowish-white flame, and forms carbonic acid and water. Its vapor, mixed with oxygen or atmospheric air, forms a violently explosive mixture. One volume of ether vapor consumes, in burning, six volumes of oxygen gas: the products are, four volumes of carbonic acid, and five volumes of aqueous vapor. By the slow combustion of ether vapor, by means of a coil of platinum wire, acetic, formic, and aldehydic acids are produced. Ether is soluble in 10 parts of water. Alcohol dissolves ether in all proportions. Ether extracts corrosive sublimate, perchloride of gold, bichloride of platinum, and perchloride of iron, from their watery solutions. It readily dissolves bromine and iodine; but the solutions, by keeping, undergo decomposition. It sparingly dissolves sulphur and phosphorus, and the ethereal solution of phosphorus is luminous in the dark, when poured on hot water. It dissolves the volatile oils, most of the fatty and resinous substances, some of the vegetable alkaloids, urea, osmazome, gun cotton (forming *collodion*), and caoutchouc. It is recommended by M. Stas as the best solvent for the separation of the alkaloids, morphia, strychnia, &c., in medico-legal analysis. [Shaken with an equal bulk of water, it loses from one-tenth to one-eighth of its volume. It boils actively in a test-tube half filled with it and enclosed in the hand, on the addition of small pieces of glass. Half a fluidounce of the liquid, evaporated from a porcelain plate by causing it to flow to and fro over the surface, yields a faintly aromatic odor as the last portions pass off, and leaves the surface without taste or smell, but covered with a deposit of moisture. U. S. Ph.]

*Therapeutics. Internal Use.*—Ether is principally valuable as a speedy and powerful agent in spasmodic and painful affections which are not dependent on local vascular excitement, but are accompanied by a pale cold skin, and a small feeble pulse. If administered during a paroxysm of spasmodic asthma, it generally gives relief, but has no tendency to prevent the recurrence of attacks. In cramp of the stomach, singultus, and flatulent colic, its happy effects are well established. It is sometimes highly advantageous in a paroxysm of angina pectoris. During the passage of urinary or biliary calculi, it may be used as a substitute for, or in combination with, opium, to overcome the spasm of the ducts or tubes through which the calculus is passing. In the latter stages of continued fever, ether is sometimes employed to relieve the subsultus tendinum and hiccup. Desbois de Rochefort administered it in intermittent fevers. He gave it about half an hour before the expected paroxysm; it acted as a mild diaphoretic, and prevented the recurrence of the attack. Headache of the kind popularly called nervous, that is unconnected with vascular excitement, is sometimes speedily relieved by ether. I have found it beneficial principally in females of delicate habits. In such it occasionally gives immediate relief, even when the throbbing of the temporal arteries and suffusion of the eyes (symptoms which usually contraindicate the employment of ether) would seem to show the existence of excitement of the cerebral vessels. In flatulence of the stomach it may be taken in combination with some aromatic water. Against sea-sickness it should be swallowed in a glass of white wine. In faintness and lowness of spirits, it is a popular remedy. In poisoning by hemlock and fungi, it has been employed. In asphyxia it has been used with benefit.

*External Use.*—The principal external use of ether is to produce cold by its speedy evaporation. Thus, in strangulated hernia, it may be dropped on the tumor and allowed to evaporate freely. By this means a considerable degree of cold is produced, and, in consequence, the bulk of the part diminished, whereby the reduction of the hernia is facilitated. Dropped on the forehead, or applied by means of a piece of thin muslin, ether diminishes vascular excitement, by the cold produced from its evaporation, and is exceedingly efficacious in headache and inflammatory conditions of the brain. In burns and scalds it may also be employed as a refrigerant. If its evaporation be stopped or checked, as by covering it with a compress, it acts as a local irritant, causing rubefaction, and, by long-continued application, vesication. It is used with friction as a local stimulant.

*Ether Vapor.*—Ether vapor has been inhaled in cases of insanity attended with much excitement. The effect has been only a temporary diminution of the excitement. In twelve cases, chiefly recent and characterized by considerable excitement, it thus produced temporary relief. In one instance it disposed the patient to take food which she had resisted before. It thus prevented the necessity of using the feedingtube. In another case with suicidal and homicidal disposition accompanied by great restlessness, it was given every night at bedtime for about three weeks, with the effect of always procuring a quiet night. In 1847 it was administered to sixteen patients in the Utica Asylum. A few were highly excited by it; several seemed intoxicated, and said that they felt as if drunk; one rested remarkably well the next night; two experienced no effect of any kind from it; some were decidedly improved by it, becoming more active, cheerful, and sociable. Dr. Willis has found it of great service in spasmodic diseases of the respiratory organs, and especially valuable in cutting short the severe paroxysms of *whooping-cough*. It has also been employed successfully in cases of *strangulated hernia* for the reduction of the hernia, but as an anæsthetic it has been almost entirely superseded by chloroform.

[In the face of the large and rapidly increasing number of deaths from the inhalation of chloroform, deaths which the greatest skill and most cautious foresight cannot always avert, it is a matter of surprise to many American physicians that in Great Britain chloroform should be so universally preferred to ether as an anæsthetic, and that a no less eminent body than the Royal Medical and Chirurgical Society of London should have publicly sanctioned it, discountenancing the use of ether. The only advantages that chloroform possesses over the latter anæsthetic, are its greater pleasantness to the patient, and its greater convenience to the surgeon in taking less time and trouble to produce the desired effect. But surely such considerations ought to have no weight in the balance against the risk of life. Chloroform has been well characterized by a French writer as wonderful and terrible in its powers. In a recent article, Prof. Simpson, of Edinburgh, states that one manufactory of it in that city produces yearly 2,500,000 doses, and then asks, are every two million and a half full doses, which are used of opium, antimony, aloes, Epsom salts, &c., attended with as little danger and as few ultimate deaths as these annual 2,500,000 doses of chloroform? A method of reasoning which seems to me much more brilliant than sound. Those remedies injure by being improperly employed, and cannot be replaced by other equally efficacious drugs. But in the use of chloroform the surgeon exposes his patient to an *unnecessary* danger, which no skill or foresight can guard against. If a patient is killed, does the fact that 10,000 others have taken the dose and escaped unharmed, bring him to life again, console his friends, or afford maintenance to his family? There are conceivable circumstances which may justify the use of chloroform in an individual case; but I am now alluding to the general use of the drug, so common in Great Britain. Are such paragraphs as this, which occurs in a recent Liverpool paper, of no significance: "The jury's verdict was: died from the effects of chloroform by misadventure. No blame was attached to either Dr. S——— or Mr. P———." The operation for which the chloroform was administered was amputation of the finger!

In many parts of the continent of Europe, and in most portions of the United States, chloroform is not used as an anæsthetic, except it be in obstetric cases, in which there seems to be less danger; and although chloroform is superior to ether as an anæsthetic in rapidity and pleasantness of action, yet its superiority is not so great as many suppose. In the administration of ether, the cardinal fact that its vapor is capable of supporting life for a long time, without any admixture of oxygen, must be borne in mind. Its administrator, therefore, should endeavor to force the patient to breathe the pure vapor; and if he succeeds in this, the length of time and amount of ether required are much less than by the simple sponge-method of administration. Dr. Lente, of New York, states that patients may be "etherized as quickly and with as little trouble as you can safely chloroformize them; that is, in from three to four minutes (average), and with from one and a half to two and a half ounces of the drug. But if you choose to use from two to three ounces of the drug—and more than the latter is almost never necessary—you may shorten the time by a minute." In administering the ether, a cone should be formed of stiff paper or pasteboard, which may be covered on the inside with a single layer of flannel. The ether should be poured all over the flannel, which affords a large surface for rapid evaporation, and the cone then be held firmly against the patient's face, so as to prevent any access of air to his nose or mouth. However hard he may resist and struggle, he should not be allowed any air, but be forced to breathe the vapor of ether deeply and fully. If it becomes necessary to replenish the ether, the cone should be from off his face as few seconds as possible. A mixture of chloroform and ether, or chloroform, ether, and alcohol, has been much used by some Philadelphia surgeons, but is open to very many objections, and a death caused by it recently will probably be the cause of its going into disuse. It is probably nearly as dangerous as chloroform, and possesses its attractions in but a small degree.—W.]

*Administration.*—Liquid ether is given internally in the form of spirit of ether.

*Pharmaceutic Uses.*—Ether is used in the preparation of tannic acid, collodion, of liquid extract of ergot, liquid extract of fern, and of liniment of cantharides, and as a test for the purity of calomel, corrosive sublimate, the red and green iodides of mercury, iodine, kamela, scammony, and resin of scammony. Pure ether is used in the extraction and purification of aconitia and digitalin. It is also used as a test of the purity of aconitia, atrophia, resin of podophyllum, sulphate of quinia, and for the estimation of the quantity of quinia contained in yellow cinchona bark.

### *Officinal Preparation.*

SPIRITUS ÆTHERIS, *Spirit of Ether.*—Take of ether, ten fluidounces; rectified spirit, one pint. Mix.

*Test.*—Specific gravity 0.809.

*Administration.*—Miscible with water in all proportions.

*Dose.*—Fl. drm. j to fl. drms. ij.

Used for the preparation of ethereal tincture of lobelia.

## **Spiritus Ætheris Nitrosi** [U. S.], *Spirit of Nitrous Ether.*

*Synonym.*—Spiritus Ætheris Nitrici, *Lond.*, *Ed.* [Sweet Spirit of Nitre, U. S. P.]

Nitrous ether, $C_4H_5O,NO_3,=75$, dissolved in rectified spirit.

*Preparation.*—Take of nitrite of soda, five ounces; sulphuric acid, four fluidounces; rectified spirit, two pints. Introduce the nitrite of soda into a matrass connected with a condenser; pour upon it the spirit and the sulphuric acid, previously mixed; and distil thirty-five fluidounces, the receiver being kept very cool.

By the action of sulphuric acid upon nitrite of soda, nitrous acid is evolved, $NaO,NO_3+SO_3=NaO,SO_3+NO_3$, and this combining with alcohol forms nitrous ether and water, $C_4H_5O,HO+NO_3=C_4H_5O,NO_3+HO$, which are held in solution by the spirit. This process is much improved by dissolving the nitrite of soda in ten fluidounces of water before adding the spirit and acid. By this process the quantity ordered to be distilled can be obtained without other products.

[" Take of nitric acid, nineteen troyounces and a half; stronger alcohol, nine pints; carbonate of potassa, a troyounce. Introduce four pints of the alcohol into a retort having the capacity of eight pints and containing some pieces of glass, and add the nitric acid. Adapt the retort to a Liebig's condenser, and apply heat by means of a water-bath so arranged that the water may be drawn off during the process. When the mixture boils briskly, draw off almost all the water of the bath, and allow the distillation to proceed spontaneously until it begins to slacken. Then cautiously reapply heat by means of the water-bath, and continue the distillation until four pints of the distilled liquor have passed over. Having thrown away the residue, rinse the apparatus thoroughly, return the liquid to the retort, add the carbonate of potassa to it, agitate the mixture, and again distil by means of a water-bath, slowly at first, until three pints and a half of distilled liquid have been obtained. With this mix thoroughly the remainder of the alcohol, and transfer the mixture to half-pint bottles, which must be well stopped, and protected from the light." U. S. In this process the nitric acid first oxidizes a portion of the alcohol, changing it into aldehyde and water, and is converted into nitrous acid ($NO_3$). This then reacts with the remainder of the alcohol so as to form the nitrite of the oxide of ethyl; the water of the alcohol being liberated. Thus alcohol and nitric acid $C_4H_6O_2 + NO_5 = (C_4H_4O_2)$ (aldehyde) $+ 2HO + NO_3$. And $NO_3 + (C_4H_5O_2) = (C_4H_5O + NO_3) + HO$. The object of the second distillation with the carbonate of potash is to free the preparation from any excess of acid which may be present. The advantage of this process over the British is its yielding a spirit of more uniform and certain strength. The nitrite of soda (British Pharmacopœia) is of very unequal strength, containing only a small and variable proportion of the proper nitrite. As a consequence of this, the product varies.—W.]

*Officinal Characters.*—Transparent and nearly colorless, with a very slight tinge of yellow, mobile, inflammable, of a peculiar penetrating apple-like odor, and sweetish cooling sharp taste. When agitated with the solution of sulphate of iron and a few drops of sulphuric acid it becomes deep olive-brown or black (owing to the formation and solution of binoxide of nitrogen).

[The following are the officinal properties of this preparation as made by the U. S. process:—

Spirit of nitrous ether is a volatile, inflammable liquid, of a pale-yellow color inclining slightly to green, having a fragrant ethereal odor, free from pungency, and a sharp, burning taste. It slightly reddens litmus, but does not cause effervescence when a crystal of bicarbonate of potassa is dropped into it. When mixed with half its volume of officinal solution of potassa, previously diluted with an equal measure of distilled water, it assumes a yellow color, which slightly deepens, without becoming brown, in twelve hours. A portion of the spirit in a test-tube half filled with it, plunged into water heated to 145°, and held there until it has acquired that temperature, will boil distinctly on the addition of a few small pieces of glass. Spirit of nitrous ether has the specific gravity 0.837, and contains from four and three-tenths to five per cent. of its peculiar ether. It should not be long kept, as it becomes strongly acid by age. U. S. Ph.]

*Tests.*—Specific gravity 0.843 It effervesces feebly or not at all when shaken with a little bicarbonate of soda. If it is agitated with twice its volume of a saturated solution of chloride of calcium, $1\frac{1}{2}$ per cent. by volume of nitrous ether separates and rises to the surface.

The non-occurrence of effervescence shows the absence of free acid; the separation of $1\frac{1}{2}$ per cent. of nitrous ether indicates the presence of about $9\frac{1}{2}$ per cent. of nitrous ether, 8 per cent. remaining dissolved in the mixture. If the nitrite of soda has been carefully prepared, without deflagration, the specific gravity will be about 0.854, and will yield 5 per cent. by volume of nitrous ether.

*Therapeutics.*—Spirit of nitrous ether is employed as a diuretic in mild dropsical complaints, as in the anasarca which follows scarlatina. It is given in conjunction with squill, acetate or nitrate of potash, or digitalis. As a refrigerant and diaphoretic, it is used in febrile complaints in combination with the acetate of ammonia and tartarated antimony. As a carminative it is frequently useful in relieving flatulence and allaying nausea. On account of its volatility, it may be applied to produce cold by its evaporation. Spirit dealers employ it as a flavoring ingredient.

*Administration.*—The usual dose of this liquid in febrile cases is fl. drm. $\frac{1}{2}$ to fl. drs. ij. When we wish it to act as a diuretic, it should be given in large doses, as two or three teaspoonfuls.

### [**Oleum Æthereum,** *Ethereal Oil.* Heavy Oil of Wine.

"Take of stronger alcohol, two pints; sulphuric acid, sixty-one troyounces; distilled water, a fluidounce; stronger ether, a sufficient quantity. Add the acid slowly to the alcohol, mix them thoroughly, and allow the mixture to stand for twelve hours. Decant the clear liquid from the sediment into a tubulated retort, of such capacity that the mixture shall nearly fill it. Adapt a thermometer tube to the tubulure by means of a cork, so that the bulb shall be deeply immersed in the liquid, and, having attached a Liebig's condenser, distil, by means of a sand-bath, at a temperature between 312° and 322°, until the liquid ceases to come over, or until a black froth begins to arise in the retort. Separate the yellow ethereal liquid from the distillate, and expose it for twenty-four hours, in a shallow capsule, to evaporate spontaneously. Then transfer the remaining liquid to a wet filter; and, when the watery portion has drained off, wash the oil which is left, while on the filter, with the distilled water. When this also has drained off, transfer the oil to a graduated measure, by perforating the point of the filter, and add to it an equal volume of stronger ether. The ethereal oil, obtained by this formula, measures about six fluidrachms." U. S.

When alcohol is distilled with a large amount of sulphuric acid, sulphurous acid, olefiant gas, heavy oil of wine, and resino-carbonaceous matters are produced. The chemical constitution and mode of formation of the heavy oil of wine are not as yet thoroughly settled. According to the U. S. Dispensatory, it is a double sulphate of ether and ethylen, with the formula $C_4H_5O,SO_3+C_4H_4SO_3$, and is conceived to be generated from two eqs. of sulphovinic acid, which are resolved into one eq. of heavy oil of wine, two of sulphuric acid, and three of water. Sulphovinic acid, it will be recollected, is the double sulphate of ether and water, the first product of the action of the sulphuric acid. Ethylen, light oil of wine, has the same constitution as olefiant gas ($C_4H_4$). It is a pale yellow oily liquid, and may be obtained pure by gently heating the heavy oil of wine with four parts of water; by this sulphovinic acid is reproduced, and the ethylen, being replaced by the water, set free. Thus $(C_4H_5O,SO_3+C_4H_4SO_3)+4HO=C_4H_5O,SO_3+4HO,SO_3+C_4H_4$.

The ether is added for the purpose of preserving the oil; without this it is very prone to undergo chemical change, becoming brown, and even separating into two layers.

*Officinal Qualities.*—Ethereal oil, thus prepared, is a transparent, nearly colorless, volatile liquid, of a peculiar, aromatic, ethereal odor, and sharp, bitter taste. It is neutral to litmus paper, not previously moistened, and has the sp. gr. of 0.91. U. S. Ph. (The sp. gr. of the pure oil is said to be 1.133.)

*Therapeutics.*—Ethereal oil is a nervous stimulant and anodyne, and is not used by itself, but is one of the ingredients of Spiritus Ætheris Compositus, U. S. (Hoffmann's Anodyne).—W.]

### [**Spiritus Ætheris Compositus,** *Compound Spirit of Ether. Hoffmann's Anodyne.*

"Take of ether, half a pint; alcohol, a pint; ethereal oil, six fluidrachms. Mix them." U. S.

*Officinal Characters.*—A colorless, volatile, inflammable liquid, having an aromatic, ethereal odor, and a burning, slightly sweetish taste. Its specific gravity is 0.815. It is neutral or but slightly acid to litmus. It gives only a slight cloudiness with chloride of barium; but when a fluidounce of it is evaporated to dryness with an excess of this test, it yields a precipitate of sulphate of baryta, which, when washed and dried, weighs six and a quarter grains. When a few drops are burned on glass or porcelain, there is no visible residue, but the surface will be left with an acid taste and reaction. A pint of water, by the admixture of forty drops, is rendered slightly opalescent. U. S. Ph.

*Therapeutics.*—Hoffmann's anodyne possesses the stimulating antispasmodic powers of ether combined with anodyne properties. It is a very useful remedy in cases of general unrest, inability to sleep, &c., dependent on nervous irritation from pain, weakness, or other causes. Given in combination with morphia, it aids it and appears to prevent some of its unpleasant effects. Hoffmann's anodyne is also very useful as a carminative, probably exceeding in this respect any of the aromatics. In cases of flatulence, depending upon nervous disturbance (hysteria, &c.), it is especially useful.

Dose, f℥j—f℥ij, given in *cold* water.—W.]

### [**Chloroformum Venale,** *Commercial Chloroform.* Mat. Med. List, U. S. P.

The present U. S. Pharmacopœia recognizes in its matera medica list impure commercial chloroform under the above caption, and from it directs chloroform to be prepared for use.

*Officinal Characters.*—A colorless liquor, varying in specific gravity from 1.45 to 1.49 Shaken with an equal volume of officinal sulphuric acid in a bottle closed with a glass stopper, it forms a mixture which separates by rest into two layers; the upper one colorless, and the lower consisting of the acid, of a brownish hue, which, after the lapse of twenty-four hours, becomes darker, but never quite black.

*Therapeutics.*—This crude chloroform may be used externally, but should never be given internally, either by the mouth or lungs.

Chloroformum Purificatum, U. S., *Purified Chloroform.* Chloroformum, *Pharm.*, 1850.—"Take of commercial chloroform, one hundred and two troyounces; sulphuric acid, seventeen troyounces; stronger alcohol, six fluidrachms; carbonate of potassa, two troyounces. Add the acid to the chloroform, and shake them together occasionally during twenty-four hours. Separate the lighter liquid from the heavier, and mix it with the stronger alcohol. Then add the carbonate of potassa, previously heated to redness, and rubbed, while warm, into powder. Agitate the mixture thoroughly, and, by means of a water-bath, distil to dryness from a retort furnished with a condenser. Lastly, keep the distilled liquid in well-stopped bottles." U. S.

The sulphuric acid oxidizes the various pyrogenic oils which contaminate the chloroform, liberating their carbon, and also attracts to itself any water that the chloroform may contain; a portion of the sulphuric acid being changed into sulphurous acid. The distillation with carbonate of potassa is to remove this sulphurous acid, a sulphite being left in the retort.—W.]

## Chloroformum, *Chloroform.*

(Terchloride of Formyl) $C_2HCl_3$=119.5.

*Preparation.*—Take of chlorinated lime, ten pounds; rectified spirit, thirty fluidounces; slaked lime, a sufficiency; water, three gallons; sulphuric acid a sufficiency; chloride of calcium, in small fragments, two ounces; distilled water, nine fluidounces. 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 liquor 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.

The production of chloroform from alcohol is to be attributed to the action of the hypochlorite of lime (CaO,ClO) contained in the chlorinated lime. This reacts upon the alcohol, displaces two-thirds of its hydrogen (which combines with oxygen to form water), and replaces it partly by chlorine, to form chloroform, partly by oxygen, to form formic acid ($C_2HO_4$), which unites with the lime also set free, to form formiate of lime, thus: $2C_4H_6O_2+8(CaO,ClO)+C_2H,Cl_3+3(CaO,C_2HO_3)+5Ca Cl+8HO$. Other compounds are, however, formed in actual practice, and some alcohol distils over unchanged, these are removed by washing with water, treating with sulphuric acid, and re-distilling.

*Officinal Characters.*—A limpid colorless liquid, of an agreeable ethereal odor and sweet taste. Mixes with alcohol and ether in all proportions; and dissolves slightly in water, communicating to it a sweetish taste. Burns, though not readily, with a green and smoky flame.

*Properties.*—Chloroform sinks readily in water. Its specific gravity varies from 1.48 to 1.496 or even to 1.5. Its boiling point is 140°, and the density of its vapor is 4.2. It is exceedingly volatile, and produces, by rapid evaporation, great cold when placed on the skin, with a slightly tingling sensation. Its vapor has a sweet taste. Chloroform is readily dissolved by oil of turpentine and bisulphide of carbon; it dissolves volatile oils, resins, camphor, and alkaloids, and separates the latter as well as iodine and bromine, when pure, from their watery solutions. When pure, it is quite neutral. It may be distilled with potash, sulphuric acid, and other acids, without change. Heated with strong nitric or sulphuric acid, it undergoes no perceptible change. When kept for some time under sulphuric acid, it evolves vapors of hydrochloric acid. When exposed to air and light, it is decomposed, chlorine and hydrochloric acid, with other products, being evolved. When kept under water, it remains unchanged. It does not decompose iodic acid or iodide of potassium.

*Tests.*—Specific gravity 1.496. Is not colored by agitation with sulphuric acid, leaves no residue and no unpleasant odor after evaporation, and evolves no gas when potassium is dropped into it (showing its freedom from water). [When mixed with an equal volume of officinal sulphuric acid, in a bottle closed by a glass stopper, no warmth is perceptible to the hand at the moment of mixing (showing absence of water), and when the liquids have been allowed to separate, and to remain in contact for twenty-four hours, no color is imparted to either, or but a faint yellowish tinge to the acid, which forms the inferior layer. U. S. P.]

*Adulterations and Impurities.*—It should sink readily in water in rounded globules, without imparting any opalescence to the liquid. This appearance would indicate the presence of alcohol. If alcohol be present, even in small quantity, it will be indicated by a thin opaque film around the globule. Another test for the presence of alcohol is the specific gravity, which will not only detect the adulteration with alcohol, but to a certain extent indicate the proportion. The proportion of alcohol in chloroform may also be determined by agitating it with an equal measure of distilled water in a graduated tube, and noticing the loss. The chloroform not being perceptibly soluble in water, should not undergo any change in volume. This test is similar to the washing of ether. Alcohol may be present in chloroform as a result of its passing over during distillation; or it may be sometimes present as an adulteration. If any traces of sulphuric acid remain in it, as a result of its use in rectifying it, this impurity may be discovered by adding a salt of baryta to water with which it has been agitated. Chloroform sometimes presents a pink color, which, according to the observation of the author, depends on the presence of manganese, either as an impurity in the chloride of lime, or as a result of the rectification of the products of distillation by peroxide of manganese, as recommended by Gregory. Under exposure to air and a strong solar light, chloroform undergoes changes which have been already described. It acquires a yellowish color; and when the stopper is removed, there is a sudden burst of acid vapor, which we have found to be chiefly hydrochloric acid, the liquid being at the same time strongly acid. According to Gregory, chlorine is also set free. It is stated that chloroform rectified by sulphuric acid is particularly liable to change.

*Physiological Effects. In the liquid state.*—In moderate medicinal doses chloroform is stimulant and antispasmodic. In larger doses it is narcotic, impairing sensorial power, and producing drowsiness. In very large or poisonous doses it appears to produce such effects as might be mistaken for poisoning by alcohol. A man swallowed four ounces of chloroform. After taking this large dose he was able to walk for a considerable distance, but he subsequently fell into a state of coma. The pupils were dilatéd, the breathing stertorous, the skin cold, the pulse imperceptible, and there were general convulsions. He recovered in about five days.

*In the state of vapor.*—After the first two or three full inspirations, there is a feeling of warmth and excitation extending from the chest to the extremities. This is followed by whirring or whizzing noises in the ears, a sensation of vibratory thrilling and benumbing throughout the body. There is excitement of the brain, with exhilaration, and phenomena similar to those produced by the protoxide of nitrogen. There is loss of sensation and motion, and at last of consciousness. Sleep, more or less profound, is induced, during which the mind is either passive, for nothing is remembered, or it continues active as in dreams. Dr. I. C. Atkinson records, as the result of observation on himself, that the senses are successively obliterated during the inhalation of chloroform. "The sense of hearing, under a moderate inhalation of chloroform, conveys correct modulations of sound to the brain; for if there be a musical turn of mind, a whole tune, after a prompter has led the way, is pleasingly sung or whistled through, no error in time being perceptible. During the gradual obscuration of the senses the mind is only conscious of the retention, to the latest, of the faculty of hearing, the senses being *obliterated one after another*, but not *simultaneously*." Among the unpleasant secondary results of its administration may be mentioned vomiting, headache, and severe collapse; but such cases may be regarded as exceptional.

*Poisonous Effects.*—In cases in which chloroform vapor has proved fatal, the symptoms and appearances have been pretty uniform. The patient passes rapidly into a state of insensibility, with stertorous breathing. The face is pale, sometimes livid, the lips congested, the breathing slow and laborious, the surface cold, the pulse sinks, and soon becomes imperceptible at the wrist. There is complete and universal relaxation of the muscular system, including the sphincters, with entire loss of sensibility. The pupils are dilated. Death has been observed to take place with great rapidity—not more than one or two minutes having elapsed. In one instance, in which thirty drops had been inhaled, the patient died in a minute; in another, so small a quantity as fifteen or twenty drops proved speedily fatal. These and other facts show that the fatality is not so much dependent on the dose administered as on the mode in which the vapor is inhaled, and the condition of the patient at the time.

*Modus Operandi.*—There is no doubt that chloroform enters into the blood, and affects its color and liquidity. The amount of carbonic acid excreted by the lungs under the influence of chloroform has been found to be diminished, showing, as in the case of alcohol and ether, that the processes of oxidation going on in the body are lessened. This does not arise from the appropriation of the oxygen in the blood by chloroform, but probably, as Dr. Snow has suggested, from an arrest of oxidation, which appears to be a property of chloroform as well as of the vapors of other volatile narcotic liquids. This experimentalist has observed that the venous blood in patients under the influence of chloroform is less dark in color than in the normal state, indicating, in his opinion, that those changes in the blood which take place in the systemic capillary circulation are diminished. The observations made by Dr. Snow with respect to the action of chloroform on the lower animals, as well as the facts he has collected with regard to the deaths which have taken place in the human subject while chloroform was being inhaled, have led him to adopt the following conclusions: "1st. Chloroform vapor, if it be inhaled in large proportion with atmospheric air, destroys life by paralyzing the heart. 2d. In smaller proportions, but long continued, it produces death apparently by the brain, and by interfering with the respiratory function. In such cases the heart is found to beat after respiration has ceased. 3d. Chloroform vapor, if it be blown upon the heart, paralyzes it immediately." Dr. Snow refers the cause of sudden death from chloroform to paralysis of the heart, owing to the vapor having been inhaled in too concentrated a form. It is to be observed, however, that this is the mode in which some have advised its administration; and the results of their practice are not in accordance with this view of its operation. In Dr. Black's opinion, when the vapor is administered in a highly concentrated form, it is irrespirable, owing to its pungency; and spasm of the glottis, leading to asphyxia, is induced. Dr. Black thinks that the safety of chloroform vapor "is in its inhalation; the chief danger consists not in its impregnating the blood too strongly, but in its non-inhalation. Any concentration of the vapor which can be breathed is safe; any condition of dilution which forces the patient to cough, or to hold his breath, is dangerous; and if persevered in for even half a minute may be fatal. When deeply narcotized, the patient can inhale the chloroform in its highest concentration; but if this be forced upon him at the commencement, he will immediately experience choking or suffocation." Death from chloroform cannot, however, be referred in all cases to asphyxia, as this theory would imply. Admitting that a patient can inhale the concentrated vapor when deeply narcotized, it is clear that a persistence in its administration under these circumstances would destroy life by a directly poisonous action. In a fatal case communicated to us by a friend, the heart suddenly ceased to beat *four minutes after the vapor had been withdrawn.* The digital arteries, which had been divided in the operation, suddenly ceased to let blood. The man was dead. This appears to corroborate Dr. Snow's view of the cause of death. [Dr. J. Chapman, dissenting from both the above-mentioned opinions, considers that death from chloroform may always be referred to mechanical obstruction of the right side of the heart as its proximate cause. After quoting the results of Dr. Snow's experiments on animals, in which the heart generally continued to beat after respiration had ceased, and the conclusion of the Paris commission, that in all animals killed by chloroform the action of the heart survives the respiration, he argues that these results are not a little remarkable, if death is caused by paralysis of the heart. In confirmation of his own opinion, he relates the following experiment: I caused a cat to inhale chloroform until respiration and the action of the heart had entirely ceased; in fact, until the animal was quite dead. The chest was then opened. The heart lay perfectly still, the right auricle and ventricle being immensely distended by blood. The pericardium having been removed, and the heart observed to be still perfectly motionless, its distension was relieved by division of the pulmonary artery (the aorta was divided at the same time), when instantly the heart resumed its rhythmical contractions. The auricles and ventricles continued to contract alternately for more than half an hour after the vessels had been divided. —Ed.]

*Morbid Appearances.*—Congestion of the vessels of the brain and its membranes has been met with, but not uniformly; the lungs congested, or in an apoplectic condition; the heart flaccid, and the cavities frequently empty, or containing but little blood; the blood generally dark in color, and very fluid. [Dr. Snow, however, records the examination of thirty-four persons who died from chloroform. In the majority of these the pulmonary artery and right side of the heart were distended with blood. The same distended condition of the right ventricle was observed in the animals which were the subject of Dr. Snow's experiments.—Ed.]

*Therapeutics. Of liquid chloroform.*—Dr. Hartshorne, of the Pennsylvania Hospital, made many trials of chloroform in large doses in water. In a case of painful *neuralgia* of the head, the patient took seventy-five drops at night, slept better than she had done for weeks, even after inhaling chloroform or ether, was unusually comfortable the next day, and continued to improve under its use. It is stated to have answered admirably as a substitue for Dover's powder in a case of *rheumatism*, and to have afforded prompt relief in a case of *flatulent colic.* M. Aran, physician to the Hospital St. Antoine, Paris, has obtained the most satisfactory results from the internal administration and external application of chloroform in *lead colic.* The doses have been from twenty to fifty drops, given at short intervals. The medicine has also been administered in the same doses by enema. Dr. Strother administered one hundred drops to a *cholera* patient, with the effect of relieving the cramps, the vomiting, and all the other alarming symptoms for several hours, during which time other remedies were applied, and the patient recovered. It was given to a patient laboring under *traumatic tetanus*, by Dr. Brickle, of New Orleans, in doses of a hundred drops, but without any very decided advantage. Dr. Warriner states that it produced immediate relief in a case of sick headache, and in a case of *dysmenorrhœa* depending on uterine neuralgia. Chloroform was used by M. Guillot as an antispasmodic in cases of *asthma*, in 1844; and Dr. Formby employed it in cases of *hysteria*, at a still earlier period. According to Dr. Christison, it is serviceable for arresting chronic vomiting depending on nervous causes, such as that which occurs in pregnancy. In *otalgia*, in the case of an adult who suffered from severe pain in the ear which had resisted leeches and morphia, Professor Malmsten, of Stockholm, employed chloroform, twelve drops being dropped into the affected ear. In a few minutes the pain subsided.

*Of chloroform vapor.*—*Surgical Operations.*—The uses of chloroform vapor in surgery may be summed up, in the language of its discoverer, in a few words: To relax the muscles in reducing dislocations, &c.; to avert the suffering attendant on deep probings and other painful but necessary modes of diagnostic examination and dressing; but, principally, to annul the pain of protracted operations by the caustic, ligature, or knife. *Tetanus and Hydrophobia.*—Chloroform vapor has been used in traumatic tetanus, with temporary relief. [I administered it during thirty-six consecutive hours to a man suffering from idiopathic tetanus, and during that time prevented the occurrence of the tetanic spasms, and was enabled to give food by the bowel; but the spasms returned on its discontinuance, and death was only retarded.—Ed.] It has also been found to alleviate the sufferings in hydrophobia; but there is no evidence that it has saved life in these diseases. *Vesical Calculus.*—In a case of lithotrity in which there was such excessive irritability of the bladder that a tablespoonful of water could not be introduced, chloroform vapor produced such a beneficial effect that while the patient was under its influence four ounces of warm water were injected, the stone was then broken, the bladder washed out, and the patient recovered without any untoward symptom. *Ophthalmic Surgery.*—Chloroform has been found particularly advantageous in operations for congenital cataract or other surgical operations where it is important to secure steadiness of the eyeball. *Hernia.*—Strangulated hernia is very frequently reduced, and the surgical operation for its relief is often avoided, by the use of chloroform. *Obstetric Practice.*—Chloroform vapor has been most extensively used in midwifery for diminishing or annulling the pains attendant on labor. Its great advantages in this branch of practice have been set forth by Dr. Simpson, Dr. Murphy, and others. Dr. Ramsbotham and Dr. Robert Lee are, however, opposed to its use under any circumstances. [In *puerperal convulsion*, chloroform vapor is very useful, in the more robust patients, after bleeding, and at times is in itself sufficient for the cure of the disease.—W.] *In Medicine.*—The vapor has been used in medical practice chiefly as an antispasmodic, and in many instances with great benefit; in other cases it has been employed as a diffusible stimulant, sedative, or narcotic. *Hooping-Cough.*—Chloroform has been found useful in abating the severity of the paroxysms, and apparently in shortening the duration of the disease. It has, in these cases, been inhaled from a few drops to half a drachm, sprinkled on the hand or on a folded handkerchief, and its vapor largely diluted with the air. *Neuralgia.*—Chloroform vapor has also been advantageously employed in neuralgia, in spasmodic asthma, in spasmodic croup, in puerperal convulsions, and various other spasmodic affections. In neuralgic affections of the sciatic nerve, chloroform has been used sciatically by Dr. Shipman with complete success in two cases. *Convulsions in Infants.*—M. Marotte relates the case of an infant, eleven months old, suffering from convulsions, with spasm of the glottis, during dentition. Chloroform vapor was cautiously administered at intervals, with success. In convulsions depending on cerebral congestion, Professor Malmsten, of Stockholm, has found the inhalation of chloroform beneficial in arresting these convulsions when ordinary remedies had failed. Twenty drops were placed on a folded handkerchief, and held at a distance of an inch and a half from the child's nose. In a very short time the convulsions had ceased. On a slight recurrence, the handkerchief was again used, with permanent benefit. Dr. West has also found the inhalation of chloroform to cut short fits of convulsions, thereby saving the strength and sometimes even the life of the patient, leaving, however, the cause of the convulsions untouched. *Cholera.*—The sleep produced by chloroform has been found to exert a certain influence over this malady. *Insanity.*—In cases of insanity attended with maniacal excitement, it has allayed the violence of the paroxysms; but, as under ether vapor, the relief has been only temporary.

*Administration and Dose.*—The dose of the *liquid* may be from five to twenty minims or more. The physicians of the United States have been in the habit of prescribing it in much larger doses. When given alone, the liquid chloroform may be mixed with water and a little mucilage; but the alcoholic solution has been generally employed, under the name of chloric ether.

Different opinions exist, not only as to the best mode of administering chloroform vapor, but as to its operation on the system. Dr. Simpson, whose opinions are entitled to respect as the discoverer of the anæsthetic properties of the liquid, as well as from the large experience he has had in administering it to persons presenting every conceivable variety of temperament, age, and state of health, contends—"1. That chloroform vapor must always be exhibited as rapidly and in as full strength as possible, if you desire to have its first or exhilarating stage practically done away with and excluded; and you effect this by giving the vapor so powerfully and speedily as to apathize the patient at once. If you act otherwise, and give it in small or slow doses, you excite and rouse the patient in the same way as if nitrous-oxide gas were exhibited. 2. In order that the patient be thus brought as speedily as possible under its full influence, the vapor should be allowed to pass into the air-tubes by both the mouth and nostrils; and hence all compression of the nostrils, &c., is to be avoided. 3. The vapor of chloroform is about four times heavier than atmospheric air. And hence, if the patient is placed on his back during its exhibition, it will, by its mere gravitation, force itself in larger quantities into the air-passages than if he were erect or seated. As to the best instrument for exhibiting the chloroform with these indications, the simple handkerchief is far preferable to every means yet adopted. It is infinitely preferable to any instrument yet seen, some of which merely exhibit it by the mouth and not by the nostrils, in small and imperfect, instead of full and complete doses; and with instruments so constructed, there is no doubt whatever that failures and exciting effects would ever and anon occur. Besides, inhaling instruments frighten patients, whilst the handkerchief does not; and mental excitement of all kinds, from whispering and talking around the patient, is to be strictly avoided, if possible. As to the quantity required to be applied to the handkerchief, it has been stated that the average dose of a fluidrachm was generally sufficient to affect an adult; but I have latterly seldom measured the quantity used. We must judge by its *effects* more than by its quantity. The operator, gathering his handkerchief into a cup-like shape in his hand, should wet freely the bottom of the cup (so to speak), and if the patient is not affected in a minute or so, he should add a little more. It evaporates rapidly, and you must not wet your handkerchief, and then delay for a minute or more in applying it. It must be applied immediately. Not unfrequently, when the patient was just becoming insensible, he will withdraw his face, or forcibly push aside the handkerchief. If you *then* fail to reapply it to his face, and keep it there, you will be liable to leave him merely excited. But probably two or three inhalations more will *now* render him quite insensible. The simplest test of its full and perfect effect is some noise or stertor in the respiration. Cease it as soon as this is fully set in. But reapply it, of course, from time to time, if it is wished to keep up its effects." A committee appointed by the American Medical Association to report on the administration of this vapor, consider—1. That the recumbent position is the most favorable for the inhalation of chloroform, and in obstetrical practice it should be administered in no other. 2. No inhaling apparatus should be employed. A common pocket handkerchief, folded in the form of a compress or sponge, applied so as to cover both the nostrils and mouth, is the best vehicle. With this there is no danger of the exclusion of atmospheric air, an accident to which we may be exposed in a greater or less degree with ordinary inhalers. The handkerchief or sponge is at the same time much less formidable in appearance, and much more readily applied. 3. Upon the handkerchief or sponge may be poured a drachm of chloroform if the full anæsthetic effect be desired, or one-half or one-third of this quantity if a less decided result only is sought for; the effect, however, to be the guide, rather than the quantity used, as very different quantities are required in different cases. 4. The inhalation should never be continued after the full anæsthetic effect has been produced, which can generally be recognized at once by the sonorous or stertorous sleep. Nor should it ever be given after the pulse begins to fail in frequency and force. It is advisable that the pulse should never be allowed to fall between sixty and sixty-five per minute; when it reaches this point the sponge should be removed, and atmospheric air alone be inhaled until the pulse recovers its tone. It is also to be borne in mind that the depressing stage of chloroform continues to *increase* for several seconds after it has been withdrawn; differing in this respect from ether, which does not appear to be cumulative in its operation, for under the influence of ether the patient never becomes more depressed than at the moment of ceasing the inhalation. Dr. Snow, who has had considerable experience in administering chloroform in this metropolis in surgical and obstetric practice, prefers the use of an inhaler so constructed as to allow the vapor to pass both by the nose and the mouth into the lungs, the patient being made to breathe through a mask. By the aid of this instrument the amount of vapor inhaled, and its degree of admixture with air, can be easily controlled. According to Dr. Snow, "atmospheric air, loaded with from four to five, or even six per cent. of chloroform vapor, may be safely administered, and will produce insensibility in the average time of from three to four minutes. The proportion of from eight to ten per cent. of chloroform vapor in atmospheric air constitutes a dangerous mixture." As a test for the degree of insensibility required for a surgical operation, Dr. Snow advises that the eyelid be raised, and its free border gently touched. If no winking takes place, the operation may be commenced. Others recommend the simple test of pinching, or advise waiting for a complete relaxation of the limbs. It has been found serviceable in cases of great depression to administer a glass of wine or brandy and water before giving the chloroform; and all agree that no food should be taken during one or two hours previous to the inhalation. A mixture of ether and chloroform is used by the order of the government throughout Austria. No death has occured from its use in Vienna, and it was used with good effect in our civil hospitals in the East. One part of chloroform to six parts of ether in cold weather, and eight parts of ether in warm weather, is the proportion recommended, but the mixture must be made at the time it is wanted for use.

*Antidotes.*—In cases of poisoning by the vapor of chloroform, the following points of treatment should be attended to. When the pulse and respiration are suspended, the patient, if not so already, should be placed in a horizontal posture, cold air should be fanned across the face, and cold water should be applied to the head. There should be a free passage of air to the mouth and nostrils, inflation of the lungs with air or oxygen gas by any of the usual methods adopted in asphyxia, and there should be at the same time forced movements of the chest to imitate respiration. Heat and friction may be applied to the chest and abdomen, and stimulants to the nostrils.

*Pharmaceutic Uses.*—Chloroform is used in the preparation of atropia, and in the test for the quantity of alkaloids contained in pale and red cinchona barks.

### *Officinal Preparations.*

Linimentum Chloroformi [U. S.], *Liniment of Chloroform.*—Take of chloroform, two fluidounces; liniment of camphor, two fluidounces.

Mix. ["Take of purified chloroform, three troyounces; olive oil, four troyounces. Mix them." U. S.]

Useful in neuralgia and other painful affections.

Spiritus Chloroformi [U. S.], *Spirit of Chloroform.*—Take of chloroform, one fluidounce; rectified spirit, nineteen fluidounces. Dissolve.

*Test.*—Specific gravity 0.871.

["Take of purified chloroform, a troyounce; stronger alcohol, six fluidounces. Dissolve the chloroform in the stronger alcohol." U. S.]

This is intended to represent chloric ether. Spirit of chloroform of this strength may be added to aqueous preparations without any separation of the chloroform. It has a fragrant odor, and a hot, sweet, fragrant taste. It is neutral to test paper. When a few drops are applied to the skin, it is more irritating and evaporates much more slowly than a similar quantity of chloroform. Unlike chloroform, it may be readily ignited; it burns with a strong yellow flame, somewhat resembling that of ether, but depositing more carbon on cold substances placed within it. It produces an intense green color with bichromate of potash and sulphuric acid.

*Therapeutics.*—It has been used with advantage as a substitute for the ethers, and is found to possess equal efficacy as a stimulant and antispasmodic. Its flavor is preferred by most persons to that of the ethereal preparations, and it may be advantageously prescribed when objection is made to the latter form of stimulant.

The *dose* for an adult is from min. xx to min. xl two or three times a day.

[Mistura Chloroformi, U. S., *Mixture of Chloroform.*—"Take of purified chloroform, half a troyounce; camphor, sixty grains; the yolk of one egg; water, six fluidounces. Rub the yolk in a mortar, first by itself, then with the camphor, previously dissolved in the chloroform, and, lastly, with the water, gradually added, so as to make a uniform mixture." U. S. Used as a stimulant anodyne and antispasmodic, combining the virtues of camphor and chloroform. Dose, f℥ss–f℥j.—W.]

## [**Iodoform**, *Teriodide of Formyl.* $C_2HI_3$.

This substance, which is not officinal, may be obtained by adding alcoholic solution of potassa to the tincture of iodine, evaporating to dryness, and treating the residue with water, which dissolves out everything except the iodoform. Iodoform is insoluble in water, soluble in alcohol and ether. It occurs in small yellow crystals, which have a sweet taste and saffron-like odor. It is volatile, non-corrosive, and unirritating when applied locally.

*Therapeutics.*—Iodoform is anodyne and alterative. It is sometimes used in neuralgic affections. It may be employed in all the diseases in which iodine is commonly used, such as goitre, rickets, scrofula, &c. It has been especially recommended in chronic enlargement of the prostate, in the form of a suppository made of a scruple of it to the ounce of cocoa butter. In chronic skin affections it has been used as an ointment.

Its vapor is anæsthetic.

Dose, gr. ij–iij t. d. in pill.—W.]

## [**Chlorocarbon**, *Bichloride of Carbon.* $C_2Cl_4$.

This may be obtained by decomposing either olefiant gas, chloroform, or the bisulphide of carbon, by chlorine gas. The reactions are as follows: With olefiant gas, $C_2H_4+8Cl=C_2Cl_4+4HCl$; with chloroform,

$C_2HCl_5+2Cl=C_2Cl_4+HCl$; with bisulphide of carbon, $C_2S_4+8Cl=C_2Cl_4+4SCl$ (chloride of sulphur).

Chlorocarbon is a transparent, very volatile, oily fluid, with an odor resembling somewhat that of chloroform. It boils at 170°. Its specific gravity is 1.50. Its vapor resembles in its effects, when inhaled, that of chloroform, but is said to act more slowly and persistently, and more depressingly on the heart. It will, therefore, probably never be used as a general anæsthetic. It has recently been recommended as a *local* anæsthetic by Prof. Simpson, of Edinburgh. He says that it is less irritant than chloroform, and injects twenty drops by means of a hypodermic syringe, with the effect of relieving local neuralgic pains, without producing any nausea or other constitutional disturbances, such as too often follow the similar use of morphia or its salts. He has also injected the *vapor* into the vagina, for the relief of hysteria, with marked success. Chlorocarbon may probably also be used with advantage as an ingredient of anodyne liniments.—W.]

**Fousel Oil.** (Appendix A.) *Amylic Alcohol; Hydrate of Oxide of Amyl.* $C_{10}H_{11}O,HO=88$.

[**Alcohol Amylicum.** Mat. Med. List, U. S. P.

"*Synonym.*—Fusel oil.

"A peculiar alcohol obtained by distillation from fermented grain or potatoes by continuing the process after the ordinary spirit has ceased to come over."]

*Preparation.*—It may be procured as follows: Take of the light liquid (oil of grain), which may be obtained at any large distillery by continuing the distillation for some time after the pure spirit has been all drawn off, any convenient quantity. Introduce it into a small still or retort connected with a condenser, and apply heat so as to cause distillation. As soon as the oil begins to come over unmixed with water, the receiver should be changed, and the distillation being resumed, and carried nearly to dryness, the desired product will be obtained. The liquid drawn over during the first part of the distillation will consist of an aqueous fluid, surmounted by a stratum of the fousel oil. This latter, though impregnated with a minute quantity of water, should be separated and preserved as being sufficiently pure for use. Its production in fermented liquids probably depends on a peculiar conversion of sugar. Thus, as Gregory has suggested, 5 equivalents of sugar will yield 4 eq. of amylic alcohol, 12 eq. of water, and 20 eq. of carbonic acid. $5(C_{12}H_{12}O_{12})=4(C_{10}H_{11}O,HO)+12HO+20CO_2$. Other products pass over with it, *e. g.* œnanthic ether, &c.

*Properties.*—Fousel oil is a limpid, transparent liquid, of a pale yellow color, nearly colorless, and having a very nauseous persistent odor, and a hot, acrid, nauseous taste. When washed with water (to remove the alcohol), and subsequently distilled from chloride of calcium (to deprive it of water), it is quite colorless. It burns in the atmosphere, only when heated, with a flame like that of light carburetted hydrogen gas. It dissolves iodine; and is a good solvent for fats, resins, and camphor. It is not miscible with water, which, however, sparingly dissolves it. Neither is it miscible with solution of ammonia nor with solution of potash. [It is sparingly soluble in water, but unites in all proportions with alcohol and ether. It does not take fire by contact with flame, and, when dropped on paper, does not leave a permanent greasy stain. U. S. Ph.]

*Tests.*—Specific gravity 0.818; boiling-point 270°. [When taken internally, fusel oil acts as a powerful irritant poison.—W.]

*Use.*—Employed in the formation of valerianic acid for the preparation of valerianate of soda.

### **Acetum,** *Vinegar.* [Mat. Med. List, U. S. P.]

Impure dilute acetic acid, prepared from French wines by the acetous fermentation.

All liquids which are susceptible of vinous fermentation may be made to yield vinegar. A solution of saccharine matter (or some substance capable of producing sugar) is the essential ingredient. It is converted by fermentation, first into alcohol, and subsequently into acetic acid. The liquids employed in the manufacture of vinegar vary according to circumstances. In this country the vinegar of commerce is obtained from an infusion of malt, or of a mixture of malt and raw barley. In wine countries it is procured from inferior wines. Dilute spirit, beer, a solution of sugar, and other liquids, are also susceptible of the acetous fermentation. In France, wine vinegar is prepared in casks, which are placed in a stoved chamber, heated to between 68° and 77° Fahr. Each vat communicates with the air by two apertures. Every eight or ten days the liquor in the vats must be changed. Either red or white wine may be used, but the latter is generally employed. Wine vinegar is of two kinds, white and red, according as it is prepared from white or red wine. White wine vinegar is usually preferred, as it keeps better. That which is made at Orleans is regarded as the best.

*Theory of Acetification.*—A remarkable distinction between the acetous and vinous fermentation is, that, for the former to be perfectly established, the presence of atmospheric air (or of oxygen) is essential, while for the latter this is not necessary. During the acetous fermentation the alcohol is converted into acetic acid and water by the absorption of atmospheric oxygen. $C_4H_5O,HO + O_4 = HO,C_4H_3O_3 + 2HO$.

*Officinal Characters.*—A liquid of a straw-color and acetous odor. Ammonia added a little in excess generally renders it slightly turbid and more or less purple.

*Tests.*—Specific gravity 1.008 to 1.022. It is scarcely affected by chloride of barium, or oxalate of ammonia, and not at all by sulphuretted hydrogen (showing its freedom from sulphuric acid, lime, and metallic impurities).

The presence of nitric acid in vinegar may be recognized by boiling this liquid with diluted sulphate of indigo. The color is discharged. Or it may be detected by saturating the suspected acid with potash or soda, and evaporating to dryness: the residue deflagrates, when thrown on red-hot coals, if nitric acid be present.

*Therapeutics.*—Taken internally, vinegar is used for various purposes: the most important of these are, to allay febrile heat by its refrigerant qualities; to diminish inordinate vascular action; to relieve certain affections of the brain supposed to depend on, or be connected with, venous congestion; and to act by its chemical properties of an acid. Thus, in *fevers*, whether simple or eruptive, but especially in those varieties commonly denominated putrid and bilious, vinegar (more or less diluted with water) is a most refreshing drink, allaying thirst, and diminishing excessive heat. In *hemorrhages*, as from the nose, lungs, stomach, or uterus, it is particularly beneficial by its refrigerant, sedative, and astringent qualities. It diminishes excessive vascular action, and promotes contraction of the bleeding vessels. As a local astringent, it is injected into the nose in epistaxis, and is used as a wash in profuse hæmorrhoidal discharges. The benefit obtained by the application of vinegar and water to the abdomen, vulva, and thighs, in uterine hemorrhages, arises principally from the cold produced. In *consumption*, vinegar, diluted with water, is sometimes serviceable as a palliative, by its refrigerant qualities: it relieves the hectic symptoms, diminishes or puts a stop to the night sweats, checks bronchial hemorrhage, and prevents diarrhœa. In *mania*, it has been recommended as a means of allaying cerebral excitement. In *poisoning by opium*, it is used as a counter-poison; but as acetic acid forms very soluble, and, therefore, powerful compounds with morphia, it ought not to be exhibited until the contents of the stomach have been evacuated. In poisoning by the alkalies and their carbonates, and by lime, vinegar is the safest and most efficacious acidulous substance that can be administered. In diseases attended with *phosphatic deposits* in the urine, it may be advantageously used either as a medicine or condiment. *Enemas containing vinegar* have been employed for the purpose of provoking alvine evacuations in obstinate constipation and strangulated hernia; of expelling the small round-worm (*Ascaris vermicularis*); of checking uterine and intestinal hemorrhage; and of relieving inflammation or congestive conditions of the brain. Sponging the face, trunk, or extremities with cold or tepid vinegar and water, usually proves refreshing and grateful in febrile disorders with a hot skin. It diminishes preternatural heat, promotes the cutaneous functions, and operates as a beneficial stimulant to the nervous system. Fomentations containing vinegar are used in bruises and sprains.

*Administration.*—Vinegar is given in doses of from one to four fluidrachms. A refrigerant drink in fevers is made by adding one or two ounces of vinegar to a quart of water. A vinegar wash is prepared by mixing three fluidounces of vinegar with five of water.

[ACETUM DESTILLATUM, U. S., *Distilled Vinegar.*—"Take of vinegar, eight pints. Distil, by means of a sand-bath, from a glass retort into a glass receiver, seven pints. Distilled vinegar may be substituted for diluted acetic acid in the preparation of the officinal vinegars." U. S.

Distilled vinegar is not a pure solution of acetic acid in water, but always contains more or less aldehyde. This, and its unequal strength, make it but a poor substitute for dilute acetic acid, whilst it is not so aromatic and pleasant as pure vinegar.—W.]

# PRODUCTS OF DESTRUCTIVE DISTILLATION.

**Acidum Aceticum,** *Acetic Acid.* [Mat. Med. List, U. S. P.]

An acid liquid prepared from wood by destructive distillation, and containing 28 per cent. of anhydrous acetic acid.

*Preparation.*—By the destructive distillation of the hard woods (oak, beech, hornbeam, ash, and birch) in iron cylinders, an impure acid, called Pyroligneous acid, is obtained. This is mixed with cream of lime, and the mixture evaporated to dryness in shallow wrought-iron pans, when it forms a black or grayish-colored granular mass, called pyrolignite of lime. If this be submitted to distillation with sulphuric acid, it yields an impure acetic acid, which is used in the manufacture of crude acetate of lead, and for making carbonate of lead by the Dutch process. If pyrolignite of lime be mixed with a solution of sulphate of soda, double decomposition is effected, and sulphate of lime and acetate of soda are the products. The latter is repeatedly crystallized until it is colorless, and is then in a fit state for the manufacture of pure acetic acid. In some manufactories the acid liquor, after the separation of the greater part of the tar, by subsidence, is at once neutralized by the carbonate of soda, and the crude acetate of soda is obtained by crystallization, and subsequently purified. The acetate of soda being treated with sulphuric acid and distilled, yields acetic acid, $NaO,C_4H_3O_3+SO_3,HO=NaO,SO_3+HO,C_4H_3O_3$. The distillation of acetic acid is usually effected in glass or earthenware stills. On the large scale, silver condensers are sometimes used.

*Officinal Characters.*—A colorless liquid with a strong acid reaction, and odor of vinegar.

*Tests.*—Specific gravity 1.044. One fluidrachm requires for neutralization 31.5 measures of the volumetric solution of soda. It leaves no residue when evaporated; gives no precipitate with sulphuretted hydrogen, chloride of barium, or nitrate of silver; and does not give rise to a blue color, when added gradually to an equal volume of the solution of iodate of potash previously mixed with a little mucilage of starch (showing its freedom from metallic impurities, sulphuric, hydrochloric, and sulphurous acids). [The U. S. Ph. directs that acetic acid should have the specific gravity 1.047; and besides several tests already mentioned, gives the following: It does not change color on the addition of hydrosulphate of ammonia. When saturated with ammonia, it gives no precipitate with iodide of potassium. If silver be digested in it, and muriatic acid afterwards added, no precipitate will be formed. Of this acid one hundred grains saturate sixty grains of bicarbonate of potassa, and contain thirty-six grains of monohydrated acetic acid. The officinal U. S. acid therefore contains 8 per cent. more of the anhydrous acid than the British.—W.]

*Therapeutics.*—See **Acidum Aceticum Glaciale.**

*Pharmaceutic Uses.*—Acetic acid is used in the preparation of digitalin, acetic extract of colchicum, liniment of cantharides, acetic liniment of turpentine, solution of acetate of ammonia, acetate of lead, acetate of potash, and oxymel.

*Officinal Preparation.*

ACIDUM ACETICUM DILUTUM [U. S.], *Dilute Acetic Acid.*—Take of acetic acid, one pint; distilled water, seven pints. Mix. ["Take of acetic acid, a pint; distilled water, seven pints. Mix them." U. S.]

*Tests.*—Specific gravity 1.006. One fluidounce requires for neutralization 31 measures of the volumetric solution of soda. [Diluted acetic acid has the specific gravity 1.006; and one hundred grains of it saturate seven and six-tenths grains of bicarbonate of patassa. U. S. Ph.] Used in the preparation of syrup of squill. [Used in the preparation of all the aceta. U. S. Ph. Also Liquor ammoniæ acetatis, Syrupus alii, Emplastrum ammoniaci.—W.]

## **Acidum Aceticum Glaciale,** *Glacial Acetic Acid.*

*Synonym.*—Acidum Aceticum, *Ed.*

Monohydrated Acetic Acid, $HO,C_4H_3O_3=60$.

*Preparation.*—Take of acetate of soda, twenty ounces; sulphuric acid, eight fluidounces. 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 fluidounces have passed over. Mix one fluidrachm of the acetic acid thus obtained with a fluidrachm of the solution of iodate of potash previously mixed with a little mucilage of starch; and, if it gives rise to a blue color, agitate the whole product of distillation with a quarter of an ounce of black oxide of manganese perfectly dry and in fine powder, and redistil.

The action of sulphuric acid upon acetate of soda not unfrequently gives rise to the formation of a little sulphurous acid ($SO_2$), which is indicated by its reducing action upon iodate of potash, iodine being liberated, which colors the starch blue ($KO,IO_5+SO_2=KO,SO_3+O_4+I$). By treatment with black oxide of manganese, this sulphurous acid is converted into sulphuric ($2MnO_2+SO_2=Mn_2O_3+SO_3$), which remains behind on redistillation. The distilled acid obtained by this process requires to be congealed by ice, and the part that remains liquid drained off. The solid portion is the monohydrated acid.

*Officinal Characters.*—A colorless liquid with a pungent acetous odor, converted, when cooled to nearly 32°, into colorless prismatic crystals. Specific gravity 1.065, which is increased by adding to the acid 10 per cent. of water.

*Properties.*—*Glacial acetic acid* is the strongest acetic acid procurable. It crystallizes at 45° F. when we throw into it any particle of solid matter (a crystal of acetic acid answers best), and the thermometer plunged into it rises at the same time from 45° to 51°. These crystals are brilliant, broad flat plates, of a pearly lustre. They melt at a temperature somewhat below 60° F. Free acetic acid is known by its peculiar odor and by its volatility. Its vapor reddens litmus, and fumes with ammonia. It does not occasion any precipitate with solutions of lime, of the salts of baryta, or of nitrate of silver. It forms with potash a very deliquescent salt. Glacial acetic acid does not cause effervescence when marble is dropped into it, unless water be added. The neutral acetates are all soluble, save those of molybdenum and tungsten. The acetates of silver and protoxide of mercury are slightly soluble. The acetates are known by the acetic odor which they emit, on the addition of sulphuric acid and the application of heat, and by the white lamellar and pearly precipitates which many of them produce with nitrate of silver and protonitrate of mercury. They redden solutions of the persalts of iron (forming *peracetate of iron*). All the acetates are decomposed by heat, and give results which vary somewhat according to the nature of the base. Some of the acetates, as those of potash, lead, and copper, evolve, when heated, an inflammable fluid, called *acetone* or *pyroacetic spirit*, whose composition is $C_6H_6O_2$.

*Tests.*—One fluidrachm requires for neutralization 97 measures of the volumetric solution of soda. It does not give rise to a blue color, when added gradually to an equal volume of the solution of iodate of potash previously mixed with a little mucilage of starch (showing its freedom from sulphurous acid).

*Therapeutics.*—Strong acetic acid is a valuable remedy for the cure of the different forms of porrigo, popularly called ring-worm or scalled head. Its application, which may be effected by means of a piece of lint wrapped around a wooden stick, causes acute but temporary pain, redness of the skin, and whitening of the abraded spots. One or two applications are usually sufficient to effect a cure. It is also employed as a caustic to destroy corns and warts. It has been proposed as a speedy means of exciting rubefaction and vesication, and for this purpose, blotting-paper or cambric, moistened with the acid, has been applied to the neck in cases of croup. In *scurvy*, acetic acid has been found serviceable. As a stimulant, disinfectant, and antiseptic, diluted acetic acid is used in gangrenous and other ill-conditioned ulcers. In ulceration of the throat, in scarlatina, and in cynache, gargles containing acetic acid are sometimes used with good effect. Acetic collyria are useful, as mild astringents, in chronic ophthalmia, and for removing lime-dust adhering to any part of the globe or lid of the eye. It may also be employed for the other purposes for which vinegar is used. (See **Acetum**, *Therapeutics*, p. 902.)

*Antidotes.*—In poisoning by strong acetic acid the treatment is the same as that for poisoning by other acids.

*Pharmaceutic Use.*—Glacial acid is one of the ingredients of creasote mixture.

## Spiritus Pyroxylicus Rectificatus, *Rectified Pyroxylic Spirit.*

Hydrated Oxide of Methyl, $C_2H_3O,HO=32$, with about ten per cent. of water; a product of the destructive distillation of wood.

*Preparation.*—The first runnings of the acid liquor derived from the destructive distillation of wood are redistilled once or twice, and the product is sold under the name of *pyroligneous ether* or *wood naphtha*. This is an impure liquor, containing, besides hydrated oxide of methyl, acetone, and other inflammable liquors. It is purified by introducing it into a retort with excess of chloride of calcium, and distilling the mixture by a water-bath, as long as volatile matter passes off. A quantity of water, equal to the spirit employed, is then added, and the distillation continued. The product is now pure or rectified pyroxylic spirit, carrying along with it a little water, which is removed by a second distillation with quicklime.

*Officinal Characters*—Colorless, mobile and inflammable, burning with a pale blue flame, having a spirituous odor and a warm ethereal taste, with a peculiar after-taste.

*Properties.*—It is more inflammable than rectified oil of turpentine. It boils at from 140° to 150° F. It dissolves many resins, mixes with most essential oils, and forms crystalline compounds with baryta, lime, and chloride of calcium.

*Tests.*—Specific gravity 0.841 to 0.846. Without action on litmus paper, free from smoky taste. Is not rendered turbid by mixture with water.

*Therapeutics.*—It is regarded as a sedative, and has been occasionally used in doses of twenty minims or more in phthisis and bronchitis, &c., to diminish expectoration, and to check cough. It is also said to be useful in relieving sickness.

[It is much to be regretted that this substance was admitted into the Pharmacopœia, notwithstanding the strong opposition made by the London and Dublin Colleges to the use of methylated spirit in pharmaceutical preparations, on account of its noxious properties. Rectified pyroxylic spirit has not indeed the nauseous odor of methylated spirit, which consists of ninety parts of rectified spirit, mixed with ten parts of *crude* pyroxylic spirit, but the admission into the Pharmacopœia, for medicinal use, of pyroxylic spirit, can hardly fail to act as an encouragement to those who maintain the fitness of methylated spirit for pharmaceutical preparations.—Ed.]

### **Creasotum**, *Creasote*. [Mat. Med. List, U. S. P.]

A product of the distillation of wood tar, $C_{16}H_{10}O_4=138$.

*Preparation.*—Creasote is an artificial product. It is prepared from the oil which is obtained by the distillation of wood tar. Those portions of the oil which are heavier than water are freed from adhering acetic acid by carbonate of potash, and are afterwards distilled. A little phosphoric acid is mixed with the product to neutralize ammonia, and another distillation resorted to. It is next mixed with a strong solution of potash, which combines with creasote, allows any eupion which may be present to collect on its surface, and, by digestion, decomposes other organic matter. The alkaline solution is then neutralized by sulphuric acid, and the oil which separates is collected and distilled. For the complete purification of the creasote, the treatment with potash, followed by neutralization and distillation, requires to be frequently repeated.

*Officinal Characters.*—A colorless liquid, with a strong empyreumatic odor, sparingly dissolved by water, but freely by alcohol, ether, and acetic acid. Coagulates albumen.

*Properties.*—Pure creasote is transparent; has a high refractive power and an oleaginous consistence. Its odor is that of peat smoke, strong, peculiar, and persistent; its taste burning and caustic. It boils at 426° F., and is fluid at 16.6° F. It is combustible, burning with a sooty flame. It is soluble in caustic potash, and dissolves resins, camphor, fats, and essential oils; and has no acid or alkaline reaction on test-paper.

*Tests.*—Specific gravity 1.065. A slip of deal dipped into it, and afterwards into hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue color. Dropped on white filtering paper and exposed to a heat of 212°, it leaves no translucent stain.

*Impurity.*—Creasote is stated to have been mixed with rectified oil of tar, capnomor, and a substance like almond oil. These are readily detected by treating the suspected liquid with acetic acid and solution of potash, in which pure creasote is completely soluble, but not so the adulterated.

*Physiological Effects.*—Creasote operates locally as an irritant and caustic. In a concentrated state it is an irritant poison. Applied to the skin, it causes heat, redness, and the destruction of the cuticle, which comes away in furfuraceous scales. On the tongue it produces a painful sensation. Placed in contact with a suppurating surface, it whitens the part like nitrate of silver. The caustic effect of creasote depends on its union with albumen. Small doses, as one or two minims, produce in most individuals no other unpleasant effect than some sensation of heat in the pharynx, œsophagus, and stomach. Larger doses give rise to nausea, vomiting, vertigo, headache, and heat of head. When given in moderate doses, it does not affect the bowels; but when the dose has been considerably augmented, diarrhœa, or even dysentery, has been produced—a dose of one hundred and twenty minims proved fatal in thirty-six hours. The influence of creasote on the urinary organs is sometimes very marked. In some cases it is recognized in the urine by its odor, showing that it has been absorbed, and the urine sometimes acquires a blackish color from its use. It has been observed to act as a diuretic, and even to cause strangury; so that in its influence over the urinary organs it bears some resemblance to turpentine.

*Therapeutics.*—As an *internal* remedy, creasote has been principally celebrated in this country as a medicine possessing extraordinary powers of arresting vomiting. It has, however, been somewhat overrated. It is decidedly injurious in inflammatory conditions and structural diseases of the stomach; it is most successful in hysterical cases, and sometimes succeeds in pregnancy. It sometimes relieves the chronic vomiting connected with granular disease of the kidneys (Christison), though it frequently fails. In gastrodynia or flatulence it occasionally succeeds, but is admissible in those cases only in which local stimulants are usually found beneficial. [In chronic dyspepsia, with excessive flatulence, creasote is often very useful, acting apparently not only as a local stimulant, but also checking putrefactive changes in the imperfectly digested food.—W.] Where both hydrocyanic acid and creasote have been separately tried without success, Dr. Elliotson advises their union. Creasote has been found to diminish both the quantity and saccharine quality of the urine in diabetes; I have tried it in this disease without obtaining benefit. Mr. Spinks and Mr. Kesteven have published cases which show the successful employment of creasote in common diarrhœa. The dose given to adults was from two to five drops every three, four, or six hours, combined with spirit of ammonia. It was seldom found by these gentlemen that the medicine required repetition beyond the second dose. It is particularly serviceable in such cases on account of its control over the nausea or vomiting which frequently attends diarrhœa. [It appears to me greatly to diminish the fetor of the breath in gangrene of the lung.—Ed.]

As an *external* agent, creasote may frequently be employed with great advantage. It has been successfully employed to relieve toothache. After carefully clearing out the cavity of the tooth, a drop of creasote, or an alcoholic solution of it, may be introduced by means of a camel's hair pencil, and the cavity filled with the cotton soaked in the liquid. As a local application to chronic skin diseases (porrigo, impetigo, eczema) it is of considerable value. When a caustic application is required, it may be applied undiluted; but for other purposes it is used either in the form of ointment or dissolved in water as a wash. Creasote may be beneficially applied to foul and indolent ulcers. It serves the double purpose of stimulating the living surface (and thereby of changing the quality of actions going on in the part), and also of preventing the putrefaction of the secreted matters. In hemorrhages creasote acts as a most efficient styptic, partly in consequence of its power of coagulating albuminous liquids, and thereby of causing the formation of a clot, and partly by causing contraction of the bleeding vessels. It has also been employed to check caries, to restrain excessive suppuration, to repress fungous granulations in burns and scalds, and to remove condylomatous and other excrescences. The inhalation of creasote vapor is occasionally useful in relieving excessive bronchial secretion. Dr. Elliotson cured two cases of glanders in the human subject by injecting an aqueous solution of creasote up the affected nostril.

*Administration.*—Creasote may be given at the commencement of its use in doses of one or two drops, diffused through an ounce of some aromatic water by the aid of mucilage; the dose should be gradually increased. As a caustic, undiluted creasote is applied by means of a camel's hair pencil. Lotions, gargles, or injections of creasote are prepared by dissolving from two to six drops in an ounce of water. A solution of this kind is sometimes mixed with poultices. The inhalation of creasote vapor may be effected by diffusing a few drops of creasote through water or a mucilaginous liquid, and breathing this by means of the ordinary inhaling bottle

### *Officinal Preparations.*

MISTURA CREASOTI, *Creasote Mixture.*—Take of creasote, sixteen minims; glacial acetic acid, sixteen minims; spirit of juniper, half a fluidrachm; syrup, one fluidounce; distilled water, fifteen fluidounces. Mix the creasote with the acetic acid, gradually add the water, and lastly the syrup and spirit of juniper.

UNGUENTUM CREASOTI [U. S.], *Ointment of Creasote.*—Take of creasote, one fluidrachm; simple ointment, one ounce. Mix thoroughly. ["Take of creasote, half a fluidrachm; lard, a troyounce. Mix them." U. S.]

[AQUA CREASOTI, *Creasote Water.*—"Take of creasote, a fluidrachm; distilled water, a pint. Mix them, and agitate the mixture until the creasote is dissolved." U. S.

This contains nearly four minims to the drachm, and may be given in doses of from gtt. xx to f℥ss.—W.]

## [**Carbolic Acid,** *Hydrated Oxide of Phenyl.* $C_{12}H_5O+HO$.

This is one of the constituents of coal tar, from which it is obtained by a rather complicated process. It may also be obtained by exposing salycilic acid ($C_{14}H_4O_4 2HO$) mixed with sand in a retort to a very sudden and strong heat by which it is broken up into carbolic and carbonic acid ($C_{14}H_4O_4 2HO$)$=C_{12}H_5O+HO+2CO_2$. As first obtained, it is a crystalline solid, but melts at the temperature of 95°. When exposed to the air, it attracts moisture and becomes fluid at ordinary temperature. It is in this form that it occurs in the shops. It is a transparent, oily liquid, which has an odor resembling that of creasote, and a hot acrid taste. It is neutral in its action on test-paper, but combines feebly with alkalies. It is distinguished from creasote by strong nitric acid producing with it pure picric acid. It is very soluble in alcohol.

*Therapeutics.*—In its actions on the system, carbolic acid closely resembles creasote. It is a powerful antiseptic, disinfectant, antifer ment, and destroyer of moulds, parasites, and other low forms of animal and vegetable life. According to M. Lemaire, 7.5 grains of it are sufficient to preserve a human corpse; applied pure to the skin or raw surface, it acts as a mild caustic, like creasote, by coagulating the albumen. In solution, it acts on gangrenous ulcers and other diseased surfaces as a detergent, disinfectant wash, a powerful stimulant and alterative, or a mild caustic, according to the strength of the application. It may be used in all unhealthy or chronic inflammations. A weak solution has been recommended in lepra, and as a certain destroyer of the itch insect and of the thread worm. Internally, carbolic acid has been strongly recommended in diarrhœa, and especially in vomiting, and dyspepsia, with pain after eating. It has been used as a hæmastatic. As a local application the strength may vary from one part in one hundred of glycerine or water to the pure acid of the shops, according to the effect desired.

Internally the dose is gtt. j to ij in pill or solution.—W.]

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## [SUCCINUM.

### Amber.

*History.*—Amber was known to Thales of Miletus, 600 years before Christ. He was the first to notice that when rubbed it acquired the power of attracting light bodies. Hence arose the term electricity, from ηλέκτρον, *amber*. Theophrastus also mentions this property.

*Natural History.*—Amber is found in different parts of the world. The principal portion of that met with in commerce comes from the southern coasts of the Baltic, in Prussia, and is cast on the shore between Königsberg and Memel. It is also found on the shores of Norfolk. It is supposed to be disengaged by the action of the sea from beds of lignite. The vegetable origin of amber is shown by various facts. It is usually associated with substances (bituminous wood, coal, &c.) known to be derived from plants. Externally we observe on it various impressions of the branches and bark of trees; and inclosed in it are insects and parts of plants (as the wood, leaves, flowers, and fruit). According to Sir David Brewster, its optical properties are those of an indurated vegetable juice. From these circumstances, as well as from its chemical composition, amber is supposed to have been a resinous exudation from some tree. As the wood, leaves, blossoms, and fruit of some coniferous plant are found in amber, this plant has been supposed to be the amber tree; and a microscopic examination of the wood leads to the conclusion that the amber tree is a species, though probably an extinct one, of the genus Pinus, closely allied to P. balsamea. On chemical grounds, however, Liebig suggests that it is a product of wax, or of some other substance allied to the fats of fixed oils; since succinic acid is formed by the oxidation of stearic and margaric acids.

*Properties.*—It occurs in irregularly-shaped pieces, usually flat, and somewhat rounded at the sides. Its color is yellowish-white (*succinum album*), yellow (*succinum citricum*), or reddish (*succinum rubrum*). It is usually translucent, sometimes opaque or transparent; it is tasteless and odorless. Its specific gravity is about 1.07. It is brittle, yields readily to the knife, has a conchoidal vitreous or resinous fracture, and becomes negatively electrical by friction; it contains various insects which apparently must have become entangled in it while it was soft and viscid. (For an account of these, consult Mr. Hope's paper before quoted; also Burmeister's *Manual of Entomology*, p. 574.)

Heated in the air, amber fuses at about 550° F., then inflames, and burns with a yellow flame, emitting a peculiar odor, and leaving behind a light shiny black coal. It cannot be fused without undergoing some chemical change. It evolves water, volatile oil, and succinic acid; the residual mass is termed *colophonium succini*. By destructive distillation in a retort or alembic, amber yields first an acid liquor (which contains succinic and acetic acids), then some succinic acid deposited in the neck of the retort, and an empyreumatic oil (*oleum succini*) comes over, at first thin and yellowish, afterwards brown and thick; towards the end of the operation, a yellow light sublimate is observed in the neck of the retort; this is called, by Berzelius, *crystallized pyrétine;* by Vogel, *volatile resin of amber;* by Gmelin, *amber-camphor*. An inflammable gas is evolved during the whole time of the operation.

*Composition.*—The *ultimate* constituents of amber are, *carbon*, *hydrogen*, and *oxygen*. The *proximate* principles are, a *volatile oil*, *two resins*, *succinic acid*, and a *bituminous substance*.

Succinic acid is a volatile crystallizable acid with the formula $C_4H_2O_3$. It is soluble in water, nearly insoluble in cold alcohol and oil of turpentine. It is said to possess stimulant and antispasmodic properties, and to promote perspiration and excretion of urine. It was formerly used in medicine in rheumatism, &c., but is not at present employed.

### **Oleum Succini,** *Oil of Amber.* Mat. Med. List, U. S. P.

"The volatile oil obtained by the destructive distillation of amber." U. S. The crude oil of amber is a thick very dark-colored liquid, which must be purified before use by redistillation. Copal and the resin dammar are often substituted for the amber, and yield an oil scarcely distinguishable from that of the true amber.

Oleum Succini Rectificatum, U. S., *Rectified Oil of Amber.*—"Take of oil of amber, a pint; water, six pints. Mix them in a glass retort, and distil until four pints of water have passed with the oil into the receiver; then separate the oil from the water, and keep it in a well-stopped bottle." U. S.

*Properties.*—Rectified oil of amber, as found in the shops, is of an amber color, strong peculiar odor, and a hot acrid taste. When perfectly pure it is very fluid, colorless, and has the specific gravity 0.758 at 75°, and boils at 186°. It is moderately soluble in alcohol, and is a pure carbo-hydrogen.

*Therapeutics.*—A powerful nervous stimulant and antispasmodic, which sometimes acts as a diuretic. When locally applied it acts as an irritant, and is used as a rubefacient in cases of chronic rheumatism and gout. Internally it is very useful in cases of hysteria, hooping-cough, and infantile convulsions dependent on mere nervous irritation. In the last two disorders it may be applied to the spine, diluted with olive oil, acting as rubefacient and antispasmodic. In obstinate hiccough it is probably next to musk the most effectual remedy. It is frequently very serviceable in quieting nervous cough. Dose, gtt. v to xv given in emulsion.—W.]

# ANIMALS.

## INVERTEBRATA.—INVERTEBRATE ANIMALS.

*Class:* ANNULOSA, *Macleay.*

### SANGUISUGA, *Savigny.*

*Generic Character.—Body* elongated, insensibly widening backwards, plano-convex, composed of numerous narrow equal very distinct segments, and furnished with a disk or sucker at each extremity. The oral *sucker* with an entire thick plaited rim, the upper lip prominent. *Mouth* large, with three equal compressed cartilaginous *jaws*, each furnished with a double row of numerous pointed cutting *teeth.*

### [HIRUDO DECORA, *Say.*

#### The American Leech.

Back of a deep green color, with three longitudinal rows of square spots, which are placed on every fifth ring, and are twenty-two in number. The lateral rows are black, the middle light brownish-orange.

Belly brownish orange, irregularly spotted with black.

Length three to five inches.

*Habitat.*—Atlantic United States.

In Philadelphia the American leech is generally preferred to the foreign species. It is not so large and powerful, and does not draw so much blood. It is usual with us to consider six of the American and two of the European as drawing an ounce of blood. Owing to its bite being not nearly so deep, the after-bleeding is much less than when the European leech is employed. For this reason the practitioner is able to gauge more accurately the amount of blood drawn, which is a great advantage, especially in the case of children.

They are caught in the ponds and streams of the central portions of Pennsylvania, and are probably plentiful all through the middle and southern Atlantic States.—W.]

### 1. S. MEDICINALIS, *Sav.*

#### The English or Speckled Leech.

*Specific Character.*—Belly greenish yellow, spotted with black.

*Habitat.*—England and most parts of Europe.

### 2. S. OFFICINALIS, *Sav.*

#### The Green Leech.

*Specific Character.*—Belly olive green, unspotted.

*Habitat.*—South of Europe.

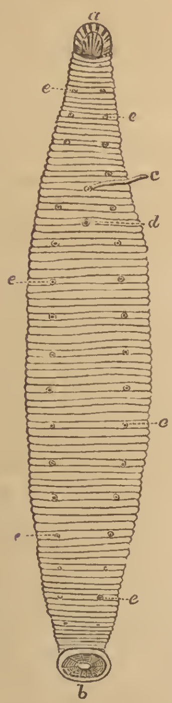
## **Hirudo,** *The Leech.*

The above-mentioned two species; imported chiefly from Hamburg.

*Officinal 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.

The Pharmacopœia has followed Savigny in describing *S. medicinalis* and *S. officinalis* as distinct species, but has misplaced the English synonyms and the descriptions. These are correctly given above. Savigny, however, though he describes *S. officinalis* as a distinct species, says that no author has yet distinguished it from the preceding species. Grube also makes *Hirudo* (*Sanguisuga*) *officinalis*, Sav., a variety of *H. medicinalis*, Linn., and both Grube and Johnson, the latest and best authorities on the subject, reject *Sanguisuga* as the generic name, and restore the older name *Hirudo*.

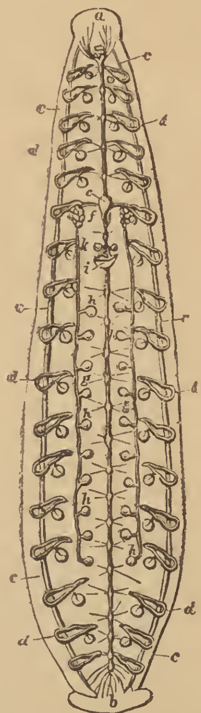
Fig. 228.



*Ventral Surface of Leach.*

*a.* Anterior disk. *b.* Posterior disk. *c.* Penis. *d.* Vaginal orifice. *e.* Stigmata, or breathing pores.

Fig. 229.



*Internal Anatomy of Leach.*

*a.* Brain. *b.* Last ganglia. *c.* Bronchial vessels. *d.* Folded mucous glands; each is connected by a duct to an air vessel. *e.* Penis. *f.* Vesiculæ seminales. *g.* Vara deferentia. *h.* Testicles. *i.* Uterus. *k.* Ovaries.

*Collection and Commerce.*—Leeches may be caught with the hand, or by a kind of net, or by the gatherers going into the ponds with naked feet, to which the leeches adhere; or by baits, especially the liver of animals. Leeches are largely imported from Hamburg. The Hamburg dealers obtain their supplies from the Ukraine. They are also brought to England from Bordeaux, Lisbon, &c. They are imported in bags and small barrels, generally in the latter. Each barrel holds about 2,000, the head being made of stout canvas, to admit the air.

*Preservation.*—The best vessels for preserving these animals are unglazed brown pans or wooden tubs. These pans should be very little more than half filled with soft water (pond, river, or rain water). This water should be changed at varying intervals, according to the season, &c.; thus, in very hot weather, or when the water has become bloody, every day or so; otherwise in summer, every two or three days; and in winter, once a week will be generally found sufficient. In consequence of the great mortality which frequently occurs amongst leeches, various plans have of late years been adopted for more effectually preserving them. Mr. Allchin has applied the principle of the aquarium to these animals, and these leech-aquaria answer the purpose very well. A good plan of keeping leeches is to place them in an unglazed brown pan or glass vessel, at the bottom of which is a bed four or more inches thick, composed of a mixture of sand, moss, and fragments of wood below, and pebbles above. This vessel should be about two-thirds filled with soft water, and covered above with a linen cloth. Under such conditions, if the water be changed as just mentioned, and the leeches kept at a moderate temperature, and in a situation where they are not liable to sudden changes, they will thrive very well.

*Mode of Biting.*—Having fixed on a suitable spot, the animal applies its oval disk, and firmly fixes it (at first, perhaps, by atmospheric pressure; then by intimate contact), so that the anterior end forms an angle with the other portions of the body. The three cartilaginous jaws bearing the sharp teeth are now stiffened and protruded through the triradiate mouth against the skin, which they perforate, not at once, but gradually, by a saw-like motion. The wound is not produced instantaneously, for the gnawing pain continues for two or three minutes after the animal has commenced operations. Thus, then, it appears that the leech saws the skin; hence the irritation and inflammation frequently produced around the orifices. The flow of blood is promoted by the suction of the animal, which swallows the fluid as fast as it is evolved. During the whole of the operation the jaws remain lodged in the skin. In proportion as the anterior cells of the stomach become filled, the blood passes into the posterior ones; and when the whole of this viscus is distended, the animal falls off. On examination it will be found that not a particle of blood has passed into the intestine.

*Physiological Effects.*—There are two classes of phenomena observed in all modes of drawing blood; one of which has been termed *local*, the other *general*. In phlebotomy and arteriotomy, the first is trifling, and of no therapeutic value; and we resort to these operations only as means of affecting the general system. On the other hand, we obtain topical effects, both powerful and useful, from cupping and leeching; hence these are termed *local*, while the former are denominated *general* blood-lettings. It must, however, be remembered, that constitutional or general effects are also frequently obtained from both cupping and leeching.

The *Constitutional or general effects of leeching* are the same in kind as those caused by the loss of blood from other means. A moderate quantity of blood may be abstracted without any obvious effects on any of the functions; but if the amount taken be increased, syncope results. The quantity necessary to produce this effect varies, however, considerably, and will depend on the mode of drawing it (whether rapidly or otherwise); the position, constitution, and age of the patient; the nature of the disease; and many other circumstances not necessary to enumerate. It is well known that a small quantity will, if taken rapidly, and the patient be in the erect posture, cause this result; whereas a considerably larger amount may be abstracted, if taken gradually, and the patient be in the recumbent position, without giving rise to it. Leeching, then, as being a slower mode of abstracting blood, is less likely to cause syncope than venesection, or even cupping. The constitutional or general effects caused by the application of leeches are best observed in children and delicate females—more especially the former. I have, on several occasions, seen infants completely blanched by the application of one or two leeches. Pelletan mentions the case of a child, six years old, who died from the hemorrhage occasioned by six leeches applied to the chest. Leeching, then, is here, to all intents and purposes, a mode of general bloodletting, arising in part from the powerful influence which the loss of a small quantity of blood produces in infants; and secondly, because one leech will cause the loss of more blood in them than in adults, owing to the greater vascularity of the cutaneous system. It is apparent, therefore, that in the diseases of infants, leeching may, in most cases, be substituted for venesection. But in disorders which are rapidly fatal, as croup, opening the jugular vein is undoubtedly to be preferred, since it is necessary to produce an immediate and powerful effect. As children advance in years, they become capable of bearing larger evacuations of blood; and therefore leeching excites a less influential effect. It is quite impossible to say at what age venesection ought to be substituted, or, in infancy, what number of leeches should be applied; since they take away such unequal quantities of blood. These are points which must be decided by the practitioner in each case.

*The local effects of leeching* must now be noticed. The jaws of the leech may be compared to three saws, each armed with sixty teeth. It is, therefore, not surprising that pain and afflux of blood to the wounded part should be occasioned by the laceration of the skin by a single leech. I have sometimes seen some of these animals produce intense redness to the extent of an inch around the bite. This is best observed when the skin is delicate, like that covering the mammæ of the female. Now when a number of these animals are applied, their united local effects must have some influence over a neighboring disease. There are also certain topical effects which occur subsequently, such as ecchymosis; the irritation and inflammation of the mouths of the punctures; the diffused redness and the soreness in the parts intervening between the bites, which cannot be without influence over morbid action. They act on the principle of counter-irritation. In taking into consideration the beneficial influence of leeches, we must, therefore, not forget these, nor the fomentations and poultices subsequently employed. When leeches are applied to the temples, especially if they fix close to the external canthus, a diffused swelling frequently arises, similar to that caused by erysipelas. This is not referable to any noxious qualities of the animal, for it happens when the finest and most healthy are employed; nor to the teeth of the animal being left within the wound, since I have seen it when the leech has fallen off spontaneously. In concluding these remarks on the local effects of leeches, I have only to add that, independently of the local irritation caused by the puncture, I believe the evacuation of blood from an inflamed part may be more beneficial than the same quantity taken by the usual operation of venesection. In other words, I am disposed to admit what were formerly termed the *derivative* effects of local bleeding. The amount of benefit obtained by the application of leeches to parts that have been injured by falls, &c., as in fractures and dislocations, has frequently appeared to me much greater than could be referred to the combined influence of the quantity of blood lost, and the local irritation of the punctures; so, also, with respect to the good effects of leeching hemorrhoidal tumors. Mr. Wardrop thinks more benefit is in some cases obtained by the application of leeches at a distance from the affected organ, constituting what has been termed a *revulsive* operation. These remarks will be sufficient to prove that, in estimating the therapeutic influence of leeches, the quantity of blood drawn is not the only element in the calculation; and, I think, in practice, constant proof will be found that leeching is more beneficial than can be accounted for by the mere quantity of blood drawn.

*Therapeutics.*—The following are some of the uses of leeches:—

*In children and delicate adults* (*as females and aged persons*) *leeches often form an excellent substitute for general bloodletting*, when the object is not to occasion any immediate or sudden effect on the disease. In children it is necessary to avoid applying them to the neck, or other parts where compression cannot be conveniently made. *In local determinations of blood*, unattended with febrile symptoms, local bloodletting, when it can be resorted to, is generally, though not invariably, preferred to venesection. The advantages of leeching over cupping are, the less pain, and the ease with which blood may be procured; for it is evident that in swelled testicle, in inflammation attending fractured limbs, and in acute inflammation of the mammary gland, patients could not, in most cases, bear the necessary pressure of the cupping-glass; and in some parts of the body, as the abdomen, blood can only be procured from cupping by a very dexterous manipulation. *In internal and other inflammatory affections*, accompanied with constitutional disorder, the rule is to employ general in preference to local bloodletting. But circumstances occasionally render the reverse practice justifiable and proper, as where the disease is not active, and the patient delicate and weak. In many instances it will be found most advantageous to combine both modes of drawing blood: for example, in *abdominal inflammations*, the application of leeches, preceded by venesection, will sometimes do more good than the same quantity taken by the lancet alone. During the progress of *fever*, with determination of blood to the brain, the application of leeches to the temples, after the use of bloodletting, is often attended with the best effects. There are some diseases in which no substitute of equal efficacy can be found for leeches. Such, I conceive, are *hemorrhoidal tumors*, and *prolapsus of the rectum*. In these cases general is not equal to local bloodletting, and cupping is out of the question. *In various organic diseases* leeches will often be found an exceedingly useful palliative means. I would particularly mention as examples, affections of the heart and lungs.

There are few, if any, diseases in which loss of blood is required, where leeching is positively objectionable. There are, however, numerous instances in which leeching is negatively objectionable: in some the quantity of blood drawn by these aninals is insufficient to make much impression on the disease, as in visceral inflammation of robust persons; in others, where the disease is very rapid and fatal, the effects of leeches are too slow, as in croup. Venesection is the remedy in all these instances.

*Mode of applying Leeches.*—Let the part be well cleansed (sometimes it may be necessary to shave it); then dry the leeches, by rolling them in a clean linen cloth; then, by grasping the body of the leech gently in a dry cloth, its head may be directed to any part where we wish it to be applied; and by gently withdrawing it as its head reaches the skin, we may compel the animal to fix its head to the spot, and insert its teeth. A narrow tube (called a *leech-glass*) will be found useful when we wish to affix one of these animals to the inside of the mouth, or any particular spot. Several circumstances influence the fixing of leeches; as the condition of the animal, whether healthy or otherwise; the nature and condition of the part to which it is applied: thus, leeches will not readily attach themselves to the soles of the feet, or the palms of the hands, or to the hairy parts—the presence of grease, vinegar, salt, and some other substances, will prevent them from biting: whereas milk, sugared water, and blood are said to have the contrary effect. Scarifying the part promotes their attachment. The condition of the patient also affects the fixing of the animal. Derheims says that leeches will not bite those under the influence of sulphur, on account of the evolution of sulphuretted hydrogen by the skin. The effluvia, or vapors of the room, as the fumes of tobacco, sulphur, vinegar, &c., will prevent them from biting, or even cause them suddenly to fall off.

The quantity of blood which a leech is capable of drawing, varies considerably. I believe four drachms to be the maximum. On an average I do not think we ought to estimate it at more than one drachm and a half. Of course this has no reference to that lost after the animal has fallen off, and which varies according to the vascularity of the part; in children being oftentimes very considerable. When the leech has had sufficient, it usually drops off; if, however, it fails to do so, or it is at any time desirable to detach it, this is readily effected by the application of salt to its body.

*After-treatment.*—When leeches have fallen off, it is generally desirable to promote the sanguineous discharge. This is best done by the use of warm fomentations or poultices; or even, in some cases, by cupping-glasses. Great caution is necessary in the case of children. Some years since, the application of a leech was ordered to the chest of a child laboring under pneumonia; it was at the same time mentioned that the bleeding should be encouraged. The directions were literally fulfilled; the discharge of blood was assiduously promoted, until so large a quantity had been lost that death was the result. In another instance two leeches were ordered for a child aged about eighteen months, suffering from pneumonic inflammation, a consequence of measles. The following day the poor little creature was found in a fainting, or rather dying, state, with face and lips completely blanched. On inquiry it appeared the leech-bites were still bleeding, and no attempt had been made to stop the discharge, the mother thinking it would be beneficial, especially as the pneumonic symptoms had considerably abated. As predicted, the little sufferer died within twenty-four hours. I have been called to many cases of hemorrhage after leech-bites, and have never failed in stopping it by compression. Sometimes mere exposure to the air will be sufficient; or, if this fail, we may apply a dossil of lint and a bandage. I usually employ compression, thus: roll a piece of lint into a fine cone, and introduce it into the bites by means of a needle or probe; over this lay a compress and bandage. Sponge may be substituted for the lint. Some employ absorbing powders, as gum arabic; or styptic washes, as a saturated solution of alum, or tannic acid. One very effectual means is to apply a stick of lunar caustic scraped to a point, or powdered nitrate of silver.

*Accidents from Leeches in the mucous cavities.*—Derheims relates a case where a young man, who had leeches applied to his anus, was so unfortunate as to have one enter his rectum unnoticed. The animal made several punctures, and was not expelled till some hours after, when salt water injections were used. The wounds caused by the bites, however, did not heal for several months, during which time the patient suffered considerably, and constantly passed blood with the feces. Whenever practicable, salt-water injections should be resorted to. Ill effects have resulted from swallowing leeches. A lady accidentally swallowed a leech she was applying to her gums. Acute cardialgia soon came on, with a feeling of erosion and creeping in the interior of the stomach; sometimes convulsive movements in the limbs and muscles of the face; frequency and irregularity of the pulse; universal agitation and paleness of the countenance. The physician who was called in, recollecting the fact ascertained by Bibiéna, that leeches could not live in wine, administered half a glass every quarter of an hour. The symptoms were soon alleviated; and the fourth dose caused vomiting, by which the dead leech was evacuated, with much glairy matter, mixed with clots of black blood. By a proper subsequent treatment the patient recovered in eight days. The following case is narrated by Drs. Taylor and Rees: A lady was directed to apply a leech to the septum of the nose. By some accident the animal insinuated itself into the nasal cavities, and, reaching the posterior nares, the patient was irresistibly compelled to swallow it. No uneasiness was felt, probably owing to the leech having already drawn much blood. A moderately strong solution of salt was administered at short intervals. The leech was not discharged by vomiting, and it did not pass by the bowels. The patient suffered from no unusual symptoms, probably owing to the early administration of the solution of salt.

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*Class:* INSECTA, *Goldfuss.*

INSECTS.

## COLEOPTERA, *Linnæus.* THE BEETLE ORDER.

[Very many, if not all, of the species of the genus cantharis are capable of producing blisters when applied to the skin. The *potato fly* (*Cantharis vittata*), which was formerly officinal in the U. S. Ph., approximates in power the Spanish fly, and may be substituted for it. It is very abundant in some sections of the United States on the potato vines, during the latter part of July and the beginning of August.

In order that the practitioner may recognize it, the following description is appended:—

The large prominent head is light red, with blackish markings. The thorax is yellowish, with profuse black markings. The elytra or wing-covers are yellowish, with each two broad black stripes, the outer of which is the broader and a little the longer. The under surface of the abdomen and the legs is blackish, and covered with a cinereous down. Length, $\frac{1}{2}$–$\frac{3}{4}$ of an inch.

This species is best collected by shaking it off the vines into hot water, and then carefully drying in the sun.—W.]

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## CANTHARIS VESICATORIA, *De Geer.*

### The Blister Beetle, or Spanish Fly.

*Zoological Character.—Form* elongated, almost cylindrical; length six to eleven lines; breadth one to two lines; color brass or copper green; odor nauseous, unpleasant. *Body* covered with whitish-gray hairs, which are most numerous on the thorax. *Head* large, subcordate, with a longitudinal furrow along its top. *Eyes* lateral, dark brown. *Antennæ* black, elongate, simple, filiform. *Maxillary palpi* with a somewhat ovate terminal joint. *Thorax* small, not larger than the head, rather quadrate, narrowed at its base. *Elytra* of a shining golden-green color, flexible, from four to six lines long, and from three-fourths to one and a half lines broad; costa slightly margined. *Wings* two, ample, thin, membranous, veined, transparent, pale brown; tips folded. *Legs* stout, from four to six lines long, the hinder ones longest; *tibiæ* clavate, in the female all terminated by two small movable *spurs;* in the male the two hinder pairs of extremities alone have this arrangement, the anterior ones having but one spur; last joint of the *tarsi* with a pair of bifid claws; *tarsi* violaceous. *Abdomen* soft, broadest in the female, which has, near the anus, two articulated caudal appendages.

*Habitat.*—Europe. Originally, perhaps, a native of the southern parts, especially Italy and Spain; now found in France, Germany, Hungary, Russia, Siberia, and England. With us they are rare. They are found on species of *Oleaceæ* (as the ash, privet, and lilac), and of *Caprifoliaceæ* (as the elder and honeysuckle).

[**Cantharis,** *Cantharides.* Mat. Med. List, U. S. P.]

The beetle dried; collected in Russia, Sicily, and Hungary.

*Mode of catching Cantharides.*—In the south of France these animals are caught during the month of May, either in the morning or evening, when they are less active, by spreading large cloths under the trees, which are then strongly shaken, or beaten with long poles. The catchers usually cover their faces, and guard their hands by gloves. Various

Fig. 230.


*Cantharides.*

methods have been recommended for killing the insects; such as exposing them to the vapor of vinegar, or of hot water, or of spirit of wine, or of oil of turpentine. Geiger states that if destroyed by dropping oil of turpentine into the bottle in which they are contained, they are not subject to the attack of mites; but I believe they are more frequently destroyed by immersing the cloths containing them in hot vinegar and water, and then drying them on hurdles covered with paper or cloths.

*Commerce.*—Cantharides are principally imported from Russia, Sicily, and Hungary. Those from Russia, which come by way of St. Petersburg, are the largest and most esteemed.

*Officinal Characters.*—From eight to ten lines long, furnished with two wing-covers of a shining metallic-green color, under which are two membranous, transparent wings; odor strong and disagreeable; powder grayish-brown, containing shining green particles.

*Preservation.*—Cantharides should be preserved in well-stoppered bottles, and to prevent them from being attacked by mites (*Acarus domesticus*), a few drops of strong acetic acid should be added to them. I have found this a most successful mode of preservation. Besides mites, they are subject to the attacks of a moth (*Tinea flavifrontella*, and two coleopterous insects (*Anthrenus muscorum* and *Hoplia farinosa*).

*Test.*—Free from mites.

*Adulteration and Goodness.*—The goodness or quality of cantharides may be recognized by their odor and freedom from other insects, especially mites. Sometimes the powder is adulterated with powdered euphorbium.

*Composition.*—The principal constituents of cantharides are, cantharidin, a volatile odorous oil, and fatty matters. *Cantharidin*, $C_{10}H_6O_6$.—Its specific gravity is 1.38. It constitutes about 0.4 per cent. of the cantharides. It crystallizes in the form of micaceous plates, which are fusible, forming a yellow oil, which by a stronger heat—between 402° and 410°—is vaporizable, forming white vapors; these subsequently condense into acicular crystals of cantharidin. Gmelin's opinion, that it is a solid volatile oil, seems to be correct. When isolated, it is not soluble in water, but becomes so by combination with the other constituents of cantharides. This, then, is the reason why an aqueous infusion of the insects contains cantharidin in solution. Cold spirit, digested on cantharides, also extracts cantharidin; which it can only do by the agency of some of the other principles of the beetles. Cantharidin is easily soluble in chloroform, benzole, ether, oils (volatile and fixed), and hot spirit of wine; and from the latter it separates as the liquid cools. It is insoluble in sulphide of carbon, and this gives an easy mode of separating it from the fatty matters which frequently contaminate it. Boiling sulphuric acid dissolves cantharidin; the solution is slightly brown; when diluted with water it deposits small needle-like crystals of cantharidin. Boiling nitric and hydrochloric acids dissolve it without changing color; the solutions, by cooling, deposit it. Cantharidin is dissolved by potash and soda; but when concentrated acetic acid is added to the solution, the cantharidin is precipitated. Ammonia is without action on it. Cantharidin is probably about fifty times stronger than cantharides, and Robiquet states that the $\frac{1}{100}$th part of a grain, applied to the edge of the lower lip, caused, in about a quarter of an hour, small blisters. *Volatile Odorous Oil.*—Orfila asserts that volatile odorous oil is one of the constituents of the insects. The distilled water of cantharides is strongly odorous and milky, and its vapor affects the eyes and kidneys like cantharides.

The active and odorous principles of cantharides reside principally in the sexual organs of the animals. Both Farines and Zier tell us that the soft contain more active matter than the hard parts. It appears, also, that the posterior is much more acrid than the anterior portion of the body; and Zier says the ovaries are particularly rich in this active matter. If so, it is evident that we ought to prefer large female to male insects. It is a well-known fact that the odor of these animals becomes much more powerful at the season of copulation than at other periods; and that persons sitting under the trees in which these insects are found, at this season more particularly, are very apt to be attacked with ophthalmia and ardor urinæ.

*Physiological Effects.*—*The topical effects* of cantharides are those of a most powerful acrid. When these insects are applied to the *skin* the first effects noticed are, a sensation of heat, accompanied by pain, redness, and slight swelling. These phenomena are soon followed by a serous effusion between the corium and epidermis, by which the latter is raised, forming what is commonly termed a *blister*, or in the more precise language of the cutaneous pathologist, an *ampulla* or *bulla*. The effused liquid has a pale yellow color, with a very feeble taste and smell. If the cuticle be removed, the subjacent corium is seen intensely reddened, and, by exposure to the air, oftentimes becomes exceedingly painful. If irritants be applied, a secretion of pus takes place, and sometimes a whitish-looking false membrane is formed. Long-continued irritation occasionally causes tubercular granulations. Not unfrequently I have noticed ecthymatous pustules around the blistered surface; and in one remarkable case which fell under my notice the whole body, but more especially the pectoral region (to which the blister had been applied), was covered with them. Sometimes the vesicles of eczema occur. Ulceration and gangrene are not uncommon; the latter effect is occasionally observed after exanthematous diseases, especially measles. I have seen death result therefrom in two instances. The constitutional symptoms frequently produced are excitement of the vascular system, denoted by the increased frequency of pulse, heat of skin, and furred tongue, and irritation of the urinary and genital organs, marked by heat and pain in passing the urine, which is usually high colored, or by complete suppression. It not unfrequently happens that the part to which a blister has been applied remains considerably darker colored than the surrounding skin. Rayer states that the disappearance of these discolorations is hastened by the use of sulphurous baths.

*Action of small or medicinal doses.*—In very small quantities there are no obvious effects. If we increase the dose, a sensation of warmth is felt in the throat, stomach, and respiratory passages, with increased secretion from the alimentary tube. By continued use a tickling or burning sensation is experienced in the urethra, with frequent desire to pass the urine, which may or may not be altered in quality and quantity. In some cases diuresis is observed, in others not; in the latter the urine is generally higher colored than usual. *Action of larger doses: Subacute poisoning.*—The symptoms are, heat in the throat, stomach, intestines, and respiratory passages; pain in the loins, burning sensation in the bladder, with frequent desire to evacuate the urine, which is sometimes bloody, and passed with difficulty, and painful priapism, indicating inflammation of all the urinary organs. The pulse is harder and more frequent, skin hot, and the respiration quickened; the nervous system is frequently excited, and headache, delirium, convulsions, and coma may occur.

*Action of poisonous doses.*—In poisonous quantities they excite inflammation of the mucous lining of the alimentary canal, with constriction and difficulty of swallowing, which is sometimes so great that not a particle of fluid can be got into the stomach without inexpressible anguish; violent burning pain, nausea, vomiting, frequently of bloody matters, sometimes with flakes like the inner lining of the alimentary tube, and great tenderness to touch. These phenomena sufficiently indicate the gastric inflammation. Ptyalism is not an uncommon occurrence. The enteritic symptoms are, abundant and frequent evacuations, sometimes of blood, with horrible griping and burning pain, and exquisite sensibility of the abdomen.

The susceptibility to cantharides is by no means uniform. Amoreux says, in one case a pinch of the powder caused death; while in another a spoonful occasioned only slight heat in the throat, and ardor urinæ. Dr. Hosack has mentioned an instance in which a man took nearly six ounces of the tincture with a view of self-destruction, yet no dangerous symptoms followed. In contrast with this, I may instance a case that came within my own knowledge, where one ounce of the tincture produced serious symptoms. Orfila has seen twenty-four grains of the powder prove fatal.

*Therapeutics. External Uses.*—Cantharides are frequently used as topical agents; sometimes as stimulants, sometimes as rubefacients, at other times as vesicants. *To stimulate topically.*—Tincture of cantharides with water (in the proportion of three or four drachms of the tincture to a pint of water) has been employed *to stimulate ulcers;* more especially sinuses and fistulous sores. In *alopecia* or *baldness*, when this is not the result of old age, ointments of cantharides have been employed to promote the growth of hair. Powdered cantharides have been advised as an application *to the parts bitten by rabid animals. To produce rubefaction.*—For this purpose the tincture may be mixed with soap or camphor liniment; or, when it is desirable to limit the effect to a particular spot, and especially if friction be objectionable, the common blistering plaster may be applied, allowing it to remain in contact with the part for an hour or two only. Rubefacient liniments are employed to excite the sensibility of the skin *in numbness and paralysis;* as also to promote local irritation *in neuralgic and rheumatic pains.* In the *inflammatory affections of children* it will be occasionally found useful to employ the plaster as a rubefacient merely. *To excite vesication.*—On account of the facility of application, certainty of effect, and slightness of pain, no agents are equal to cantharides for causing vesication when applied to the skin. It was formerly supposed that the efficacy of blisters was in proportion to the quantity of fluid discharged. But the truth is, that the therapeutic influence is in proportion to the local irritation, and has no more relation to the quantity of fluid discharged than that the latter is frequently (not invariably) in the ratio of the former. In this country we generally apply them near to the morbid part. We employ blisters in inflammatory diseases, both acute and chronic; in chronic inflammatory disease we often employ what is termed a perpetual blister, that is, the cuticle is removed, and the blistered surface dressed with ointment of savin or of cantharides. This practice is advisable in chronic diseases of the chest, of the joints, of the eyes, &c. It is hardly safe to apply blisters to children immediately after exanthematous diseases or when very feeble, sloughing being not an unfrequent result. If it be required to produce in them counter-irritation, the best plan is to dilute the common blistering plaster, by mixing with it three times its weight of soap plaster. I have seen this compound frequently employed, but never observed any unpleasant results from it. Another plan, sometimes adopted, is to apply a common blister for an hour or two only, so that it shall merely produce rubefaction.

*Internal Uses.*—These will require examination under distinct heads, according to the particular object we have in view in employing cantharides. *To act specifically on the urinary organs.*—In *dropsy* they have been used to excite diuresis, though they frequently fail in producing this effect. In *paralysis of the bladder* they are frequently useful when there are no marks of local irritation. Two opposite conditions may be the result of paralysis of this organ; namely retention or incontinence of urine. The latter condition is not unfrequently met with in children, and is very likely to be relieved by cantharides. In incontinence of urine which occurs after lingering labors, from the long-continued pressure of the child's head, cantharides are sometimes serviceable. But their use must not be commenced until all the symptoms of local irritation have subsided. *To act on the organs of generation.—In discharges from the genital organs* beneficial effects are frequently obtained by the internal use of cantharides. In gleet they have been often found serviceable. Mr. Roberton explains their efficacy by saying that they excite a mild inflammatory action on the urethra (shown by the discharge becoming thick, opaque, and puriform), which supersedes the previous morbid one. I have frequently found equal parts of tincture of perchloride of iron and tincture of cantharides a successful combination in old standing gonorrhœas. The dose is twenty drops at the commencement. *In chronic skin diseases.*—Pliny states that cantharides (*Mylabris*) were employed in a disease which he terms lichen. At the present time, tincture of cantharides is not unfrequently employed in *lepra*, *psoriasis*, and *eczema*. I have rarely had occasion to try cantharides; but Rayer says, "Of all the energetic and dangerous remedies that have been used in lepra, the tincture of cantharides is, perhaps, that which has the most remarkable influence over the disease. The great objection to its employment is its liability to excite inflammation in the digestive organs and urinary passages, especially among females, which necessitates the immediate suspension, and occasionally the entire abandonment, of the medicine." Biett has found it successful in chronic eczema, as well as in the scaly diseases.

*Administration.—Powdered* cantharides are not unfrequently employed internally. The dose is one or two grains in the form of pill. The *tincture* is the safest preparation, and should, therefore, always be preferred.

*Antidote.*—In poisoning by cantharides, remove the poison as speedily as possible from the stomach. If sickness have not commenced, the removal may be effected by the stomach-pump, emetics, or tickling the throat. Assist the vomiting by mucilaginous and albuminous demulcent liquids, as infusion of linseed, milk, white of egg with water, &c. No chemical antidote is known.

## *Officinal Preparations.*

EMPLASTRUM CANTHARIDIS, *Cantharides Plaster.*—Take of cantharides, in very fine powder, twelve ounces; yellow wax, seven ounces and a half; prepared suets, seven ounces and a half; resin, three ounces; prepared lard, six ounces. Liquefy the wax, suet, and lard together by a steam or water bath, and add the resin, previously melted; then remove them from the bath, and, a little before they solidify, sprinkle in the cantharides, and mix by stirring briskly.

In making blistering plasters, care must be taken not to add the cantharides while the melted lard is quite hot, as the heat greatly injures the vesicating power of the insect. For a similar reason the plaster should not be spread with a heated spatula. To prevent the plaster moving after its application to the skin, its margin should be covered with adhesive plaster. The usual time requisite for a blistering plaster to remain in contact with the skin is twelve hours; the vesicle is then to be cut at its most depending part, and dressed with ointment of spermaceti. When the irritation caused by these plasters is excessive, it is sometimes necessary to substitute a poultice for the ointment. When we wish to make a perpetual blister, the ointment of cantharides is employed as a dressing; or if we wish to excite less irritation, and prevent the possibility of the urinary organs being affected, the ointment of savin. The danger of applying blisters to children after exanthematous diseases, especially measles, has been already noticed.

[Ceratum Cantharidis, U. S., *Cerate of Cantharides, Blistering Cerate.*—"Take of cantharides, in very fine powder, twelve troyounces; yellow wax, resin, each seven troyounces; lard, ten troyounces. To the wax, resin, and lard, previously melted together, and strained through muslin, add the cantharides, and, by means of a water-bath, keep the mixture in a liquid state for half an hour, stirring occasionally. Then remove it from the water-bath, and stir it constantly until cool." U. S. Instead of having an officinal blistering plaster, the U. S. Pharmacopœia directs this preparation, which the physician should order to be spread into a plaster of sufficient size. Thus: ℞. Cerat. canthar. q. s. Ft. emplastr. iv×vi unc. In most situations a blister may be obtained by leaving this preparation on six hours, and then applying a poultice. In this way the greatest effect is obtainable with the least pain.—W.]

Emplastrum Calefaciens, *Warm Plaster* [Emplastrum Picis cum Cantharide, U. S., *Plaster of Pitch with Cantharides*].—Take of cantharides, in coarse powder, four ounces; boiling water, one pint; expressed oil of nutmeg, four ounces; yellow wax, four ounces; resin, four ounces; soap plaster, three pounds and a quarter; resin plaster, two pounds. Infuse the cantharides in the boiling water for six hours; squeeze strongly through calico, and evaporate the expressed liquid by a steam or water bath till reduced to one-third. Then add the other ingredients, and melt in a steam or water bath, stirring well until the whole is thoroughly mixed. ["Take of Burgundy pitch, forty-eight troyounces; cerate of cantharides, four troyounces. Melt them together by means of a water-bath, and stir constantly until the mixture thickens on cooling." U. S.]

Stimulant, rubefacient, and, in some cases, vesicant. Used in catarrh, local pains, &c.

Linimentum Cantharidis, *Liniment of Cantharides.*—Take of cantharides, in powder, eight ounces; acetic acid, four fluidounces; ether, one pint (or a sufficiency). Macerate the cantharides in the acetic acid for twenty-four hours; then place in a percolator, and allow the ether to pass slowly through till twenty fluidounces are obtained. Keep it in a stoppered bottle.

This is a new and very efficient preparation. It is useful where rapid vesication is required, where the surface intended to be blistered is uneven, and for children or insane persons, who frequently pull off blistering plasters. It should be applied with a camel-hair brush, and the application repeated less or more frequently, according as gentle or rapid and strong vesication is desired.

[Linimentum Cantharidis, U. S., *Liniment of Cantharides.*—"Take of cantharides, in fine powder, a troyounce; oil of turpentine, half a pint. Digest the cantharides with the oil for three hours in a close vessel, by means of a water-bath, and strain." U. S. This is an essentially different preparation from the Linimentum cantharidis of the British Pharmacopœia; it is intended to be used, not as a vesicant, but as a powerful rubefacient. It is a very powerful irritant, capable not only of causing simple vesication, but also deep-seated inflammation of the true derm. In most cases it should be diluted with olive oil, soap liniment, or some mild similar fluid. It may be applied in the same way as other liniments, care being taken to guard against inordinate effects.—W.]

Tinctura Cantharidis [U. S.], *Tincture of Cantharides.*—Take of cantharides, in coarse powder, a quarter of an ounce; proof spirit, one pint. Macerate the cantharides for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and, when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.

*Dose.*—Min. x, gradually increased to fl. drm. ss. Its effects on the bladder must be carefully watched. It should be given in some demulcent liquid, as decoction of barley or infusion of linseed. It is sometimes employed externally as a rubefacient.

["Take of cantharides, in fine powder, a troyounce; diluted alcohol, a sufficient quantity. Moisten the powder with half a fluidounce of diluted alcohol, pack it into a conical percolator, and gradually pour diluted alcohol upon it until two pints of tincture are obtained." U. S. The U. S. tincture is about twice the strength of the British. Five drops t. d. will occasionally produce strangury, and the commencing dose should therefore never be larger. When used as an external application, its power of vesicating should be borne in mind. It is often a useful addition to stimulant emmenagogue mixtures.—W.]

UNGUENTUM CANTHARIDIS, *Ointment of Cantharides.*—Take of cantharides, one ounce; yellow wax, one ounce; olive oil, six fluidounces. Digest the cantharides in the oil, in a covered vessel, for twelve hours, then place the vessel in a water-bath at 212° for fifteen minutes, strain through muslin with strong pressure, add the product to the wax previously melted, and stir constantly until the mixture solidifies.

Useful as a counter-irritant to keep open blisters, or to promote a discharge from issues, ulcers, &c.

[CERATUM EXTRACTI CANTHARIDIS, U. S., *Cerate of Extract of Cantharides.*—"Take of cantharides, in fine powder, five troyounces; stronger alcohol, two pints and a half, or a sufficient quantity; resin, three troyounces; yellow wax, six troyounces; lard, seven troyounces. Moisten the cantharides with stronger alcohol, pack them in a cylindrical percolator, and gradually pour on stronger alcohol, until the liquid passes nearly colorless. Evaporate the filtered liquid, by means of a water-bath, to the consistence of a soft extract. Mix this with the resin, wax, and lard, previously melted together, and keep the whole at the temperature of 212° for fifteen minutes. Lastly, strain the mixture through muslin, and stir it constantly until cool." U. S. This preparation resembles the Unguentum cantharidis of the British Pharmacopœia, and is used for similar purposes. It should be used with caution, as it is a very powerful irritant.

COLLODIUM CUM CANTHARIDE, U. S., *Collodion with Cantharides, Cantharidal Collodion.*—"Take of cantharides, in fine powder, eight troyounces; cotton, prepared by the process for collodion, and dry, one hundred grains; stronger, ether, a pint and a half; stronger alcohol, a sufficient quantity. Introduce the cantharides into a cylindrical percolator, and, having pressed them firmly, gradually pour on the ether. When fifteen fluidounces have passed, set aside the liquid in a close vessel, and continue the percolation with stronger alcohol until half a pint more of liquid is obtained. Set this in a warm place for spontaneous evaporation, and, when it is reduced to a fluidounce, mix it with the reserved liquid. Then add the cotton to the mixture, and agitate occasionally until it is dissolved. Lastly, keep the solution in a well-stopped bottle." U. S. This is a very effective preparation, which may be used to blister in the case of maniacs, children, delirious patients, &c. It should be applied with a camel-hair brush to the part, two or three coatings being made. The collodium rapidly dries, and forms a pellicle, which remains firmly adherent until the rising epidermis and effused serum loosen it.—W.]

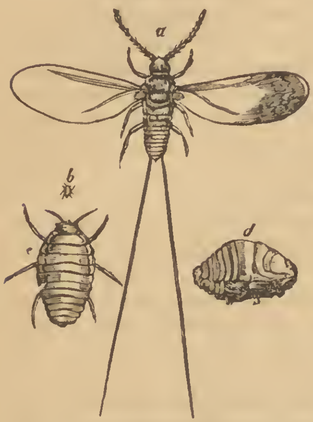
## HEMIPTERA, *Linn.* The Cochineal Order.

## COCCUS CACTI, *Linn.*

### Cochineal Insect.

*Zoological Character.*—*Tarsi* with 1 joint, terminated by a single hook. *Antennæ* of 11 joints, filiform. *Male* destitute of a rostrum, very small, with the *antennæ* shorter than the body. *Body* elongated, deep red, terminating by two long, diverging *setæ*. *Wings* two, large, white, crossed above the abdomen. *Female* apterous, furnished with a rostrum, nearly twice as large as the male, bluish red, covered with a white farina. *Antennæ* short. *Body* flattened below, convex. *Feet* short.

Fig. 231.




*Cochineal insects (male and female).*
*a.* Male, with the wings, expanded (magnified).
*b.* Adult female (natural size).
*c.* Adult female (magnified).
*d.* Impregnated female (natural size).

*Habitat.*—Mexico and Central America. It has been successfully introduced into the island of Teneriffe and Java.

### Coccus, *Cochineal.*

[Mat. Med. List, U. S. P.]

The female insect, dried; reared in Mexico and Teneriffe.

*Rearing.*—The cochineal insects feed on the *Nopal* (*Opuntia cochinillifera*). The animals are domesticated and reared with the greatest care. Plantations of these are cultivated for the nourishment of the insects. Here the impregnated females are placed; this operation being denominated *sowing*. Young ones are soon developed; and some months afterwards, when the females have become fecundated and enlarged, the harvest commences. The insects are brushed off, and killed by immersing them in hot water, and afterwards drying them in the sun or by the heat of a stove.

Fig. 232.

*Opuntia cochinillifera.*

*Commerce.*—Cochineal is imported in serons, chiefly from Honduras, Mexico, and Teneriffe. The female only is of commercial value.

*Officinal Characters.*—Ovate, plano-convex, about two lines long, wrinkled, black or grayish-white; yields, when crushed, a puce-colored powder. The grayish-white insect quickly becomes black when warmed before the fire.

*Description.*—Cochineal consists of the dried female insects, which are of an irregular figure, convex on one side and flat or somewhat hollow on the other. They are inodorous, have a bitterish warm taste, tinge the saliva violet red, and yield a dark red powder. In burning they evolve an animal odor, and leave a grayish-white ash. By infusion in water they swell up, show their ringed character, and even their feet, giving the liquid a red color. Both the Honduras and Vera Cruz kinds are distinguished into the silver and black varieties. *Silver cochineal* has a purplish-gray color; but in all the furrows and depressions we observe a whitish powder, which, examined by the aid of a lens, appears like fine wool. This powder is melted by heat, and appears to be wax. *Black cochineal* is reddish or purplish black, and devoid or nearly so of the silvery character. *Granilla* consists of very small cochineal insects, and smaller, wrinkled, globular or ovate masses (cocoons and new-born insects?), somewhat like fragments of the cochineal insect.

*Adulteration.*—An extensive system of adulterating cochineal by a mercantile house in London was discovered a few years ago. The genuine article was moistened with gum-water, and then agitated in a box or leathern bag, first with powdered sulphate of baryta, then with bone or ivory-black, to give it the appearance of black cochineal. By this means the specific gravity of the cochineal was increased from 1.25 to 1.35. Powdered talc and carbonate of lead have been used to give it a silvery appearance. But a lens will readily distinguish these powders from the real wool which gives the true silvery character.

*Composition.*—The principal constituent is *cochenillin*. *Cochenillin* (*carmine*).—Obtained by digesting cochineal in ether, to extract the fatty matter, and then in alcohol, which dissolves the carmine. This coloring matter is a brilliant purplish-red substance, with a granular or crystalline appearance; unalterable in the air, easily soluble in water and alcohol, but insoluble in ether. It fuses at 112° F. Chlorine renders it yellow. Acids change its color. The concentrated mineral acids decompose it. Alkalies render the watery solution of carmine violet. Solution of lime forms a violet precipitate with it. The affinity of hydrate of alumina for it is most remarkable; the compound formed by their union is called a *lake*.

*Pharmaceutic Uses.*—The only real value of cochineal consists in the coloring matter, for the sake of which it is used in the compound tincture of cardamom and a compound tincture of cinchona.

### *Officinal Preparation.*

TINCTURA COCCI, *Tincture of Cochineal.*—Take of cochineal, in powder, two ounces and a half; proof spirit one pint. Macerate for seven days, strain, express, filter, and add sufficient proof spirit to make one pint.

This preparation is only useful as a red coloring fluid.

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## ORDER: **HYMENOPTERA**, *Linn.* THE BEE ORDER.

## **APIS MELLIFICA**, *Linn.*

### **The Hive Bee, or Honey Bee.**

*Zoological Character.*—*Body* brownish black, covered with hairs. *Abdomen* of the same color, with a transverse grayish band. *Antennæ* filiform, and shorter than the combined length of the head and the thorax. *Labium* filiform, composing, with the jaws, a kind of *proboscis*, geniculate, and bent downwards. First joint of the posterior *tarsi* large, compressed; no *spines* at the extremity of the last two *legs*. Upper *wings* with one radial and three cubital cells.

*Habitat.*—Old continent. In a state of nature they reside in hollow trees; but they are almost universally domesticated, and are preserved in *hives*.

Bees furnish two officinal products, viz., *honey* and *wax*. Of the latter, both *yellow wax* and *white wax* are officinal.

**Mel**, *Honey*. [Mat. Med. List, U. S. P.]

A saccharine secretion deposited by the insect in the honeycomb; British and imported.

*Production.*—Honey is secreted by flowers, and is collected by the working or neuter bees, who take it by suction or lapping, and pass it into the dilatation of the œsophagus, denominated *crop*, *sucking-stomach*, or *honey-bag;* beyond which, we presume, the honey does not pass, as it has never been found in the true stomach. When the animal arrives at the hive, the honey is disgorged by a kind of inverted peristaltic motion, and is probably somewhat altered in its properties by the secretions of the crop. It is used by the animal as food.

*Officinal Characters.*—A viscid semi-translucent liquid, of a brownish-yellow color, with a peculiar heavy odor, and a very sweet taste.

*Description.*—Honey varies in its taste and odor according to the age of the bees and flowers on which they have fed. A hive which has never swarmed is considered to yield the best, which is therefore called *virgin honey*. The flavor of Narbonne honey, which is so much admired, is said to arise from the labiate flowers on which the animals feed. To imitate this, a sprig of rosemary is sometimes added to the honey obtained from other places.

*Purity.*—Flour, it is said, is now and then mixed with honey. This adulteration may be readily detected by its insolubility in cold water, and by the following

*Test.*—Boiled with water for five minutes, and allowed to cool, it does not become blue with the solution of iodine.

*Composition.*—The constituents of honey vary somewhat according to the food of the bees, the season, the age of the animals, the mode of extracting it from the combs, &c. It must, however, be regarded at all times as a concentrated solution of *sugar*, mixed with *odorous*, *coloring*, *gummy*, and *waxy* matters. The saccharine matter is of two kinds: one crystallizable, and analogous to the sugar of grapes; the other uncrystallizable, and similar to the uncrystallizable brown syrup of the sugar-cane. Guibourt has found, also, mannite, which differs from sugar in not fermenting when mixed with water and yeast.

*Physiological Effects.*—Honey is emollient, demulcent, and laxative. When fresh, it is apt to occasion indigestion and colic.

*Therapeutics.*—Mixed with flour, and spread on linen or leather, it is a popular application to promote the maturation of small abscesses and furunculi. It sometimes forms a constituent of gargles, partly on account of its taste, partly for its emollient operation. It is also used as a vehicle for the application of other more powerful agents to the mouth and throat, especially in children. It is occasionally employed as an emollient and demulcent in inflammatory affections. In troublesome coughs, barley-water, mixed with honey, and sharpened with slices of lemon, and taken warm, forms a very agreeable and useful demulcent to allay troublesome coughs.

*Officinal Preparations.*

Mel Depuratum, *Clarified Honey* [Mel Despumatum, U. S., *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. [" Take of honey, a convenient quantity. Melt it by means of a water-bath, and then remove the scum." U. S.]

The object of this process is to deprive honey of certain impurities, which render it apt to ferment; but the flavor and odor of the honey are somewhat injured by the operation.

Clarified honey is an ingredient in borax honey.

OXYMEL, *Oxymel.*—Take of clarified honey, forty ounces; acetic acid, five fluidounces; distilled water, five fluidounces. Liquefy the honey by heat, and mix with it the acetic acid and water.

It is employed as a detergent and pectoral. It is frequently added to gargles; but is more commonly used as an expectorant in slight colds and coughs. Diffused through barley-water, it forms an agreeable refrigerant drink in febrile and inflammatory complaints. It is sometimes used as a vehicle for other medicines.

*Dose.*—Fl. drm. j to fl. oz. ½.

### Cera Flava, *Yellow Wax.* [Mat. Med. List, U. S. P.]

The prepared honeycomb; British and imported.

*Secretion of Bees' Wax.*—Yellow wax is secreted in glands placed on the ventral scales of the bee. With this wax the bees construct the *comb*, the cells of which are hexagonal with angular bottoms. The substance called *propolis* is collected by the bees from the buds of trees. It is of a resinous nature, and is used for lining the cells of a new comb, stopping crevices, &c.

*Preparation.*—The comb, from which the honey has been allowed to drip, is first subjected to pressure. It is then melted in water, by which means the impurities subside, and the wax is poured into moulds and left to cool.

*Officinal Characters.*—Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odor.

*Description.*—Yellow wax has a remarkable and peculiar odor; its color is more or less yellow, but varying in degree; its specific gravity varies from 0.960 to 0.965.

*Adulteration.*—It is said to be sometimes adulterated with suet, which gives it a fatty and disagreeable taste. Resin may be recognized by its solubility in cold alcohol; bean or pea meal, by its insolubility in oil of turpentine.

*Tests.*—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.

### Cera Alba, *White Wax.* [Mat. Med. List, U. S. P.]

Yellow wax, bleached by exposure to moisture, air, and light; British and imported.

*Wax Bleaching.*—This is effected by melting yellow wax, either in a copper vessel, or in a large vat or tub, by means of steam, running it off, while in the melted state, into a trough, called a *cradle*, perforated at the bottom with holes, and placed over a large water-tank, at one end of which is a revolving cylinder almost wholly immersed in water. By this means the wax is solidified, converted into a kind of ribbon, and conveyed on the surface of the water to the other end of the tank. These ribbons of wax are here lifted out, and conveyed in baskets to the bleaching grounds, where they are exposed to the air for one or two weeks (according to the state of the weather), being turned every day, and watered from time to time. The wax is then re-melted, re-ribboned, and re-bleached; it is subsequently refined by melting in water acidulated with sulphuric acid.

*Officinal Characters.*—Hard, nearly white, translucent.

*Description.*—White wax is yellowish white: I have never met with pure wax perfectly white. The circular cakes of commerce frequently contain spermaceti, which the dealers add to improve the color. Pure wax is solid, brittle, inodorous, or nearly so, insipid, fusible, and at a much higher temperature decomposable. Its specific gravity is about 0.965.

*Tests.*—Not unctuous to the touch; does not melt under 150°.

*Composition.*—Wax is a compound of three substances; myricin, cerin, and cerolein; which are separable from each other by boiling in alcohol, in which the myricin is insoluble, and from which the cerin crystallizes by cooling, while the cerolein remains in solution. *Myricin* $C_{92}H_{92}O_4$.—It fuses at 149° F. According to Brodie, it forms 73 per cent. of the wax. It is not saponifiable by potash. *Cerin* $C_{54}H_{54}O_4$.—It fuses at 143½° F. It constitutes about 22 per cent. of wax. It dissolves in 16 parts of boiling alcohol. By saponification with potash it yields margaric acid, a minute portion of oleic acid, and a considerable quantity of a non-saponifiable fat. *Cerolein* constitutes about 5 per cent. of wax.

*Physiological Effects and Uses.*—Wax is an emollient and demulcent. It has been administered internally, in the form of emulsion (prepared with melted wax and soap, yolk of eggs, or mucilage), in *diarrhœa* and *dysentery*, especially when ulceration of the alimentary canal is suspected. Its principal use, however, is *external*, sometimes as a mild sheathing or protecting application, sometimes as a basis for the application of other agents.

*Pharmaceutic Uses.*—*Yellow wax* is an ingredient in several ointments and plasters. *White wax* is contained in more than half of the officinal ointments.

### *Officinal Preparation.*

Unguentum Simplex, *Simple Ointment.*—Take of white wax, two ounces; prepared lard, three ounces; almond oil, three fluidounces. Melt the wax and lard in the oil on a water-bath; then remove the mixture, and stir until it becomes solid.

A mild and cooling dressing. Used also as a basis for more active preparations in a considerable number of officinal ointments.

[The corresponding preparation in the United States Pharmacopœia is the Unguentum Adipis (see **Adeps**).—W.]

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## VERTEBRATA.—VERTEBRATE ANIMALS.

### *Class:* Pisces, *Fishes.*

### ACIPENSER, *Linn.*

*Zoological Character.*—*Body* elongated, angular, defended by indurated plates and spines, arranged in longitudinal rows. *Snout* pointed, conical. *Mouth* placed under the surface of the head, tubular, and without teeth.

**Isinglass.** (Appendix B. I.)

[**Icthyocolla.** Mat. Med. List, U. S. P.]

The swimming-bladder or sound of various species of Acipenser, *Linn.*, prepared and cut into fine shreds.

*Habitat.*—The species mostly inhabit the Black and Caspian Seas, and their tributary rivers.

The organ from which isinglass is usually produced is the *air-bag* or *swimming-bladder*, sometimes termed the *sound.* It is a membranous sac filled with air, and placed under the spine, in the middle of the back, and above the centre of gravity.

*Preparation.*—The mode of preparing the swimming-bladder for sale as isinglass varies in different countries. Sometimes the bag is dried unopened, as in the case of the *purse*, *pipe*, and *lump* isinglass of the shops. At other times it is laid open, and submitted to some preparation, being either dried unfolded, as in the *leaf* and *honeycomb* isinglass, or folded, as in the *staple* and *book* isinglass, or rolled out, as in the *ribbon* isinglass. When it arrives in this country, it is soaked, scraped, and cleaned. Formerly it was picked into shreds by women and children, but it is now usually rolled and cut into filaments by machinery.

*Varieties.*—Many varieties of isinglass are imported: the Russian kinds are the most esteemed, but the Brazilian, on account of its cheapness, is very extensively used. The source of Brazilian isinglass is unknown. The New York isinglass, Hudson's Bay isinglass, and East Indian isinglass, are not procured from species of Acipenser.

*Composition.*—Isinglass of fine quality consists principally of *gelatine* about ninety-eight per cent., *albumen*, *membrane* insoluble in boiling water, with *salts of potash* and *soda*, and some *phosphate of lime.*

*Use.*—Isinglass has been placed in the Appendix to the Pharmacopœia solely for testing.

*Officinal Preparation.*

Solution of Gelatine.—Take of isinglass, in shreds, fifty grains; warm distilled water, one fluidounce. Mix and digest for half an hour on a water-bath with repeated shaking, and filter through clean tow moistened with distilled water.

Used as a test to distinguish gallic from tannic acid; the latter gives with it a yellowish-white precipitate. The former has no effect upon it.

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## GADUS MORRHUA, *Linn.*

### The Cod.

*Zoological Character.*—*Body* moderately elongated, two or three feet long, slightly compressed, and covered with rather soft and small scales; back and sides grayish-brown with yellowish spots. *Fins* all soft; *ventrals* pointed and attached to the throat; *dorsal* three; *caudal* distinct. *Head* without scales. *Jaws* and front of the *vomer* armed with pointed, unequal, mostly small teeth, disposed in several rows like a rasp. *Branchiæ* large, with seven rays.

*Habitat.*—Abundant on the coasts of Norway, France, and England, but especially on the coast of Newfoundland and Labrador.

**Oleum Morrhuæ,** *Cod-Liver Oil.* [Mat. Med. List, U. S. P.]

The oil extracted from the fresh liver by a steam heat not exceeding 180°.

*Preparation.*—In Newfoundland, where cod-liver oil is prepared in enormous quantities, the best oil is generally obtained by placing the perfectly fresh and cleaned livers, in a comminuted state, directly they are taken from the fish, in a boiler, and heating them, at as low a temperature as is required, by the application of steam heat. By this means the liquid oil separates and floats at the surface, from which it is ladled and filtered into casks, with as little exposure to the air as possible. If much solid fat separates from this by cooling, it is again strained and is ready for use. This method of obtaining the oil is substantially that which has been adopted for many years in the establishment of J. Bell & Co. They proceed as follows: The livers are obtained as fresh as possible, and, after careful inspection, all the inferior ones are removed, and the remainder are carefully cleaned, cut open, and washed two or three times in cold water. They are then exposed to a steam heat of about 180°, and occasionally stirred until all the oil has risen to the surface. This is filtered, and afterwards exposed to a temperature of about 50°, in order to congeal the more solid fat (*margarine*). The oil is then again filtered, and kept in jars well secured from the air.

*Officinal Characters.*—Pale yellow, with a slight fishy odor and bland fishy taste.

*Description and Varieties.*—Two varieties of oil are used medicinally in England. These are: 1. Pale, or nearly colorless; Newfoundland and English, and occasionally Norwegian. 2. Yellow, or light brown; Norwegian. These varieties owe their characters partly to their several modes of preparation, and partly to the state of the livers used for the extraction of the oil. The lightest colored oil is that which is separated from the livers quickly, or before putrefaction has commenced. The light brown oil has either remained longer in contact with the livers, has been prepared by higher temperatures, or has been obtained from livers in which decomposition has commenced. A darker brown offensive oil, obtained from putrid livers, is largely employed by curriers, but is quite unfit for use in medicine. But between the finest pale yellow or almost colorless oil, and the dark brown cod-oil used by curriers, there is an almost infinite variety of shade, so that no absolute difference can be founded on color only. The pale yellow oil is the only kind ordered in the Pharmacopœia. The odor of this oil is not disagreeable; its taste is slightly that of the liver of the cod, and, when fresh, it leaves no acrid flavor in the throat. It reacts feebly as an acid, and has a specific gravity of 0.923 at 63.5° F. Cold alcohol dissolves from 2.5 to 2.7 per cent., hot alcohol from 3.5 to 4.5 per cent. In ether it is soluble in all proportions.

*Composition.*—Fresh cod-liver oil consists principally of oleine 80 per cent., margarine about 15 per cent., with a substance called gaduin, very analogous to one of the bile acids, cholic, acetic, and butyric acids, and at times indications of iodine and bromine. Sulphuric acid has been employed as a test for cod-liver oil. If a drop of strong sulphuric acid be added to fresh cod-liver oil, the latter assumes a fine violet color, which soon passes into yellowish or brownish red. Some samples of oil produce at once the red color, without the preliminary violet tint. This coloration depends on the action of sulphuric acid on some one or more organic constituents of the oil, and the following facts lead me to infer that it is in part due to the presence in the oil of one of the constituents of the bile. Pettenkofer, in 1844, pointed out a new test for bile. If a liquid supposed to contain bile is mixed with about two-thirds of its volume of sulphuric acid, and if, the liquid being kept cool, a few drops of a solution of cane sugar (four or five parts of water to one of sugar) be added, and the mixture shaken up, a violet-red color is produced, provided bile be present. Strecker has recently observed that acetic acid may be substituted for sugar. The color developed agrees with that produced by the addition of sulphuric acid to cod-liver oil, which contains the essential constituents of the bile. Cholic acid produces the same color with sugar and sulphuric acid as bile; so that the test doubtless acts on this acid. De Jongh has shown that cholic acid is contained in cod-liver oil, and, as the oil contains acetic acid, we have the requisite agent to enable the sulphuric acid to act on the cholic acid, and the development of the purple or violet-red color is then readily accounted for. It follows, therefore, from what has now been stated, that sulphuric acid is a test for liver oils. It does not distinguish one liver oil from another, for it reacts equally with the oil of the liver of the ray, and with the oil of the liver of the cod. Neither does it distinguish good cod-liver oil from bad, for it produces its characteristic reaction both with common brown cod-oil and with the finest and palest qualities. But it serves to distinguish oil procured from the liver from oil obtained from other parts of the animal.

*Purity.*—The oil as contained in the cells of the fresh liver is nearly colorless. It is obvious, therefore, that of the varieties of oil to which reference has been made, the most colorless, prepared entirely from fresh livers, must possess the constituents of the oil in their purest state. The darker varieties, which are obtained either at a higher temperature, or from livers in which putrefaction has made more or less progress, contain a large proportion of volatile acids and biliary matters; while the lighter sort is precisely the poorest in these bodies, but is richest in oleic acid and glycerine. Chemical analysis lends no support to the opinion, at one time entertained, that the brown oil is superior as a therapeutic agent to the pale oil. Chemistry has not discovered any substances in the darker oil which would confer on it superior activity as a medicine. Experience fully confirms the inference drawn from observation of the chemical constitution of these varieties of cod-liver oil, as to their relative therapeutic value. The pale oil is most readily tolerated by the stomach. On the other hand, the disgusting odor and flavor, and nauseating qualities of the brown oil preclude its repeated use. Moreover, there is reason to suspect that, if patients could conquer their aversion to it, its free use, like that of other rancid and empyreumatic fats, would disturb the digestive functions, and be attended with injurious effects. At the Brompton Hospital it has been found that the use of the darker kinds cannot be long continued; the clear and straw-colored inodorous oil is that which is now administered in this institution. Dr. Williams, in his "Principles of Medicine," affirms the superiority of the pure fresh oil. Dr. Garrod likewise sums up his argument in favor of the pale oil thus: 1. "It is the real oil, as contained in the liver of the cod-fish. 2. It contains no products of putrefaction, such as are found in the dark oils. 3. It sits more easily on delicate stomachs. 4. Experience has proved it to be a most effective therapeutic agent."

*Physiological Effects.*—At the commencement of its use, cod-liver oil frequently causes nausea, disagreeable eructation, and occasionally vomiting. In the dose of a tablespoonful it acts as a laxative, diaphoretic, and diuretic. But Taufflieb declares that in doses of from two to four (tea?) spoonfuls a day, he never found it "exert any appreciable influence upon the urine or perspiration, or produce any disturbance in the economy." The disagreeable flavor of the oil sometimes creates nausea and sickness, but when habit has surmounted the repugnance to it, these effects cease. In several cases it has proved emmenagogue; and on some occasions it has given rise to a cutaneous eruption. Dr. Bardsley found that most persons were disposed to get fat under its use. Increase of weight has been strikingly shown to be the result of the use of cod-liver oil at the Brompton Hospital. This was observed in 219 cases, to the extent of 70 per cent., taking both stages of the disease and the sexes collectively; a loss of weight in 21 per cent.; while in $8\frac{1}{2}$ per cent. the weight remained stationary. The researches of Dr. Theophilus Thompson, Dr. Garrod, Dr. Williams, and others, with various substitutes, tend to the conclusion that this oil owes its action to its oleine, and that the presence or absence of iodine, bromine, &c., in the infinitely small proportions in which they are met with as constituents of cod-liver oil, cannot affect the results of its administration. Some chemists have failed to detect iodine in cod-liver oil. Other oils are not so readily digested as cod-liver oil, hence they are less suitable for medicinal use. The superior therapeutic powers of cod-liver oil may possibly be owing to some peculiar constitution of its oleine. It is, however, certain that no other oil is equally adapted to the purposes for which this is used. In the opinion of Dr. Williams cod-liver oil is a nutrient, affording fat of a better kind, more fluid, less prone to change, and more capable of being absorbed into the structure of the body than other forms of fat. Dr. Theophilus Thompson has found that, during the administration of cod-liver oil to phthisical patients, their blood grew richer in red corpuscles, and he refers to a previous observation of Dr. Franz Simon to the same effect. The use of almond or olive oil did not produce this result, but cocoa-nut oil acted like cod-liver oil.

*Therapeutics.*—Although it has been used more or less successfully in a considerable number of diseases, the cases in which it has proved most successful are those of a gouty, rheumatic, scrofulous, or phthisical nature. But even in these it requires a long-continued use to prove successful. One writer who has employed it observes that its use must be continued "at least a month, often six weeks, and sometimes for years." The oil is best adapted for relaxed, torpid, and phlegmatic temperaments, and for scrofulous subjects. In plethoric habits, and where irritation of the stomach and bowels, or inflammation, exists, its use is contraindicated. *Rheumatism*, *scrofula*, and *phthisis* are the diseases in which it has proved most successful. In *rheumatism* it is indicated in the chronic forms of this disease, where the muscles and tendons are rigid, and the joints nearly inflexible. In chronic *gout* it is said not to be so efficacious. In *scrofula* it has proved successful in most forms of the disease, but especially when the disease has affected the bones (as in rickets, caries, &c.), and in tabes mesenterica. In the latter intractable form its efficacy has been surprising. *Phthisis.*—The experience of the profession at large appears to have established the fact that cod-liver oil is one of the most efficacious of all remedies in arresting the progress of pulmonary phthisis; that it enables patients to struggle on longer against the inroads of the disease, and thus sometimes to obtain cicatrization and contraction of cavities which otherwise must have produced speedy death. The "First Medical Report" of the Hospital for Consumption, at Brompton, brought to the notice of the profession the results of the earliest trial, on a large scale, of cod-liver oil in phthisis. From the statistical results observed in 542 cases, published in that Report, we have abridged the following table:—

| | First Stage. | Second and Third Stages. | All Stages. | TOTAL. |
|---|---|---|---|---|
| | Per Cent. | | | |
| Improved . . . | 67.1 | 56.6 | 63.1 | 342 |
| Arrested . . . . | 23.0 | 14.0 | 18.1 | 98 |
| Not improved . . | 9.9 | 28.8 | 18.8 | 102 |

The reporters add that when it is recollected that of the whole number treated at the Hospital without the oil, the disease was arrested in only five per cent., the value of this remedy, under the use of which the disease appears to have been arrested in eighteen per cent. of the cases, must be considered very great; and the result proves that cod-liver oil exerts a greater controlling influence over phthisis than any other remedy. Dr. C. J. B. Williams confirms the favorable reports of the therapeutic action of cod-liver oil in phthisis. In the second stage of the disease, Dr. Williams states that he has seen a large number of cases very decidedly and lastingly improved; and even in the third stage the progress of the disease has been arrested. *Chronic skin diseases.*—Attention was drawn to the use of cod-liver oil in the treatment of these diseases by Dr. Marshall Hall some years since. In tinea favosa, impetigo, and chronic eczema it has been found efficacious as a topical application. Mr. Thomas Hunt says that he has found cod-liver oil of very great value in acne, lupus, sycosis menti, and other chronic cutaneous affections.

*Administration.*—For an adult the dose at the commencement is a tablespoonful, which has sometimes been increased to six times this quantity. This dose is to be repeated two, three, or four times a day for several weeks or even months. The dose given at the Brompton Hospital is one drachm at the commencement. In some few cases it has been increased to one ounce and a half. Dr. Theophilus Thompson is of opinion that the action of cod-liver oil is promoted by the addition of solution of potash. Dr. Bardsley gave from half an ounce to an ounce and a half twice or thrice a day in warm table-beer. For children of twelve months or under, the dose is a teaspoonful night and morning. The addition of some aromatic oil (as of lemon, peppermint, cinnamon, or anise) partly covers the unpleasant taste and smell. It is sometimes taken in the form of an emulsion. Peppermint-water and lozenges have been recommended for covering the unpleasant taste of the remedy. Orange wine has been very extensively employed as a vehicle for its administration. Various methods have been recommended for preventing the sickness which the oil occasionally produces. Perhaps the best is the addition of a small dose of hydrocyanic acid dissolved in mucilage, or of solution of potash, or of both these. A little magnesia taken shortly after the oil, or a minute portion of common salt taken both before and after it, often succeeds; a slice of lemon has a similar effect. The fact has now been repeatedly noticed that patients taking the oil, and more particularly children, after a time not only get accustomed to, but acquire a relish for the flavor of the oil. The oil should be administered soon after a meal. When pure cod-liver oil is given immediately after a farinaceous meal without any vehicle, it rarely creates nausea, eructation, or vomiting. Much depends upon the quality of the oil. Where the stomach resists the use of the oil, it may be administered in the form of enema, the bowels having been previously emptied. The oil has also been applied *externally* in scrofulous and rheumatic affections, compresses of lint being soaked in it and applied over the seat of the disease. Dr. Theophilus Thompson speaks favorably of frictions with cod-liver oil.

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*Class:* AVES, *Birds.*

## GALLUS BANCKIVA *var.* DOMESTICUS, *Temminck.*

### The Domestic Cock and Hen.

*Zoological Character.*—*Bill* of medium size, strong, naked at the base; upper *mandible* arched, convex, bent towards the point. *Head* surmounted by a dentated *comb*. *Ears* naked. *Throat* wattled. *Comb* and *wattles* of the female less than those of the male. *Toes* three, anterior, united to the first joint; one posterior, raised from the ground. *Tarsus* with a long curved *spur*. *Feathers* of the neck linear, elongated; of the body elegantly variegated; of the wings short; of the tail compressed and ascending, middle ones arched.

*Habitat.*—Domesticated in all the four quarters of the globe.

The eggs of the hen are too well known to need much description. Their specific gravity varies from 1.080 to 1.090. The relative weights of the different parts of the egg are, according to Dr. Prout, as follows: *shell and membrane* 106.9; *liquid albumen* 604.2; *yolk* 288.9 = 1000. The albumen is alone officinal.

### White of Egg. (Appendix A.)

The liquid albumen of the egg.

*Composition.*—Glaire or white of egg consists, according to Gmelin, of *albumen* 12.0, *mucus* 2.7, *salts* 0.3, and *water* 85.0. According to Dr. Bostock, *white of egg* consists of *water* 80.0, *albumen* 15.5, *uncoagulable matter* 4.5 = 100. The coagulability of albumen by heat, and its incoagulability by acetic acid, distinguish it from caseine. Albumen is coagulated by corrosive sublimate. Albumen of glaire is distinguished from albumen of the serum of the blood by its being coagulated by ether.

*Therapeutics.*—White of egg is a valuable agent in the treatment of poisoning by corrosive sublimate, sulphate of copper, and bichloride of tin. Its efficacy in these cases depends on the combination of the albumen with the oxide or chloride of the metal. It is used as a demulcent or sheathing agent in all cases of corrosive or acrid poisoning.

*Officinal Preparation.*

SOLUTION OF ALBUMEN (Appendix B. II.).—Take of one egg, the white; distilled water, four fluidounces. Mix by trituration in a mortar, and filter through clean tow first moistened with distilled water. This solution must be recently prepared.

*Class: Mammalia, Linn., Mammals.*

**CETACEA**, *Linnæus.* The Cetacean Order.

## PHYSETER MACROCEPHALUS, *Linn.*

### The Sperm Whale.

*Zoological Character.*—Length forty-five to fifty feet. *Skin* smooth, without hair; of back and sides blackish or slate-blue, a little spotted with white; of belly, whitish. A longitudinal *eminence* on the back over the anus. *Head* very large; superior portion consisting of large cartilaginous cavities filled with oily matter. *Teeth* of lower jaw twenty to thirty-three on each side, recurved and pointed, entering, when the mouth is closed, into corresponding cavities of the upper jaw; teeth of upper jaw small, conical, concealed in the gums. *Spiracular orifices* united at the upper part of the snout into a single spout-hole directed to the left side. *Tail* narrow, conical.

*Habitat.*—Pacific and Indian Oceans.

### Cetaceum, *Spermaceti.* [Mat. Med. List, U. S. P.]

Nearly pure cetine, separated by cooling and purification from the oil contained in the head.

*Extraction of Spermaceti.*—In the right side of the nose and upper surface of the head of the whale is a triangular-shaped cavity, called by the whalers "the case." Into this the whalers make an opening, and take out the liquid contents (oil and spermaceti) by a bucket. The spermaceti from the case is carefully boiled alone, and placed in separate casks, when it is called "*head matter.*"

*Purification.*—The substance called "*head matter*" consists of spermaceti and sperm oil. Its color is yellow. Its consistence varies with the temperature. In cold weather it consists of a congealed mass (spermaceti) surrounded and infiltrated by oil. To separate the latter as much as possible, it is put into filter bags. The solid thus obtained is then submitted to compression in hair bags, placed in an hydraulic press. It is then melted in water, and the impurities are skimmed off. Subsequently, it is remelted in a weak solution of potash. It is then fused in a tub by the agency of steam, ladled into tin pans, and allowed slowly to concentrate into large, white, translucent, crystalline masses.

*Officinal Characters.*—Crystalline, pearly white, glistening, translucent, with little taste or odor, reducible to powder by the addition of a little rectified spirit.

*Properties.*—Commercial spermaceti usually contains a minute portion of sperm oil, which is best removed by boiling in alcohol. The cetine or pure spermaceti is dissolved, and is deposited on cooling in a crystalline mass. This process should be repeated so long as the alcohol extracts any oil. It is insoluble in water, and slightly soluble only in alcohol, even at a boiling temperature.

*Tests.*—Scarcely unctuous to the touch; does not melt under 100°.

*Officinal Preparation.*

Unguentum Cetacei, *Ointment of Spermaceti* [Ceratum Cetacei, U. S., *Cerate of Spermaceti*].—Take of spermaceti, five ounces; white wax, two ounces; almond oil, one pint, or a sufficiency. Melt together with a gentle heat, remove the mixture, and stir constantly until it solidifies. ["Take of spermaceti, a troyounce; white wax, three troy ounces; olive oil, five troyounces. Melt together the spermaceti and wax; then add the oil previously heated, and stir the mixture constantly until cool." U. S.]

Employed as a mild and simple dressing for blisters and excoriated surfaces. [Spermaceti is one of the constituents of Unguentum Aquæ Rosæ, U. S.—W.]

## RUMINANTIA, *Cuvier*. The Ruminant Order.

## MOSCHUS MOSCHIFERUS, *Linn.*

### The Musk Animal.

*Zoological Character.*—An elegant animal, about the size of a goat, with slender *body*, no *horns*, long and pointed *ears*, scarcely any *tail*, gray-brown *fur*, and very coarse hair. The *male* has two long *canines* in the upper jaw, and a *pouch* in front of the preputial orifice containing an unctuous musky secretion. The *female* has two inguinal *mammæ*.

Fig. 233.

*Moschus moschiferus.*

Fig. 234.


*Belly of Moschus moschiferus.* (From Pallas.)

*a.* Tail. *b.* Anus. *c.* Scrotum. *d.* Preputial orifice. *e.* Abdomen. *h.* Orifice of the musk sac.

*Anatomy of the Musk Sac.*—The sac is peculiar to the male animal. If he be supposed to be laid on his back, and the belly examined (Fig. 234), we observe behind the navel, and immediately in front of the preputial orifice (*d*), a small aperture (*h*) leading into the *musk canal*, which terminates in the cavity of the *musk sac*. The aperture is about half an inch from the umbilicus, and usually about a line or a line and a half from the preputial orifice. In some preparations in my possession the distance is much greater. The preputial orifice is somewhat more prominent, and has a number of longish hairs projecting from it, in the form of a brush or hair-pencil; whereas the external musk aperture is placed in a depression, and is smooth. The *musk sac* is of an oval form, rather broader at the anterior than at the posterior part. It is flat and smooth above, where it is in contact with the abdominal muscles, but convex below (supposing the animal to be standing). Its breadth is from $1\frac{1}{4}$ to

$1\frac{3}{4}$ inches; its length from 2 to $2\frac{1}{2}$ inches; its depth varies, being greatest anteriorly, where it is about $\frac{1}{2}$ or $\frac{3}{4}$ of an inch. The *external aperture* of the musk sac is placed in the median line, but nearer to the anterior than the posterior extremity of the sac. The musk sac consists of an *outer* or *hairy coat or skin*, which is a continuation of the hide, and the hairs of which are disposed in a circular manner around the musk orifice, and within this, proceeding from without inwards, of four other coats, which are *muscular*, *fibrous*, *pearly*, and *epidermoid*. On the innermost coat are little depressions in which are small glandular bodies, by which the musk is secreted. *Contents of the Musk Sac.*—Pallas found that in young animals the sac was empty and contracted. In the adult animal it contained about 60–90 grains of musk, and in old animals more than a quarter of an ounce. But these quantities must be below the average, since the dried pods of commerce contain, on the average, more musk than this. Mr. Campbell describes the musk found in the sac as soft, reddish-brown, granular, and having the appearance of soft ginger-bread.

*Habitat.*—Native of Thibet and Central Asia.

## **Moschus,** *Musk.* [Mat. Med. List, U. S. P.]

The inspissated secretion from the preputial follicles, dried; imported from China.

*Officinal Characters.*—In irregular reddish-black rather unctuous grains; having a strong, peculiar, very diffusible odor, 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 grayish hairs arranged in a concentric manner around its central orifice.

*Description.*—Two kinds of musk are known in this country, viz., *China* or *Thibet musk*, and *Russian*, *Siberian*, or *Kabardine*. *China* or *Thibet musk.*—This is imported in small rectangular boxes, covered externally by silk, and lined with sheet-lead and paper. These boxes contain about twenty-five sacs or pods, each wrapped separately in paper. On the outside of the lid of some of the boxes is marked "*Linchong musk;*" and on the inside of the lid is a rude Chinese representation of the musk-hunters, some shooting the animal, others cutting out the musk-bag. On the paper which envelops each pod are similar rude representations in blue or red ink. *Pod musk* consists of roundish or somewhat oval pods, which are generally broader at one end than at the other. The hairs are brownish-yellow, grayish or whitish, bristle-like, and stiff, arranged in a concentric manner around the orifice of the sac. A careful examination will always discover the remains of the penis. The pods are about $2\frac{1}{2}$ inches long, and $1\frac{3}{4}$ inches broad; their weight, as well as that of the contained musk, is very variable. The average weight of the pods is about three-quarters of an ounce, and that of the musk about 160 grains. *Grain musk* (the contents of the pod) is granular, unctuous in the feel, mixed with hairs, of a dark reddish-brown color, a bitter aromatic taste, and a strong, remarkable, very persistent smell. Good musk will retain its odor for more than a century. Its odor can scarcely be called peculiar, since it is common to several animals and vegetables. A few drops of solution of potash added to musk increases its odor, by setting free, it is supposed, ammonia.

*Siberian*, *Russian*, or *Kabardine musk.*—This is an inferior kind. The pods are said to be more oblong or oval than those of the China kind; the hairs longer and whiter. But I have examined large quantities of Siberian musk, the pods of which are not distinguishable from those of the China by any of these characters. The only invariable distinction I have observed is in the scent, which is remarkably different; it is much less powerful, and more nauseous and disagreeable, being somewhat empyreumatic. Dealers, we are informed, rely upon another difference, namely, the greater length of the Siberian compared with the China pods. Geiger says it is sometimes accompanied by an odor somewhat similar to that of the sweat of a horse.

*Adulteration.*—The great sophisticators of musk are the Chinese. I have seen several *artificial* pods of musk which had been imported from Canton. T. W. C. Martius calls this artificial kind *Wampo musk*, and says that, for some years past, it has been extensively introduced into commerce. The hairy portion of the sacs is formed of a piece of the skin of a musk animal (readily distinguishable by its remarkable hairs), coarsely sown at the edges to a piece of membrane, which represents the internal smooth or hairless portion of the sacs. These pods are distinguished from the genuine ones by the following characters: the absence of any aperture in the middle of the hairy coat; the hair not being arranged in a circular manner; and the absence of remains of the penis (found in every genuine musk sac). These false sacs, as well as the genuine ones, are sometimes enveloped in papers marked "*Musk collected in Nankin by Jung-then-chung-chung-kee.*" The odor of the musk of the false sacs is ammoniacal. *Grain musk* is sometimes imitated by dried blood, and perhaps by other substances. The fraud is to be detected by a careful examination of the appearance and odor of the particles, and by their chemical characters. An infusion of genuine musk gives a precipitate with tincture of galls, and acetate of lead, but none with a solution of corrosive sublimate. By incineration genuine musk leaves behind a grayish-white ash, whereas blood yields a reddish one. *Artificial musk* is said to be prepared by rubbing in a mortar dried bullock's blood with caustic ammonia, and mixing the half-dried musk with genuine musk. According to Markham, "the substances commonly used for adulteration, or to fill the counterfeit pods, are—blood boiled or baked on the fire, then dried, beaten to powder, kneaded into a paste, and made into grains and coarse powder to resemble genuine musk."

*Composition.*—Musk has been several times analyzed. The most important constituent is an *odorous principle.* This has not hitherto been isolated. The strong and diffusive odor of musk would lead us to expect that its odorous matter was highly volatile. Yet such is not the fact; for we cannot deprive musk of its peculiar odor by distillation, though the distilled liquor has a musky smell. As it is destructible by heat, it is obviously organic. Some have suggested that it is the result of putrefaction of one or more of the constituents of musk; and in support of this statement it is asserted that, by Leslie's method of desiccation, musk may be dried and rendered odorless. I have repeatedly performed this experiment with every care, but without obtaining odorless musk. Robiquet was of opinion that many odorous substances owed their odor to a certain quantity of ammonia, which, being disengaged, carried off with it substances not otherwise volatile, which masked the ammoniacal smell. In applying this hypothesis to musk, it must be admitted that it harmonizes well with several of the circumstances observed. Thus musk evolves ammonia; water distilled from musk contains ammonia; and potash added to a solution of musk heightens its odor (by facilitating the evolution of ammonia?).

*Physiological Effects.*—Musk disturbs the functions of the stomach, acts as a stimulant to the vascular system and brain, and afterwards proves narcotic. Jörg and his pupils submitted themselves to its influence in doses of from 2 to 15 grains in water, or mixed with magnesia. Its primitive effects were eructation, weight at the stomach, diminution or increase of appetite, dryness of the œsophagus, heaviness of the head, vertigo, and headache. The secondary effects were more marked on the encephalon than on the digestive canal; disposition to sleep, faintness, and a feeling of heaviness in the whole body; lastly, deep and long-continued sleep. In very large doses the action on the nervous system was very marked; trembling in the limbs, and even convulsions, were observed. The pulse was increased in frequency, and became somewhat fuller. These effects show that musk belongs to the cerebro-spinants. It is a stimulant to the nervous and vascular systems, and an irritant to the stomach. Its effects are by no means uniform. Trousseau and Pidoux suffered from its use neither excitement of the vascular system nor sleep. Its influence is more manifest in some constitutions (those, for example, commonly termed nervous, in which there is a very sensitive or excitable condition of the nervous system), than in others (as the phlegmatic). Moreover, its effects are more marked in some morbid conditions of the cerebral functions (*e. g.* hysterical), than in the healthy condition of these functions. In some persons the nervous system appears to be peculiarly susceptible of the odor of musk; for it is reported that headache, giddiness, and even fainting have been induced by it. When the digestive apparatus is previously in a state of irritation, musk increases the local disorder, giving rise to pain, nausea, vomiting, and diarrhœa. The odorous principle of musk is absorbed, and subsequently thrown out of the system by the excretories. Barbier observes that the urine and the sweat of persons who have taken this substance are powerfully impregnated with its odor—now and then so strongly, that the hand, applied for the purpose of feeling the pulse, retains its odor for some time. Trousseau and Pidoux mention that in their experiments the excretions acquired a feeble odor of musk. Jörg, however, denies that the excretions of those who have taken musk have the smell of this substance.

*Therapeutics.*—The effects of musk, already alluded to, show that it is a remedy which will be useful where we want to excite the nervous system; and *vice versa*, that it will be hurtful where there exists a determination of blood to the brain, and in those constitutions denominated plethoric. The diseases in which experience seems to have shown that musk is sometimes useful are those which are attended with convulsive movements, and which, therefore, are called *spasmodic;* such, for example, as hysteria, epilepsy (especially of children, and where the disease does not depend on organic changes, or on plethora), chorea, and even some cases of tetanus. The employment of musk here has led to its denomination of antispasmodic. Dr. Cullen, on whose practical information I place great reliance, says, "I maintain that musk, when genuine, is one of the most powerful antispasmodics that we are acquainted with. I have found it to be a powerful remedy in many convulsive and spasmodic affections, and in some of a very peculiar kind. I had once a gentleman affected with a spasm of the pharynx, preventing deglutition, and almost respiration. This, when other remedies had failed, was relieved by the use of musk, which often showed its power; for the disease continued to recur at times for some years after, and was only obviated or relieved by the use of musk." In *retrocedent gout*, as where gout attacks the stomach or the head, giving rise to headache or delirium, musk has been found beneficial. Cullen relates a case where immediate relief was obtained by the exhibition of fifteen grains of genuine musk.

*Administration.*—Musk should be given in substance, either in the form of boluses, or suspended in water by means of saccharine or mucilaginous substances. Its dose is from eight to fifteen grains. In children it may sometimes be used in the form of enema.

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## OVIS ARIES, *Linn.*

### The Sheep.

*Generic Character.*—*Horns*, common to both sexes, sometimes wanting in the female, strong, thick, angular, wrinkled transversely, turned backwards and outwards in a spiral manner. No *beard.* Two *mammæ.*

Modern zoologists ascribe our domesticated sheep to *O. Ammon*, Linn., the *Argali* of Siberia, or to *O. Musimon*, Schraeber, the *Moufflon* of Sardinia.

*Habitat.*—Domesticated everywhere.

**Sevum Præparatum**, *Prepared Suet.* [Mat. Med. List, U. S. P.]

The internal fat of the abdomen purified by melting and straining.

*Officinal Characters.*—White, soft, smooth, almost scentless; fusible at 103°.

*Description.*—Prepared suet is the fat from the neighborhood of the kidneys of the animal. It is prepared by melting it over a slow fire, and straining through linen or flannel in order to separate the membranous portions.

*Composition.*—Suet is principally composed of *stearine* and *oleine*, with a little *margarine.*

*Pharmaceutic Uses.*—It is employed as a basis for ointment of mercury and for cantharides plaster.

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## BOS TAURUS, *Linn.*

### The Ox.

*Zoological Character.*—*Body* about seven feet long, thick. *Limbs* strong. *Head* large; *forehead* flat, longer than broad; *muzzle* square. *Eyes* large. *Ears* funnel-shaped. *Horns* simple, conical, round, arising from the opposite extremities of an occipital ridge, and directed laterally with the points inclining upwards or forwards. *Mammæ* four, disposed in a square form. *Tail* long.

*Habitat.*—Domesticated everywhere.

### [Pepsin.

The nitrogenized catalytic agent of the gastric juice is not officinal in either the British or the United States Pharmacopœia. It may be obtained by the following process of M. Boudault: The fresh rennet bags of sheep are opened and their inner surface washed with cold water. The mucous membrane is then scraped off, reduced to a pulp in a mortar, and digested for twelve hours in distilled water. To the infusion thus obtained acetate of lead is added, and a precipitate of the oxide of lead and pepsin thrown down. This precipitate is mixed with water, and a stream of sulphuretted hydrogen is passed through it. By this means sulphuret of lead is precipitated, and the pepsin obtained in solution. This solution is afterwards evaporated at a temperature not exceeding 100° F. (lest decomposition be induced) until of a syrupy consistency. The syrup is then reduced to a powder by mixing with perfectly dry starch. According to M. Ballard, fifteen grains of this, in half a fluidounce of water at 100° F., should dissolve in twelve hours a drachm and a half of boiled white of egg. Instead of pepsin, some practitioners use a *rennet wine*, which may be prepared by macerating the stomach of a calf, sheep, or other animal in sherry wine. A teaspoonful of rennet wine should be able to coagulate half a pint of milk at 100° F. in two minutes.

*Therapeutics.*—Pepsin is employed to aid in digestion, in cases of debility of the stomach from any cause. When there is a deficiency of acid in the stomach, it may be administered with lactic or very dilute muriatic acid. It has been recommended in the vomiting of pregnancy, and very highly in the cholera infantum or summer complaint of young children. Dr. Gray has recommended the rennet wine in diabetes, believing it to afford relief by converting into lactic acid any grape sugar that may be formed in the stomach.

The pepsin may be administered in fifteen to twenty-five grain doses, dissolved extemporaneously in syrup of cherries or other vehicle. The practitioner should bear in mind its frequent inertness from careless preparation. The dose of the wine is f℥j to f℥ss.—W.]

## **Milk.** (Appendix A.) *Cow's Milk.*

*Description.*—Cow's Milk is an opaque, white, emulsive liquid, with a bland sweetish taste, a faint peculiar odor, and a specific gravity of about 1.030: the latter property is subject to considerable variation. When recently drawn from the animal it is slightly alkaline.

*Composition.*—Milk has been the subject of repeated chemical investigation. Its principal constituents are casein, butter, and sugar of milk. Subjected to a microscopical examination, milk is observed to consist of myriads of very minute *globular particles* floating in a serous liquid. They instantly disappear by solution on the addition of a drop of caustic alkali. Both Donné and Sir A. Cooper have separated the globules by repeated filtration; the filtered liquor was transparent. The milk globules consist essentially of *butter*. Donné denies that they contain any casein, since they are soluble both in alcohol and ether, which do not dissolve this principle. Being specifically lighter than the liquor in which they are suspended, they readily separate by standing. They therefore rise to the surface, carrying with them some casein, and retaining some of the serum, thus forming what is called *cream*. The milk from which the cream is separated is termed *skimmed milk*. *Cream* has a variable specific gravity; the average, perhaps, is 1.024. The upper stratum of cream is richest in butter, the lowest in casein. By agitation, as in the process termed *churning*, the fatty globules unite to form *butter;* the residue, called *butter-milk*, consists of casein, serum, and a little butter. *Skimmed milk*, like cream, has a variable specific gravity; perhaps the average may be taken at 1.035. If left to itself it readily acquires acid properties, while white coagula, commonly termed *curds*, separate from it. If an acid or rennet (an infusion of the fourth stomach of the calf) be added to it, this change is immediately effected. The curd separated by the rennet is called *casein*. But after rennet has ceased to produce any more coagula, acetic acid will cause a further quantity to be formed. The *whey* left after the separation of the casein yields, on evaporation, sugar of milk, one or more nitrogenous substances, lactic acid, and some salts. *Casein.*—An albuminous substance, distinguished from the albumen of the egg and of blood by its not coagulating when heated, by its being coagulated on the addition of acetic acid, and by the products of its spontaneous decomposition. When dried, it is yellowish and transparent, like gum; it is odorless, and has a very slight taste. It is soluble in water. If its solution be boiled in contact with the air, it becomes covered with a white pellicle insoluble in water. The acids unite to form with it, when they are in excess, insoluble compounds. Various salts (as sulphate of copper, corrosive sublimate, nitrate of silver, bichloride of tin, &c.) form insoluble compounds with it. *Butter.*—This well-known substance consists of three fatty bodies, *stearine*, *oleine*, and *butyrine*. The latter substance is characterized by yielding, by saponification, three volatile, odorous, fatty acids, viz., *butyric*, *capric*, and *caproic acids*. A small quantity of these acids exists in ordinary butter, especially when it has been exposed to the air, and gives butter its peculiar odor. *Sugar of milk* (see below).

*Physiological Effects and Uses.*—As a medicinal agent, milk is regarded as a demulcent and emollient. As a *demulcent*, milk is an exceedingly valuable substance in irritation of the pulmonary and digestive organs. It is an excellent sheathing agent in poisoning by caustic and acrid substances, and in some of these cases it acts as a chemical antidote; for example, in poisoning by corrosive sublimate, sulphate of copper, bichloride of tin, and the mineral acids. Milk is further employed, on account of its emollient qualities, in the preparation of the bread and milk poultice, which requires to be frequently renewed on account of the facility with which it undergoes decomposition and acquires acrid qualities.

*Pharmaceutic Use.*—Milk is an ingredient of scammony mixture.

**Saccharum Lactis,** *Sugar of Milk.* [Mat. Med. List, U. S. P.]

$C_{24}H_{24}O_{24}$.

Crystallized Sugar, obtained from the whey of cow's milk by evaporation.

*Officinal Characters.*—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; grayish-white, crystalline on the surface and in its texture, translucent, hard, scentless, faintly sweet, gritty when chewed.

*Description.*—It is extensively made in Switzerland. Mr. Hess has shown that, under certain conditions, sugar of milk is susceptible of fermentation, as was before inferred from the fact that the Tartars prepare a vinous liquid, called *Koumiss*, from mare's milk. It is very slightly soluble in alcohol. It is much less sweet, and less soluble in water, than common sugar. By the action of nitric acid it yields, like gum, saccholactic or mucic acid; so that it forms, as it were, a connecting link between sugar and gum. Owing to its presence the oxide of copper is reduced by Trommer's test on boiling milk with sulphate of copper and potash.

*Uses.*—It does not appear to possess any remedial activity, but it is useful as a means of giving in the form of powder, and of diluting more powerful medicines.

[**Acidum Lacticum,** *Lactic Acid.* Mat. Med. List, U. S. P.

$C_6H_5O_5+HO$.

This is the acid of sour milk, and has also been found in some animal secretions and juices as well as some vegetable juices. It is one of the solvents of the gastric fluid. It may be formed by exciting a peculiar fermentation not only in sugar of milk but also in cane or other sugar. Thus, if the azotized matter of partly prepared malt be placed in contact with a sugar, it will set up a fermentation in it which will change it first into lactic and eventually into butyric acid, but if the malt be allowed to perfect itself before being placed with the sugar, it will cause a fermentation which will produce first alcohol and then acetic acid. Sauer Kraut is a preparation of cabbage, the sugar of which has undergone this lactic acid fermentation, owing to the partial decomposition of its azotized constituents. This fermentation, like that produced by yeast, is accompanied by the growth of a peculiar microscopic fungus.

*Officinal Characters.*—A syrupy, nearly transparent liquid, of a pale wine color, having a slight, bland odor, and a very sour taste. Its specific gravity is 1.212. It unites in all proportions with water, alcohol, and ether. It is not precipitated by solution of acetate of lead, or of oxalate of ammonia; and, when saturated with ammonia, affords no precipitate with hydrosulphuric acid. When gently heated, it yields no odor of acetic or butyric acid. Ninety grains of lactic acid are saturated by not less than seventy-five grains of bicarbonate of potassa. When it is treated with a caustic alkali in excess, the color is not materially deepened.

*Therapeutics.*—On account of its existing in the gastric juices, lactic acid has been proposed as a remedy in dyspepsia, and is said to have been used with advantage. It may be administered with pepsin, and probably increases its solvent power. It has also been used in cases of phosphatic alkaline urine.

*Dose.*—f ʒss to f ℥j, taken in sweetened water at meal time.—W.]

### **Ox Bile,** *Ox Gall.* (Appendix A.)

The fresh bile of the ox.

*Characters.*—The fresh bile of the ox is a viscid ropy fluid of a greenish-brown color, an unpleasant odor, and a taste at first bitter, but afterwards sweetish. It has an alkaline reaction, is miscible with water, and produces a froth when shaken with it similar to that produced by soap. It also resembles soap in its detergent properties. It yields, by evaporation, 9.2 per cent. of dry residue.

*Composition.*—Fresh ox bile consists principally of cholic and choleic acids in combination with soda, cholesterin, green coloring matter, fats, and mucus of the gall bladder. From the latter the bile is separated by solution in rectified spirit. *Cholic* or *glyco-cholic acid*, $C_{52}H_{43}O_{12}N$.—This is obtained by the action of sulphuric acid on solution of the cholate of soda. It separates in groups of radiating crystals. It is soluble in alcohol, and is sparingly dissolved by water and ether. The salts are bitter and sweet, and resemble soap. *Choleic* or *tauro-cholic acid*, $C_{52}H_{45}O_{14}S_2N$.—This exists in the bile in combination with soda, and has not been obtained in a perfectly pure state. When boiled with alkalies it is converted into cholalic acid and taurin. *Cholesterin.*—Is a peculiar fatty body. It exists only in very minute quantity in the bile; but it forms the principal constituent of biliary calculi. Hot alcohol dissolves it, and, on cooling, deposits it in pearly scales. It is soluble also in pyroxylic spirit.

### **Fel Bovinum Purificatum,** *Purified Ox Bile.*

*Preparation.*—Take of fresh ox bile, one pint; rectified spirit, two pints. Mix the bile and the spirit by agitation in a bottle, and set aside for twelve hours until the sediment subsides. Decant the clear solution, and evaporate in a porcelain capsule on a water-bath until the residue acquires the consistence of a vegetable extract.

In this process the spirit precipitates the mucus of the gall-bladder, which is insoluble in it.

*Officinal Characters.*—A yellowish-green substance of pilular consistence, having a taste partly sweet and partly bitter, soluble in water and spirit. A solution of one or two grains of it, in about a fluidrachm 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 re-dissolved, gradually acquires a cherry-red color, which changes in succession to carmine, purple, and violet.

*Test.*—Its watery solution gives no precipitate on the addition of rectified spirit.

*Therapeutics.*—It is usually regarded as being slightly laxative in its action, and is said to be especially useful when there is a deficient secretion of bile.

*Dose.*—From five to ten grains or more in pills, or in gelatin capsules. It is sometimes administered in the form of an enema, for which purpose about sixty grains may be dissolved in four ounces of warm water.

[**Oleum Bubulum,** *Neat's-foot Oil.* Mat. Med. List, U. S. P.

The oil prepared from the bones of Bos domesticus.

The oil is obtained by boiling the feet of the ox, deprived of their hoofs, in water, skimming off the fat which rises to the surface, purifying it by a second boiling, and then separating the oil from the suet by expression. It is a bland oil, and has been used instead of cod-liver oil with advantage in cases of phthisis in which the stomach would not bear the latter. Its principal use is, however, in the preparation of citrine ointment (Ung. hydrargyri nitratis, U. S. P.).—W.]

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## PACHYDERMATA, *Cuvier.* The Pachyderm Order.

## SUS SCROFA, *Linn.*

### The Hog.

*Zoological Character.*—*Body* covered with bristles. *Molars* 28, the posterior tuberculous; *incisors* 6 in each jaw; *canines* or *tusks* strong, triangular, inclined laterally. *Toes* 4 on each foot, 2 middle only touching the ground, armed with strong *hoofs*. *Nose* elongated, cartilaginous. *Teats* 12.

*Habitat.*—Domesticated.

### Hog's Fat. (Appendix A.)

The internal fat of the abdomen.

### Adeps Præparatus, *Prepared Lard.*

### [Adeps, *Lard.* Mat. Med. List, U. S. P.]

*Synonym.*—Axungia, *Ed.*

Hog's fat, deprived of its membranes, and purified by heat.

*Preparation.*—Take of the internal fat of the abdomen of the hog, perfectly fresh, fourteen pounds. Remove as much as possible of the membranes; cut the fat into small pieces, and liquefy it over a water-bath at a boiling heat; strain through fine linen, again heat it on the water-bath, stirring continually until it becomes clear, and entirely free from water. Keep it in a stone jar.

*Officinal Characters.*—A soft white fatty substance, melting at about 100°.

*Properties.*—*Hog's lard* or *axunge* (so called from the use anciently made of it, namely, greasing the axle of a wheel), is at ordinary temperatures a white or yellowish-white solid. In the liquid state it should be perfectly clear and transparent; but if it be intermixed with water it has a whitish or milky appearance. It should have little or no taste or odor. By exposure to the air, however, it acquires an unpleasant odor and acid properties. In this state it is said to be *rancid.* As stearine does not become rancid in the air, while oleine does, the rancidity of lard is referred to the latter constituent. But it has been found that the purer the oleine the less readily does this change occur; whence it is assumed that some foreign substance in the oleine is the primary cause of rancidity, either by undergoing decomposition or by acting on the oleine.

*Tests.*—Has no rancid odor, dissolves entirely in ether. Distilled water in which it has been boiled, when cooled and filtered, gives no precipitate with nitrate of silver.

*Composition.*—Fresh lard, according to Braconnot, contains 62 per cent. of oleine, or elaine, and 38 of margarine and stearine.

*Therapeutic Uses.*—Prepared lard is an ingredient of cantharides plaster, of the suppositories, and of nearly all the ointments.

[UNGUENTUM ADIPIS, *Ointment of Lard.* Unguentum Simplex, *Pharm.*, 1850.—" Take of lard, eight troyounces; white wax, two troyounces. Melt them together with a moderate heat, and stir the mixture constantly while cooling." U. S. (See **Unguentum Simplex**.)

CERATUM ADIPIS, *Cerate of Lard.* Ceratum Simplex, *Pharm.*, 1850.—" Take of lard, eight troyounces; white wax, four troyounces." U. S. Used as a protective application, when it is desirable rapidly to heal blisters, or other inflamed parts. It is universally known in this country as simple cerate.—W.]

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## RODENTIA, *Cuvier.* THE RODENT ORDER.

## CASTOR FIBER, *Linn.*

### The Beaver.

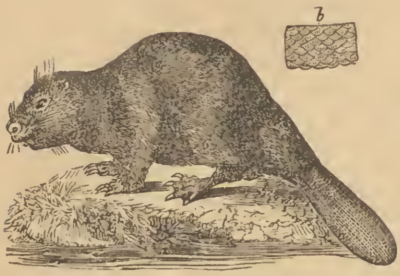
*Zoological Character.*—*Body* covered with a reddish-brown *fur*, and terminating in a long, broad, thick, and horizontally flattened *tail* of an oval form, which is covered with scales; *back* convex. *Toes* 5 on each foot; the posterior longer, and connected by membranes. *Canines* 0, *incisors* 2, *molars* 8, in each jaw=20; *incisors* very powerful, orange-colored anteriorly; *molars* with flat crowns, appearing as if formed of a double sinuous bony fillet.

### Castoreum, *Castor.* [Mat. Med. List, U. S. P.]

The preputial follicles and their secretion, dried, separated from the somewhat shorter and smaller oil sacs which are frequently attached to them; from the Hudson's Bay territory.

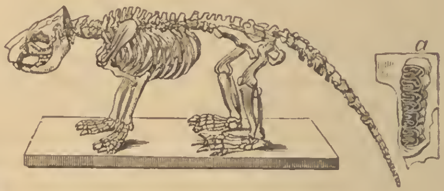
*Anatomy of the Castor Sacs.*—Both male and female beavers are furnished with castor sacs or follicles: hence it will be convenient to consider them in the two sexes separately. *Male Castor Sacs.*—If the animal be placed on his back, we observe, near the tail, a hollow (called by some a *cloaca*) inclosed by a large wrinkled somewhat hairy cutaneous protuberance, which, according to Perrault, is easily contracted and dilated, not only by a sphincter, as the anus, but simply like a slit. In this hollow the anus, the prepuce, and the oil sacs open. When the skin of the abdomen is removed, four eminences, covered by their appropriate muscles, are brought into view. They are placed between the

Fig. 235.




*Castor Fiber.*
b. Scales of the tail.

Fig. 236.




*Skeleton of Castor Fiber.*
a. Molar tooth.

pubic arch and the so-called cloaca. The two nearest the pubes are the *castor sacs*, while those next the cloaca are the *oil sacs*. Between the two castor sacs, in the male, lies the *penis*, with its bone; it is lodged in a long *preputial canal*, which terminates in the cloaca, and has some analogy to a vagina; so that there is some difficulty to determine, until the skin is removed, whether the individual be male or female. The penis points towards the tail, not towards the navel. The *castor sacs* open by a common aperture into the preputial canal. This aperture is about one inch in width, and is placed opposite the extremity of the *glans penis* in the relaxed condition of the organ, and about one inch from the orifice of the prepuce. The *castor sacs* are pyriform and compressed. They communicate with each other at their cervical portion; but their fundi diverge outwards and towards the pubes. Each castor sac is composed of an *external* or *cellular* coat, which incloses *muscular fibres*. Within these fibres lies a very *vascular coat*, which covers the scaly or glandular coat, and sends processes in between the convolutions of the latter. The *scaly* or *glandular coat* forms numerous folds or convolutions, which are largest and most numerous in the fundus of the sac. Externally, it is shining, silvery, and iridescent. Internally, it presents numerous small lanceolate oblong or semilunar scales, which are mostly toothed at their margin, and envelop each a *brown body*, which is supposed to be a gland, and is lodged in a small cavity. The inner surface of the castor sacs is lined with *epithelium* (a continuation of the epithelium of the prepuce), which invests the glands and scales of the scaly or glandular coat. In the cavity of the castor sac is found the secretion, which, when recent, is thin, fluid, highly odorous, yellow or orange, becoming deeper colored by exposure to the air. The quantity of this secretion is liable to great variation. The *oil sacs* are pyriform conglomerate glands, placed one on each side between the castor sac and anus; their ducts terminate in the cloaca. The secretion of these sacs is a fatty matter, having the consistence of syrup or honey, a peculiar odor, and a yellowish color. *Female Castor Sacs.*—We are less perfectly acquainted with the anatomy of the female beaver. It is said to be furnished with similar, though smaller, castor sacs and oil sacs; but it is probable that the male alone yields the castor sacs of commerce.

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

*Description.*—Canadian, or Hudson's Bay castor, is imported from their territory by the Hudson's Bay Company. It usually consists of two isolated sacs, which are connected so as to form two parts, like a purse, or like two testicles connected by the spermatic cords. The size of the sacs varies considerably. They are elongated and pyriform, and frequently wrinkled. The penis, or the oil sacs, or both, are sometimes attached to them. The color and other external characters are variable. In 1834 I examined between three and four thousand pounds of castor, which was offered for sale by the Hudson's Bay Company. A considerable quantity of it was covered externally with a bluish-white mouldiness, while the remainder was of a brownish color. The brown color, however, was sometimes dark, and in other cases yellowish, or even reddish. Some castor sacs are found nearly empty, and present, in their dried state, a very fibrous character; these are of inferior quality. Others are found gorged with unctuous matter, and, when quite dry, break with a resinous fracture, presenting no fibres until they have been macerated in spirit of wine. These alone correspond to the officinal character. In sacs which have been recently taken the contents are still soft.

*Composition.*—Canadian castor, from the best results of chemical analysis, appears to contain volatile oil, resin, castorin, with animal and saline matters. *Volatile Oil.*—Is obtained by distilling successive portions of castor with the same water. It is colorless, or pale yellow, has the odor of castor, and an acrid bitter taste. Wöhler has announced that this oil contains carbolic acid and salicin. *Resin.*—This is dark brown, and has an acrid bitter taste. It is insoluble in ether, but dissolves readily in alcohol. Water precipitates it from its alcoholic solution. *Castorin.*—Is a white, crystalline, fatty, non-saponifiable substance, analogous to cholesterin. It is soluble in ether and boiling alcohol, separating in crystalline scales as the solution cools.

*Physiological Effects.*—Castor is usually denominated a stimulant and antispasmodic. Since the time of Hippocrates it has been regarded as endowed with a specific influence over the uterus. In 1768, Mr. Alexander took it in various doses to the extent of a quarter of an ounce; and the only effect he experienced from it was disagreeable eructations. In 1824, Jörg and his pupils, males and females, submitted themselves to its influence; but the only effects were a slight uneasiness in the epigastric region, and disagreeable eructations, having the odor of castor, and which were not allayed by breakfast or dinner, and only ceased at night when sleep came on. These facts seem to show that castor possesses but little medicinal power; yet Dr. Cullen declares that on many occasions it is certainly a very powerful antispasmodic. Its odorous particles become absorbed, for they have been recognized in the urine by their smell.

*Therapeutics.*—Castor was formerly in great repute in those affections of the nervous system denominated *spasmodic*, such as hysteria, epilepsy, and catalepsy, more especially when these diseases occurred in females, and were attended with uterine disorder. In those kinds of fever called *nervous*, this medicine has also been recommended. In the northern parts of Europe it is used for its supposed *uterine influence*, to promote the lochial discharge, and the expulsion of retained placentæ. It is, however, little employed, partly, perhaps, in consequence of its disagreeable taste and smell, its variable quality, and its high price; but for the most part, I believe, because practitioners consider it an almost inert remedy.

*Administration.*—It is best given in substance, either reduced to powder or in the form of pill. Dose, sixty to one hundred and twenty grains.

### *Officinal Preparation.*

TINCTURA CASTOREI [U. S.], *Tincture of Castor.*—Take of castor, one ounce; rectified spirit, one pint. Macerate for seven days, strain, express, filter, and add sufficient rectified spirit to make one pint. ["Take of castor, bruised, two troyounces; alcohol, two pints. Macerate for seven days, express, and filter through paper." U. S.]

The castor should be employed in coarse powder. The quantity used in the process is much too small. A fluidounce of the tincture contains less than twenty-two grains, so that to give a medium dose of castor (sixty grains) it would be necessary to administer nearly three ounces of rectified spirit.

*Dose.*—Fl. drm. i to fl. drs. iv.

# PHYSIOLOGICAL CLASSIFICATION OF MEDICINES.

Although in the present state of our knowledge a physiological classification of medicines cannot be satisfactorily effected, on which account I have not thought it advisable in the preceding pages to follow this arrangement, still it appears to me that it will be useful to add to the account of the individual medicines some notice of the more important groups which they form when arranged on physiological principles.

In doing this, I shall adopt the following arrangement:—

| Medicines. | Classes. | Sub-classes. | Orders. |
|---|---|---|---|
| Medicines employed for their external topical effects. | 1. Mechanico-topical medicines. | ........ | 1. Dentifrices. |
| | 2. Chemico-topical medicines. | ........ | 2. Caustics.<br>3. Topical astringents.<br>4. Disinfectants. |
| | 3. Dynamico-topical medicines. | ........ | 5. Irritants.<br>6. Emollients. |
| Medicines employed for their internal mostly remote or general effects. | 4. Cœliacs—influencing the digestive organs. | ........ | 7. Stomachics.<br>8. Carminatives.<br>9. Antacids.<br>10. Emetics.<br>11. Antemetics.<br>12. Cathartics.<br>13. Astringents.<br>14. Demulcents.<br>15. Antidotes.<br>16. Anthelmintics.<br>17. Cholagogues.<br>18. Sialagogues.<br>19. Antisialics. |
| | 5. Hæmatics—influencing the blood. | ........ | 20. Hæmatinics.<br>21. Spanæmics.<br>22. Diluents. |
| | 6. Cardiacs — influencing the circulating organs. | ........ | 23. Stimulants.<br>24. Sedatives.<br>25. Styptics. |
| | 7. Pneumatics — influencing tho respiratory organs. | ........ | 26. Expectorants.<br>27. Contrapituitants.<br>28. Paregorics.<br>29. Antasthmatics. |
| | 8. Neurotics, or cerebro-spinals — influencing the nervous system. | Phrenics — influencing the mind. | 30. Exhilarants.<br>31. Narcotics. |
| | | Hypnics — influencing sleep. | 32. Hypnotics.<br>33. Anthypnotics. |
| | | Æsthetics—influencing sensation. | 34. Hyperæsthetics.<br>35. Anæsthetics.<br>36. Anodynes. |
| | | Cinetics — influencing motion. | 37. Tonics.<br>38. Relaxants.<br>39. Spastics.<br>40. Antispasmodics.<br>41. Mydriatics.<br>42. Myositics. |
| | 9. Uretics — influencing the urinary organs. | ........ | 43. Diuretics.<br>44. Ischuretics.<br>45. Urino-genitals.<br>46. Lithics.<br>47. Lithontlytics. |
| | 10. Genetics — influencing the reproductive organs. | ........ | 48. Aphrodisiacs.<br>49. Anaphrodisiacs.<br>50. Emmenagogues.<br>51. Ecbolics. |
| | 11. Hidrotics — influencing perspiration. | ........ | 52. Diaphoretics.<br>53. Anthidrotics. |
| | 12. Temperators—influencing the temperature of the body. | ........ | 54. Calefacients.<br>55. Refrigerants. |
| | 13. Resolvents — influencing inflammatory deposits. | ........ | 56. Resolvents. |

## MEDICINES USED EXTERNALLY.

### *Class* 1. Mechanico-Topical Medicines.

These are topical remedies which operate therapeutically by a physical or mechanical agency.

#### *Order* 1. Dentifrices.

Mechanical agents, usually powders, employed for cleansing the teeth.

The following substances form the bases of most of the dentrifices now in use:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Charcoal. | Red cinchona bark. |
| Sulphate of potash. | Pale catechu. |
| Acid tartrate of potash. | Myrrh. |
| Phosphate of soda. | Rhatany. |
| Salt. | |
| Precipitated carbonate of lime. | |
| Chlorinated lime. | |

Tooth powders require to have a certain degree of hardness or grittiness to enable them to remove the foreign matters adherent to the teeth; but if too hard they are injurious to the enamel. Charcoal is a good detergent. Chalk is very soft. Rhatany, cinchona, and catechu are useful astringents. Myrrh is employed partly for its odor. All insoluble powders, however, are more or less objectionable, since they are apt to accumulate in the space formed by the fold of the gum and the neck of the tooth, and thus present a colored circle. The soluble substances which may be used as tooth powders are sulphate of potash, phosphate of soda, acid tartrate of potash, and common salt.

### *Class* 2. Chemico-Topical Medicines.

Chemical agents which are employed as topical medicines.

We may divide them, according to the purposes for which they are used, into three orders, viz., *caustics*, *topical astringents*, and *disinfectants*.

#### *Order* 2. Caustics. (From καίω, I burn.)

Chemical agents which destroy animal tissues and decompose interposed animal fluids.

Caustics are conveniently grouped in two sub-orders—escharotics and catheretics.

##### *Sub-order* 1. *Escharotics* (from ἐσχάρα, an eschar), *Corrosives.*

The stronger caustics, which corrode or effect the complete destruction of the parts to which they are applied, and which give rise to the formation of an eschar.

The escharotics in most frequent use are—

*Mineral.*

| | | |
|---|---|---|
| Sulphuric acid. | Caustic potash. | Terchloride of antimony. |
| Hydrochloric acid. | Caustic soda. | Chloride of zinc. |
| Nitric acid. | | |

These destroy both the structure and life of a part. The eschar is succeeded by inflammation and suppuration in subjacent tissues, by which the slough is separated from the living parts.

They are employed: 1. To effect the destruction of living parts: thus to remove excrescences or morbid growths of various kinds, such as warts, condylomata, some kinds of polypi, malignant growths, and spongy granulations; to form issues; and to open abscesses. 2. To decompose the virus of rabid animals, and the venom of the viper and other poisonous serpents.

*Sub-order* 2. *Catheretics.* (From χαθαιρέω, I reduce.)

The milder caustics, which enter into chemical combination with the tissues and decompose the animal fluids.

Those in most frequent use are the following:—

*Mineral.*

| | |
|---|---|
| Iodine. | Acetate of lead. |
| Strong solution of ammonia. | Sulphate of copper. |
| Lime. | Subacetate of copper. |
| Alum. | Red oxide of mercury. |
| Arsenious acid. | Acid solution of nitrate of mercury. |
| Sulphate of zinc. | Corrosive sublimate. |
| Acetate of zinc. | Nitrate of silver. |

*Vegetable.*

| | |
|---|---|
| Acetic acid. | Creasote. |

These do not effect that complete destruction of parts which the escharotics do, but they frequently alter the living actions going on in subjacent parts. They are used for various purposes, of which the following are the principal: 1. To effect the destruction or removal of parts, as warts, hairs, &c. Catheretics which remove hair from the skin are called *Depilatories.* Lime, alone or with alkalies, is generally used for removing the hair in the treatment of porrigo favosa. Cazenave's *pommade épilatoire* is as follows: Carbonate of soda, 10 parts; lime, 5 parts; lard, 40 parts. Mix. 2. To alter the action of subjacent parts. Most catheretics are practically useful in this way: they effect a chemical change in the superficial parts, and alter the morbid action in subjacent ones. The employment of arsenious acid in lupus; of sulphate of copper and nitrate of silver in promoting the cicatrization of ulcers; of solutions of several metallic salts in inflammatory and other affections of the mucous membranes (as in mucous and purulent ophthalmia, gonorrhœa, &c.); of tincture of iodine applied to the skin over joints affected with rheumatic or gouty inflammation; and of nitrate of silver in erysipelas; are examples of this use of catheretics. 3. To stop hemorrhage from numerous small vessels. Catheretics act as styptics, in part by causing contraction of the vessels, but principally by coagulating the blood.

### *Order* 3. Topical Astringents.

These are chemical agents which constrict fibres and coagulate albuminous fluids. When employed to obviate relaxation of fibres and tissues, and to check excessive secretion, they are called *astringents;* but when used to repress hemorrhage, they are termed *styptics.* Those astringents which are employed to check secretion and exhalation, and which exercise but little corrugating power over the solids, are denominated *desiccants.* When used to subdue inflammation of superficial parts, they are sometimes called *repellents.*

The following is a list of the most frequently employed astringents:—

*Mineral.*

Lime.
Alum.
Oxide of zinc.
Carbonate of zinc.
Sulphate of zinc.
Acetate of zinc.
Acetate of lead.
Subacetate of lead.
Sulphate of iron.
Perchloride of iron.
Sulphate of copper.
Corrosive sublimate.
Nitrate of silver.

*Vegetable.*

Oil of turpentine.
Tannic acid.
Vegetable astringents, containing tannic acid.

---

Alcohol.

The astringents are catheretics acting in a milder and more dilute form. All of them react chemically on the animal solids and fluids. But astringents are not mere chemical agents: they operate dynamically also, and are powerful topical stimulants or excitants; though this dynamical influence, on which their utility as medicinal agents depends, is apparently a consequence of their chemical action. The general indications for the use of the astringents are atony and relaxation of the solid parts, with profuse secretion. The general contraindications for their use are rigidity and hardness of the solids, great irritation or inflammation, and dryness of secreting surfaces.

As topical remedies, they are employed for the following purposes: 1. To stop preternatural secretion from mucous surfaces; as in leucorrhœa, gonorrhœa, and gleet. 2. To check profuse secretion from ulcerated surfaces. 3. To stop hemorrhage; as from the uterus and piles. 4. To strengthen and constringe relaxed parts; as in prolapsus. 5. To subdue inflammation of superficial parts. The most successful method of treating mucous and purulent inflammation of the conjunctiva is by the use of astringents, especially of nitrate of silver and alum. This constitutes what is commonly termed the *stimulant* method of treatment. The slighter and more chronic forms of conjunctivitis are usually treated with lotions of sulphate of zinc or of acetate or subacetate of lead. The astringents act first chemically, and then dynamically: the vessels and other tissues of the part are constringed, and their vital properties beneficially influenced. In erysipelas, also, nitrate of silver is sometimes of considerable utility. In acute rheumatism and gout, the pain, redness, swelling, and stiffness of the affected joint are greatly relieved by the use of the tincture or liniment of iodine. Lead-washes are useful as cooling and sedative applications in superficial inflammation, in contusions, fractures, excoriations, &c. In profuse discharges from the skin (as in eczema and impetigo) and in excoriations the acetates of lead and oxide of zinc are useful as desiccants. The solution or tincture of perchloride of iron is occasionally applied as a styptic, or to repress the growth of spongy granulations. Lastly, Mr. Vincent states that he has found great advantage from the employment of sulphate of iron (in the proportion of a grain of the salt to an ounce of water) in prolapsus ani. The patients should be kept in bed, and after the bowel has been cleansed out, a small quantity of the injection should be daily thrown up and retained.

### *Order* 4. Disinfectants.

Chemical agents which absorb or destroy putrescent effluvia, organic fetors, and miasmata.

The following substances have been used as disinfectants:—

*Mineral.*

| | | |
|---|---|---|
| Wood charcoal. | Chlorinated soda. | Subacetate of lead. |
| Animal charcoal. | Lime. | Perchloride of iron. |
| Sulphurous acid. | Chlorinated lime. | Sulphate of iron. |
| Chlorine. | Chloride of zinc. | Sulphate of copper. |
| Permanganate of potash. | Acetate of lead. | |

*Vegetable.*

| | |
|---|---|
| Acetic acid. | Creasote. |

Disinfectants act more or less energetically on fetid and offensive effluvia, whose unpleasant odor they destroy; they are, therefore, *deodorizers*, and, by analogy, they are presumed to act on and render inert miasmata; but their efficacy in this way is oftentimes very equivocal. Charcoal absorbs putrescent effluvia. Lime absorbs carbonic acid, sulphuretted hydrogen, and perhaps other noxious substances. It is extensively employed, in the form of lime-wash, for the walls of buildings. Chlorine acts on organic vapors and gases chiefly by its affinity for hydrogen, with which it unites and forms hydrochloric acid. It decomposes sulphuretted hydrogen, ammonia, hydrosulphuret of ammonia, phosphuretted hydrogen, and some other fetid and offensive vapors. It is used for fumigation; but, in many instances, it has been found to be inert with respect to miasmata, while it is itself an irritating, offensive, and corrosive substance. Chlorinated soda and chlorinated lime destroy offensive odors, decompose sulphuretted hydrogen, ammonia, and hydrosulphuret of ammonia. A solution of chlorinated soda constitutes the disinfecting liquid of Labarraque. Several metallic salts are useful deodorizers, and are termed disinfectants. They react on sulphuretted hydrogen and the hydrosulphurets, forming insoluble, inodorous, metallic sulphurets; and they unite with animal matters, and check putrefaction. They are, therefore, said to act as disinfectants *by fixation*. A solution of nitrate of lead (in the proportion of about one drachm of the salt to a fluidounce of water) constitutes *Ledoyen's disinfecting fluid*. The acetate or subacetate of lead may be employed as a substitute for the nitrate. A solution of chloride of zinc constitutes *Burnett's disinfecting liquid;* but its power of decomposing sulphuretted hydrogen is very limited. A solution of a persalt of iron is said to constitute *Ellerman's deodorizing fluid*. A solution of sulphate of copper is applicable as a disinfectant. Sulphurous acid gas is a deoxidizing agent which destroys the color and odor of many organic substances. It has also been used as a disinfectant. Besides the foregoing, other agents have also been employed as disinfectants, as heat and ventilation. Thus the late Dr. Henry has apparently shown that the infectious matter of certain diseases (as scarlatina) is either dissipated or destroyed by a temperature not below 200° F.; and he, therefore, suggested that infected clothing, &c., may be disinfected on this principle; for he found that neither the texture nor color of piece goods and other articles of clothing was injured by a temperature of 250° F. Ventilation, however, is the most important disinfecting process. To disguise unpleasant odors, fumigations with balsamic and resinous substances (*e. g.* benzoin, storax, mastich, &c.), camphor, cascarilla, &c., are sometimes employed. The fumes of burning lavender, brown paper, &c., are employed in the sick chamber for a similar purpose. None of these substances destroy noxious effluvia chemically; they merely overpower or disguise them.

Disinfecting and decolorizing tooth-powders, washes, and lozenges owe their efficacy to chlorinated lime, and are used to destroy the unpleasant odor of the breath, and restore the white color of the teeth when stained by tobacco, &c. Thus, one part of chlorinated lime may be added to twenty or thirty parts of chalk, and used as a decolorizing tooth-powder. A disinfecting mouth-wash is prepared by digesting 180 grains of chlorinated lime in two ounces of distilled water; and, to the filtered solution, adding two ounces of spirit, to which some scent (as otto of roses) has been added.

### *Class* 3. Dynamico-Topical Medicines.

The dynamical agents used as topical remedies may be conveniently arranged in two orders; the one including the *irritants*, the other the *emollients*. The former irritate or excite; the latter soothe and lessen excitement.

#### *Order* 5. Irritants.

*Acrids.*

Substances which by their acrid properties stimulate, irritate, or inflame the living parts with which they are placed in contact, independently of any known chemical action.

The following is a list of the irritants most frequently employed in medicine as external topical agents:—

| | | |
|---|---|---|
| | *Mineral.* | |
| Sulphurated potash. | Ammonia. | Tartarated antimony. |
| | *Vegetable.* | |
| Ginger. | Croton oil. | Horseradish. |
| Veratria. | Mezereon. | Mustard. |
| Savin. | Capsicum. | ——— |
| Oil of turpentine. | Arnica. | Acetic acid. |
| Resin. | Ammoniac. | |
| Pepper. | Elemi. | |
| | *Animal.* | |
| | Cantharides. | |

Irritants are employed as topical agents for various purposes: 1. To stimulate or irritate the skin, for the purpose of effecting counter-irritation. When used to produce redness merely, they are termed *rubefacients*. For this purpose mustard poultices are frequently applied externally to relieve internal inflammatory affections. Ginger, pepper, and turpentine are also employed for the same purpose. Sometimes they are used as *vesicants* or *epispastics*; that is, to cause the exhalation of a thin serous fluid under the cuticle. Cantharides are generally employed for this purpose; though mezereon and some of the chemical irritants (as acetic acid and ammonia) are occasionally used for the same object. Lastly, some of the irritants produce a crop of pustules, when they are termed *suppurants*. Croton oil and tartarated antimony are of this kind. The latter, perhaps, acts chemically as well as dynamically. 2. To stimulate ulcerated surfaces. Surgeons employ a variety of topical applications to ulcerated surfaces for the purpose of augmenting or altering the vital activity of the part.

#### *Order* 6. Emollients.

Topical agents which lessen irritation, and diminish the insensible contractility of the living tissues, thereby causing relaxation and softening.

The following is a list of the most frequently employed emollients:—

*Vegetable.*

| | | |
|---|---|---|
| Barley. | Treacle. | Linseed oil. |
| Wheat flour. | Olive oil. | Glycerine. |
| Bread. | Almond oil. | Collodion. |
| Starch. | Linseed. | |

*Animal.*

| | | |
|---|---|---|
| Honey. | White of egg. | Milk. |
| Wax. | Spermaceti. | Suet. |
| Isinglass. | Lard. | |

*Water* and *oily substances* are, perhaps, the essential emollient principles. For though *gum*, *starch*, *albumen*, and *gelatine* are so termed, they do not act as such unless water be present. Emollients may be arranged in the following groups:—

1. *Aqueous emollients.*—This group contains water, the principal and most important substance of the order. In order, however, that it may act as an emollient, it must have a certain temperature, for neither very cold nor boiling water has any emollient effect. Dr. Cullen fixes 62° F. as the lowest temperature at which this fluid can be emollient; and observes, that the greater its warmth the greater will be its emollient power, provided that pain or scalding be not produced. Aqueous vapor is, for two reasons, more emollient than liquid water: in the first place, it penetrates the organic tissues more powerfully; and secondly, a greater degree of heat can be applied by it than by liquid water. Dr. Cullen was doubtful whether advantage could be gained by an addition made to water.

2. *Oleaginous emollients.*—This group includes the oily, fatty, and waxy substances; such as the vegetable oils, as olive, almond, and linseed oils, and the animal fats, as lard, suet, wax, and spermaceti.

3. *Mucilaginous emollients.*—This group contains tragacanth, gum arabic, and linseed.

4. *Amylaceous emollients.*—This group includes starchy or farinaceous substances; as wheat flour, bread, barley, starch, &c.

5. *Saccharine emollients.*—This order consists of the saccharine substances; as treacle and honey—and glycerine.

6. *Albuminous emollients.*—This includes the white of egg and milk—and collodion.

7. *Gelatinous emollients.*—This group contains isinglass.

Emollients have an operation diametrically opposite to irritants and astringents. They relax, soften, and swell the tissues, and render them more flexible. Applied to inflamed parts, they diminish heat, tension, and pain, and oftentimes assist in producing the resolution of the disease; and when the inflammation is too violent, or too far advanced, for this to be effected, they are useful by promoting suppuration. These effects have been referred by some to a physical, by others to a vital agency. Most writers have regarded them as mechanical agents, and explain their influence just as they account for the action of warm water or oil on inorganic substances—leather, for example. But we should always be cautious in applying physical explanations to vital phenomena; and in the present instance this is particularly necessary. Emollients act physically on unorganized parts of the body (the cuticle, for example); but, on living parts, they exert another kind of influence; for cold water, which diminishes the cohesion of soft parts, and renders them softer and more flexible, has not the same effect on living tissues. Moreover, Dr.

A. Crawford has shown that some medicinal agents which diminish the cohesion of dead animal tissues have an opposite effect on the living ones. Emollients are also used to prevent the action of the air and irritating matters on the body, by involving them, or by sheathing or defending surfaces from substances capable of operating on them injuriously. When used for these purposes, they are denominated *demulcents*. They are applied externally, in the form of local baths, poultices, fomentations, &c., both as emollients and demulcents, in local inflammations, especially erythema, painful ulcers, burns, &c.

## MEDICINES USED INTERNALLY.

### *Class* 4. CŒLIACS. (From κοιλία, the belly.)

Medicines acting on the digestive organs and their contents.

These may be divided into thirteen orders.

#### *Order* 7. STOMACHICS.

*Peptics, Appetizers.*

Medicines which directly promote the functions of the stomach, increasing the appetite and assisting digestion.

This order consists almost entirely of vegetable bitters, *i. e.* simple bitters, aromatic bitters, astringent bitters, and laxative bitters. The mineral and some of the vegetable acids frequently contribute to the same end. The only other directly stomachic medicines are the carminatives or aromatics, which constitute a separate order. Simple astringents are not used as stomachics. Stomachics may be arranged in seven groups, as follows:—

*Mineral.*

| | | |
|---|---|---|
| Phosphoric acid. | Hydrochloric acid. | Alkaline carbonates. |
| Sulphuric acid. | Nitric acid. | |

*Vegetable.*

*a. Simple bitters.*

| | | |
|---|---|---|
| Iceland moss. | Chiretta. | Sulphate of quinia. |
| Sulphate of bebeeria. | Strychnia. | Quassia. |
| Gentian. | Nux vomica. | Calumbo. |

*b. Aromatic bitters.*

| | | |
|---|---|---|
| Hop. | Chamomile. | Orange peel. |
| Serpentary. | Cusparia. | Lemon peel. |
| Cascarilla. | Myrrh. | |

*c. Astringent bitters.*

| | | |
|---|---|---|
| Elm bark. | Bebeeru bark. | Cinchona barks. |

*d. Laxative bitters.*

| | | |
|---|---|---|
| Aloes. | Rhubarb. | Dandelion root. |

*e. Acids.*

| | |
|---|---|
| Tartaric. | Citric. |

*Animal.*

Ox bile.

The diluted mineral and vegetable acids, when swallowed in moderate doses, at first allay thirst, sharpen the appetite, and promote digestion.

Alkalines probably aid in the digestion and absorption of fatty substances, especially when there is a deficiency of bile and pancreatic juice.

Simple or pure bitters.—This group includes those vegetable sto. machics which possess bitterness with little or no astringency or aroma- These remedies are employed to promote the appetite and assist digestion in atonic and enfeebled conditions of the stomach. They act secondarily as general tonics in feebleness and debility of the whole system, and especially of the muscles; and as anthelmintics. Their beneficial operation in expelling intestinal worms has been referred to their poisonous influence over these parasitical animals, but ought, perhaps, rather to be ascribed to their improvement of the condition of the alimentary canal, and to the removal of those states which favor the production of these beings. The power which they possess of retarding acetous fermentation may, perhaps, contribute to their beneficial operation in some dyspeptic cases accompanied with acidity and flatulence.

Aromatic bitters.—These possess bitterness with an aromatic flavor, but little or no astringency. They are often more agreeable to the stomach than simple bitters.

Astringent bitters.—This group contains those vegetable tonics which possess both bitterness and astringency in an eminent degree. It combines the effects of both these principles, and is the most important group of the order. It is the union of bitterness, astringency, and aroma that makes tea and coffee such universally favorite stomachics.

Laxative bitters.—In addition to being bitter stomachics, these agents act as laxatives or purgatives. In relaxed conditions of the digestive organs, rhubarb in small doses promotes the appetite, assists the digestive process, and improves the quality of the alvine secretions. When dyspepsia is connected with a deficient secretion of bile, the other articles of this group act as cholagogues, or to some extent supply the place of the bile.

### *Order* 8. Carminatives. (From *carmen*, a charm.)

#### *Cordials*, *Aromatics.*

Medicines which are used as stimulants to the gastro-intestinal canal. When given to dispel flatus and relieve colicky pains they are termed *carminatives*. When administered in dyspeptic cases to promote digestion they act as *stomachics* and *cordials*. They contain an aromatic principle, generally a volatile oil, and are therefore commonly termed *aromatics*.

*Vegetable.*

| | | |
|---|---|---|
| Ginger. | Oil of peppermint. | Coriander and its oil. |
| Cardamoms. | Oil of rosemary. | Cloves and their oil. |
| Saffron. | Capsicum. | Pimento and its oil. |
| Pepper. | Oil of chamomile. | Oil of cajuput. |
| Cinnamon and its oil. | Caraway and its oil. | Oil of rue. |
| Camphor. | Dill and its oil. | Oil of lemon. |
| Nutmeg and its oil. | Fennel. | Horseradish. |
| Oil of lavender. | Oil of anise. | Mustard. |
| Oil of spearmint. | | |

### *Order* 9. Antacids.

Medicines which relieve acidity of the stomach and bowels. These are:—

*Mineral.*

| | |
|---|---|
| Ammonia and its carbonate. | Lime and its carbonate (chalk). |
| Potash and its carbonates. | Magnesia and its carbonate. |
| Soda and its carbonates. | |

These substances, by combining with and neutralizing the free acid, relieve acidity of the stomach, and the flatulence and heartburn which usually accompany it; but they do not correct the faulty digestion which gives rise to acidity. On the contrary, their continued use impairs digestion. If, therefore, they are frequently required, they should be combined with a light bitter, as calumbo, cascarilla, or orange peel. The carbonates are better borne than the caustic alkalies, and the bicarbonates better than the carbonates. Magnesia or its carbonate, carbonate of ammonia, and bicarbonate of soda are most frequently employed. They also act as antacids and alteratives in rheumatic and gouty inflammation, especially when it is accompanied with uric acid in the urine, and as lithonlitics or antilithics.

### *Order* 10. Emetics.

Medicinal agents which are used for the purpose of promoting vomiting.

The number of medicinal substances capable of exciting vomiting is very great; but only a few of them are in common use. Their operation is promoted by repletion of the stomach, especially with tepid liquids; and by titilation of the fauces, and especially the velum pendulum palati. The following is a list of officinal emetics:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Carbonate of ammonia. | Squill. |
| Alum. | Chamomile. |
| Tartarated antimony. | Ipecacuan. |
| Sulphate of zinc. | Senega. |
| Sulphate of copper. | Mustard. |

Usually, within twenty or thirty minutes after taking an emetic a general feeling of uneasiness and nausea comes on. The pulse becomes small, feeble, and irregular; the face and lips grow pale; a distressing sensation of relaxation, of faintness, and coldness of the whole system is experienced; the saliva flows copiously from the mouth; the eyes lose their lustre; and the whole countenance appears dejected. These symptoms, which constitute the first stage of vomiting, continue for a variable period, and are followed by the ejection of the contents of the stomach. As soon as actual vomiting commences, the general phenomena are altered; the pulse becomes frequent and full, the temperature of the body increases, and a sweat breaks out on the face and other parts. During the act of vomiting, in consequence of the pressure made on the abdominal aorta, and the interruption to the circulation through the lungs, from the impeded respiration, the blood returns with difficulty from the head, the face swells and becomes colored, the conjunctiva is turgid and red, the jugular veins are gorged, and tears burst from the eyes. The violent straining is often attended with pain in the head and eyes, and with the involuntary expulsion of the urine and feces. The matters vomited vary according to circumstances; they may consist of the alimentary substances, bile, &c., contained in the stomach and duodenum previous to the exhibition of the emetic; of the fluids collected by the action of the emetic; and, lastly, of the emetic itself. Sometimes striæ of blood are observed, which usually come from the pharynx. The number of vomitings, and the ease with which they are effected, are liable to considerable variation, arising from the state of the digestive organs, the temperament of the patient, the state of the cerebral functions, &c. When the vomiting has entirely ceased, the patient feels languid, oppressed, and drowsy, and the pulse becomes weak and slow: the exhaustion is sometimes so great as to be attended with fatal consequences. Among other occasional ill consequences of vomiting may be mentioned comatose affections, uterine or pulmonary hemorrhages, hernia, abortion, suffocation, prolapsus of the uterus, rupture of the abdominal muscles, &c. These effects are produced by the violent muscular exertions which attend the act of vomiting. They suggest caution as to the use of emetics. Thus, in apoplexy, and some other cerebral affections, or when a tendency thereto exists; in pregnancy, especially when miscarriage is threatened; in prolapsus uteri, hernia, aneurism, &c., the danger to be apprehended from emetics is obvious. The concussion which they excite sometimes dislodges gall-stones. The intensity and duration of the different stages of vomiting have no necessary relation to each other. Thus the sulphates of zinc and copper excite speedy vomiting, with but little nausea; while tartarated antimony, on the other hand, produces great nausea and depression of system. Hence, when the depressing effects of emetics are required, as in inflammatory and other diseases, we employ the last-mentioned emetic. Vomiting is a reflex-spinal act. "In vomiting excited through the fauces, it is the trifacial which is the nerve of transmission; in vomiting induced by an emetic, the pneumogastric and splanchnic nerves act simultaneously in transmitting the irritation. These nerves convey the excitement ultimately to the medulla oblongata. The irritation produced by the exhibition of emetics gives rise to an increased secretion from the mucous follicles of the stomach and duodenum; as is shown by the thick, filamentous, and viscid matters frequently ejected. We presume that they likewise augment absorption during the stage of nausea, previously to the act of vomiting, and when the force of the circulation is reduced. Of the substances employed as emetics, some (as mustard) appear to act merely as local irritants to the stomach, for they cause vomiting only when they have been swallowed. Others (as tartarated antimony) may be termed *specific emetics*, since they induce vomiting, not only when they are introduced into the stomach, but also when injected into the veins.

Emetics are employed for several purposes, of which the following are the most important: 1. To evacuate the stomach. They are resorted to for the purpose of expelling poisons, undigested food, or other foul matters. When the object is merely to empty the stomach of its contents, those emetics should be selected which occasion the least nausea and distress. For women and children, ipecacuan is the mildest and safest emetic. For cases of poisoning, the sulphates of zinc and copper are preferred to tartarated antimony; they operate speedily and effectually, and with less nausea than the last-mentioned salt. In the absence of these, a dessert-spoonful of powdered mustard, or a tablespoonful of common salt, stirred up in a tumblerful of water, may be used. 2. To expel foreign bodies lodged in the throat or œsophagus. In cases of choking from the impaction of meat in the throat, the foreign body has been dislodged by provoking vomiting by means of a solution of tartarated antimony injected into the veins. 3. To excite nausea, and thereby to depress the vascular and muscular systems. When employed for this purpose, they are termed *nauseants*. For the fulfilment of this object tartarated antimony is usually employed in strong subjects; but in females and children ipecacuan is frequently substituted. Nauseants are used to reduce vascular action in some active hemorrhages, in inflammatory fever, and in acute inflammation of the lungs, testicles, mammæ, air-tubes, cellular membrane, skin, and joints; but in inflammation of the alimentary canal they are unsafe. They are sometimes employed to depress the tone of the muscular system in dislocations of the, larger joints, and thereby to assist reduction by overcoming the force of the opposing muscles. In various spasmodic affections, as spasmodic asthma, whooping-cough, &c., the efficacy of nauseating emetics is referable to their depressing influence over the muscular fibre. Emetics have been recommended to promote the passage of gall-stones, which they are said to do partly by relaxing the muscular fibres of the gall-ducts, partly by the concussion which they effect. But in acute cases they are usually unnecessary, as violent vomiting and great depression generally attend the passage of a biliary calculus. 4. To promote secretion and excretion. In hepatic derangements, especially those dependent on a torpid condition of the portal vessels, and in some cases of dyspepsia, emetics prove highly serviceable; probably by promoting the secretion and excretion of bile, pancreatic juice, and gastric mucus. In inflammatory affections of the bronchial tubes, of the larynx and throat, emetics are often found useful; and they are so, probably, in part at least, by their augmenting secretion from the affected parts, and thereby promoting the resolution of the disease. The operation of an emetic is frequently succeeded by a soft, lax, and damp state of the skin, a condition highly favorable to the subsidence of very slight febrile disorders. In chronic bronchitis, with copious secretion and little power to expectorate, emetics are frequently useful; for though, in consequence of the spasmodic closure of the glottis during the act of vomiting, the effort of the muscles of expiration is principally expended on the stomach, the bronchial secretion is also forced upwards, and the subsequent expectoration is generally easier and more abundant. For this purpose, wine of ipecacuan may be combined with tincture of squill, though sulphate of zinc will generally effect the object with less exhaustion. In croup, nauseants are not sufficient; vomiting is necessary in order to dislodge and expel the false membranes; and in the advanced stage of the disease, when the powers are failing, irritant emetics, as senega and sulphate of zinc, are preferable to those which nauseate.

*Order* 11. ANTEMETICS. (From ἀντί, against, and ἐμετός, vomiting.)

Medicines which relieve vomiting.

A great variety of medicines are capable, if used in suitable cases, of relieving vomiting, though it is generally necessary, in order to prevent its recurrence, to remove the exciting cause. Those which are most frequently employed are:—

*Mineral.*

| | |
|---|---|
| Ice. | Hyposulphite of soda. |
| Carbonic acid (aerated water, effervescing salines). | Lime (solution of). |
| Nitro-hydrochloric acid. | Magnesia. |
| Hydrocyanic acid. | Carbonate of magnesia. |
| Bicarbonate of soda. | White bismuth. |

*Vegetable.*

| | | |
|---|---|---|
| Hemlock. | Calumbo. | Chloroform. |
| Kino. | Opium. | Creasote. |

| | | |
|---|---|---|
| Demulcents. | Stimulants. | Cordials. |
| Sedatives. | Carminatives. | |

These are used in the following cases:—

1. Vomiting from organic disease of the stomach, as cancer and ulcer.

may sometimes be relieved by hydrocyanic acid, opium, white bismuth, and oleaginous demulcents.

2. Vomiting from protracted indigestion, with or without gastric fermentation and sarcina, by hyposulphite of soda, the earthy and alkaline carbonates, magnesia, solution of lime, and calumbo. Pyrosis by kino and opium.

3. Vomiting from the ingestion of decomposing animal food is generally relieved, after the expulsion of the offending matter, by hot spices, warm stimulants and cordials, as capsicum, brandy, and creasote.

4. Vomiting from pestilential maladies, with great vital depression, by the remedies referred to in 3.

5. Sympathetic vomiting from irritation or organic lesion of distant organs, by hydrocyanic acid, hemlock, opium, and creasote.

6. Vomiting from pregnancy, by the remedies in 2, hydrocyanic acid, and creasote.

7. Vomiting from the motion of vessels at sea (sea-sickness), by bicarbonate of soda, hydrocyanic acid, opium, chloroform, and creasote.

8. Vomiting from the abuse of intoxicating liquors, by carbonic acid (aerated water) and creasote.

9. Vomiting from contamination of the blood, as in uræmia, by nitro-hydrochloric acid.

The most powerful of these remedies are hydrocyanic acid, creasote, carbonic acid, bicarbonate of soda, and solution of lime. Ice may be given in any case except 3; carbonic acid may be used in almost all cases with more or less advantage; lime seldom fails to relieve; creasote is adapted to almost every kind of vomiting, except that which arises from organic disease of the stomach, and hydrocyanic acid relieves 1, 2, 5, 6, and 7.

## *Order* 12. Cathartics. (From καθαίρω, I purge or cleanse.)

Medicines which produce alvine evacuations.

The following is a list of officinal cathartics:—

*Mineral.*

| | | |
|---|---|---|
| Sulphur. | Phosphate of soda. | Sulphate of magnesia. |
| Sulphate of potash. | Tartrate of soda and potash. | Tartarated antimony. |
| Tartrate of potash. | Magnesia. | Mercury. |
| Acid tartrate of potash. | Carbonate of magnesia. | Calomel. |
| Salt. | | |

*Vegetable.*

| | | |
|---|---|---|
| Barbadoes aloes. | Resin of scammony. | Prune. |
| Socotrine aloes. | Jalap. | Tamarind. |
| Oil of turpentine. | Resin of jalap. | Senna. |
| Fig. | Manna. | Cassia pulp. |
| Castor oil. | Olive oil. | Gamboge. |
| Croton oil. | Taraxacum. | Podophyllum. |
| Rhubarb. | Colocynth. | Resin of podophyllum. |
| Scammony. | Elaterium. | |

*Animal.*

Honey.

Cathartics cause alvine evacuations by increasing the peristaltic motion of the intestines, and by promoting secretions from the mucous lining. The milder purgatives, however, operate principally by their influence on the muscular coat of the intestines; while the stronger ones stimulate the mucous follicles and exhalants, and give rise to liquid evacuations. The latter are denominated *hydragogues* (from ὕδωρ, water, and ἀγωγός, eliciting). Some of them create nausea, faintness, occasionally vomiting, colicky pains, abdominal tenderness, and tenesmus. The more violent ones, if given in an over-dose, produce inflammation of the alimentary canal, characterized by violent vomiting and purging, abdominal pain and tenderness, cold extremities, and sinking pulse. They are denominated *drastics* (from δράω, I am active). Emollient or demulcent drinks (as barley water, gruel, and broth) are taken to favor their safe operation. As the intestinal surface consists of about 1400 square inches, from the whole of which secretion and inhalation are going on, it is obvious that purging offers a very powerful means of diminishing the quantity of the fluids of the body. A distinction is usually made in practice between *cooling* and *warm* purgatives. By the former are commonly meant saline purgatives, which, while they cause purging without having any tendency to excite inflammation, are supposed to have a refrigerant influence over the system, and are adapted for febrile and inflammatory cases. By the latter are meant the more violent cathartics, which are presumed either to quicken the pulse, or at least to excite the abdominal vascular system, and, therefore, are considered to be less fitted for febrile cases. The more powerful cathartics are acrids or local irritants. Some of them (*e. g.* gamboge) operate almost solely in this way; for they do not excite purging except when they are introduced into the alimentary canal, and they easily excite vomiting when swallowed. But most of the drastics exert, in addition, a specific influence over the alimentary canal, so that they excite purging when injected into the veins, or when applied either to the serous membranes or cellular tissue. Senna, castor and croton oils, colocynth, and elaterium operate in this way. This circumstance, therefore, favors the notion that they act, in part at least, after absorption. A considerable number of cathartic substances have been detected in the blood and secretions. Some cathartics act also as diuretics, as acid tartrate of potash and gamboge. Dr. Christison observed that where diuretics had been given for some time without effect, he has frequently seen their action brought on "by a single dose of some hydragogue cathartic, such as gamboge." The resinous particles, in their passage out of the system through the renal vessels, probably acted as topical stimulants. Different parts of the alimentary canal are unequally affected by different cathartics. Thus aloes is remarkable for its action on the large intestine; moreover, many of the drastic cathartics, as gamboge and colocynth, create more irritation in the large than in the small intestines.

Cathartics may be conveniently arranged in five groups, as follows:—

1. *Laxatives.*—This group contains the *mild cathartics*, such as sulphur, acid tartrate of potash, manna, cassia pulp, tamarind, prune, fig, honey, and the fixed oils (as castor, almond, and olive oils). These very gently evacuate the contents of the intestinal canal, and usually without causing any obvious irritation, or affecting the general system. Manna, however, is apt to occasion flatulence and griping. Laxatives are employed in any case where we wish to evacuate the bowels with the least possible irritation—as in children and pregnant women; in persons afflicted with inflammation of any of the abdominal or pelvic viscera, with hernia, prolapsus of the womb or rectum, piles, or stricture of the rectum; and after surgical operations about the abdomen and pelvis.

2. *Saline or cooling cathartics.*—This group is composed of the alkaline and earthy purgative salts. They increase the peristaltic motion of the alimentary canal, and augment the effusion of fluids by the exhalants of the mucous surface, thereby giving rise to watery stools. The sulphates

of magnesia and potash, the alkaline tartrates, and the phosphate of soda, are the salts in most frequent use as cathartics. In certain doses, most salts act as purgatives; when they do this, they are evacuated by the alimentary canal. Administered in smaller doses, they do not purge, but become absorbed, and are subsequently eliminated by the excreting organs, especially by the kidneys, when they act as diuretics. The salts are chiefly employed therapeutically as cooling or antiphlogistic cathartics or laxatives, in febrile or inflammatory complaints. They are also useful in other cases where a mild action on the gastro-intestinal mucous membrane is required, along with a gently resolvent effect on the system, as in liver complaints.

3. *Milder acrid cathartics.*—This group includes senna, rhubarb, and aloes. These are more active substances than any of the preceding. They are acrids and stimulants, but their local action is not sufficiently violent to cause inflammation. Senna is employed where we want an active, though not very acrid or irritant, purgative. Rhubarb is administered in relaxed and debilitated conditions of the alimentary canal, on account of its tonic properties. Aloes is used in torpid conditions of the large intestines, and in affections of the head. It is usually considered objectionable in piles and diseases of the rectum.

4. *Drastic cathartics.*—This group comprehends the *strong acrid purgatives;* such as jalap, scammony, gamboge, croton oil, podophyllum, colocynth, and elaterium. These, when swallowed in large doses, act as acrid poisons. They are employed as purgatives in torpid conditions of the bowels; as hydragogues in dropsical affections; and as counter-irritants in affections of the brain. They are objectionable remedies in inflammatory and irritable conditions of the alimentary canal.

5. *Mercurial cathartics.*—The principal of these are mercury and chalk, mercurial pill, and calomel. We employ them as alterative purgatives, and to promote the hepatic functions. As they are uncertain in their operations, they are usually combined with, or followed by, other purgatives.

The following are the principal general uses of cathartics:—

1. To evacuate the contents of the alimentary canal, and thereby to relieve those morbid symptoms which arise from their presence. The substances which cathartics are employed to remove are retained feculent matters, undigested food, morbid secretions, worms, and poisonous agents.

2. To promote secretion and exhalation from the gastro-intestinal mucous surface. Cathartics are employed directly for the production of this effect, and indirectly for the attainment of other objects, of which the following are the chief:—

α. The establishment of healthy alvine secretion when this is defective or perverted, especially in torpid conditions of the alimentary canal. β. The promotion of the elimination of morbid agents contained in the blood, either absorbed poisons, or retained principles which ought to have been evacuated by other excreting organs. γ. The diminution of the volume of the circulating fluid, and the relief of plethora, congestion, and other maladies dependent thereon. δ. The increase of density of the blood. By the use of evacuants (such as hydragogues, diuretics, and diaphoretics), a discharge of the watery part of the blood is effected, and the density of the plasma is thereby increased. In diseases characterized by excess of water in the blood, as anæmia, as well also in albuminuria, the employment of purgatives to carry off water from the blood constitutes an important part of the treatment. ε. The augmentation of the action of the absorbents. Hydragogues which carry a large quantity of fluid out of the system by the bowels promote absorption, and thereby oftentimes prove most beneficial in dropsies. ζ. The antagonism of other secretions. Thus cathartics are employed to check excessive ptyalism from mercury, and to diminish the secretion of milk in nurses who are weaning. η. The establishment of a substitute for other secretions. Thus, in defective secretion from the uterus, kidneys, &c., cathartics are employed to relieve the morbid symptoms resulting therefrom. θ. The relief of inflammation. Cathartics are frequently employed as antiphlogistics. They assist in removing or counteracting some of the elements of inflammation; and they do this in part by promoting secretion and exhalation from the gastro-intestinal canal; by which they relieve congestion of, and determination to, inflamed parts, lessen inflammatory fever, and promote the expulsion of morbid agents from the system and the absorption of some of the effused products of inflammation.

3. To promote the secretion of the liver and pancreas. By irritating the orifice of the ductus communis choledochus, active cathartics produce an augmented secretion and excretion of bile and pancreatic juice; and hence these agents are well fitted for relieving those symptoms which arise from congestion or torpor of the portal system.

4. To stimulate or excite the muscular fibres of the alimentary canal, and thereby to relieve torpor, inactivity, or even a paralyzed state of this organ. The torpor referred to exists chiefly in the cæcum and colon, and is most frequently met with in females, and in persons partially paralyzed. Although it is greatly relieved by the use of cathartics, these in general give only temporary relief; indeed, it not unfrequently happens that, after their action is over, the inactivity of the bowel is augmented. Tonics, especially iron, and, in some cases, minute doses of the extract of nux vomica, or of strychnia, combined with or aided by the occasional employment of cathartics, sometimes prove most effective. Aloetic purges are particularly useful when the condition of the uterus and rectum does not prohibit their use.

5. To affect remote organs on the principle of revulsion or counter-irritation. Cathartics operate as revulsives or counter-irritants by the powerful impression which they make on the intestinal nerves, and by the determination of blood to the abdominal organs, and the augmentation of secretion (intestinal, hepatic, and pancreatic) which they effect. They often prove most effective remedial agents in affections of the brain and other remote organs. In chorea, hysteria, determination of blood to the brain, or threatened apoplexy, and various other maladies, cathartics, are most valuable remedies, operating apparently on the principle of counter-irritation.

6. To promote the catamenia. Some of the more active purgatives, particularly those which act in an especial manner on the large intestine, as aloes, extend their irritating or stimulating influence to the whole of the pelvic vessels, and in this way frequently prove emmenagogue.

### *Order* 13. Astringents.

Medicines which diminish secretion from the gastro-intestinal mucous surface, and are remedies for gastric and intestinal fluxes.

The following are the most important:—

*Minerals.*

| | | |
|---|---|---|
| Mineral acids. | White bismuth. | Perchloride of iron. |
| Borax. | Sulphate of zinc. | Pernitrate of iron. |
| Lime. | Acetate of lead. | Sulphate of silver. |
| Carbonate of lime (chalk). | Sulphate of iron. | Nitrate of silver. |
| Alum. | | |

*Vegetable.*

| | | |
|---|---|---|
| Galls. | Catechu. | Rhatany. |
| Tannic acid. | Red rose petals. | Opium. |
| Gallic acid. | Kino. | Hydrochlorate of morphia. |
| Oak bark. | Logwood. | ——— |
| Bearberry leaves. | Pomegranate root. | Vinegar. |
| Ipecacuan. | Bael. | Creasote. |

---

Carminatives. Stimulants.

The medicines of this order are principally beneficial by their local astringent influence in checking or preventing excessive discharges, as they can be applied directly to the affected part, either by the mouth or rectum. Opium is especially adapted for fluxes attended with an irritable condition of the secreting surface. Carminatives and stimulants, especially ammonia, brandy, and spices, are frequently used to modify and check asthenic fluxes from the bowels, when the irritation or congestion is slight. In such cases they appear to act as astringents. The remedy most frequently employed is a combination of aromatics and chalk, with or without opium; but when irritation is violent, or inflammation or fever is present, they are apt to aggravate the malady, which is then better relieved by diaphoretics and diuretics. Dr. McKidd, of Elgin, recommends in chronic diarrhœa large doses (20 grains) of ipecacuan, in form of pill, every twelve hours, reducing the dose in a few days to ten grains. Dr. Begbie uses it both by the mouth and by injection. Large doses were of great use in the early stage of dysentery during the Crimean war, and were invariably employed by the native doctors. Professor Skoda, of Berlin, treats dysentery by enemata, first of opium; if this fails, of sulphate of copper; if this also fails, of nitrate of silver, which is almost always effectual. Dr. R. H. Watson gives 60 grains of nitrate of silver in an ounce of water by injection.

### *Order* 14. Demulcents.

Medicines which prevent the action of irritating matters on the alimentary canal, by involving them, or by sheathing or defending the mucous surface from substances capable of acting on it injuriously.

This order consists of nearly the same substances as the *emollients* which are adapted for external use, with the exception of collodion, and the addition of charcoal and Iceland moss. They are administered when acrid poisons have been swallowed, and in irritation, inflammation, and ulceration of the alimentary canal, either by the mouth or in the form of enema.

### *Order* 15. Antidotes.

Agents which remove poison from the body, or which by their chemical or mechanical action render them more or less inert.

They may be arranged in the following manner:—

### 1. Purgative Antidotes.

*a. Emetics.*

*Mineral.*

Salt.
Soap.
Tartarated antimony.
Sulphate of zinc.
Sulphate of copper.

*Vegetable.*

Ipecacuan.
Mustard.

*b. Cathartics*

*Mineral.*

Sulphate of magnesia.

*Vegetable*

Castor oil.

### 2. Chemical Antidotes.

| *Antidotes.* | *Poisons.* |
|---|---|
| *Mineral.* | |
| Animal charcoal | Vegetable alkaloids. |
| Carbonic acid, bottled soda water | Caustic alkalies.<br>Caustic lime. |
| Sulphuric acid | Carbonate of lead.<br>Acetate of lead. |
| Chlorine gas and solution<br>Chlorinated soda<br>Chlorinated lime | Carbonic acid.<br>Sulphuretted hydrogen.<br>Hydrosulphuret of ammonia.<br>Hydrocyanic acid. |
| Ammonia (gas and solution) | Hydrocyanic acid. |
| Carbonate of ammonia | Hydrocyanic acid. |
| Carbonates of potash and soda | Mineral acids. |
| Ferrocyanide of potassium | Salts of copper. |
| Salt | Nitrate of silver. |
| Soap | Mineral acids. |
| Lime | Arsenious acid. |
| Chalk | Mineral acids.<br>Oxalic acid.<br>Tartaric acid. |
| Magnesia, and carbonate of magnesia | Phosphorus.<br>Mineral acids.<br>Arsenious acid. |
| Sulphate of magnesia<br>Alum | Carbonate of lead.<br>Acetate of lead. |
| Reduced iron | Sulphate of copper. |
| Hydrated peroxide of iron | Arsenious acid. |
| Mineral acids.<br>Strong solution of ammonia<br>Caustic potash<br>Caustic soda<br>Nitrate of silver | Wounds of rabid animals and poisonous snakes. |
| *Vegetable and Animal.* | |
| White of egg<br>Milk<br>Wheat flour | Solution of chlorine.<br>Chlorinated soda.<br>Chlorinated lime.<br>Sulphate of copper.<br>Subacetate of copper.<br>Corrosive sublimate. |
| Starch<br>Wheat flour<br>Bread<br>Barley | Iodine. |
| Galls<br>Tannic acid<br>Oak bark<br>Pale Cinchona bark<br>Catechu | Alkaloids, and the plants which contain them, viz: Colchicum, belladonna, tobacco, nux vomica, ipecacuan, hemlock, opium, aconite.<br>Tartarated antimony? |
| Tartaric acid<br>Lemon juice and citric acid<br>Vinegar<br>Acetic acid | Alkalies and their carbonates. |

3. MECHANICAL ANTIDOTES.

| Antidotes. | | Poisons. |
|---|---|---|
| *Mineral.* | | |
| Water | | Mineral acids. |
| Animal charcoal | | Alkalies and their carbonates. |
| Wood charcoal | | Chlorinated soda. |
| Magnesia | | Chlorinated lime. |
| Peroxide of iron | | Arsenious acid. |
| *Vegetable and Animal.* | | |
| Tragacanth. | Olive oil. | |
| Gum arabic. | Almond oil. | |
| Linseed. | Linseed oil. | |
| Castor oil. | Gelatin. | |

4. DYNAMICAL ANTIDOTES.

| Antidotes | Poisons |
|---|---|
| *Mineral.* | |
| Ammonia | Hydrocyanic acid. Digitalis. Tobacco. Poisonous snake and insect bites. |
| *Vegetable.* | |
| Belladonna | Opium and morphia. |
| Tobacco | Nux vomica and strychnia. |
| Opium and hydrochlorate of morphia | Belladonna and atropia. Stramonium. Arsenious acid. |
| Rectified spirit | Arsenious acid. Digitalis. Tobacco. Poisonous snake bites. |

5. ELIMINATING ANTIDOTES.

| Antidotes | Poisons |
|---|---|
| Sulphuric acid, Sulphurated potash, Iodide of potassium | Lead and mercury. |

In the treatment of cases of poisoning, the therapeutic indications to be fulfilled are several:—

1. The most important is the removal of the poison from the part to which it has been applied. From the *stomach* it is removed by the stomach pump, by the use of emetics, by tickling the throat with the finger or a feather dipped in oil, and, in the case of irritant poisons, by promoting vomiting by diluents and demulcents. In corrosive poisoning (as by strong acids and alkalies), the use of the stomach pump is dangerous. As domestic emetics, a dessert-spoonful of flour of mustard, or a tablespoonful of salt, stirred up in a tumblerful of water, or strong soapsuds may be used. But the more effective emetics are twenty to forty grains of sulphate of zinc, or five to fifteen grains of sulphate of copper. In their absence, twenty or thirty grains of powdered ipecacuan, or even two or three grains of tartarated antimony, may be administered. The emetic should be given in a glass of warm water, and repeated in a quarter of an hour, if it has not operated. From the *bowels* the poison is best removed by the use of castor oil and laxative enemas.

2. Another indication in the treatment of poisoning is the use of *chemical antidotes*. These either render the poison insoluble, and thereby prevent its absorption, or convert it into a harmless soluble substance; or in the case of poisoned wounds, destroy the wounded part, and deprive it of the power of absorbing.

3. A third indication is to sheathe the living part from contact with

the poison, by which not only the topical irritant-action, but also the absorption, of the poison is prevented or lessened. This is effected by *mechanical antidotes.*

4. A fourth indication is to counteract or relieve the effects of the poison. This is accomplished by agents which may be termed *dynamical antidotes.* Thus coffee is given to counteract the narcotism produced by opium; ammonia and brandy, to relieve the depression produced by digitalis or hydrocyanic acid, or the bites of poisonous snakes and insects; opium, to allay the acute pain caused by irritant-poisons.

5. A fifth indication is to promote the speedy removal of the poison from the system after its absorption. Most poisons are absorbed into the blood, and are subsequently expelled from the system by the excreting organs. It is very doubtful whether we have any means of accelerating their elimination. But others, as lead and mercury, appear to form compounds with the albumen of the tissues, have a spanæmic effect on the blood, and continue to act as depressing poisons on the body, especially on the nervous system, producing paralysis and shaking palsy, until they are artificially eliminated. Iodide of potassium, sulphur baths, sulphuric acid, and the persevering use of diaphoretics, diuretics, and purgatives, are the means best adapted to this end.

*Order* 16. Anthelmintics. (From ἀντί, against, and ἕλμινς, a worm.)

Agents which cause the destruction or expulsion of intestinal worms.

In English medical practice only three intestinal worms come under our notice for treatment, viz., *Ascaris lumbricoides*, or large round-worm, found in the small intestine; *Ascaris vermicularis*, or small thread-worm, found in the rectum; *Tænia solium*, or common tapeworm, found in the small intestines.

A considerable number of substances have been considered to possess anthelmintic properties. Some of these act obnoxiously on intestinal worms, destroying or injuring them; these are the anthelmintics properly so called; the anthelmintic specifics; or the *vermicides* of some authors. Others prove anthelmintic in consequence of their operation on the bowels; these are the cathartic anthelmintics, or *vermifuges.* Others again are chiefly used as prophylactics.

Vermicides.

*Mineral.*

| | | |
|---|---|---|
| Ice-water. | Salt. | Solution of lime. |

*Vegetable.*

| | | |
|---|---|---|
| Fern root. | Kamela | Pomegranate root. |
| Cevadilla. | Santonica. | [Pumpkin seed.] |
| [Chenopodium.] | Santonin. | ——— |
| Savin. | Kousso. | Vinegar. |
| Oil of turpentine. | | |

Vermifuges.

*Mineral.*

| | | |
|---|---|---|
| Tartarated antimony. | | Calomel. |

*Vegetable.*

| | | |
|---|---|---|
| Aloes. | Jalap. | Ipecacuan. |
| Castor oil. | Scammony. | Senna. |
| | | Gamboge. |

Prophylactics.

| | | |
|---|---|---|
| Sulphate of iron. | Perchloride of iron. | Quassia. |

Anthelmintic prophylactics are agents which increase the tone of the digestive organs, and thereby obviate that condition of the stomach and bowels which appears to favor the generation and nourishment of these animals. The best anthelmintic prophylactics are wholesome food and the use of purgatives, if the bowels be costive, and of bitter or ferruginous tonics if debility exist. The circumstances which favor or check the production of intestinal worms are imperfectly understood; and the assumption that their formation is referable to a debilitated state of the alimentary canal is entirely hypothetical. Some persons appear to be constitutionally disposed to their production.

In the treatment of intestinal worms, it is generally advisable to employ both cathartics and the anthelmintic specifics. The first aid the expulsion of the worms in at least two ways; mechanically, and by preventing the accumulation of intestinal mucus. Some cathartics may also act as poisons to the worms. Anthelmintics are administered both by the mouth and by the rectum. When the worms are contained in the small intestine (as the large round-worm and the tapeworm) they should be given by the mouth; but for worms in the rectum (as the small thread-worm) anthelmintic enemata are preferable. "To introduce at one end of a tube, several yards long, substances which are intended to act upon animals that live quite at its other end, would be a very roundabout course." (Dr. Watson.)

Each kind of parasite has been supposed to require its particular mode of treatment. It may be useful, therefore, to notice successively the remedies which have gained the most repute for each species of worms.

1. *Treatment for thread-worm* (Ascaris vermicularis).—As these animals usually inhabit the rectum, they are best treated by enemata. These may consist of ice-water, vinegar and water, salt and water, infusion of quassia with or without common salt in solution, solution of lime, solution of sulphate of iron, solution of perchloride of iron (one drachm of the officinal solution in half a pint of water), decoction of aloes, castor oil (in gruel or any other simple vehicle), oil of turpentine, or infusion of senna. A solution of a tablespoonful of common salt in cold water, or in infusion of quassia, usually proves a most effective anthelmintic enema. Where this fails, a turpentine enema may be had recourse to. For children, one to four drachms; for adults, one or two ounces, of this oil may be administered mixed with gruel. The intolerable itching which thread-worms give rise to is frequently allayed by enemata of olive oil. Dr. Watson states that it may be quieted by applying a towel, wetted with cold water, to the fundament, while in bed. Brisk cathartics should be from time to time administered by the mouth. The thread-worm is sometimes found in the cæcum. In this case it is obvious that enemata must fail in removing them. We must then administer our remedies by the mouth. Besides the use of cathartics, bitters (quassia, santonica, &c.), and chalybeates (sulphate or perchloride of iron), or, where these fail, oil of turpentine may be had recourse to.

2. *Treatment for the long round-worm* (Ascaris lumbricoides).—This species of parasite is best treated by active evacuants, and in the intervals of their use by some of the specific anthelmintics. A mixture of calomel and jalap forms a good purgative. Where calomel is objectionable, a mixture of jalap, scammony, and gamboge may be substituted; or, in some cases, a mixture of jalap and rhubarb. I have frequently found the infusion of senna, with an occasional dose of calomel, very effectual. Bradley recommends the use of antimonial or ipecacuan emetics. When the worms are contained in the stomach or upper part

of the small intestines, the use of emetics undoubtedly proves very serviceable. The specific anthelmintics which have been recommended for this species of worm are very numerous, though few of them, I suspect, are employed in this country at the present time. Bitters (as quassia) and chalybeates (sulphate and perchloride of iron) are frequently employed, and with benefit. Oil of turpentine sometimes proves effective, but less frequently so than in tapeworm.

3. *Treatment for tapeworm* (Tænia solium).—For the tapeworm we use a combination of purgatives and vermicides. The most successful remedies for tapeworm are oil of turpentine and extract of fern root (fern oil). Oil of turpentine should be given in full doses; for an adult, from six drachms to an ounce and a half; for a child, from half a drachm to two or three drachms. It should be given so that it may pass through the bowels rapidly without becoming absorbed; and thus, by coming in contact with the worm, destroy it. To fulfil these objects it should be taken in the morning fasting, and, to insure its purgative effect, an equal quantity of castor oil should be given, either in conjunction with it or within a few hours after it. Cevadilla, which Schmucher considered to be infallible, pomegranate root, kousso, and kamela, are also celebrated anthelmintics for this species of intestinal worm.

[Although the anthelmintics have been divided above into vermifuges and reputed vermicides, it is doubtful whether all of the latter are entitled to this designation. At all events their vermicidal powers differ considerably. In a summary of a series of cases published by Dr. Peacock to show the relative value of different anthelmintics in the treatment of tænia, the extract of fern root, kamela, and kousso are compared. The extract of fern root was far the most efficacious, the animal being generally expelled in a dead or dying state, though sometimes alive. After the use of kamela, which, as I have stated, has been highly praised as a vermicide by Drs. Mackinnon and Anderson, the worm, if expelled, was generally in portions which were mostly quite alive, so that as a vermicide it was much inferior to fern oil. Kousso appeared to be the least efficacious of the three, indeed to be very inferior to the others. Mr. Callaway states that the Abyssinians, with whom kousso is a native remedy, have learned to put more confidence in oil of turpentine. The efficacy of oil of turpentine is universally acknowledged; but even this is now generally held to be inferior to fern oil. Küchenmeister commends oil of turpentine, which he says usually expels the worm entire; while with kousso he has always been more or less unlucky, the worm being expelled in fragments without the head. Professor Martius, of Erlangen, who has used kousso largely, never saw the head come away. The portions of worm expelled by pomegranate root are usually alive. —Ed.]

*Order* 17. Cholagogues. (From χολή, bile, and ἀγωγός, eliciting.)

Medicines which promote the secretion or excretion of bile.

The most efficacious cholagogues are:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Nitro-hydrochloric acid. | Aloes. |
| Mercury. | Rhubarb. |
| Calomel. | Dandelion root. |
| | Podophyllum. |
| | Resin of podophyllum. |

It is probable that most, if not all, drastic purgatives increase the secretion and excretion both of bile and pancreatic juice, by irritating the opening of the ductus choledochus in the duodenum; just as certain substances, taken into the mouth, provoke an increased discharge of saliva, by irritating the mouths of the salivary ducts. Graaf says, that if a purgative be administered to a dog, and, when it is beginning to operate, the abdomen be laid open, the bile and pancreatic juice will be observed flowing into the duodenum. The term cholagogue, however, has been more particularly applied to substances named above which have been supposed to have a specific influence in promoting the secretion or excretion of bile. Cholagogues are employed to promote the secretion and excretion of bile in maladies in which these functions are defective, and generally in torpid conditions of the portal system.

*Order* 18. SIALAGOGUES. (From σίαλον, saliva, and ἀγωγός, eliciting.)

Medicines which augment the secretion of saliva and buccal mucus.

Sialagogues are of two kinds: some produce their effect by direct application to the mouth; others are swallowed, and require to be absorbed before they act as such. The former are called topical sialagogues; the latter are the remote or specific sialagogues.

### *Topical Sialagogues.*

These are sialagogues which are applied to the mouth. When used in a soft or solid state they are called *masticatories* (from *mastico*, I eat or chew). They act on the mucous follicles of the mouth and the salivary glands. Most solid or soft bodies, when chewed, increase the flow of saliva; but acrids do this in an eminent degree. The following is a list of officinal topical sialagogues:—

*Vegetable.*

| | | |
|---|---|---|
| Ginger. | Tobacco. | Horseradish. |
| Mezereon. | Mustard. | |

In almost all parts of the world masticatories are more or less used. In this country the masticatory commonly employed by sailors is tobacco. As the saliva is generally swallowed, masticatories do not confine their action to the mouth, but excite likewise the stomach. For habitual use, and as mere sialagogues, mucilaginous and emollient masticatories might be resorted to, but we find that acrids of various kinds have always been preferred. Masticatories, as therapeutic agents, have been principally used either as topical applications in affections of the gums, tongue, tonsils, salivary glands, &c., or as counter-irritants in complaints of neighboring organs, as in earache, rheumatism of the pericranium, affections of the nose, &c. The stronger masticatories, as mustard and horseradish, excite an increased discharge of nasal mucus and tears, as well as of saliva and mucus of the mouth.

### *Specific or Remote Sialagogues.*

This group contains:—

*Mineral.*

| | |
|---|---|
| Iodide of potassium. | Mercurials. |

Several substances have had the reputation of producing salivation or ptyalism by internal use. Of these, the preparations of *mercury* are the only ones on which much reliance can be placed, and even they sometimes disappoint us. Mercurials are given in certain diseases to excite ptyalism, and in some cases it is necessary to keep up this effect for several weeks. It is not, however, supposed that the salivation is the cause of the benefit derived, but an indication that the constitution is sufficiently influenced by the medicine. Iodide of potassium occasionally causes salivation, but it is not used for that purpose.

### *Order* 19. ANTISIALICS. (From ἀντί, against, and σαίλον, saliva.)

Medicines which check salivation—salivary astringents.

*Gargles.*

| | | |
|---|---|---|
| Chlorinated soda. | Alum. | Rectified spirit. |
| Chlorinated lime. | Sulphate of copper. | |

*Internal Remedies.*

| | |
|---|---|
| Opium. | Purgatives. |

These are seldom required except to restrain the salivation caused by mercury, when excessive or unnecessarily protracted after the discontinuance of the medicine. The topical remedies are generally sufficient. Should they not be so, purgatives will generally be useful by their derivative action, and opium, given rather frequently, seldom fails to restrain the discharge.

## *Class* 5. HÆMATICS. (From αἷμα, blood.)

Medicines which are supposed to act as therapeutic agents by effecting changes in the condition of the blood.

These may be arranged as hæmatinics, spanæmics, and diluents.

### *Order* 20. HÆMATINICS. (From *hæmatin*, the red coloring matter of the blood.)

Medicines which augment the number of blood-corpuscles or the amount of hæmatin in the blood.

This order is exclusively composed of iron and its compounds: *ferruginous* medicines; *chalybeates.* The following is a list of the more frequently employed substances composing this order:—

*Mineral.*

| | |
|---|---|
| Reduced iron. | Iodide of iron. |
| Magnetic oxide of iron. | Pernitrate of iron. |
| Peroxide of iron. | Citrate of iron and ammonia. |
| Saccharated carbonate of iron. | Citrate of iron and quinia. |
| Phosphate of iron. | Tartarated iron. |
| Sulphate of iron. | Ferruginous waters. |
| Perchloride of iron. | |

In the treatment of anæmia, iron acts, in part, as an aliment. It supplies to the blood-corpuscles an ingredient in which they are deficient, and it may, therefore, be said to serve as nourishment for them. The condition in which the iron exists in the hæmatin is still a *quæstio vexata;* and, therefore, the most appropriate ferruginous compound for the treatment of anæmia must, for the present, remain doubtful. Experience, however, has fully proved that this condition of system may be cured both by metallic iron and by the ferruginous compounds; both by peroxide and persalts, and by protoxide and protosalts; both by insoluble and by soluble ferruginous preparations. But, though all these substances are capable of acting as hæmatinics and of curing anæmia, they are not all equally eligible or efficacious. Some of them, in fact, do not possess any immediate or direct hæmatinic power, as metallic iron and the insoluble ferruginous compounds; for metallic iron acquires medicinal activity only by decomposing water in the stomach, and combining with oxygen to form the protoxide of iron, which dissolves in the acid contents of the stomach, and in this way becomes absorbable, while hydrogen gas is evolved; and the insoluble ferruginous compounds, not being absorbable, cannot act on the general system; but, by the change effected in them by the acid liquors in the gastro-intestinal canal, they give rise to the formation of soluble compounds, which are absorbed; and in this way the insoluble ferruginous compounds indirectly or mediately act as hæmatinics. But, as they depend for their activity on the acidity of the gastro-intestinal juices, which is limited and variable, it is obvious that their operation is slow and cannot be uniform. All the soluble ferruginous preparations which contain iron in the basic part, such as the iodide, chloride, and sulphate, the citrate of iron and ammonia, and tartrated iron, possess medicinal activity, and act as hæmatinics. But the soluble compounds containing iron in the acid part, such as ferrocyanide and ferridcyanide of potassium, are useless as hæmatinics, and are not applicable, therefore, for the cure of anæmia.

In what way does iron relieve anæmia? Is it merely by supplying the ingredient in which the blood is deficient? I think not. Anæmia frequently occurs without any obvious cause; when there has been no deficiency of food, air, and light, and no profuse discharges. In such cases the disease cannot be ascribed to want of iron in the system, but to some defect in the sanguification process; the iron which is taken in with the food has not been properly applied in the manufacture of hæmatin or red blood-corpuscles. In such cases the chalybeate medicine relieves the anæmia by correcting the defect in the blood-making process, the seat and nature of which are at present unknown. The menstrual function is frequently either entirely suspended in anæmia, or the discharge is small in quantity and of a pale watery character. The restoration of the function and the improvement in the quality of the evacuation, effected by the use of iron, are referable to the beneficial change produced in the quality of the blood.

The efficacy of purgatives in promoting the effect of the ferruginous compounds in anæmia, has been ingeniously explained by Dr. G. O. Rees. By removing water from the blood, they increase the specific gravity of the plasma. This, then, by an endosmotic action, deprives the blood-corpuscles of their dilute watery hæmatin, which is replaced by the more dense liquor sanguinis. The corpuscles, when thus supplied with a liquor denser than the chyle, are in a condition to absorb, by an endosmotic action, the ferriferous chyle. After the long-continued use of the ferruginous compounds, we frequently find excitement of the vascular system (particularly of the brain): thus we have throbbing of the cerebral vessels, and sometimes pain in the head, a febrile condition of system, with a tendency to hemorrhage.

### *Order* 21. Spanæmics. (From σπανός, poor, and αἷμα, blood.)

Agents which diminish the amount of the solid constituents of the blood, especially the fibrin and corpuscles, and thus give rise to that condition of the circulating fluid called by Simon spanæmia, or poverty of blood.

Most of the metals, except iron, as well as the mineral acids, the alkalies, iodine and bromine, are capable, by long-continued use, of producing this effect, but the medicines which are generally employed to produce it are:—

*Mineral.*

| | |
|---|---|
| Acids. | Bromide of potassium. |
| Alkalies. | Tartarated antimony. |
| Alkaline and earthy salts. | Mercury. |
| Iodine and Iodide of potassium. | Calomel. |

*Vegetable.*

Acids.

*Acids.*—The chemical influence of the acids in the alimentary canal is an interesting object of inquiry. It is obvious that if, as Liebig infers from Lehmann's experiments, the gastric juice naturally contain lactate of magnesia, this salt will suffer partial decomposition by the introduction of one of the mineral acids into the stomach. The acids unite in the alimentary canal not only with the albuminous substances and mucus, but also with the alkaline (soda) and earthy bases (lime and magnesia) found in the saliva, bile, and pancreatic juice; and in this way they become neutralized and form compounds, some of which are soluble, others insoluble; the former are absorbed, and the latter rejected. In considering, therefore, the chemical influence of the acids on the blood and on distant parts, it is important to bear in mind the fact just mentioned; namely, that the acids enter the blood in combination with bases; so that they react in the stomach and alimentary canal as acids, but in the blood as salts. The impossibility of dissolving ossific deposits in distant organs by the internal administration of the acids is, therefore, readily accounted for. It is obvious, moreover, that no analogy can exist between the chemical influence of free acids added to blood after its withdrawal from the body and that of acids combined with bases (that is, of salts) entering the blood from the alimentary canal. That the acids which have been administered by the mouth traverse the system is demonstrated by the fact of their subsequent detection in the secretions, especially the urine. But, while in the blood, they must be in combination, since their acid properties are neutralized. It must not, however, be inferred that the influence of the acids on the blood and general system is identical with that of the salts of the same acids; for it must be remembered that the acids deprive the system of part of its alkaline and earthy bases, which are employed in neutralizing and conducting the acids safely out of the system, and which, but for the administration of the latter would have been otherwise applied to the purposes of the economy. Now these bases, though obtained directly from the saliva, the bile (chiefly), and the pancreatic juice, are indirectly derived from the blood; so that, in a secondary way, at least, the acids must modify the composition of the blood. A striking illustration of the different effects produced on the system by the vegetable acids and by their salts is derived from Wöhler's observations. Several of the free vegetable acids, when administered by the mouth, are subsequently detected in the urine in combination with an alkali; but, when given in combination with an alkali, carbonates (bicarbonates?) of the alkali are detected in the urine. The free vegetable acid, therefore, robs the system of alkaline matter, while the salts of the same acids deprive the system of oxygen in order to be converted into carbonates. From the preceding remarks, it may be inferred that the precise changes effected in the blood by the internal administration of the acids are very obscure; nay, the very action of these bodies on the circulating fluid is rather assumed than demonstrated. The statements of authors as to the changes in the physical and chemical properties of the blood, produced by the administration of acids, are, therefore, for the most part, hypothetical, as are also the pathological and therapeutical deductions therefrom. Dr. Stevens' statements, respecting the effect on the blood of acids administered internally, are entirely hypothetical, and are founded on the erroneous notion that the acids enter the circulation in the free state, and that their action on the circulating blood is similar to that which they exercise on blood drawn from the body. Schultz, also, has more recently fallen into similar errors. Both the acids and salts (alkaline and earthy), he says, act on the blood as hæmatolytics, *i. e.* blood-destroying agents, the former acting on the corpuscles and the latter on the plasma or fibrin. To the action of the acids on the blood-corpuscles he ascribes their antiphlogistic power. They have, he says, an extraordinary faculty of abstracting the coloring matter from the corpuscles, and of rendering it soluble in the plasma.

*Alkalies and alkaline salts* have also been supposed useful, chiefly on theoretic grounds, because their continued use leads to a diminution of the fibrin of the blood, which, in acute inflammation, is augmented in quantity. But their chemical influence is not very energetic, and the precise changes which they effect have not been carefully examined. The chemical influence of the neutral salts is exercised both on the blood-corpuscles and on the plasma; they brighten the red color of the former, and, in general, lessen the quantity of spontaneously coagulating matter (fibrin) in the latter. The neutral salts for the most part retard or prevent the coagulation of the blood. It is well known that the addition of nitrate of potash or sulphate of soda to fresh-drawn blood impedes the coagulation; and the same effect appears to be produced by administering these salts to living animals. In a case of acute pneumonia in a robust countryman, Schultz abstracted two ounces of blood. The blood thus abstracted yielded five per cent. of fibrin. At the end of twenty-four hours, during which the patient had taken one hundred and eighty grains of nitre and an ounce of sulphate of soda, two ounces of blood were again drawn, and yielded only 3.4 per cent. of fibrin. The use of the nitre and the alkaline sulphate was continued, and at the end of twenty-four hours more the patient was again bled to the same extent, but this portion of blood yielded only 1.9 per cent. of fibrin. Thus, then, it appeared that under the continued use of these salts the quantity of fibrin in the blood progressively lessened. This effect has been termed *antiplastic*. This effect of salines is, however, probably neither constant nor universal. When salts are added to the blood they lessen or destroy the adhesiveness of the corpuscles for each other, and thereby separate and render them distinct. Now, as in buffy blood the corpuscles have an increased tendency to aggregate and to separate from the blood, Mr. Gulliver suggests that probably the efficacy of saline medicines in inflammation depends on their correcting this disordered state of the blood. Most of the neutral alkaline salts containing a vegetable acid are converted, by oxidation, into carbonates (or bicarbonates), in which state they are found in the urine, to which they communicate an alkaline quality. In fevers salines are in almost universal use. They are employed with the obvious effect of promoting the action of the secreting organs, and with the supposed effect of altering the crasis of the blood. Dr. Stevens explains the efficacyof salines in malignant fevers by supposing that they restore to the blood the saline matter in which, in these cases, he declares this fluid to be deficient, as is evinced by the dark color of the circulating fluid. To the saline impregnation he ascribes the vermilion red color and some other properties of the blood, and he regards the black color of this liquid as a certain proof of the loss or diminution of its saline ingredients. They have also been employed to restore the saline qualities of the blood in malignant cholera. In this disease the blood is remarkably black, incapable of coagulating, and contains more albumen and hæmatosin, but less water and saline parts, than natural; while the enormous discharges from the bowels consist of a weak solution of albumen containing the salts of the blood. The obvious indications, therefore, in the treatment of this disease, are to restore the water and saline matter to the blood. Hence originated what has been called the *saline treatment* of cholera. This, at first, consisted in the exhibition of certain alkaline salts by the mouth, and in the form of enemata. The following are formulæ which have been recommended:—

| | |
|---|---|
| Take of Carbonate of soda | 30 grs. |
| Chloride of sodium | 20 " |
| Chlorate of potash | 7 " |

Dissolve in half a tumblerful of water.

This to be repeated at intervals of from fifteen minutes to an hour, according to circumstances.

| | |
|---|---|
| Take of Phosphate of soda | 10 grs. |
| Chloride of sodium | 10 " |
| Carbonate of soda | 5 " |
| Sulphate of soda | 10 " |

Dissolve in six ounces of water.

The mixture to be repeated every second hour.

This plan, however, was followed by that of injecting saline solutions into the veins, which was, I believe, first practised by Dr. Latta. The *immediate* effects of these injections, in a large majority of cases, were most astonishing; restoration of pulse, improvement in the respiration, voice, and general appearance, return of consciousness, and a feeling of comfort. In many instances, however, these effects were only temporary, and were followed by collapse and death. In some, injurious consequences resulted, as phlebitis, drowsiness, &c. The reports as to the ultimate benefit of the saline treatment in cholera are so contradictory that it is exceedingly difficult to offer to the student a correct and impartial estimate of its value. That it failed in a large proportion of cases after an extensive trial, and greatly disappointed some of its staunchest supporters, cannot be doubted. Dr. Griffin states that all the published cases of injection which he can find recorded amount to 282, of which 221 died, while 61 only recovered; but he thinks that the average recoveries from collapse by this method of treatment "far exceeded the amount of recoveries from any other treatment in the same disease, and under the same circumstances." The solutions used for injecting the veins have been of too low a specific gravity, and such as to injure the blood-corpuscles by too rapid endosmose. A specific gravity of about 1030 appears indicated, whereas Dr. Latta's fluid was about 1004 to 1005. A heavy fluid of 1030, composed merely of water and salts, would mix more easily with the blood than the watery injections; it would rapidly diffuse itself, and in all probability produce its vivifying effects in small quantities (Taylor and Rees).

*Iodine and bromine* enter the blood in a state of combination. From analogy, rather than from observation, the iodides and bromides are supposed to lessen the amount of solid constituents, especially the fibrin and corpuscles, and to increase the proportion of water.

*Mercurials and Antimonials.*—The effects produced on the blood by the protracted use of these agents have not been chemically investigated. The older writers, as Huxham, state that mercury produces a watery and dissolved condition of the blood; and the same kind of opinion, expressed in a different form of language, is held by modern writers. Dr. J. R. Farre states that a course of mercury diminishes the number of blood-corpuscles; and he says that he gave mercury to a full plethoric woman, and "in six weeks blanched her as white as a lily." I am unacquainted with any chemical observations as to the state of the blood after the protracted use of antimonials; but, from analogy, it is inferred to be similar to that caused by mercurials.

It is evident, therefore, that our knowledge of the effect on the blood of the medicines termed spanæmics is at present extremely imperfect.

### *Order* 22. Diluents.

Agents which lower the specific gravity of the blood by increasing the proportion of its fluid parts.

These are:—

Water.
Aqueous fluids.

Aqueous fluids can alone act as diluents; their effect being in reality due to the water which they contain. The rapid introduction of water into the circulation, either by injection into the veins or by absorption from the alimentary canal, lowers the specific gravity of the blood, and, by causing plethora, checks absorption, and promotes the action of the secreting and exhaling organs (kidney, skin, and pulmonary surface). Under the various names of slops, ptisans, thin diet, fever diet, broth diet, &c., diluents are employed in fevers to quench thirst and promote the action of the secreting and exhaling organs.

## *Class* 6. Cardiacs.

Agents influencing the circulating organs.

### *Order* 23. Stimulants.

*Restoratives.*

Medicines which increase the force and frequency of the heart's action by calling forth the nervous influence.

*Mineral.*

| | |
|---|---|
| Phosphorus. | Ammonia. |
| Carbonate of Ammonia. | |

*Vegetable.*

| | | |
|---|---|---|
| Oil of Turpentine. | Rectified Spirit, | Alcoholics. |
| Serpentary. | Wine, | |
| Arnica. | Ether, | |
| Camphor. | Chloroform, | |
| Valerian. | Carminatives. | |
| Assafœtida. | | |

*Animal.*

Musk.

The topical action of stimulants is not necessarily accompanied with any obvious changes, either chemical or anatomical. All affect the gustatory organ; their taste being warm, pungent, and acrid. Swallowed in moderate quantities they act first as stimulants to the gastro-intestinal canal; they give rise to a sensation of warmth in the stomach, promote the contraction of the muscular coat of the stomach and intestines, and thereby expel gaseous matters and assist digestion. In general they produce hyperæmia and increased secretion of the mucous follicles of the gastro-intestinal surface. The active principle of most, if not all of them, becomes absorbed, in some cases, perhaps, after having undergone a greater or less chemical change. Ether, alcohol, and the volatile oils are rapidly absorbed. Those which are very slowly absorbed are frequently in part evacuated with the excrements before sufficient time has elapsed for their total absorption. Many of them have been recognized in the blood by their odor (*e.g.* turpentine, alcohol, camphor, the odorous principle of musk, and assafœtida). These, therefore, have been absorbed unaltered. A very large number of them have been recognized in the secretions by their unaltered odor. In the urine and breath they have been especially recognized. In some cases, however, the odor has undergone a change, as in the case of the oil of turpentine, which communicates a violet odor to the urine. While in the blood they act as stimulants to the heart and bloodvessels, and increase the frequency and fulness of the pulse. They do this probably by coming in contact with the surfaces of these parts, the organic nerves of which are susceptible of the impression of the stimulating particles. The augmented action of the heart and arteries is attended with quickened respiration, and an increase of the temperature of the superficial and remote parts of the body; whence the stimulants are frequently termed *calefacients*. The brain and spinal cord are stimulated to a more active performance of their functions by the more copious supply of blood which they receive. In some cases functional disorder of these parts is produced. In this way the stimulants, by causing an increased supply of blood to the various parts of the body, act physiologically as functional exalters, or pathologically as exciters of a febrile state. Sometimes the same principle produces, under different circumstances, apparently different effects. Thus brandy in moderate quantities acts as a stimulant; but taken in excess it overpowers the brain, exhausts the nervous power, and impedes its generation, disengagement, and communication; thus acting both as a sedative and narcotic. In their passage out of the system through the secretory organs, stimulants act as topical agents and augment secretion. Hence we find among them some of the most powerful and effective expectorants, sudorifics, and diuretics.

Stimulants are the remedies for asthenic disorders. The general indication for their employment is exhaustion. They are well adapted for certain nervous and spasmodic diseases, as hysteria; in which there is great nervous excitement, a feeble circulation, and debility. They are contraindicated in maladies of a sthenic character; in acute inflammation, ardent fever, hyperæmia, and plethora. The alcoholics are employed as powerful and diffusible stimulants in failure of the vital powers. In delirium from exhaustion and inanition they are invaluable; but in delirium from congestion or inflammation of the brain they are injurious.

### *Order* 24. Sedatives.

Agents which directly diminish the force of the heart's action by repressing nervous influence.

Sedatives have been confounded with both stimulants and narcotics. The effect of a sedative should be distinguished from the exhaustion which results from over-stimulation; the former is primary and direct; the latter is secondary and indirect. Several of the substances called narcotics act also as sedatives; but all sedatives are not narcotics; for example, tartarated antimony. Narcotics may be advantageously combined with either stimulants or sedatives; as opium with brandy or ammonia, or opium with digitalis or tartarated antimony. But stimulants and sedatives, as brandy and digitalis, or ammonia and tartarated antimony, cannot be expected to produce any useful combined effect.

The following are the substances most frequently employed as sedatives:—

*Mineral.*

| | | |
|---|---|---|
| Hydrocyanic acid. | Tartarated antimony. | Acetate of lead. |
| Nitrate of potash. | | |

*Vegetable.*

| | | |
|---|---|---|
| Colchicum. | Hyoscyamus. | Poppy capsules. |
| Camphor. | Tobacco. | Opium. |
| Digitalis. | Hemlock. | Aconite. |
| Belladonna. | Lemon juice. | |

After the absorption of these agents or their active principles into the blood, they operate as sedatives to the vascular system; that is, they diminish the force of the heart's action, and reduce the strength, and sometimes the frequency also of the pulse; but diminution of the frequency of the pulse is neither a constant nor a necessary effect of a sedative.

Digitalis and other sedatives sometimes make the pulse quicker than it was before; but every person who has bled a few patients must have observed that the pulse becomes quicker as the patient grows faint. Mere increased frequency of pulse is not, therefore, a proof that digitalis at first produces a stimulant effect, as no person will call bloodletting to syncope a stimulant.

According to M. Pfaff, the calmative effect produced by digitalis on the action of the heart and arteries when morbidly excited is often prolonged for five or eight weeks; but he recommends that after it has been administered for a week it should be discontinued, and that recourse should be had to squill or colchicum, which also have a calmative action, and after their use, the effects of digitalis, if resumed, are more promptly produced and more permanent.

Digitalis frequently causes an intermittent pulse. In excessive doses some of the sedatives (*e. g.* tobacco, aconite, and digitalis) destroy life by causing paralytic syncope.

Sedatives are employed to reduce the force of the vascular system in acute inflammation and inflammatory fever. For this purpose tartarated antimony and nitrate of potash, or sometimes colchicum, are used; also to tranquillize the action of the heart, and to allay the excessive irritability of the nervous system, when not dependent on anæmia or extreme debility. The narcotic sedatives are frequently used for the same purpose, and also to control irregularities of the circulation. The value of acetate of lead in repressing hemorrhage arises partly from its sedative action on the heart. To allay palpitation, hydrocyanic acid, digitalis, and aconite are sometimes used with advantage. Belladonna plaster is frequently employed for the same purpose. Camphor, either alone or combined with hyoscyamus, quiets the tumultuous palpitation which often arises from hypertrophy of the heart with dilatation.

Lemon juice, when given in large doses to the old and infirm, frequently reduces very considerably (sometimes dangerously) both the frequency and force of the pulse. A similar property belongs, though less conspicuously, to most of the dilute mineral and vegetable acids. Most sedatives, especially the acids, tartarated antimony, and nitrate of potash, also act as *refrigerants.*

### *Order* 25. STYPTICS.

Medicines which repress hemorrhage.

The following are the most important styptics:—

*Mineral.*

| | | |
|---|---|---|
| Sulphuric acid. | Alum. | Sulphate of iron. |
| Nitrate of potash. | Acetate of lead. | Perchloride of iron. |
| | | Pernitrate of iron. |

*Vegetable.*

| | | |
|---|---|---|
| Ergot. | Matico. | ——— |
| Oil of turpentine. | Digitalis. | Rectified spirit. |
| Tannic acid. | Bearberry leaves. | Vinegar. |
| Gallic acid. | Rhatany. | Creasote. |

Most of these substances belong to the order astringents, and repress hemorrhage by diminishing the calibre of the bleeding vessels, or by constricting the tissues which surround them. When the hemorrhage occurs in the lungs or uterus it can only be checked in this way; but when it takes place from the stomach or bowels, the additional property possessed by many styptics of coagulating the blood largely conduces to this end. Acetate of lead and gallic acid are the most powerful styptics; but tannic acid, possessing both these properties, is preferable to the latter in gastric and intestinal hemorrhage. According to Mr. C. Hunter, gallic acid, taken internally, has sometimes completely arrested hemorrhage from bleeding malignant tumors. Nitrate of potash is very useful, especially in hæmoptysis, from its power of reducing the force and frequency of the pulse. Digitalis controls active hemorrage by the same means. The astringent salts of iron, especially the perchloride, are employed with great benefit in passive hemorrhages from the bowels, kidneys, uterus, and bladder. Dr. Piazza, of Bologna, found that the addition of common salt to chloride of iron greatly increases its styptic properties. Alum is used in similar cases, and also as a local styptic in epistaxis, and in hemorrhage from the gums and throat, and from leech bites. Sulphuric acid with sulphate of magnesia is often sufficient in slight cases; and oil of turpentine is especially useful in hæmatemesis, and not unfrequently in other hemorrhages, after acetate of lead and gallic acid have failed to arrest them completely. Some styptics have a special action on certain organs. Bearberry leaves are chiefly useful in hæmaturia; ergot restrains uterine hemorrhage; and, according to Dr. Howship, digitalis cures menorrhagia, when unconnected with organic disease, more speedily and with more certainty than any other remedy. The action of matico is probably topical and mechanical.

## *Class* 7. PNEUMATICS. (From πνεῦμα, breath.)

Medicines which act as therapeutic agents by their influence over the respiratory organs.

Some of these modify the condition and secretion of the bronchial mucous membrane, while others correct abnormal states of the muscles of the bronchial tubes.

## *Order* 26. Expectorants.

Medicines which promote the evacuation of mucus and other secreted matters, from the bronchi, trachea, and larynx.

The term expectorant is usually applied to agents which increase or promote the secretion of bronchial mucus. It has also been applied to medicines which aid the evacuation (expectoration) of the already secreted bronchial mucus (*i. e.* to medicines which excite cough), and to medicines which alter the quality of the bronchial mucus, and by rendering it thinner and less viscid assist the patient in bringing it up. The substances usually supposed to promote the secretion of bronchial mucus may be divided into two kinds; those which produce their effect by direct application to the bronchial membrane, and those which are administered by the stomach, and require to be absorbed before they act as expectorants.

1. Topical.—Applied in the form of liquid to the fauces, or in the form of gas or vapor to the mucous membrane of the lungs.

*Mineral.*

| | |
|---|---|
| Water. | Iodine. |
| Chlorine. | Carbonate of ammonia. |

*Vegetable.*

| | | |
|---|---|---|
| Tar. | Benzoic acid. | Ether. |
| Tobacco. | ——— | Acetic acid. |
| Stramonium. | Rectified spirit. | |

———

Demulcents.

2. General.—Taken into the stomach and acting through the circulation.

*Mineral.*

| | |
|---|---|
| Carbonate of ammonia. | Tartarated antimony. |

*Vegetable.*

| | | |
|---|---|---|
| Squill. | Ammoniac. | Copaiva. |
| Storax. | Assafœtida. | Myrrh. |
| Benzoin. | Galbanum. | Senega. |
| Benzoic acid. | Balsam of Peru. | |
| Ipecacuan. | Balsam of tolu. | |

Of all the classes of the Materia Medica none are more uncertain in their operation than expectorants. Most of the agents employed as such act relatively; that is, they obviate the causes which interfere with healthy secretion.

The topical expectorants are of two kinds; some are emollients and demulcents, others are local stimulants. To the former belong not merely the liquids applied to the fauces, but also warm aqueous vapor when inhaled, and in that way applied to the bronchial membrane. Irritating gases and vapors (as chlorine, the vapor of acetic or of benzoic acid, &c.), when inhaled, produce coughing, as well as an augmentation of secretion. "We provoke coughing," says Schwilgué, "to favor the expulsion of foreign bodies introduced from without into the air-tubes, and especially of liquids. We have recourse to it to favor the expectoration of mucus, of membraniform concretions, and of pus, which have accumulated in the air-passages, whenever the local irritation is not sufficiently great." The balsams are also used as stimulants to the mucous membrane lining the air-passages. In chronic inflammation of the larynx, whether accompanied or not by ulceration, balsamic fumigations are more serviceable than the internal exhibition of the balsams. The air of the patient's chamber may be impregnated with balsamic vapors by placing a little benzoin or tolu on some live coals, and allowing the vapor to escape into the room; or the patient may inhale the vapor of boiling water to which a drachm or two of the balsams have been added.

The general expectorants are also of two kinds, some being stimulating, others nauseating and relaxing. Probably all the stimulating expectorants act topically, after absorption, on the bronchial membrane with which they are brought into contact by means of the blood. Some of them, as assafœtida, have been detected by their odor in the breath. Emetia (and consequently ipecacuan) and tartarated antimony have, according to Magendie and Orfila, a specific influence over the lungs, which organs, in animals killed by these substances, are said to present traces of inflammation and congestion.

Expectorants are exclusively employed in maladies of the secreting organ on which they operate. The emollient and the nauseating expectorants (tartarated antimony and ipecacuan) are adapted for the more acute forms of bronchial irritation and inflammation; the stimulating expectorants (as the balsams of tolu and Peru, storax, benzoin, and benzoic acid) for the more chronic forms. Senega is a most valuable remedy in the latter stages of acute inflammation of the lungs and bronchial membrane. The addition of carbonate of ammonia renders it still more useful. The fetid gums, especially assafœtida, are more particularly adapted for the subacute and chronic forms of bronchitis accompanied with spasm of the muscular fibres of the bronchi, and which is so commonly observed in those whose bronchial tubes and cells are dilated. Squill is very generally employed, but is best adapted to chronic pulmonary affections, and is improper in cases attended with much inflammation or febrile disorder.

### *Order* 27. CONTRAPITUITANTS. (From *contra*, against, and *pituita*, phlegm.)

*Bronchial Astringents.*

Medicines which check the excessive secretion of the bronchial membrane.

[These medicines are sometimes, but I think improperly, included among expectorants, whose action is generally opposite. Nevertheless, the fetid gums and the balsams at first assist the evacuation (expectoration) of the bronchial fluids, and afterwards check their secretion.—ED.]

*Mineral.*

Sulphate of zinc. Acetate of lead.

*Vegetable.*

Fetid gums.
Balsams.
Opium.

Hydrochlorate of morphia.

---

Creasote vapor.

In bronchorrhœa the most frequently employed mineral astringents are sulphate of zinc and acetate of lead. Opium and morphia are also used to check profuse secretion in bronchial fluxes, as in catarrh. The inhalation of creasote vapor is occasionally useful, and the value of the fetid gums and balsams in bronchorrhœa must be familiar to every one.

*Order* 28. PAREGORICS. (From παρηγορέω, I soothe or appease.)

*Pulmonary Sedatives.*

Medicines which relieve irritability of the bronchial membrane.

This order will include the *demulcents* which are applied in the liquid form to the fauces, and the *sedatives*, especially the following:—

*Vegetable.*

| | |
|---|---|
| Hyoscyamus. | Hydrochlorate of morphia. |
| Hemlock. | ——— |
| Poppy capsules. | Chloroform. |
| Opium. | |

In catarrh, pneumonia, and pulmonic affections in general, where the cough is dry and harsh, and the expectorated matters are acrid, the use of demulcents is often attended with very beneficial effects. By their lubricating and soothing influence over the nerves distributed to the fauces, they probably affect the bronchial membrane and pulmonic structure by a reflex action. Inhalation of the vapor of chloroform, placed at a little distance (two or three feet) from the nostrils, often relieves obstinate cough without at all affecting consciousness or ordinary sensation. The term paregoric is especially applied to camphorated tincture of opium.

*Order* 29. ANTASTHMATICS. (From ἀντί, against, and ἄσθμα, short-drawn breathing.)

Medicines which relieve spasm of the muscular fibres of the bronchial tubes.

The agents chiefly employed therapeutically for this purpose are:—

*Mineral.*

| | | |
|---|---|---|
| Nitrate of potash. | Nitric acid. | Iron and its salts. |

*Vegetable.*

| | | |
|---|---|---|
| Belladonna. | Hyoscyamus. | Lobelia. |
| Stramonium. | Tobacco. | Assafœtida. |

The efficacy of certain narcotics (*e. g.* stramonium and belladonna) in relieving a paroxysm of spasmodic asthma may be ascribed to their power of allaying spasm of the muscular fibres of the bronchial tubes. Dr. C. J. B. Williams found that several substances destroyed the contractility of these fibres. "Extracts of stramonium and belladonna produced this effect most completely; extract of hemlock, and bimeconate of morphia, also, to a great degree. The action of these poisons on the bronchial fibres does not correspond with that on other contractile tissues, such as the heart and arteries, œsophagus and intestines, and the voluntary muscles. These in many cases have retained their irritability when that of the bronchi has been destroyed." Stramonium and tobacco are usually smoked. Lobelia is occasionally useful in small doses, gradually increased. Assafœtida is useful in bronchitis accompanied with spasm of the bronchial fibres. Dr. Bree, who was himself a sufferer from asthma, regards iron as preferable to all other remedies. However, the experience of others has not confirmed his favorable opinion of it. He also recommends nitric acid. Inhalation of the vapor of burning paper, previously saturated with nitrate of potash, generally affords relief. The particular gas which produces the antispasmodic effect has not been determined.

### *Class* 8. NEUROTICS. (From νεῦρον,, a nerve.)

*Cerebro-spinals.*

Medicines influencing the nervous system.

Neurotics or cerebro-spinals produce or prevent sleep, or affect one or more of the functions of the brain and spinal cord, and their respective nerves. These functions are the mind, sensation, and the voluntary and reflex spinal motions. Although there is no neurotic agent which exclusively limits its influence to one function, yet, as we employ particular neurotics for affecting particular functions, we may conveniently arrange the substances composing this class in four sub-classes, as follows:—

1. Neurotics affecting the mental faculties (*phrenics*).
2. Neurotics affecting sleep (*hypnics*).
3. Neurotics affecting sensation (*æsthetics*).
4. Neurotics affecting the voluntary or reflex-spinal motions (*cinetics*).

#### *Sub-class* 1. PHRENICS. (From φρήν, mind.)

Medicines influencing the mental faculties.

##### *Order* 30. EXHILARANTS.

Medicines which exalt or excite the mind, enliven, or exhilarate.

*Vegetable.*

| | | | |
|---|---|---|---|
| Indian hemp. | Oil of rue. | Rectified spirit, | Alcoholics. |
| Camphor. | Opium. | Wine, | |
| Valerian. | ——— | Ether, | |
| | | Chloroform, | |

These medicines all belong to the order stimulants, which, by causing an increased supply of blood to the brain and spinal cord, excite them (for a time at least) to a more active performance of their functions.

##### *Order* 31. NARCOTICS. (From νάρκη, stupor.)

Medicines which stupefy the mind.

*Vegetable.*

| | | |
|---|---|---|
| Indian hemp. | Tobacco. | Hydrochlorate of morphia. |
| Belladonna. | Poppy capsules. | ——— |
| Hyoscyamus. | Opium. | Alcoholics in large doses. |

I shall notice these two orders together, because the exhilarating or narcotic effects of these medicines depend partly, indeed, on the nature of the phrenic employed, but chiefly on the quantity administered, and on the individuality and the habit of the patient. Wine, for example, taken moderately, exhilarates; in larger quantity, inebriates; and in excessive quantity, stupefies. In one individual excitement predominates; in another, stupefaction; nay, what is only a stimulant to one is a narcotic poison to another. The opium-eaters in the East furnish examples of all these varieties.

The employment of wine and ardent spirit for the purpose of exhilaration and inebriation is familiar to every one. The ethers produce a similar, but more rapid and temporary effect; and I have known intoxication produced by swallowing chloroform. The ethers and chloroform are procured from alcohol, which, as is well known, is obtained by distillation from vinous liquids. I include all these under the term alcoholics. In the effects of the alcoholics three degrees may be distinguished. The *first* is that of exhilaration or excitement. This is best seen when the quantity is small. When the dose is larger, this degree constitutes the first stage of operation. Volition and intellect are excited, but not otherwise disordered. The *second* degree or stage is that of inebriation, in which both the mental faculties and volition are disturbed as well as excited. There is more or less confusion of intellect, or delirium, varying in intensity and character in different individuals. Volition is impaired; there is vertigo, thick speech, and inability to stand or walk; the individual reels or falls about when he attempts to walk. As yet sensation exists, though lessened: sensibility to painful and other impressions being diminished. The *third* degree is unconsciousness and stupefaction. The individual is now insensible, or nearly so, though sometimes capable of being roused when loudly spoken to. Opium produces two kinds or degrees of effect, viz., excitement and sleep or stupor. The predominance of the one or the other depends on circumstances before adverted to. The general effects on the mental functions, for the production of which opium is chewed and smoked by Eastern nations, are tranquillity and serenity of mind, freedom from bodily and mental uneasiness, a feeling of comfort and happiness, animation, and exhilaration. Opium is also employed to render persons capable of undergoing great mental exertion and bodily fatigue, and to beneficially modify the condition of the intellectual functions in delirium tremens, and in some forms of insanity. In large doses it gives rise to heavy sleep and narcotism. Indian hemp is used in India, Caubul, and Syria, for the purpose of exhilaration and intoxication. It causes, at least in Asiatics, a very agreeable kind of delirium, and impaired volition, followed by insensibility, during which the patient retains any position in which he may be placed. This effect simulates catalepsy. Belladonna in large doses produces cheerful delirium, with phantasms followed by stupor; but it is rarely employed for its mental influence. Hyoscyamus is used as a calming, soothing, and tranquillizing agent in nervous excitability and mania. Tobacco is smoked on account of its calming and tranquillizing influence on the nervous system. It is sometimes useful (for those accustomed to the practice) in mental excitement and wakefulness. Valerian, oil of rue, and serpentary are used as stimulants to the cerebro-spinal system, under the denomination of *nervines*, in nervous, hypochondriacal, and hysterical complaints, and sometimes to relieve nervous exhaustion in the latter stages of continued fever. Camphor is a popular favorite with some nervous and hysterical females, on account of its agreeable effects on "the nerves." Large doses of it occasion confusion of intellect, delirium, impaired volition, and insensibility. It has been used to calm the violence of maniacal patients, and to allay excitement of the sexual feelings. In insensibility or profound coma, camphor, in the form of enema, has been found by Dr. Copland highly serviceable by rousing the patient.

### *Sub-class* 2. Hypnics. (From ὕπνος, sleep.)

Medicines influencing sleep.

### *Order* 32. Hypnotics. *Soporifics.*

Agents which cause sleep.

*Mineral.*

Affusion with cold water.

*Vegetable.*

| | |
|---|---|
| Hops. | Digitalis. |
| | Narcotics. |

Of these the most powerful are opium and morphia. The narcotic effects of poppy are much weaker. Belladonna and hyoscyamus will sometimes produce sleep when opium fails or is unsuitable, as in cases attended with symptoms of irritation, and in fever or delirium tremens, with contracted pupil. Belladonna has been used successfully both internally and applied in the form of extract to the freshly blistered skin. Tincture of digitalis in large doses (2–4 drachms) is said by Mr. Jones, of Jersey, to be the most effectual hypnotic in the latter disease. A moderate quantity of wine or spirits, taken with hot water at bedtime, frequently disposes to sleep, whence it is popularly called a nightcap. The narcotic effects of hops (real or supposed) are derived from their odor. I have found Indian hemp act as a soporific. When other means fail, affusion of cold water on the head frequently succeeds immediately.

*Order* 33. ANTHYPNOTICS.

Agents which prevent sleep.

Probably no officinal substances are more effectual in preventing sleep than strong green tea and coffee. But these often fail, succeeding best in nervous constitutions.

*Sub-class* 3. ÆSTHETICS. (From αἴσθησις, sensation.)

Medicines influencing sensation.

*Order* 34. HYPERÆSTHETICS. (From ὑπέρ, above, and αἴσθησις, sensation.)

Medicines which render sensation more acute.

*Vegetable.*

Nux vomica. Strychnia.

Nux vomica and strychnia heighten the sensations of touch, vision, and hearing, and give rise to various unpleasant or painful sensations in different parts of the body, especially in paralyzed parts. These medicines have been employed to rouse the sensibility and increase the excitability of paralyzed parts.

*Order* 35. ANÆSTHETICS. (From ἀν, negative, and αἴσθησις, sensation.)

Agents which are capable of destroying common sensibility, as well as sensibility to pain.

These are:—

*Mineral.*

Ice.

*Vegetable.*

| | |
|---|---|
| Indian hemp. | Rectified spirit. |
| Aconite. | Ether. |
| Aconitia. | Chloroform. |

Of these agents ether and chloroform are used in the state of vapor; the others in the solid or liquid state. Vapors or gases which, when inhaled, temporarily suspend the common or general sensibility of the body; in other words, produce insensibility, and are thereby fitted for preventing pain during surgical operations and parturition, are the anæsthetics commonly so called. By inhalation these vapors are absorbed into the blood. This is proved by the detection of them in different parts of the body (even in amputated limbs), and by their continued exhalation by the breath for some time after the individual has ceased to inhale them. The blood thus holding in solution the vapor of the anæsthetic agent, acts on the nervous centres, and disturbs or suspends, or even destroys, their functions. All the functions of the nervous centres are not simultaneously, but successively and progressively, affected. The intellect or mind, and volition or the power of regulating locomotion, are first lost; then sensation and motion, and lastly the power of respiration. The action of certain parts supplied by the ganglionic system of nerves, as the heart and intestines, continues for some time after the death of the individual. Flourens thus describes the successive and progressive action of ether on the nervous centres: First, the cerebral lobes lose their power, viz., the intellect; next the cerebellum loses the power of regulating locomotion; afterwards the spinal marrow loses the principle of sensation and motion; and, lastly, the medulla oblongata loses its power, viz., the motor principle of respiration; and, with this, life is lost. There is diminished sensibility to pain during the second stage. Complete insensibility to pain exists during the third stage; in some cases it is also found in the second stage. Unconsciousness, therefore, is not absolutely essential to the anæsthetic effect. When patients are recovering from the state of insensibility, the inhalation having been discontinued, it often happens that they acquire consciousness, vision, hearing, and the power of speech, without becoming sensible to the pain of an operation. Every one is now familiar with the application of these anæsthetics for the prevention of pain during surgical operations and parturition.

The principal solid and liquid agents to which the term anæsthetic is properly applied are ice, aconite, and aconitia. Ice is employed as a local anæsthetic, and has the advantage of destroying the sensation of a part to which it is applied, without occasioning loss of consciousness. Alcohol and Indian hemp, when taken into the stomach in large quantities, frequently produce general effects similar to those which follow the inhalation of ether and chloroform. Dr. O'Shaughnessy describes a patient in the cataleptic state which the latter drug occasions, as "almost insensible to all impressions," and the insensibility or indifference to pain of a man when madly drunk is sufficiently notorious. These agents, however, are seldom employed for this purpose. They have no local anæsthetic action. Tincture of aconite, when taken internally in small doses, produces, especially in hysterical females, tingling, numbness, and various anomalous sensations in different parts of the body. These remote effects probably depend on the topical action of the active principle of the aconite on the nerves through the medium of the blood. When applied to the skin or lips aconite occasions numbness of the part, along with tingling and pricking, somewhat analogous to the feeling which is experienced when sensation is returning to a part which has been "asleep," after the removal of pressure upon a nerve, and which is commonly called "pins and needles." The benumbing effect of aconitia is still more apparent. When the ointment has been rubbed on the face, a razor passed over the part in the act of shaving is not felt. Such agents may be denominated *nerve-benumbers*. The benumbers are frequently employed for the relief of neuralgia.

*Order* 36. ANODYNES. (From ἀν, negative, and ὀδύνη, pain.)

Medicines which relieve pain.

This order consists of solid and liquid agents which, when swallowed, injected into the rectum, or applied to the skin, alleviate pain, but produce no perceptible alteration in the normal feeling of parts to which they are applied. Their anodyne effect seems referable to their influence over the nervous centres, on which they act as *stupefacients*.

The following are the principal anodynes:—

*Vegetable.*

Belladonna.
Atropia.
Hyoscyamus.
Stramonium.
Hemlock.
Opium.
Hydrochlorate of morphia.

Liquid ether.
Creasote.
Anæsthetics.

Of these, ether, opium, and morphia are by far the most certain and effective anodynes for relieving acute pain of internal organs. They are most successful in alleviating spasmodic pain. Creasote is sometimes used with great advantage as an anodyne. A patient under Dr. Shortt, in the Royal Infirmary of Edinburgh, afflicted with cancer of the stomach, derived relief from pain in ten minutes after taking a dose of fifteen drops. Dr. Cormack remarks, that when its anodyne action is wished speedily the object is best attained by inhaling its vapors. Anodynes are also employed to relieve neuralgic pain, and often afford more relief when injected into the cellular tissue than when introduced into the stomach. The repetition of the hypodermic injection in the same situation, viz., the immediate neighborhood of the seat of pain, has sometimes occasioned the formation of abscesses; but the injection is found to be equally efficacious, and not liable to this objection, if practised in different and more distant situations.

*Sub-order. Antineuralgics.* (From ἀντί, against, νεῦρον, a nerve, and ἄλγος, pain.)

Medicines which relieve chiefly that kind of pain known as neuralgia. This sub-order consists chiefly of the following:—

*Mineral.*

Hydrocyanic acid.
Arsenic.
White bismuth.
Peroxide of iron.

*Vegetable.*

Sulphate of quinia.

These agents do not act either as benumbers or stupefacients. Hydrocyanic acid alone has a very slight benumbing effect on the nerves of common sensation; and, in large doses, causes sudden loss of intellect, sensation, and volition. In many cases, if not in all, the pain which these medicines relieve is produced by reflection or sympathy. This reflection of impressions which produce sensation is effected by the nervous, probably the spinal centre. They probably relieve neuralgia by their influence on the nervous centre. Hydrocyanic acid is well known to depress the reflex motor functions of the spinal cord, and it is not unlikely, therefore, that it does the same with the reflex sensory functions. The antineuralgics are applicable to neuralgia in general, but are more particularly serviceable in the neuralgia of certain parts, as of the face (tic douloureux), of the stomach (gastrodynia), and of the bowels (enterodynia). The peroxide of iron has been extensively employed in tic douloureux, and with variable success; in some cases acting in a most extraordinarily beneficial manner, in others being of no avail.

*Sub-class* 4. CINETICS. (From κίνησις, motion.)

Agents influencing the voluntary and reflex spinal movements.

The cinetics may be considered under two heads, according as they affect the tonicity or the irritability of muscles.

### 1. Cinetics Influencing the Tonicity of Muscles.

Muscular, as well as some non-muscular, parts possess the property called *tonicity* or *tone*, sometimes termed *retractility*. It is a tendency to passive or slow and moderate contraction, not necessarily alternating with relaxation. It is augmented by cold and impaired by heat. It is greatly influenced by, if it be not absolutely dependent on, the cerebro-spinal system. Pharmaceutical agents which augment the tonicity are called *tonics*, while those which lessen it are denominated *relaxants*.

#### *Order* 37. Tonics. (From τόνος, tone.)

Agents which increase the tone of the system.

The following is a list of the substances to which the term tonic is usually applied:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Mineral acids. | Bitter stomachics. |
| Alum. | Aromatic bitters. |
| Arsenious acid. | Astringent bitters. |
| Sulphate of zinc. | Simple astringents, containing tannic or gallic acids. |
| Iron and its salts. | |
| Sulphate of copper. | |
| Nitrate of silver. | |

The tonic principles, when taken into the stomach, form, in most cases, new chemical combinations, then become absorbed, and are afterwards thrown out of the system by the excreting organs. Quinia has been detected in the blood, urine, and milk, and tannic and gallic acids in the urine.

The action of a tonic must not be confounded with that of a stimulant. Tonics give strength, stimulants call it forth. Stimulants excite action; but action is not strength: on the contrary, over-action increases exhaustion.

Tonics are employed where the tonicity of the system is defective; that is, in cases of atony or debility, with a soft, flaccid, and loose condition of the soft solids. Properly administered in these cases, their true tonic operation is then observed. Their immediate effects are to increase the appetite, and assist digestion. After they have been administered for some time, the soft solids (as the muscles, cellular tissue, &c.) become firmer, the muscular strength greater, and the pulse stronger, though not quicker. In fact, all the functions are performed with more energy, and the patient is capable of greater exertion. Many of the mineral tonics are remarkable for their peculiar and powerful curative agency in certain diseases, whose pathology is very obscure. I allude to the cure of ague by arsenic; of chorea and neuralgia by arsenic and iron; and of epilepsy by arsenic, iron, and silver. Iron produces its tonic effects principally, though not solely, by improving the condition of the blood, but the effects of the other metals, which do not act as hæmatinics, prove the action of these tonics on the central organs of the nervous system. The bitter vegetable stomachics and aromatic bitters not only promote the appetite and assist digestion, but also act as general tonics in feebleness and debility of the whole system, and especially of the muscles. The astringent bitters, and the simple astringents which possess considerable astringency, with little or no bitterness, fulfil the same therapeutic indications as the bitter tonics. They also cause local contraction and corrugation of the tissues. In the mouth they give rise to a peculiar sensation of roughness and stypticity. They are chiefly employed to obviate relaxation of fibres and tissues, and to prevent or check excessive discharges.

The agents called tonics only act as such in certain states of disease Under other conditions they act as irritants or stimulants. In the healthy state moderate doses produce no sensible effects, or perhaps a slight excitement of the appetite merely, while large quantities give rise to nausea and vomiting. In irritation or inflammation of the stomach and intestines, and in febrile conditions of system, attended with a hot and dry skin, and a furred and dry tongue, tonics act as local irritants and stimulants, and add to the severity of all the morbid symptoms. Tonics sometimes purge, at others constipate. When diarrhœa arises from or is kept up by a weakened state of the intestinal tube, tonics, by restoring strength, may produce constipation. On the other hand, when constipation depends on a debilitated and torpid condition of this tube —a circumstance not uncommon in females—tonics not unfrequently occasion alvine evacuations. Dr. Cullen, having noticed how frequently bitters act as laxatives and purgatives, has inserted them in his list of cathartics.

### *Order* 38. Relaxants.

Agents which depress and lower the tonicity of fibres, and thereby cause relaxation of muscular and other tissues.

To this order belong:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Tartarated antimony. | Tobacco. |
| | Ether. |
| | Chloroform. |

These medicines are administered to cause relaxation of the muscles, and thereby to enable the surgeon to effect the reduction of dislocations of the larger joints, and of strangulated hernia. [At the present time the vapor of chloroform is almost exclusively used to fulfil this indication, on account of the certainty with which the effect is produced, the power which the administrator has of regulating that effect, and the slight inconvenience and the absence of pain which the patient experiences. —Ed.]

### 2. Cinetics influencing Irritability of the Muscles.

Irritability is a property peculiar to muscular structures, and, unlike tonicity, is increased by warmth, and diminished by cold. Most physiologists regard irritability as an inherent property in the muscles themselves, but some consider it to be derived from the spinal cord. However this may be, it is admitted by all that the irritability of muscles is greatly under the influence of the nervous system. The contraction of muscular fibres may be induced by the nervous stimulus, and by stimuli acting directly on the muscular fibre. The antispasmodic and paralyzing effect of opium, and the spasmodic or tetanic condition induced by nux vomica, are referable, at least chiefly, to changes effected in the nervous stimulus, and not to alterations of the contractility of the muscular fibre. For Matteucci found that in frogs poisoned by opium or nux vomica, when the excitability of the nerves was destroyed, and when the electric current which was applied to them no longer occasioned muscular contractions, the muscles themselves, when submitted directly to the action of the current, underwent contraction.

The cinetics which act on the irritability of muscles are of two kinds —those which augment and those which lessen this property. The former (some of them at least) produce spasm or convulsions, and may be termed *spastics;* the latter produce an opposite or paralyzed state of muscles, and being employed chiefly in the treatment of spasmodic diseases, are termed *antispasmodics.*

*Order* 39. SPASTICS. (From σπάσις, a convulsion or spasm.)

Agents which augment the irritability of muscles.

The principal officinal spastics are:—

*Mineral.*

| | |
|---|---|
| Sulphur. | Bromide of potassium. |
| Sulphurated potash. | Mercurials. |

*Vegetable.*

| | |
|---|---|
| Ergot. | Belladonna. |
| Nux vomica. | Hyoscyamus. |
| Strychnia. | Hemlock. |

*Animal.*

Cantharides.

[Brown-Séquard considers that paraplegia arises from two opposite conditions of the spinal cord, an hyperæmic condition, generally accompanied with exalted reflex function of the cord, and an anæmic condition with diminution of reflex power. The former condition occurs in congestion and inflammation of the cord, the latter in reflex paralysis and white softening. Those agents which relieve the latter condition are the *true* and *direct spastics*, as nux vomica, strychnia, and perhaps sulphur. Strychnia directly increases the amount of blood circulating in the cord, and thereby increases its nutrition, when defective, and restores its lost powers. It also exerts a special influence on the cord independently of its nutrition. Hence he recommends strychnia to be used persistently in almost all cases of paraplegia, when there is no inflammation or congestion of the cord or its membranes, unless it produces spasms, when it may be discontinued for a few days. But it should be avoided as dangerous in those cases in which there are signs of congestion or inflammation. Sulphur also, he says, may certainly be employed with advantage in reflex paralysis and white softening, in which there is no irritation, especially when employed by means of a bath containing sulphurated potash, which affords the benefit of its stimulant action to the skin without disturbing the functions of the digestive canal. Bromide of potassium is also useful in uterine reflex paraplegia. Ergot, belladonna, hyoscyamus, and mercury act in a different manner. They are *indirectly spastic.* They diminish increased vascularity of the cord, and restore irritability to muscles paralyzed from this cause; but belladonna, hyoscyamus, and mercury do not produce spasm. Ergot is, according to Brown-Séquard, a powerful exciter of unstriped muscle in bloodvessels, in the uterus, in the bowels, &c. It acts even more energetically than belladonna, on the bloodvessels of the spinal cord and its membranes, contracting the bloodvessels, and thereby diminishing the amount of blood. Hence ergot and belladonna are the most powerful and reliable medicines in congestion and inflammation of the cord and its membranes, but most dangerous agents, only capable of increasing the paralysis if employed in cases of paraplegia without symptoms of irritation, such as cases of reflex paraplegia and white softening. The distinguished physiologist above mentioned observes that no agent has been used more extensively

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and blindly than mercury in paraplegia, but that it is only in cases with an increased amount of blood in the spinal cord or its membranes that mercury is used with advantage. Open blisters are useful as derivatives in the same cases, and as constantly injurious in reflex paraplegia. It has been already stated that in hemiplegia from apoplectic effusion, and in dropped hand from lead, strychnia, though often very serviceable, if used at the right period, is useless until the effused blood or the lead has been absorbed. Strychnia, in consequence of its action on the muscular coat of the intestines, is a useful addition to aloetic and other purgatives when costiveness accompanies paraplegia, or arises from a distended and torpid state of the bowels. Its endermic application to the anus has also relieved involuntary evacuation arising from paralysis of the sphincter ani, and its injection into the bladder has cured incontinence of urine due to paralysis of the neck of that organ. Cantharides also appear to augment the irritability of at least some muscular parts, the neck of the bladder, for instance, in the treatment of weakness and paralysis of which they are frequently employed with advantage.—Ed.]

### *Order* 40. Antispasmodics.

Agents which diminish irritability of muscles, and relieve spasm.
The following are the principal antispasmodics:—

| | *Mineral.* | |
|---|---|---|
| Ammonia. | Arsenious acid. | Iron and its salts. |
| Carbonate of ammonia. | Oxide of zinc. | Sulphate of copper. |
| Chloride of barium. | Sulphate of zinc. | Oxide of silver. |
| Hydrocyanic acid. | Valerianate of zinc. | Nitrate of silver. |
| | *Vegetable.* | |
| Indian hemp. | Tobacco. | Oil of pimento. |
| Oil of peppermint. | Valerian. | Oil of rue. |
| Oil of lavender. | Hemlock. | Opium. |
| Oil of rosemary. | Assafœtida. | ——— |
| Belladonna. | Galbanum. | Rectified spirit. |
| Hyoscyamus. | Ammoniac. | Ether. |
| Stramonium. | Oil of cloves. | Chloroform. |
| | *Animal.* | |
| Cod-liver oil. | Musk. | Castor. |

Some of these agents chiefly influence the voluntary, others chiefly the involuntary muscles. To the 1*st division* belong those medicines which render the voluntary muscles more obedient to the will by communicating tone to them and by reducing the excitability of the spinal excito-motory system, as in chorea, epilepsy, and other chronic convulsive diseases, viz., arsenic, zinc, iron, copper, and nitrate of silver. To the 2*d division* belong hydrocyanic acid, belladonna, stramonium, the carminative volatile oils, valerian, the fetid gum-resins, alcohol, ether, musk, and castor. Hydrocyanic acid is a valuable remedy for allaying vomiting, hiccup, palpitation, and convulsive cough. Stramonium, belladonna, and occasionally tobacco, give relief in attacks of spasmodic asthma, but they are unsuitable remedies in convulsions. Alcohol, ether, ammonia, the fetid gum-resins, the volatile oils, and according to some musk and castor, are valuable antispasmodics in convulsive and spasmodic diseases occurring in weak subjects and unattended by inflammation, especially in hysteria and flatulent colic. "They act as stimulants to the heart and vessels, and to the cerebral functions, and seem to operate as sedatives to the medullary system." Dr. Williams says, alcoholic stimulants are probably the best antispasmodics in the prevention and treatment of convulsion, *e. g.* a glass of wine every half hour. Tobacco, opium, and the vapor of chloroform belong to both divisions. Tobacco is a valuable remedy in tetanus, and in the spasms caused by strychnia, in colic, ilius, strangulated hernia, and in retention of urine either from spasm of the neck of the bladder or from spasmodic stricture. Opium which produces turgescence of the vessels of the brain is a most valuable agent in the cramps of cholera, in colic, in spasm of the gall ducts and of the ureters brought on by calculi, and in painful contractions of the bladder, rectum, and uterus. It also allays the irregular muscular twitchings and tremor which occur in delirium tremens and in fever, provided the pupil is not contracted. The vapor of chloroform relieves the spasms of tetanus and the convulsions of chorea, and is occasionally useful in spasmodic cough. To these may be added Indian hemp, which, if given in proper doses, is also sometimes serviceable in chorea and tetanus. Dr. Gnecchi, of Milan, has several times cured traumatic tetanus with chloride of barium. Dr. Radcliffe thinks that the diet of persons suffering from chronic convulsive disorder should contain more than an average amount of fatty matters, and finds cod-liver oil very useful in such cases.

### *Order* 41. MYDRIATICS. (From ἀμυδρός, indistinct.)

Agents which cause preternatural dilatation of the pupil.

The most important therapeutic agents possessing this property are—

*Vegetable.*

Belladonna. Atropia.

These substances taken internally diminish the vascularity of the nervous centres, and like most other substances which produce this effect, as ergot, dilate the pupil. But, independently of this general effect, they also dilate the pupil by their local action. Hence they are used by oculists for this purpose.

### *Order* 42. MYOSITICS. (From μύωψ, short-sighted.)

Agents which cause preternatural contraction of the pupil.

Such are—

*Vegetable.*

Opium. Hydrochlorate of morphia. Calabar bean.

[Opium and morphia taken internally increase the vascularity of the nervous centres, and contract the pupils. But as opium has not, like belladonna, a local action on the pupil, and as the internal use of opium does not contract the pupil without producing its constitutional narcotic effects, it is not used for this purpose. The Calabar bean (*Physostigma venenosum*, which is not yet officinal, but well deserves to be so) has, like belladonna, a local action on the pupil, which it contracts, thus relieving the disease called mydriasis, in which the pupil is dilated, and the eye presbyopic.—ED.] Indications for the use of belladonna or opium in cerebral diseases have been drawn from the condition of the pupil. Thus Dr. Graves has proposed the employment of belladonna in those cases of fever which are attended with contraction of pupil; and Sir Henry Holland has suggested that in this condition of pupil opium is contraindicated.

## *Class* 9. Uretics. (From οὐρέω, I make water.)

Medicines which influence the urinary organs.

### *Order* 43. Diuretics. (From διά, through, and οὐρέω, I make water.)

Medicinal agents which promote the secretion of urine.

The following is a list of the officinal diuretics:—

*Mineral.*

| | | |
|---|---|---|
| Water. | Iodide of potassium. | Acetate of potash. |
| Solution of potash. | Nitrate of potash. | Mercury. |
| Carbonate of potash. | Tartrate of potash. | Calomel. |
| Bicarbonate of potash. | Acid tartrate of potash. | Corrosive sublimate. |
| Chlorate of potash. | Citrate of potash. | |

*Vegetable.*

| | | |
|---|---|---|
| Squill. | Bearberry leaves. | Horseradish root. |
| Colchicum. | Dandelion root. | Mustard. |
| Oil of turpentine. | Broom tops. | Pareira. |
| Oil of juniper. | Copaiva. | ——— |
| Digitalis. | Buchu. | Rectified spirit. |
| Tobacco. | Gamboge. | Spirit of nitrous ether. |

*Animal.*

Cantharides.

There are two principal modes of promoting the secretion of urine: the one direct, the other indirect. The *indirect* method consists in augmenting the quantity of fluids taken into the stomach, or in removing any cause which checks the secretion. The *direct* mode is to stimulate the kidneys by means which specifically affect these organs. These means are the diuretics properly so called. The quantity of urine secreted in the healthy state is liable to considerable variation. Temperature, season of the year, climate, time of day, quantity of fluid consumed as drink, state of health, &c., are among the common circumstances modifying this secretion. Whenever an unusual quantity of aqueous fluid is taken into the system, the kidneys are the organs by means of which the excess is, for the most part, got rid of. If the customary discharge from the skin or lungs be checked—by cold, for instance—the kidneys endeavor to make up for the deficiency of action in the other organs. Thus, in winter and in cold climates more urine is secreted than in summer and in hot climates. Again, if transpiration be promoted, as by external warmth, the secretion of urine is diminished. Hence, when we wish to augment the renal secretion, diluents should be freely administered, and the skin kept cool. There is reason to believe that all diuretic medicines, strictly so termed, become absorbed, are carried in the blood to the kidneys, and are there eliminated, either unchanged, or more or less altered. We must not, however, imagine that every substance which can be detected in the urine is a diuretic; for, in some instances, this is evidently not the case; and, on the other hand, there are several medicines whose active principles are supposed to excite an increased flow of urine by absorption and local contact with the renal vessels, but which cannot be recognized in this secretion on account of the absence of any known sensible or chemical characters by which these principles can be readily detected. As it is probable that all agents which prove diuretic by their direct stimulant influence over the kidneys do so by their topical action on these organs, it follows, that in order to enable them to reach the kidneys they must be administered either in solution or in such a condition that they may become dissolved in the fluids of the gastro-intestinal canal. Moreover, the solutions should be very dilute: otherwise, instead of becoming absorbed, they may act as cathartics. In Laveran and Millon's experiments with tartrate of soda and potash, when solutions of this salt caused purgation they did not become absorbed; on the contrary, solutions which did not purge became absorbed and rendered the urine alkaline. By augmenting the secretion of urine we diminish the quantity of fluid in the bloodvessels, and thus promote absorption from the serous cavities and cellular tissue. But the uncertainty of the action of diuretic medicines in dropsies is well known to every practitioner. The reason of this uncertainty is, that in a very large majority of cases dropsy arises from organic disease of the heart, kidneys, liver, or lungs; and to the influence of these maladies must be referred the failure of the so-called diuretics to augment the secretion of urine. "If," says Dr. Barlow, "a sufficient quantity of water cannot be received into the small intestines, or the circuit through the portal system in the vena cava ascendens, or thence through the lungs and heart into the systemic circulation, be obstructed; or if there be extensive disorganization of the kidneys, the due secretion of urine cannot be effected." When the obstruction exists in the portal system, medicines calculated to relieve this should be conjoined with the diuretics, whose operation they greatly promote. Hence the efficacy in these cases of administering mercurials (as mercurial pill or calomel) with diuretics. So also active cathartics sometimes augment the secretion of urine and aid the operation of diuretics by irritating the mouth of the common gall duct, causing an increased discharge of bile and pancreatic juice, and thereby relieving a congested state of the liver. When the obstruction exists in the chest (heart or lungs), the operation of diuretics is aided by agents, such as digitalis, which tranquillize the action of the heart.

Considered with reference to their chemical properties, or to the nature and effects of their active principles, the diuretics may be arranged in the following groups: 1. *Aqueous diuretics.*—Aqueous drinks promote diuresis, indirectly, when the skin is kept cool, as I have before mentioned. 2. *Alkaline and saline diuretics.*—This group consists chiefly of potash and the potash salts. The alkaline salts which contain a vegetable acid appear in the urine in the form of alkaline carbonates. In order to become converted into carbonates (or bicarbonates) the vegetable alkaline salts must undergo oxidation in the system, by which the vegetable acid is resolved into carbonic acid and water. Acetic acid ($C_4H_3O_3$) requires eight equivalents of oxygen; citric acid ($C_{12}H_5O_{11}$), a tribasic acid, eighteen equivalents of oxygen; and tartaric acid ($C_8H_4O_{19}$), a bibasic acid, ten equivalents, to convert them respectively into carbonic acid and water. When saline substances are employed as diuretics they should be given in the form of dilute aqueous solution, as strong solutions act as cathartics. 3. *Mercurial diuretics.*—Mercurials (especially mercurial pill, calomel, and corrosive sublimate) are frequently given in conjunction with the diuretics properly so called. They are useful by their influence over the portal circulation and as sorbefacients. 4. *Sedative diuretics.*—This group includes tobacco and digitalis, which reduce the force and frequency of the heart's action. The diuretic effect has been referred, by Dr. Paris, to their sedative operation. For, as the energy of absorption is generally in the inverse ratio of that of circulation, it is presumed that all means which diminish arterial action must indirectly prove diuretic by exciting the function of absorption. Thus in dropsy, and especially in cardiac dropsy, digitalis may promote the diuretic effect of other substances. 5. *Bitter acrid diuretics.*—To this group belong squill, colchicum, broom tops, &c. These agents, in an over-dose, readily occasion vomiting. They owe their activity to an acrid principle, which operates, through the circulation, on the renal vessels as a local stimulant or irritant, and in this way proves diuretic. According to my own observations, broom tops less frequently fail to prove diuretic than most other agents of this class. 6. *Acrid diuretics whose active principle is volatile oil.*—A considerable number of diuretics are referable to this group; as horseradish root, mustard, buchu, copaiva, oil of turpentine, oil of juniper, and cantharides. The volatile oil is absorbed, and is carried by the blood to the kidneys, on which it acts topically as a stimulant. 7. *Alcoholic and ethereal diuretics.*—This group includes alcohol, and spirit of nitrous ether.

Diuretics are employed for various purposes, of which the following are the principal: 1. To restore the healthy action of the kidneys in diseases generally in which the secretion of urine is diminished. 2. To promote the absorption of dropsical effusions. In most dropsies the renal secretion is diminished; and the obvious indication, therefore, is to augment this secretion, in order not only to prevent further effusion, but also to promote the absorption of the fluid already effused. With this view diuretics are administered; but, as I have already observed, they frequently fail to augment the quantity of urine. In the dropsy which follows scarlatina, the saline diuretics, especially nitrate of potash, with purgatives (jalap and acid tartrate of potash) in general prove successful. In dropsy dependent on granular disease of the kidney, digitalis, colchicum, and cantharides are, in the early period of the disease, of benefit. They should be preceded by or alternated with hydragogues (elaterium or jalap and acid tartrate of potash), diaphoretics (powder of ipecacuan and opium), and warm bathing. With the exception of warm bathing, the same plan may be adopted for the relief of dropsy arising from cardiac disease. 3. To promote the elimination of poisonous agents from the system. 4. To remove effete organic matter from the blood. 5. To augment the elimination of water, and thereby to enable the urine to keep in solution the solid constituents of this secretion, as well as to act as a solvent for calculi contained in the urinary organs (see *Lithonlytics*, p. 1001). 6. To relieve inflammatory action. Saline diuretics form part of the antiphlogistic treatment employed in inflammation.

[Diuretics are generally considered useful in proportion to the increase which they occasion in the amount of urine; but the above enumeration of the various purposes for which they are employed will show that the elimination of water is only one of these purposes, and that when our object is to remove either organic or inorganic solids from the body we must seek for those properties which influence the amount of the solid rather than of the fluid constituents of the urine Hammond (*Amer. Quart. Journ. of Med. Sciences*, January, 1859) says that neither digitalis, juniper, nor squill increases the total amount of solid matter eliminated by the kidneys. They increase the amount of inorganic matter in the urine, but considerably reduce the quantity of organic matter; and as the latter is generally considered to contaminate the blood in disease, they not only do not depurate the blood in disease, but are positively injurious. Colchicum acts in a materially different manner, eliminating an increased quantity of both organic and inorganic matter. This is shown in the following table.—Ed.]

| | Quantity of urine in cubic cent. | Sp. gr. | Total solids. | Inorganic solids. | Organic solids. |
|---|---|---|---|---|---|
| Normal standard . | 1474.5 | 1024.30 | 75.31 | 30.17 | 45.14 |
| Digitalis . . | 1822.8 | 1015.87 | 67.00 | 31.54 | 35.43 |
| Normal standard . | 1237.5 | 1022.50 | 61.23 | 23.12 | 38.11 |
| Juniper . . . | 1763.2 | 1016.28 | 61.50 | 25.03 | 36.42 |
| Normal standard . | 1358.0 | 1023.51 | 69.35 | 27.22 | 42.13 |
| Squill . . . | 1533.5 | 1020.20 | 60.15 | 30.60 | 29.55 |
| Normal standard . | 1280.0 | 1025.08 | 63.12 | 29.8 | 33.29 |
| Colchicum . . | 1556.0 | 1023.58 | 77.28 | 35.23 | 42.04 |

*Order* 44. Ischuretics. (From ἰσχέω I restrain, and οὐρέω, I pass water.)

Medicines which diminish the amount of urine. The most powerful substances of this order are:—

*Mineral.*

Iodide of iron.
Perchloride of iron.
Sulphate of iron.

*Vegetable.*

Opium.
Hydrochlorate of morphia.

---

Diaphoretics.

Opium and morphia are used to check profuse renal secretion; for example, in diabetes, and hydruria or diuresis. Sprœgel asserts that though opium checks the excretion of urine, it does not diminish its secretion; for, in animals to which he had administered opium, he found the bladder full of urine, though none had been passed for three days. But though opium checks the excretion of urine, it undoubtedly also diminishes its secretion. In hydruria the mineral astringents are very useful, especially the perchloride of iron, and the same disease occurring in horses is frequently cured by iodide of iron. The influence of diaphoretics in diminishing the renal excretion is sufficiently notorious.

*Order* 45. Urino-genitals.

Medicines which restrain inordinate secretion from the mucous surface of the urinary bladder, urethra, and vagina.

*Mineral.*

Hydrochloric acid.
Nitric acid.
Alum.
Sulphate of zinc.
Acetate of lead.
Subacetate of lead.
Sulphate of iron.
Perchloride of iron.
Nitrate of silver.

*Vegetable.*

Oil of turpentine.
Canada balsam.
Tannic acid and astringent vegetables which contain it.
Cubebs, and oil of cubebs.
Bearberry leaves.
Copaiva, and oil of copaiva.
Buchu.
Pareira.

*Animal.*

Cantharides.

Bearberry leaves, buchu, and pareira are the medicines chiefly employed in the treatment of cystorrhœa or catarrh of the bladder; but when the mucous discharge is occasioned and kept up by local irritation, as by a calculus, or enlarged prostate, attention must be directed to the removal or relief of the exciting cause. Very dilute solutions of the mineral acids (hydrochloric and nitric) injected into the bladder have proved useful in chronic inflammation of its mucous membrane, accompanied by a deposition of the phosphates, both by their solvent action on the latter, and by benefiting the condition of the mucous membrane of the bladder. The oleo-resins are employed with great benefit in gonorrhœa, leucorrhœa, gleet, and chronic catarrh of the bladder. Cubebs are employed not only in gonorrhœa, but in cystorrhœa, and in abscesses of the prostate gland. Cantharides in leucorrhœa and gonorrhœa. As astringents the perchloride and sulphate are used both as internal and topical agents. In mucous discharges from the genital organs, as gleet and leucorrhœa, the internal employment of the perchloride of iron, sometimes conjoined with the tincture of cantharides, has been found highly useful. Any of the vegetable astringents containing tannic acid may be employed topically in leucorrhœa; oak bark, galls, and tannic acid itself are the most used, and alum, the acetates of lead, sulphate of zinc, and nitrate of silver are largely employed as injections, both in this disease and in gonorrhœa.

*Order* 46. LITHICS. (From λίθος, a stone or urinary calculus.)

*Antilithics.*

Medicines which counteract the predisposition to the formation of urinary calculi.

The following is a list of the medicinal agents used as lithics:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Water. | Oil of turpentine. |
| Mineral acids. | Bearberry leaves. |
| Carbonic acid. | Benzoic acid. |
| Phosphate of soda. | Opium. |
| Borax. | Vegetable astringents. |
| Soap. | Vegetable bitters. |
| Potash, Soda, Lithia } and their { Carbonates. Acetates. Citrates. Tartrates. | Vegetable acids. |
| | Diuretics. |
| Benzoate of ammonia. | |
| Vichi and Malvern mineral waters. | |

The preventive treatment of lithiasis varies somewhat, according to the chemical nature of the urinary deposit. Lithics, considered with reference to their influence over the urine, are of two kinds, diuretics and alteratives.

1. *Diuretic lithics.*—Diuretics have long been celebrated in the treatment of gravel. In some cases they appear to act by increasing the quantity of water secreted by the kidneys, and thus by rendering the urine more dilute to enable this secretion to retain in solution its solid constituents. In other cases they appear to give relief by promoting the secretion of uric or lithic acid, which, in some cases, appear to act as a sort of *materies morbi* (Prout). In this way Dr. Prout thinks that "the good effects long ascribed to certain remedies of the active diuretic kind may be probably explained; such remedies appearing to possess the power, when given in favorable conditions of the system, of exciting the kidneys to separate large quantities of lithic acid; and in this way, by bringing about an artificial crisis, to produce great and immediate benefit." The efficacy, in the uric acid diathesis, of a mixture of turpentine and opium, of hydrochloric acid and opium, of spirit of nitrous

ether, of oil of juniper, &c., may thus be in part explained. The beneficial effect of colchicum in gout has been ascribed to its causing the secretion of uric acid. Opium is useful in these cases, "not only on account of its sedative properties, but from the property which it likewise possesses of increasing the secretion of lithic acid." (Prout.) When the lithic acid is disposed to come away in the form of gravel, Dr. Prout advises the use of a combination of hydrochloric acid and opium; but when it is disposed to concrete, he substitutes solution of potash for the acid.

2. *Alterative lithics.*—These are agents which alter the chemical qualities of the urine, and thereby prevent the formation of urinary deposits. Some of them affect the urine by a direct chemical agency; that is, they become absorbed, are eliminated in the kidneys, and thus directly alter the chemical properties of the urine. The alkaline and saline lithics act, in part at least, in this way. The acetates, citrates, and tartrates modify the composition of the urine, and communicate to it an alkaline quality. Hence they are used as lithics in the uric acid diathesis. Of the natural mineral waters those of Vichi have been most noted for the cure of gravel. They contain bicarbonate of soda, and when taken internally render the urine alkaline. The Malvern water, principally by its purity, but partly also by the minute quantity of alkali which it contains, is useful in uric acid deposits. There is abundant evidence to prove that patients afflicted with the uric acid diathesis have sometimes experienced from the use of solution of lime extraordinary benefit, which Chevallier attributes to the great solubility of the salt formed under these circumstances, viz., urate of lime. The mineral acids have also been used to modify the renal secretion, and though they are secreted by the kidneys in combination with a base, and do not, therefore, react in the urine as free acids, yet they are occasionally useful. Other alterative lithics indirectly alter the chemical qualities of the urine by the changes they effect in the vital processes of the animal economy. They modify the primary or secondary assimilation processes either by their influence over the nervous system or otherwise. Opium and vegetable bitters oftentimes prove beneficial in deposits of the triple phosphates; the former allays nervous irritation; the latter are calculated to relieve debility.

*Order* 47. LITHONLYTICS. (From λίθος, a stone or urinary calculus, and λύω, I dissolve or break up.)

*Lithontriptics, Solvents for the Stone.*

*Mineral.*

| | |
|---|---|
| Water. | Tartrate of soda and potash. |
| Carbonic acid. | Carbonate of lithia. |
| Mineral acids. | Citrate of lithia. |
| Bicarbonates of potash and soda. | Carbonated solutions of the alkaline bicarbonates. |
| Phosphates of soda. | Solution of lime. |
| Borax. | |

These have been employed in two ways, viz., by the mouth and by injection into the bladder.

1. *Lithonlytics administered by the mouth.*

"A perfectly healthy condition of the urine," says Dr. Prout, "is not only one of the most natural, but probably also one of the most powerful solvents, for all the ingredients likely to exist in urinary calculi, that we can hope to possess. So satisfied am I of the general truth of this remark, that my belief is, that there is scarcely any form of stone that would long bear the continued action of healthy urine without becoming more or less dissolved or disintegrated." Admitting this to be true, it follows that the most rational mode of effecting the solution of urinary calculi is by promoting the copious secretion of healthy urine. In health the transparency of the urine is scarcely affected by the cooling of this liquid, a few nebulæ of mucus being alone deposited. When, however, the solid constituents of this secretion exist in an absolute or relative excess, the urine is either turbid when voided, or becomes so in cooling. It is obvious, therefore, that in the latter state it is unfitted for acting as a solvent of urinary calculi, as it is already saturated. In such cases water becomes a valuable agent. It dilutes the urine, and enables it not only to retain in solution, on cooling, the ordinary constituents of this secretion, but to act as a solvent of calculi. Hence, then, a copious use of aqueous fluids is an indispensable adjuvant of all lithonlytics. Even the long-continued action of large quantities of simple water on urinary calculi is capable, apparently, of disintegrating, and, in some cases, of dissolving them. Bourchardat asserts that water is the best lithonlytic, and states that great water-drinkers are never afflicted with urinary calculi. He also insists "that lithonlytics are in general really and surely useful only when the urine remains limpid on cooling." The great majority of agents employed as solvents for the stone are either acid or alkaline: the former being employed in phosphatic deposits, the latter in the uric acid diathesis. But as healthy urine contains no free and uncombined alkaline or acid ingredient, Dr. Prout concludes that lithonlytics "are to be sought for among a class of harmless and unirritating compounds, the elements of which are so associated as to act at the same time, with respect to calculous ingredients, both as alkalies and acids." At present no substance of this kind is known; but the solutions of the super-carbonated alkalies, containing a great excess of carbonic acid, approach the nearest to them. These are used in two forms, either as natural mineral waters, or as artificial soda and potash waters. Of the latter, "the potash waters are preferable; and when the calculus is of the uric acid variety, and the diathesis decided, from thirty to sixty grains of the carbonated alkali, and as much of the tartrate of soda and potash, may be dissolved in each bottle, which may be taken twice a day with an equal quantity of warm distilled water. On the other hand, when the concretions consist of the phosphates, and the urine is decidedly alkaline, the alkali may be omitted altogether, and the compound may either consist of distilled water impregnated with carbonic acid gas, or occasionally some acid, as the nitric, may be substituted for the alkali." (Prout.) Soap and solution of lime have been much celebrated as solvents for urinary calculi; but, notwithstanding the favorable reports to the contrary, it appears to me that no rational ground of hope can now be entertained that solution of lime is capable of dissolving urinary calculi in the kidneys or bladder. Borax and phosphate of soda are other lithonlytics which have been used in consequence of their solutions acting as good solvents for lithic acid. In conclusion it may be observed, that while in several instances marked benefit and relief have been obtained by substances *administered by the mouth* under the name of lithonlytics, no confidence can be placed in the solvent power of any agent hitherto so employed. The relief obtained in several instances has been derived, not from the solution of the calculi, but from the diminution of pain and irritation in the urinary organs. It deserves also to be noticed that nearly all the medicines which are reported to have been successfully administered by the mouth for the solution of urinary calculi belong to the class of alkaline substances; and that the secret of their success seems to have been their plentiful dilution with aqueous liquids. Provided this be attended to, it is probable that the carbonated alkalies are as good lithonlytics as the caustic alkalies, while they are much less obnoxious to the digestive organs.

### 2. *Lithonlytics injected into the bladder.*

The direct and certain mode of bringing solvents in contact with calculi contained within the bladder is by injection. But the objection to this mode of proceeding is, that the introduction of chemical agents, sufficiently strong to exert much influence over the calculi, into the bladder, would be attended with dangerous irritation to the vesical coats. This plausible objection has not, however, in all cases, been found to hold good. On the contrary, lithonlytic injections into the bladder have, in some instances, allayed irritation. The substances which have been employed in this way are—lime-water, alkaline solutions, acid solutions, and Mr. Ure has proposed to employ a solution of carbonate of lithia. In several instances solution of lime has been introduced into the bladder without inconvenience; and in one instance it appears to have been successful, as it is stated that no relic of the stone was left. In this case about five ounces of the solution were introduced twice daily for ten weeks. Alkaline solutions have also been used, and, in some cases, successfully. In one instance from three to six ounces of a solution of potash, which hardly produced a feeling of warmth in the mouth at 98° F., was introduced twice daily, and is said to have effected a perfect cure. In another case a solution of 115 grains of bicarbonate of soda in a pint of water rendered the fragments of an uric acid calculus so friable that very slight pressure was sufficient to break them. Water acidulated with hydrochloric, sulphuric, or nitric acid has been tried in several instances, and in some with success. Sir B. Brodie employed water acidulated with two or two and a half minims of nitric acid to every ounce of distilled water. The injection was used for from fifteen to thirty minutes every two or three days. The symptoms were relieved, and a phosphatic calculus dissolved. In another case, water containing a small portion of nitric acid (from $\frac{4}{100}$ths to $\frac{5}{100}$ths) has been injected with success. Even simple water injected into the bladder daily for several months appears to have partially dissolved and disintegrated a phosphatic calculus. On the whole, it is obvious that sufficient success has been obtained by the injection of lithonlytic liquids into the bladder to warrant further experiments and perseverance in this method of treatment.

## *Class* 10. GENETICS. (From γένεσις, origin or generation.)

Medicines which influence the sexual organs.

This class includes the medicinal agents which are supposed to affect the venereal orgasm, and also those which act on the uterus.

### 1. *Affecting the Orgasm.*

The existence of medicinal agents endowed with specific aphrodisiac or anaphrodisiac powers has been denied by some and admitted by others. Most modern systematic writers on pharmacology have agreed with Dr. Cullen in the belief of the non-existence of agents of this kind; and, therefore, in recent works on Materia Medica, aphrodisiacs and anaphrodisiacs are, as distinct classes or orders, unnoticed. But it appears to me that Dr. Cullen's opinion is scarcely supported by fact. That the sexual feelings and powers may be influenced directly or indirectly by substances taken into the stomach cannot, I think, be doubted. The aphrodisiac property of phosphorus, for example, has been recognized both in man and the lower animals; and there is reason to believe that some other agents, as Indian hemp, act in the same way. The anaphrodisiac effects of nauseants and drastics are well known. From time immemorial a belief has existed in the aphrodisiac and anaphrodisiac properties of certain dietetic and medicinal agents; and, though the popular opinion may be in many cases erroneous, there is reason to suspect that it has some foundation in fact. Such agents would probably prove more influential on the susceptible nervous system of inhabitants of warm than of cold climates. In practice, cases not unfrequently occur in which aphrodisiac or anaphrodisiac agents are indicated, and in which medicinal substances are given with the view of producing one or the other of these effects. It appears to me, therefore, that a brief enumeration of substances reputed to possess aphrodisiac or anaphrodisiac properties may not be uninteresting or useless.

*Order* 48. APHRODISIACS. (From ἀφροδίσιος, exciting sexual desires.)

Medicines which are supposed to excite the sexual feelings, or to increase the sexual powers.

The following are reputed aphrodisiacs:—

*Mineral.*

Phosphorus. Chalybeates.

*Vegetable.*

| | | |
|---|---|---|
| Indian hemp. | Nux vomica. | Spices. |
| Oil of turpentine. | Assafœtida. | Opium. |
| | Wine. | |

*Animal.*

Cantharides. Musk. Castor.

Musk, castor, and other powerfully odorous substances have been employed as sexual stimulants. Several intoxicating agents, especially wine, Indian hemp, and opium, have been used as aphrodisiacs; but it is doubtful whether any of them increase the sexual powers, though they may excite desire; wine is well known to diminish them. Spices, the fetid gum-resins, the turpentines, phosphorus, and cantharides are also reputed aphrodisiacs, and may occasionally act as such. Perhaps nux vomica is more entitled to this name than most of the articles mentioned. It has been already observed that the excitement of the sexual feelings which Trousseau has seen produced by nux vomica led him to employ this remedy against impotence, and that he found it successful both in males and females. In some cases, however, its good effects were observed only while the patients were taking the medicine.

[To increase the sexual desire, however, while the power is wanting, will seldom if ever be desirable, and the most rational means of restoring the powers when lost or impaired by excess of any kind, whether by excessive sexual indulgence, by intemperance, or by over-exercise of the mind, will be to *avoid* the useless excitement of the desire, to live temperately and much in the open air, avoiding heated rooms and late hours, and soft beds, to exercise the body and spare the brain, and to use all the other tonic means of improving the animal vigor, especially, if not unsuitable to the case, chalybeates, and the shower or cold plunge bath. —Ed.]

*Order* 49. Anaphrodisiacs. (From ἀναφροδισία, absence of sexual desire.)

Medicinal agents which are supposed to take away or repress the sexual feelings.

| *Mineral.* | *Vegetable.* |
|---|---|
| Bromide of potassium. | Camphor. |
| Carbonate of soda. | Hemlock. |
| Tartarated antimony. | ——— |
| | Drastic cathartics. |

Nauseants, as tartarated antimony, and drastic cathartics, act as anaphrodisiacs. Carbonate of soda and soda water are also said to possess similar powers, as well as hemlock. Camphor has long enjoyed a similar reputation, and by the school of Salernum it was said, "*Camphora per nares castrat odor mares.*" The anaphrodisiac properties of bromide of potassium have only very recently become known, but they are well established, and have obtained for this drug readmission into a British pharmacopœia.

*Order* 50. Emmenagogues. (From ἐμμήνια, the menstrual discharge, and ἀγωγός, eliciting.

Medicines which excite or promote the catamenia.

| | *Mineral.* | |
|---|---|---|
| Sulphur. | Borax. | Mercurials. |
| Ammonia. | Chalybeates. | |
| | *Vegetable.* | |
| Ergot. | Assafœtida. | Oil of rue. |
| Aloes. | Galbanum. | Gamboge. |
| Savin. | Colocynth. | |
| | *Animal.* | |
| | Castor. | |

As the suppression or retention of the catamenia may be occasioned by very different circumstances, no one agent can be expected to prove emmenagogue in all, or even in many cases. Deficient menstruation is rarely, perhaps, an idiopathic disease, but in general merely a morbid symptom; and therefore those agents which remove it must be relative, that is, must have reference to the disease which produces it. When amenorrhœa coexists with anæmia, the most effectual emmenagogues are the chalybeates. In most cases it will be found advisable to conjoin aloetic purges. In hysterical amenorrhœa unaccompanied by anæmia, ammonia, the fetid gum-resins, and castor prove indirectly emmenagogue. Here also aloetic purges frequently prove serviceable. When amenorrhœa occurs in plethoric habits, bloodletting and active cathartics act indirectly as emmenagogues. But the term emmenagogue is usually employed in a more limited sense, namely, to indicate those substances which are supposed to possess a specific power of affecting the uterus, and thereby of promoting the catamenial discharge. There are, however, few bodies to which this definition can be strictly applied. Indeed, two reasons have led some pharmacological writers to doubt the existence of any medicines which can be properly termed specific emmenagogues, namely, the uncertainty of all the means so named, and the uterus not being an organ intended for the excretion of foreign matters. The substances usually regarded as specific emmenagogues are, for the most part, medicines which, when taken in large doses, act as drastic purgatives. Such are savin, aloes, gamboge, &c. They excite the pelvic circulation, give rise to a sensation of bearing down of the womb, especially in females disposed to procidentia uteri, increase uterine hemorrhage or the menstrual discharge when given during these conditions, and, when administered in chlorosis or amenorrhœa, sometimes bring on the catamenia. Sulphur and the sulphureous waters are frequently resorted to on account of their supposed stimulant influence over the venous system. Rue is a reputed and popular emmenagogue. Ergot possesses an unequivocal influence over the uterus. But it rather promotes uterine contractions than the menstrual function, though it has on many occasions been successfully employed in amenorrhœa. Borax is a stimulant to the uterus, and sometimes proves emmenagogue. Mercurials promote the catamenia in common with the secretions generally.

*Order* 51. ECBOLICS. (From ἐκβάλλω, I expel.)

Medicines which excite uterine contractions, and thereby promote the expulsion of the contents of the uterus.

*Mineral.*

Borax.

*Vegetable.*

Ergot. Digitalis.

Ecbolics are essentially distinguished from emmenagogues by this circumstance: that while the latter stimulate the vascular system of the uterus, the former excite the uterine muscular fibres. Ecbolics promote the expulsion of all substances contained in the uterine cavity, such as the fœtus, the placenta, hydatids, clots of blood, &c. The number of ecbolics is very small. Ergot is the only one universally acknowledged and generally employed. Borax is a doubtful ecbolic. [After ergot, digitalis has perhaps the strongest claim to this title, as, according to Dr. Howship Dickenson, it has an immediate special action on the uterus, which it causes to contract with sufficient force to occasion pain.—ED.]

*Class* 11. HIDROTICS. (From ἱδρώς, sweat.)

Medicines which influence the amount of perspiration.

*Order* 52. DIAPHORETICS. (From διαφορέω, I throw off by perspiration.)

*Sudorifics.*

Medicinal agents which increase the cutaneous perspiration.

The agents which, under certain circumstances, augment cutaneous exhalation are both numerous and heterogeneous. External heat, assisted by the copious use of diluents, constitutes an important and powerful means of promoting sweating. Whenever a large quantity of fluid is taken into the system, the excess is got rid of by the kidneys, the skin, and the lungs; and if we keep the skin warm, as by warm clothing, or the use of hot air or hot vapor bath, the action of the cutaneous exhalants is promoted, and sweating results; but if the skin be kept cool, the kidneys are stimulated, and the greater part of the liquid passes off through them. Friction, exercise, and all agents which excite vascular action, have a tendency to promote sweating. The sudden and temporary application of cold, as in the affusion of cold water, sometimes proves sudorific by the reaction which it occasions. Lastly, medicinal agents, acting through the circulation, cause sweating. These are the sudorifics or diaphoretics properly so called.

The following is a list of the officinal diaphoretics:—

*Mineral.*

| | |
|---|---|
| Water. | Nitrate of potash. |
| Sulphur. | Alkaline citrates and tartrates. |
| Solution of ammonia. | Oxide of antimony. |
| Carbonate of ammonia. | Sulphurated antimony. |
| Hydrochlorate of ammonia. | Tartarated antimony. |
| Acetate of ammonia. | |

*Vegetable.*

| | | |
|---|---|---|
| Sarsaparilla. | Ipecacuan. | Hydrochlorate of morphia. |
| Oil of turpentine. | Oil of cajuput. | ——— |
| Sassafras. | Copaiva. | Rectified spirit. |
| Camphor. | Guaiac wood. | Wine. |
| Mezereon. | Guaiac resin. | Ether. |
| Dulcamara? | Opium. | |

Diaphoretics are relative agents; they succeed only in certain states of the body. Moreover, for different conditions different diaphoretics are required. They constitute an exceedingly uncertain class of remedies, with regard both to the production of sweating and to the advantage to be derived therefrom. Sir H. Holland suggests that when benefit follows the use of diaphoretic medicines it is often ascribable, not to their direct influence on the exhalant vessels, but to other changes which they excite in the system, of which sweating is to be regarded rather as the effect and proof than as the active cause. The operation of diaphoretics is promoted by the exhibition of large quantities of warm mild diluents, and by keeping the skin warm. Moreover, they are more effective when given at bedtime, since there appears to be greater disposition to sweating during sleep than in the waking state. The exhibition of diuretics should be avoided during the operation of diaphoretics, as they appear to check the operation of the latter. The same rule has been laid down with regard to purgatives; but it is well known that perspiration is often the consequence of hypercatharsis. Dr. Edwards has shown that cutaneous transpiration is effected in two ways—by a physical action or evaporation, and by an organic action or transudation. *Evaporation*, or the physical action, is the consequence of the porosity of bodies, and takes place equally in the dead and living state. It is influenced by the hygrometric states of the surrounding air, by its motion or stillness, by its pressure, and by its temperature. Thus dryness, agitation, and diminution of the weight of the air increase it. *Transudation*, or the organic action of transpiration, is a vital process, effected by minute spiral follicles or sudoriferous canals, and depends essentially on causes inherent in the animal economy, although it may be influenced to a certain extent by external agents. Thus, elevating the temperature of the surrounding air, preventing its frequent renewal, and covering the patient with warm clothing, are means which promote the organic, but check the physical, action of transpiration. Diaphoretics affect the transudation or the vital process. They probably affect the exhalants in one or both of two ways; by increasing the force of the general circulation, or by specifically stimulating the cutaneous vessels.

Diaphoretics may be arranged in eight groups, as follows:—

1. *Aqueous diaphoretics.*—Under this head are included not only simple water, but gruel, whey, and tea. These, when assisted by external

warmth, often prove very effective diaphoretics, even when used alone; while to all the other groups they are valuable adjuvants; and in no cases are they injurious.

2. *Sulphur.*—This substance promotes the action of the skin, and its efficacy in chronic cutaneous diseases has long been established. In these maladies, sulphur and the sulphureous waters are employed internally.

8. *Alkaline and saline diaphoretics.*—The salts of the alkalies are frequently used to promote perspiration. Acetate and carbonate of ammonia, alkaline citrates and tartrates, hydrochlorate of ammonia, and nitrate of potash are employed for this purpose in fevers.

4. *Antimonial diaphoretics.*—We use this group of diaphoretics in febrile and inflammatory cases. It is preferred to the opiate diaphoretics when there is inflammation or congestion of the brain, or a tendency to either of these conditions.

5. *Opiate diaphoretics.*—Opium and its alkali morphia have a remarkable tendency to produce sweating. The former is often used as a diaphoretic, commonly in the form of the powder of ipecacuan and opium, when no disorder of the brain exists; and especially when an anodyne is indicated. When the stomach is very irritable, an opiate diaphoretic is preferred to an antimonial one. In rheumatism and slight catarrhs, the powder of ipecacuan and opium proves highly serviceable. In diabetes and granular disease of the kidneys it is the best sudorific we can use, especially when conjoined with the warm bath. Opium greatly assists the diaphoretic action of camphor, and opium and camphor form a serviceable sudorific compound when the surface is cold, as in cholera.

6. *Oleaginous and resinous diaphoretics.*—This group includes a large number of substances, some of which owe their activity to volatile oil, as sassafras and camphor; others to resin, as mezereon and guaiac wood and resin; while some contain both oil and resin, as copaiva. The substances of this order possess stimulant properties. They probably act locally on the cutaneous vessels through the blood; for some of them, (*e. g.* copaiva) can be detected by their odor in the perspiration, and they occasionally excite a slight eruption on the skin. The diaphoretics of this group are useful in chronic rheumatism, secondary syphilis, and chronic cutaneous diseases.

7. *Alcoholic diaphoretics.*—Alcohol and wine augment cutaneous exhalation.

8. *Ipecacuan.*—I believe the diaphoretic property of ipecacuan to be considerably less than is commonly supposed. The powder of ipecacuan and opium owes its power of producing sweating almost exclusively to the opium which it contains.

Diaphoretics are employed for various purposes, of which the following are the chief:—

1. To restore the cutaneous secretion when it has been checked by cold, and thereby to relieve the ill consequences of its suppression. The milder forms of disease, induced by what is familiarly termed "catching cold," are often successfully treated by the use of diluents and diaphoretics. In catarrhal and rheumatic affections they are employed with great benefit. 2. To promote the subsidence of diseases which naturally terminate by augmented cutaneous secretion or exanthematous eruptions; as in simple continued fever, the exanthemata, and intermittents. 3. To produce determination to the surface in various maladies attended with coldness of the skin and congestion of internal organs. 4. To antagonize other secretions. Thus diaphoretics are employed to check exces-

sive secretion of urine, and sometimes to relieve diarrhœa. Opium is a valuable agent in some of these cases; for, while it acts as a diaphoretic, it checks secretion from the kidneys and intestines; and hence in diabetes and diarrhœa it serves a twofold purpose. 5. To establish a substitute for some other secretion. Both the skin and kidneys are engaged in the common function of eliminating water; and hence, when the renal secretion is diminished or suppressed, we endeavor to relieve the system by the use of diaphoretics. In dropsy from granular degeneration of the kidney, the employment of warm baths and Dover's powder is frequently attended with great benefit.

*Order* 53. ANTIHIDROTICS. (From ἀντί, against, and ἱδρώς, sweat.)

Medicines which restrain perspiration.

| *Mineral.* | *Vegetable.* |
|---|---|
| Sulphuric acid. | Vinegar. |
| Oxide of zinc. | Acetic acid. |
| Perchloride of iron. | —— |
| Sulphate of iron. | Diuretics. |
| Compound mixture of iron. | |
| Saline cathartics. | |

Excessive perspiration may arise from several causes, as: 1, from a plethoric habit of body; 2, from a relaxed state of the cutaneous exhalants, accompanied with general want of tone; 3, from hectic, from rheumatism, or from intermittent fever. Perspiration from the first mentioned cause is best relieved by a drier and less oleaginous diet, by the use of diuretics, and occasionally of saline cathartics, by the shower or plunge bath, and by horse exercise. In the second case it is relieved by the astringent salts of iron and the shower bath, or sponging with vinegar and water; and even when the perspiration has the character of hectic, and is symptomatic of suppurative action, if the cause cannot be removed, the perspiration can still be frequently controlled by sulphuric acid, oxide of zinc, or the compound mixture of iron, long known as Griffith's antihectic mixture. Sulphuric acid is the most powerful antihidrotic.

## *Class* 12. TEMPERATORS.

Agents which influence the temperature of the body.

### *Order* 54. CALEFACIENTS.

Medicinal substances which promote or raise the temperature of the body.

This effect is ordinarily produced by the agents which accelerate the circulation and respiration, *i. e.* by *stimulants*, hot drinks, and external heat, especially the hot bath.

### *Order* 55. REFRIGERANTS.

Medical substances which diminish the temperature of the body when preternaturally increased. The only agent which in all cases reduces animal heat is cold, used in the form of ice, cold air, cold baths, cold lotions, cold drinks, &c. These abstract heat, and thereby lower the intensity of the vital movements, diminish vascular action, and reduce the calorific functions. But there are certain medicinal substances which, by continued internal use, appear to allay febrile heat, though they have no power of diminishing the ordinary or healthy temperature, and to these the term refrigerants is usually applied. The substances supposed to produce these effects are:—

| *Mineral.* | *Vegetable.* |
|---|---|
| Mineral acids. | Lemon juice. |
| Chlorate of potash. | Vegetable acids. |
| Nitrate of potash. | ——— |
| Acid tartrate of potash. | Sedatives. |

*Class* 13. RESOLVENTS. (From *resolvo,* I loosen or dissolve.)

Medicines which influence inflammatory deposits, and promote their reabsorption.

*Order* 56. RESOLVENTS. *Liquefacients, Sorbefacients, Alteratives.*

*Mineral.*

| | | |
|---|---|---|
| Alkalies. | Bromine. | Corrosive sublimate. |
| Alkaline carbonates. | Bromide of potassium. | Green iodide of mercury. |
| Iodine. | Mercury. | Red iodide of mercury. |
| Iodide of potassium. | Calomel. | Sulphurated antimony. |

*Vegetable.*

| | |
|---|---|
| Sarsaparilla. | Dandelion root. |
| Hemlock. | Guaiac wood and resin. |

These medicines promote secretion and exhalation generally, soften and loosen textures, check phlegmonous inflammation, lessen inflammatory effusions, and promote their reabsorption. Their antiphlogistic effect is best seen after the use of mercury, the action of which, observes Dr. J. R. Farre, "is positively antiphlegmonous. If it be pushed far enough, it produces an effect the exact reverse of the phlegmonous state; namely, the erythematous inflammation, the tendency of which is to loosen structure, while that of phlegmonous inflammation is to bind texture. Under the influence of mercurials, the gums become spongy, and deposits of coagulable lymph (as in iritis) are removed. The beneficial effects of mercurials, antimonials, iodine, alkalies, &c., in promoting the resolution of visceral and glandular inflammation, and in relieving active congestions, may be ascribed to the antiphlegmonous action referred to by Dr. Farre. These agents are opposed to the exudation of plastic or coagulable lymph (hence they check union by adhesion), and to the formation of false membranes. During their use, visceral and glandular enlargements and indurations, thickening of membranes (as of the periosteum), and morbid, but non-malignant, growths of various kinds, are sometimes observed to get softer and smaller, and ultimately to disappear. Dr. Ashwell graphically describes indurations and hard tumors of the uterus, especially of the os and cervix, as having "melted away" under the influence of iodine. In hepatization of the lungs, the effused solid matter is often absorbed, and the cells rendered again permeable to air, by the use of mercury. The resolvent operation of these medicines is usually explained by referring it to an augmented activity of the absorbents. But this explanation is imperfect, and does not account for all the phenomena. The effect is ascribable to a change in the nutrition of the parts affected. My friend Dr. Billing is of opinion that "mercury and iodine remove morbid growths by starving them, which they effect by contracting the capillaries." But I conceive there must be something more in the influence of these remedies than a mere reduction in the quantity of blood supplied to the affected parts. The enlargements which these agents remove are not mere hypertrophies;

their structure is morbid, and they must, in consequence, have been induced by a change in the quality of the vital activity; in other words, by morbid action. Medicines, therefore, which remove these abnormal conditions, can only do so by restoring healthy action; that is, by an *alterative* influence. By what force or power they are enabled to effect changes of this kind, must, for the present at least, be a matter of speculation. Müller thinks it is by affinity. "They produce," he observes, "such an alteration in the composition of the tissues, that the affinities already existing are already annulled, and new ones induced, so as to enable the vital principle—the power which determines the constant reproduction of all parts in conformity with the original type of the individual—to effect the further restoration and cure; the mercury itself does not complete the cure." Iodine, bromine, and their compounds are useful in aiding the removal of some of the products of inflammation. They are chiefly serviceable in scrofulous, rheumatic, and syphilitic inflammations. They are not adapted for acute inflammation, but for inflammation of a chronic character. They are also serviceable in relieving certain non-malignant alterations of texture, referable not to inflammation, but to perverted nutrition, and which are accompanied with increased deposit of solid matter, such as induration with enlargement or swelling of organs, especially of the lymphatic glands, thyroid gland, liver, and spleen. It is doubtful whether they have any influence over that kind of increased nutrition which is attended with hypertrophy. The power of the alkaline iodides as resolvents appears greatly increased by combination with the caustic alkalies. The union of the iodide of potassium with solution of potash forms a compound under the use of which glandular and other swellings occasionally become removed with a rapidity seldom observed when either remedy is exhibited alone (Taylor and Rees). Solution of potash is employed with advantage in bronchocele, mammary tumors, diseases of the mesenteric glands, induration of the liver, parotid and salivary glands, and, according to Dr. Seymour, even in malignant disease of the ovaries. It was extensively employed by Mr. Brandish in scrofula. Sulphurated antimony is employed in glandular enlargements and secondary syphilis, generally combined with calomel, as in the compound calomel pill.

The resolvent influence of vegetables is much less apparent. Sarsaparilla has enjoyed a high reputation for its alterative effects, especially when combined with guaiac and mezereon. Its reputation is probably much greater than it deserves, but it is often a very useful medicine in glandular enlargements and various other chronic maladies connected with a depraved or cachectic state of the system. Mr. Pearson found guaiac serviceable to patients who had been submitted to a mercurial course, and observed that thickening of the ligaments and periosteum subsided under its use. Dandelion root is chiefly useful in chronic inflammation and enlargement of the liver; and of the resolvent and alterative effects of hemlock there can hardly be a doubt. It not only diminishes enlarged lymphatic glands, bronchocele, and mammary tumors, but diseases supposed to have been cancerous have been greatly relieved, and in some cases apparently cured, by this remedy.

# POSOLOGICAL TABLE.

| | |
|---|---|
| Acacia | gr. 20 to gr. 60 |
| Acetum | fl. drm. 1 to fl. oz. $\frac{1}{2}$ |
| Acidum Aceticum dilutum | fl. drm. 1 to fl. oz. $\frac{1}{2}$ |
| Acidum Arseniosum | gr. $\frac{1}{45}$ to gr. $\frac{1}{12}$ |
| Acidum Benzoicum | gr. 10 to gr. 15 |
| Acidum Citricum | gr. 10 to gr. 30 |
| Acidum Gallicum | gr. 3 to gr. 10 |
| Acidum Hydrochloricum dilutum | min. 20 to min. 40 |
| Acidum Hydrocyanicum dilutum | min. 3 to min. 7 |
| Acidum Nitricum dilutum | min. 15 to min. 25 |
| Acidum Nitro-hydrochloricum dilutum | min. 10 to min. 15 |
| Acidum Phosphoricum dilutum | min. 20 to fl. drm. 1 |
| Acidum Sulphuricum aromaticum | min. 10 to min. 30 |
| Acidum Sulphuricum dilutum | min. 10 to min. 30 |
| Acidum Tannicum | gr. 3 to gr. 10 |
| Acidum Tartaricum | gr. 10 to gr. 30 |
| Aconiti Radix | gr. 1 to gr. 2 |
| Aloe Barbadensis | gr. 3 to gr. 5 |
| Aloe Socotrina | gr. 3 to gr. 5 |
| Alumen (as an astringent) | gr. 10 to gr. 20 |
| — as an emetic | gr. 30 to gr. 60 |
| Ammoniacum | gr. 10 to gr. 30 |
| Ammoniæ Benzoas | gr. 10 to gr. 20 |
| Ammoniæ Carbonas (as a stimulant) | gr. 5 to gr. 15 |
| — as an emetic | gr. 30 |
| Ammoniæ Hydrochloras | gr. 5 to gr. 30 |
| Ammoniæ Phosphas | gr. 5 to gr. 30 |
| Anethum | gr. 10 to gr. 60 |
| Anthemis | gr. 10 to gr. 30 |
| Antimonii Oxidum | gr. 1 to gr. 3 |
| Antimonium Tartaratum (as a diaphoretic or expectorant) | gr. $\frac{1}{12}$ to gr. $\frac{1}{6}$ |
| — as a nauseant or sedative | gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$ |
| — as an antiphlogistic | gr. $\frac{1}{2}$ to gr. 2 |
| — as an emetic | gr. 1 to gr. 2 |
| Antimonium Sulphuratum (as an alterative) | gr. 1 to gr. 4 |
| — as an emetic | gr. 5 to gr. 20 |
| Aqua Anethi | fl. oz. 1 to fl. oz. 3 |
| Aqua Aurantii | fl. oz. 1 to fl. oz. 2 |
| Aqua Camphoræ | fl. oz. 1 to fl. oz. 2 |
| Aqua Carui | fl. oz. 1 to fl. oz. 3 |
| Aqua Cinnamomi | fl. oz. 1 to fl. oz. 2 |
| Aqua Fœniculi | fl. oz. 1 to fl. oz. 3 |
| Aqua Laurocerasi | min. 10 to min. 60 |
| Aqua Menthæ piperitæ | fl. oz. 1 to fl. oz. 3 |
| Aqua Menthæ viridis | fl. oz. 1 to fl. oz. 3 |
| Aqua Pimentæ | fl. oz. 1 to fl. oz. 2 |
| Aqua Rosæ | fl. oz. 1 to fl. oz. 2 |
| Aqua Sambuci | fl. oz. 1 to fl. oz. 2 |
| Argenti Nitras | gr. $\frac{1}{6}$ to gr. 3 |
| Argenti Oxidum | gr. $\frac{1}{2}$ to gr. 2 |
| Arnica | gr. 5 to gr. 20 |
| Assafœtida | gr. 5 to gr. 30 |
| Atropia | gr. $\frac{1}{30}$ to gr. $\frac{1}{10}$ |
| Balsamum Peruvianum | fl. drm. $\frac{1}{2}$ to fl. drm. 1 |
| Balsamum Tolutanum | gr. 10 to gr. 30 |
| Belladonna | gr. 1, gradually increased |
| Benzoinum | gr. 10 to gr. 20 |
| Beberiæ Sulphas (as a tonic) | gr. 1 to gr. 3 |
| — as a febrifuge | gr. 5 to gr. 20 |
| Bismuthum album | gr. 5 to gr. 20 |
| Borax | gr. 30 to gr. 60 |
| Bucco | gr. 20 to gr. 30 |
| Calcis Carbonas præcipitata | gr. 20 to gr. 40 |
| Calcis Phosphas precipitata | gr. 10 to gr. 20 |
| Calomelas (as an alterative) | gr. $\frac{1}{2}$ to gr. 1 |
| — as a purgative | gr. 2 to gr. 5 |
| — as a sialagogue | gr. 1 to gr. 3, frequently repeated |
| — as a sedative | gr. 20 to gr. 30 |
| Calumba | gr. 10 to gr. 30 |
| Calx Chlorata | gr. 1 to gr. 5 |
| Cambogia | gr. 1 to gr. 4 |
| Camphora | gr. 1 to gr. 15 |
| Capsicum | gr. 5 to gr. 10 |
| Carbo animalis purificatus | gr. 10 to oz. $\frac{1}{4}$ |
| Carbo ligni | gr. 10 to oz. $\frac{1}{4}$ |
| Cardamomum | gr. 5 to gr. 20 |
| Carui | gr. 20 to gr. 60 |
| Caryophyllum | gr. 5 to gr. 10 |
| Cascarilla | gr. 10 to gr. 30 |
| Cassia | gr. 60 to oz. $\frac{1}{4}$ |
| Castoreum | gr. 60 to gr. 120 |
| Catechu | gr. 10 to gr. 40 |
| Cerevisiæ Fermentum | fl. oz. 1 |
| Cinchona flava | gr. 20 to gr. 60 |
| Cinchona pallida | gr. 20 to gr. 60 |
| Cinchona rubra | gr. 20 to gr. 60 |
| Cinnamomum | gr. 10 to gr. 20 |
| Colchici cormus | gr. 2 to gr. 8 |
| Confectio Piperis | gr. 60 to gr. 180 |
| Confectio Rosæ Gallicæ | gr. 60 or ad libitum |
| Confectio Scammonii | gr. 30 to gr. 60 |
| Confectio Sennæ | gr. 60 to oz. $\frac{1}{4}$ |
| Confectio Sulphuris | gr. 60 to gr. 120 |
| Confectio Terebinthinæ | gr. 60 to oz. $\frac{1}{2}$ |
| Conium | gr. 3 to gr. 10 |
| Copaiba | min. 20 to fl. drm. 1 |
| Coriandrum | gr. 30 to gr. 60 |
| Creasotum | min. 1 to min. 3 |
| Creta præparata | gr. 10 to gr. 60 |
| Cubeba | gr. 10 to gr. 60 |
| Cupri Sulphas (as a tonic and astringent) | gr. $\frac{1}{4}$ to gr. 2 |
| — as an emetic | gr. 3 to gr. 15 |
| Cusparia | oz. $\frac{1}{4}$ to oz. $\frac{1}{2}$ |

| | |
|---|---|
| Decoctum Aloes compositum | fl. oz. $\frac{1}{2}$ to fl. oz. 2 |
| Decoctum Cetrariæ | fl. oz. 1 to fl. oz. 4 |
| Decoctum Cinchonæ flavæ | fl. oz. 1 to fl. oz. 2 |
| Decoctum Granati radicis | fl. oz. 2 every half hour |
| Decoctum Hæmatoxyli | fl. oz. 1 to fl. oz. 2 |
| Decoctum Hordei | ad libitum |
| Decoctum Pareiræ | fl. oz. 1 to fl. oz. 2 |
| Decoctum Quercus | fl. oz. 2 to fl. oz. 6 |
| Decoctum Sarsæ | fl. oz. 4 to fl. oz. 8 |
| Decoctum Sarsæ compositum | fl. oz. 4 to fl. oz. 8 |
| Decoctum Scoparii | fl. oz. 1 to fl. oz. 2 |
| Decoctum Taraxaci | fl. oz. 1 to fl. oz. 2 |
| Digitatinum | gr. $\frac{1}{60}$ to gr. $\frac{1}{30}$ |
| Digitalis | gr. $\frac{1}{2}$ to gr. $1\frac{1}{2}$ |
| Elaterium | gr. $\frac{1}{16}$ to gr. $\frac{1}{2}$ |
| Ergota (as an astringent or styptic) | gr. 5 to gr. 15 |
| — as an ecbolic | gr. 20 |
| Extractum Aconiti | gr. 1 to gr. 2 |
| Extractum Aloes Barbadensis | gr. 5 to gr. 10 |
| Extractum Aloes Socotrinæ | gr. 5 to gr. 10 |
| Extractum Anthemidis | gr. 10 to gr. 20 |
| Extractum Belæ liquidum | fl. drm. $\frac{1}{2}$ to fl. drs. 2 |
| Extractum Belladonnæ | gr. 1 to gr. 3 |
| Extractum Calumbæ | gr. 3 to gr. 10 |
| Extractum Cannabis indicæ | gr. 1 to gr. 5 |
| Extractum Cinchonæ flavæ liquidum | min. 10 to min. 30 |
| Extractum Colchici | gr. $\frac{1}{2}$ to gr. 1 |
| Extractum Colchici aceticum | gr. $\frac{1}{2}$ to gr. 2 |
| Extractum Colocynthidis compositum | gr. 5 to gr. 15 |
| Extractum Conii | gr. 5 to gr. 10 |
| Extractum Ergotæ liquidum | min. 15 to min. 20 |
| Extractum Filicis liquidum | fl. drm. $\frac{1}{2}$ to fl. drm. 1 |
| Extractum Gentianæ | gr. 10 to gr. 30 |
| Extractum Glycyrrhizæ | gr. 10 to gr. 60 |
| Extractum Hæmatoxyli | gr. 10 to gr. 30 |
| Extractum Hyoscyami | gr. 5 to gr. 20 |
| Extractum Jalapæ | gr. 10 to gr. 20 |
| Extractum Krameriæ | gr. 5 to gr. 20 |
| Extractum Lupuli | gr. 5 to gr. 20 |
| Extractum Nucis vomicæ | gr. $\frac{1}{2}$ to gr. 2 |
| Extractum Opii | gr. $\frac{1}{2}$ to gr. 2 |
| Extractum Opii liquidum | min. 10 to min. 40 |
| Extractum Pareiræ liquidum | fl. drm. $\frac{1}{2}$ to fl. drs. 2 |
| Extractum Quassiæ | gr. 3 to gr. 5 |
| Extractum Rhei | gr. 10 to gr. 20 |
| Extractum Sarsæ liquidum | fl. drm. $\frac{1}{2}$ to fl. drs. 3 |
| Extractum Stramonii | gr. $\frac{1}{4}$, cautiously increased |
| Extractum Taraxaci | gr. 10 to gr. 30 |
| Fel Bovinum purificatum | gr. 5 to gr. 10 |
| Ferri Arsenias | gr. $\frac{1}{16}$ to gr. $\frac{1}{12}$ |
| Ferri Carbonas saccharata | gr. 5 to gr. 10 |
| Ferri et Ammoniæ Citras | gr. 5 to gr. 10 |
| Ferri et Quiniæ Citras | gr. 3 to gr. 10 |
| Ferri Iodidum | gr. 3 to gr. 10 |
| Ferri Oxidum magneticum | gr. 5 to gr. 10 |
| Ferri Peroxidum | gr. 10 to gr. 30 |
| Ferri Peroxidum Hydratum | ad libitum |
| Ferri Phosphas | gr. 2 to gr. 10 |
| Ferri Sulphas | gr. 1 to gr. 5 |
| Ferri Sulphas exsiccata | gr. $\frac{1}{2}$ to gr. 3 |
| Ferri granulata | gr. 1 to gr. 5 |
| Ferrum redactum | gr. 1 to gr. 10 |
| Ferrum Tartaratum | gr. 10 to gr. 30 |
| Filix Mas | gr. 50 to gr. 150 |
| Galbanum | gr. 10 to gr. 30 |
| Glycerinum | fl. drm. $\frac{1}{2}$ to fl. drs. 2 |
| Guaiaci Resina | gr. 10 to gr. 30 |
| Hydrargyri Iodidum rubrum | gr. $\frac{1}{16}$ to gr. $\frac{1}{4}$ |
| Hydrargyri Iodidum viride | gr. 1 to gr. 4 |
| Hydrargyrum corrosivum sublimatum | gr. $\frac{1}{16}$ to gr. $\frac{1}{8}$ |
| Hydrargyrum cum Creta | gr. 5 to gr. 20 |
| Infusum Anthemidis | fl. oz. 1 to fl. oz. 2 |
| Infusum Aurantii | fl. oz. 1 to fl. oz. 2 |
| Infusum Bucco | fl. oz. 1 to fl. oz. 2 |
| Infusum Calumbæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Caryophylli | fl. oz. 1 to fl. oz. 2 |
| Infusum Cascarillæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Catechu | fl. oz. 1 to fl. oz. 2 |
| Infusum Chiratæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Cinchonæ flavæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Cuspariæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Cusso | fl. oz. 4 to fl. oz. 8 |
| Infusum Digitalis | fl. oz. $\frac{1}{2}$ to fl. oz. 1 |
| Infusum Dulcamaræ | fl. oz. 1 to fl. oz. 4 |
| Infusum Ergotæ | fl. oz. $1\frac{1}{2}$ to fl. oz. 2 |
| Infusum Gentianæ compositum | fl. oz. $\frac{1}{2}$ to fl. oz. 1 |
| Infusum Krameriæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Lini | fl. oz. 2 to fl. oz. 4 |
| Infusum Lupuli | fl. oz. 1 to fl. oz. 2 |
| Infusum Maticæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Quassiæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Rhei | fl. oz. 1 to fl. oz. 2 |
| Infusum Rosæ acidum | fl. oz. 1 to fl. oz. 2 |
| Infusum Senegæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Sennæ | fl. oz. 2 to fl. oz. 4 |
| Infusum Serpentariæ | fl. oz. 1 to fl. oz. 2 |
| Infusum Uvæ Ursi | fl. oz. 1 to fl. oz. 3 |
| Infusum Valerianæ | fl. oz. 1 to fl. oz. 2 |
| Iodum | gr. $\frac{1}{8}$ to gr. $\frac{1}{2}$ |
| Ipecacuanha (as an expectorant or sudorific) | gr. 1 |
| — as a nauseant | gr. 1 to gr. 3 |
| — as an emetic | gr. 15 to gr. 30 |
| Jalapa | gr. 10 to gr. 30 |
| Jalapæ Resina | gr. 4 to gr. 8 |
| Kamela | gr. 30 to gr. 150 |
| Kino | gr. 10 to gr. 30 |
| Krameria | gr. 10 to gr. 30 |
| Liquor Ammoniæ Acetatis | fl. drm. 1 to fl. drs. 4 |
| Liquor Arsenicalis | min. 3 to min. 10 |
| Liquor Atropiæ | min. 4 to min. 12 |
| Liquor Calcis | fl. oz. $\frac{1}{2}$ to fl. oz. 3 |
| Liquor Calcis Chloratæ | min. 10 to min. 30 |
| Liquor Chlori | fl. drm. 1 to fl. drs. 2 |

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|---|---|
| Liquor Ferri Pernitratis | min. 10 to fl. drm. 1 |
| Liquor Morphiæ Hydrochloratis | min. 20 to fl. drm. 1 |
| Liquor Potassæ | min. 20 to fl. drs. 2 |
| Liquor Sodæ | min. 10 to fl. drm. 1 |
| Liquor Sodæ Arseniatis | min. 5 to min. 10 |
| Liquor Sodæ Chloratæ | min. 10 to min. 30 |
| Liquor Strychniæ | min. 6 to min. 30 |
| Lithiæ Carbonas | gr. 3 to gr. 6 |
| Lithiæ Citras | gr. 5 to gr. 10 |
| Lobelia (as an expectorant) | gr. 1 to gr. 5 |
| — as an emetic | gr. 10 to gr. 20 |
| Magnesia, or Magnesia levis (as an antacid) | gr. 10 to gr. 30 |
| — as a purgative | gr. 20 to gr. 60 |
| Magnesiæ Carbonas, or Magnesiæ Carbonas levis (as an antacid) | gr. 5 to gr. 20 |
| — as a purgative | gr. 10 to gr. 60 |
| Magnesiæ Sulphas | oz. ½ to oz. 1½ |
| Manna | oz. 1 to oz. 2 |
| Matica | gr. 30 to gr. 60 |
| Mistura Ammoniaci | fl. oz. ½ to fl. oz. 1 |
| Mistura Amygdalæ | fl. oz. 1 to fl. oz. 2 |
| Mistura Creasoti | fl. oz. 1 to fl. oz. 2 |
| Mistura Cretæ | fl. oz. 1 to fl. oz. 3 |
| Mistura Ferri composita | fl. oz. 1 to fl. oz. 2 |
| Mistura Guaiaci | fl. oz. ½ to fl. oz. 2 |
| Mistura Scammonii | fl. oz. 2 |
| Morphiæ Hydrochloras | gr. ⅛ to gr. ½ |
| Moschus | gr. 8 to gr. 15 |
| Myristica | gr. 20 to gr. 30 |
| Myrrha | gr. 10 to gr. 30 |
| Nux vomica | gr. 2 to gr. 3 |
| Oleum Amygdalæ | fl. drm. 1 to fl. drs. 4 |
| Oleum Anethi | min. 2 to min. 5 |
| Oleum Anisi | min. 2 to min. 5 |
| Oleum Anthemidis | min. 1 to min. 5 |
| Oleum Cajuputi | min. 2 to min. 10 |
| Oleum Carui | min. 1 to min. 5 |
| Oleum Caryophylli | min. 2 to min. 6 |
| Oleum Cinnamomi | min. 1 to min. 3 |
| Oleum Copaibæ | min. 10 to min. 20 |
| Oleum Coriandri | min. 2 to min. 5 |
| Oleum Crotonis | min. 1 to min. 3 |
| Oleum Cubebæ | min. 10 to fl. drm. 1 |
| Oleum Juniperi | min. 20 to fl. drm. 1 |
| Oleum Lavandulæ | min. 2 to min. 5 |
| Oleum Limonis | min. 2 to min. 5 |
| Oleum Menthæ piperitæ | min. 2 to min. 5 |
| Oleum Menthæ viridis | min. 2 to min. 5 |
| Oleum Morrhuæ | fl. drm. 1 to fl. oz. 1 |
| Oleum Myristicæ | min. 1 to min. 2 |
| Oleum Olivæ | fl. oz. 1 to fl. oz. 2 |
| Oleum Pimentæ | min. 2 to min. 5 |
| Oleum Ricini | fl. oz. ½ to fl. oz. 1½ |
| Oleum Rosmarini | min. 2 to min. 5 |
| Oleum Rutæ | min. 2 to min. 6 |
| Oleum Sabinæ | min. 2 to min. 6 |
| Oleum Terebinthinæ (as a diuretic) | min. 10 to fl. drm. 1 |
| — as an anthelmintic | fl. oz. ½ to fl. oz. 2 |
| Opium | gr. ¼ to gr. 5 |
| Oxymel | fl. drm. 1 to fl. drs. 4 |
| Phosphorus | gr. $\frac{1}{20}$ |
| Pilula Aloes Barbadensis | gr. 5 to gr. 10 |
| Pilula Aloes Socotrinæ | gr. 5 to gr. 10 |
| Pilula Aloes et Assafœtida | gr. 10 to gr. 20 |
| Pilula Aloes et Myrrhæ | gr. 10 to gr. 15 |
| Pilula Assafœtidæ composita | gr. 5 to gr. 20 |
| Pilula Calomelanos composita | gr. 5 to gr. 10 |
| Pilula Cambogiæ composita | gr. 10 to gr. 15 |
| Pilula Colocynthidis composita | gr. 5 to gr. 15 |
| Pilula Colocynthidis et Hyoscyami | gr. 8 to gr. 20 |
| Pilula Ferri Carbonatis | gr. 5 to gr. 10 |
| Pilula Ferri Iodidi | gr. 9 to gr. 10 |
| Pilula Hydrargyri (as an alterative) | gr. 2 or 3 |
| — as a sialagogue | gr. 5 often repeated |
| — as a purgative | gr. 5 to gr. 15 |
| Pilula Opii | gr. 3 to gr. 10 |
| Pilula Plumbi cum Opio | gr. 4 to gr. 8 |
| Pilula Rhei composita | gr. 10 to gr. 20 |
| Pilula Scammonii composita | gr. 10 to gr. 20 |
| Pilula Scillæ composita | gr. 5 to gr. 10 |
| Pimenta | gr. 10 to gr. 60 |
| Piper | gr. 5 to gr. 15 |
| Plumbi Acetas | gr. 1 to gr. 10 |
| Podophylli Resina | gr. ¼ to gr. 1 [gr. ⅛ to gr. ½] |
| Podophyllum | gr. 20 to gr. 30 |
| Potassæ Acetas | gr. 20 to gr. 60 |
| Potassæ Bicarbonas | gr. 10 to gr. 30 |
| Potassæ Carbonas | gr. 10 to gr. 30 |
| Potassæ Chloras | gr. 10 to gr. 30 |
| Potassæ Citras | gr. 20 to gr. 60 |
| Potassæ Nitras | gr. 10 to gr. 30 |
| Potassæ Sulphas | gr. 15 to gr. 60 |
| Potassæ Tartras | oz. ¼ to oz. ½ |
| Potassæ Tartras acida (as a diuretic) | gr. 20 to gr. 60 |
| — as a purgative | gr. 60 to oz. ½ |
| Potassii Bromidum | gr. 4 to gr. 10 |
| Potassii Iodidum | gr. 3 to gr. 10 |
| Pulvis Amygdalæ compositus | gr. 50 to oz. ¼ |
| Pulvis Antimonialis | gr. 3 to gr. 10 |
| Pulvis Aromaticus | gr. 10 to gr. 30 |
| Pulvis Catechu compositus | gr. 20 to gr. 40 |
| Pulvis Cretæ aromaticus | gr. 30 to gr. 60 |
| Pulvis Cretæ aromaticus cum Opio | gr. 10 to gr. 40 |
| Pulvis Ipecacuanhæ cum Opio | gr. 5 to gr. 15 |
| Pulvis Jalapæ compositus | gr. 20 to gr. 60 |
| Pulvis Kino cum Opio | gr. 5 to gr. 20 |
| Pulvis Rhei compositus | gr. 20 to gr. 40 |
| Pulvis Scammonii compositus | gr. 10 to gr. 20 |
| Pulvis Tragacanthæ compositus | gr. 20 to gr. 60 |
| Quiniæ Sulphas | gr. 1 to gr. 10 |
| Rheum | gr. 10 to gr. 20 |
| Sabina | gr. 5 to gr. 15 |
| Santonica | gr. 10 to gr. 60 |
| Santoninum | gr. 2 to gr. 6 |
| Sapo durus | gr. 5 to gr. 30 |
| Scammoniæ Resina | gr. 8 to gr. 10 |
| Scammonium | gr. 10 to gr. 15 |
| Scilla (as an expectorant) | gr. 1 |
| — as an emetic | gr. 5 to gr. 15 |
| Senega | gr. 10 to gr. 30 |
| Senna | gr. 30 to gr. 120 |

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|---|---|
| Serpentaria | gr. 10 to gr. 30 |
| Sinapis (as an emetic) | 1 teaspoonful to 1 tablespoonful |
| Sodæ Bicarbonas | gr. 10 to gr. 60 |
| Sodæ Carbonas | gr. 10 to gr. 30 |
| Sodæ Carbonas exsiccata | gr. 4 to gr. 10 |
| Sodæ Phosphas | oz. 1 to oz. 1½ |
| Sodæ et Potassæ Tartras | oz. ¼ to oz. 1 |
| Sodii Chloridum (as an emetic) | 2 or 3 tablespoonfuls |
| — as a cathartic | oz. ½ to oz. 1 |
| Spiritus Ætheris | fl. drm. 1 to fl. drs. 2 |
| Spiritus Ætheris Nitrosi | fl. drm. ½ to fl. drs. 2 |
| Spiritus Ammoniæ aromaticus | fl. drm. ½ to fl. drm. 1 |
| Spiritus Armoraciæ compositus | fl. drm. 1 to fl. drs. 2 |
| Spiritus Cajuputi | min. 20 to fl. drm. 1 |
| Spiritus Camphoræ | min. 10 to fl. drm. 1 |
| Spiritus Chloroformi | min. 20 to min. 40 |
| Spiritus Juniperi | min. 20 to min. 60 |
| Spiritus Lavandulæ | min. 20 to min. 30 |
| Spiritus Menthæ piperitæ | min. 10 to min. 30 |
| Spiritus Myristicæ | min. 10 to min. 20 |
| Spiritus Pyroxylicus rectificatus | min. 20 |
| Spiritus Rosmarini | min. 10 to min. 30 |
| Strychnia | gr. $\frac{1}{20}$ to gr. ¼ |
| Styrax præparatus | gr. 10 to gr. 20 |
| Succus Conii | min. 30 to fl. drs. 1½ |
| Succus Limonis | fl. drm. 1 to fl. drs. 4 |
| Succus Scoparii | fl. drm. 1 to fl. drs. 2 |
| Succus Taraxaci | fl. drm. 1 to fl. drs. 2 |
| Sulphur præcipitatum or Sulphur sublimatum (as an alterative or sudorific) | gr. 20 to gr. 30 |
| — as a purgative | gr. 60 to oz. ¼ |
| Syrupus Aurantii | fl. drm. 1 to fl. drs. 2 |
| Syrupus Aurantii Floris | fl. drm. 1 to fl. drs. 2 |
| Syrupus Ferri Iodidi | fl. drm. ½ to fl. drm. 1 |
| Syrupus Ferri Phosphatis | fl. drm. 1 to fl. drs. 4 |
| Syrupus Hemidesmi | fl. drm. 1 to fl. drs. 2 |
| Syrupus Limonis | fl. drm. 1 to fl. drs. 4 |
| Syrupus Mori | fl. drm. 1 to fl. drs. 2 |
| Syrupus Papaveris | fl. drm. 1 to fl. drs. 4 |
| Syrupus Rhœados | fl. drm. 1 to fl. drs. 2 |
| Syrupus Rosæ gallicæ | fl. drm. 1 to fl. drs. 2 |
| Syrupus Scillæ | fl. drm. 1 to fl. drs. 2 |
| Syrupus Sennæ | fl. drm. 1 to fl. drs. 2 |
| Syrupus Tolutanus | fl. drm 1 to fl. drs. 2 |
| Syrupus Zingiberis | fl. drm. 1 to fl. drs. 2 |
| Tamarindus | ad libitum |
| Terebinthina Canadensis | gr. 20 to gr. 30 |
| Tinctura Aconiti | min. 5 to min. 15 |
| Tinctura Aloes | fl. drs. 2 to fl. drs. 3 |
| Tinctura Arnicæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Assafœtidæ | fl. drm. ½ to fl. drs. 2 |
| Tinctura Aurantii | fl. drm. 1 to fl. drs. 2 |
| Tinctura Belladonnæ | min. 10 to min. 30 |
| Tinctura Benzoini composita | fl. drm. 1 to fl. drs. 2 |
| Tinctura Bucco | fl. drm. 1 to fl. drs. 4 |
| Tinctura Calumbæ | fl. drm. ½ to fl. drs. 2 |
| Tinctura Camphoræ cum Opio | fl. drm. 1 to fl. drs. 3 |
| Tintura Cannabis indicæ | min. 10 to fl. drs. 2 or more |
| Tinctura Cantharidis | min. 10 to fl. drm. ½ |
| Tinctura Capsici | min. 15 to min. 30 |
| Tinctura Cardamomi composita | fl. drm. 1 to fl. drs. 2 |
| Tinctura Cascarillæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Castorei | fl. drm. 1 to fl. drs. 2 |
| Tinctura Catechu | fl. drm. 1 to fl. drs. 2 |
| Tinctura Chiratæ | fl. drm. ½ to fl. drs. 2 |
| Tinctura Cinchonæ composita | fl. drm. 1 to fl. drs. 2 |
| Tinctura Cinchonæ flavæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Cinnamomi | fl. drm. 1 to fl. drs. 2 |
| Tinctura Cocci | fl. drm. ½ |
| Tinctura Colchici Seminis | fl. drm. ½ to fl. drs. 2 |
| Tinctura Conii Fructus | min. 20 to fl. drm. 1 |
| Tinctura Croci | fl. drm. ½ |
| Tinctura Digitalis | min. 10 to min. 40 |
| Tinctura Ergotæ (as a styptic) | min. 15 to min. 30 |
| — as an ecbolic | fl. drm. 1 |
| Tinctura Ferri Perchloridi | min. 10 to min. 30 |
| Tinctura Gallæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Gentianæ composita | fl. drm. ½ to fl. drs. 2 |
| Tinctura Guaiaci Ammoniata | fl. drm. ½ to fl. drs. 2 |
| Tinctura Hyoscyami | fl. drm. ½ to fl. drs. 2 |
| Tinctura Iodi | min. 5 to min. 20 |
| Tinctura Jalapæ | fl. drm. 1 to fl. drs. 4 |
| Tinctura Kino | fl. drm. 1 to fl. drs. 2 |
| Tinctura Krameriæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Lavandulæ composita | fl. drm. ½ to fl. drs. 2 |
| Tinctura Limonis | fl. drm. 1 to fl. drs. 2 |
| Tinctura Lobeliæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Lobeliæ ætherea | fl. drm. 1 to fl. drs. 2 |
| Tinctura Lupuli | fl. drm. 1 to fl. drs. 2 |
| Tinctura Myrrhæ | fl. drm. ½ to fl. drm. 1 |
| Tinctura Nucis vomicæ | min. 10 to min. 20 |
| Tinctura Opii | min. 10 to min. 40 |
| Tinctura Quiniæ composita | fl. drm. 1 to fl. drs. 2 |
| Tinctura Rhei (as a stomachic) | fl. drm. 1 to fl. drs. 2 |
| — as a purgative | fl. oz. ½ |
| Tinctura Sabinæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Scillæ | min. 15 to min. 30 |
| Tinctura Senegæ | fl. drm. ½ to fl. drs. 2 |
| Tinctura Sennæ | fl. drm. 1 to fl. drs. 4 |
| Tinctura Serpentariæ | fl. drm. 1 to fl. drs. 2 |
| Tinctura Stramonii | min. 10 to min. 20 |
| Tinctura Tolutana | min. 30 to fl. drm. 1 |
| Tinctura Valerianæ | fl. drm. 1 to fl. drs. 4 |
| Tinctura Valerianæ Ammoniata | fl. drm. ½ to fl. drm. 1 |
| Tinctura Zingiberis | fl. drm. ½ to fl. drm. 1 |
| Tragacantha | gr. 10 to gr. 30 |
| Trochisci Acidi Tannici | 2 to 5 lozenges |
| Trochisci Bismuthi | 2 to 5 lozenges |
| Trochisci Catechu | 2 to 5 lozenges |
| Trochisci Morphiæ | 2 to 5 lozenges |
| Trochisci Morphiæ et Ipecacuanhæ | 2 to 5 lozenges |
| Trochisci Opii | 2 to 5 lozenges |
| Uva Ursi | gr. 20 to gr. 30 |
| Valeriana | gr. 20 to gr. 60 |
| Veratria | gr. $\frac{1}{10}$ to gr. ⅙ |

| | |
|---|---|
| Vinum Aloes . . . . | fl. drm. 1 to fl. drs. 2 |
| Vinum Antimoniale (as a diaphoretic or expectorant) . . . . | min. 10 to min. 30 |
| — as a nauseant . . | fl. drm. 1 to fl. drs. 2 |
| — as an emetic . . | fl. oz. ½ |
| Vinum Colchici . . . | fl. drm. ½ to fl. drm. 1 |
| Vinum Ferri . . . . | fl. oz. ½ to fl. oz. 1 |
| Vinum Ipecacuanhæ (as a diaphoretic or expectorant) . . . . | min. 10 to min. 40 |
| Vinum Ipecacuanhæ (as an emetic) . . . . | fl. drs. 2 to fl. drs. 4 |
| Vinum Opii . . . . | min. 10 to min. 40 |
| Zinci Acetas (as a tonic) | gr. 1 to gr. 2 |
| — as an emetic . . | gr. 10 to gr. 20 |
| Zinci Oxidum . . . | gr. 2 to gr. 10 |
| Zinci Sulphas (as a tonic) . . . . . | gr. 2 to gr. 10 |
| — as an emetic . . | gr. 20 to gr. 30 |
| Zinci Valerianas . . . | gr. 1 to gr. 3 |
| Zingiber . . . . . | gr. 20 to gr. 30 |

# INDEX.

# ERRATA.

Page 202, *for* Antimonii Sulphuratum, *read* "Antimonii Sulphuretum."
" 359, *for* Pilula Aloes et Myrrhæ, *read* "Pilulæ, &c."
" 451, *before* Chenopodium Anthelminticum, *insert* "*Chenopodiaceæ.* The Goosefoot Family."
" 790, *for* Citras Limetta, *read* "Citrus Limetta."
" 875, *for* hydrastis, *read* "*Hydrastis.*"

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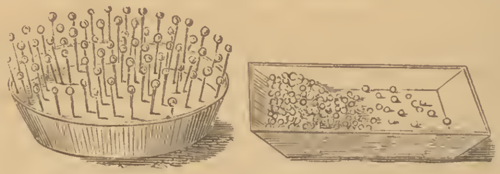

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