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THE STUDENT'S GUIDE  
TO  
MATERIA MEDICA

BY THE SAME AUTHOR.

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THE STUDENT'S GUIDE  
TO  
MATERIA MEDICA  
AND THERAPEUTICS

IN ACCORDANCE WITH THE BRITISH PHARMACOPŒIA

BY

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1882

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TO

E. HEADLAM GREENHOW,

M.D., F.R.C.P., F.R.S., ETC. ETC.

CONSULTING PHYSICIAN TO, AND FORMERLY LECTURER ON THE  
PRINCIPLES AND PRACTICE OF MEDICINE AT, THE  
MIDDLESEX HOSPITAL,

THIS SMALL VOLUME

*Is Inscribed*

WITH THE SINCERE RESPECT OF

THE AUTHOR.



PREFACE  
TO  
THE SECOND EDITION.

---

THIS work is intended as a Guide for Students while attending a Course of Lectures on the *Materia Medica* and Preparations of the British Pharmacopœia, and as an aid to them in preparing for their examinations.

The Author assumes that every student reads the British Pharmacopœia, that he may learn the history, characters, and mode of preparation of the various medicines official therein.

This Guide is to supplement the Pharmacopœia in the student's hands. Its object is to give an account of the chemical composition of medicines, to explain the chemistry of the processes by which remedies are prepared, and of the re-actions which occur in applying tests of their purity. The processes of volumetric analysis are explained as far as this can be done in a work which is necessarily of limited dimensions.

In treating of the uses of medicines the Author has endeavoured to avoid burdening the memory with that which may be uncertain and unsettled. General principles of therapeutics have been mainly

regarded, and the information given has been of as definite and positive a character as possible.

The general arrangement is, the Author trusts, such as will induce continuous reading rather than merely an effort to learn by heart such facts as are likely to be required for examination purposes alone.

The Chemical Nomenclature corresponds with that of the Pharmacopœia. The symbols  $\text{g}$  and  $\text{z}$ , representing 20 and 60 grains respectively, are introduced a few times, as they are employed by prescribers, and should therefore be understood. Questions put by students after hearing a Lecture have suggested to the Author the utility of adding a very short Glossary of Therapeutical Terms.

Among the works to which the Author is indebted for information in preparing this book, he would specially name Pereira's "Materia Medica;" the "Materia Medica" of Dr. Phillips; Garrod's "Materia Medica and Therapeutics;" Wood and Bache's "United States' Dispensatory;" Horatio Wood's "New Remedies;" Attfield's "Chemistry;" Squire's "Companion to the British Pharmacopœia;" and the excellent "Manuals of Therapeutics" by Drs. Farquharson, Ringer, and Waring.

61, WELBECK STREET, CAVENDISH SQUARE.

May, 1882.

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# PART I.

## INORGANIC MATERIA MEDICA.

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### CHAPTER I.

#### OXYGEN.—NITROGEN.—HYDROGEN.—WATER.—NITROUS OXIDE.—NITRIC ACID.

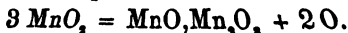
Of the sixty-three known elementary bodies, there are thirty-three mentioned in the British Pharmacopœia (p. 401), and of this number twenty-three are metallic, and ten non-metallic bodies, four of these last being the gases Oxygen, Hydrogen, Nitrogen, and Chlorine.

The first three of these gases, in their free state, are of not much pharmaceutical interest, and a brief notice of their chief properties will be sufficient.

**Oxygen.** O = 16.

Oxygen gas can be obtained by the action of heat on the chlorate of potash, or on the black oxide of manganese. The chlorate of potash ( $KClO_3$ ) readily parts with its oxygen; and when the process is complete, chloride of potassium ( $KCl$ ) remains as the sole residuary product. If, however, the action be arrested when only one-third of the oxygen gas has been driven off, then some perchlorate of potassium ( $KClO_4$ ) remains in the residuary salt.

Oxide of manganese when heated gives up about one-ninth of its weight of oxygen. Here is a formula showing the decomposition—



Pure oxygen is a colourless gas, heavier than air, and it forms about one-fifth of the air we breathe, It is slightly soluble in water, about 3 vols. in 100 at common temperatures; but under pressure water will absorb a larger proportion of the gas, and thus is prepared the beverage known as Oxygen Water.

**Physiological Effects of Oxygen Gas.**—When oxygen gas is allowed to play on the surface of a wound it produces a burning sensation, and after a while increase of inflammation and suppuration. It acts as a stimulant, and indolent congestion around a sore is seen to disappear under its influence. In senile and phagedænic gangrene a local bath of oxygen has proved valuable at the hands of Drs. Paul and Laugier. When pure oxygen is inhaled by the lungs the pulse and respiration are quickened; and in the instances of animals confined in oxygen, after an hour or more symptoms of exhaustion come on and the animal slowly dies, though the oxygen in the chamber be not exhausted.

Oxygen is absorbed rapidly when injected into the cavity of the pleura; and when inhaled it is, up to a certain extent, absorbed by the blood; the alkalinity of the blood favouring its absorption.

Inhalation of oxygen has been employed in a variety of diseases, and in some with much success. Trousseau has used inhalations of oxygen with good results in cases of extreme anæmia, or bloodlessness, where tonics and chalybeates seemed powerless. One girl, in an extreme state of exhaustion and debility, with a pulse of 130, inhaled in the course of the day 5 or 6 litres (a litre is  $35\frac{1}{4}$  fluid oz.). Her pulse soon fell to 80, and in two days she was able to leave her bed. In these cases one of the first effects of the inhalation of the oxygen was a sense of agreeable coolness at the chest.

Dr. Sieveking has used oxygen inhalation with benefit in cases of asphyxia from coal gas. In gout, *with copious deposit of lithates*, a mixture of 1 part

of oxygen with 4 of air has been used by Dr. Goolden with the effect of relieving the gout and clearing the urine of the lithate deposit. Berenger Ferrièrè has observed inhalation of oxygen to diminish the amount of sugar in the urine of saccharine diabetes. It appears, therefore, that oxygen, diluted with air, may be used in cases of asphyxia, and of imperfect oxygenation of the system, with a reasonable prospect of doing good.

In Barth's apparatus the gas is kept in a compressed state in a metal bottle ; and for use, some of this compressed gas is mixed with a given quantity of air in the inhaling bag.

Dr. Andrew H. Smith has used from one to two gallons daily of oxygen for inhalation in some chronic diseases, and as much as eighty or one hundred gallons in cases of urgent suffocative dyspnoea. The reddening of the tissues, usually observed as an effect of oxygen inhalation, Dr. Smith believes to be due to the oxygen mixing with those impurities which are formed in an atmosphere which has been breathed for some time, for when these impurities were absorbed and removed the reddening effect of the oxygen on the tissues was not observed. Urea and uric acid, as well as the amount of colouring matter, were all diminished in the urine of those who inhaled oxygen.

### Hydrogen. $H = 1$ .

Hydrogen, combined with oxygen, forms water; two atoms of hydrogen with one of oxygen as  $H_2O$  representing the formula for water.

Hydrogen gas is lighter than air, and is inflammable; as a gas it has no medicinal interest. Hydrogen can be obtained by decomposing water by the action of granulated zinc and dilute sulphuric acid. Among the articles employed for testing in the Pharmacopœia, we find  $H_2S$ , sulphuretted hydrogen, a gas obtained by the action of sulphuric acid on the



sulphide of iron, very soluble in cold water, and of use as a test for metals, as will be seen hereafter.

### **Aqua. Water. H<sub>2</sub>O.**

The employment of water in Pharmacy will be treated of in the first section on the Organic Materia Medica; a few words will here be said on the—

#### **Therapeutical Uses of Water.**

Cold affusion of water over the face and chest is a good method for the revival of persons who have fainted, or are overcome by sunstroke, asphyxia, or such poisons as chloroform, opium, or hydrocyanic acid. Forcibly slapping the chest and face with a cloth dipped in cold water aids greatly to stimulate reflex action, and so excite respiration in such cases as those above indicated.

The continuous application of a piece of lint dipped in water over a bruised or inflamed part tends to check bleeding and prevent inflammation. The lint should be kept cool by arranging that cold water drop continually upon it (irrigation), or small pieces of ice may be laid over the lint, care being taken that the cold be not so intense and prolonged as to cause gangrene and death of the part, as seen in cases of frostbite.

In fevers, with increase of body temperature to 103°–105° F. and delirium, excellent results can be obtained by applying cloths, wrung out of cold water, round the patient, and cooling these as they become heated by sprinkling them with pounded ice. The patient must be watched, and if faintness come on the process should be at once arrested. Blankets and warm coverings must on no account be placed over the wet sheet, for if this be done the patient will be kept in a warm fomentation, and great faintness and exhaustion be the result.

The treatment of enteric, or typhoid, fever by the *cold bath* has proved eminently successful in Germany,

and also in this country at the hands of Dr. Collie, Dr. Cayley, and others.\*

To enter fully into this subject would be quite incompatible with the necessary limits of this small work, but the following facts given to me by Mr. Douty, Dr. Cayley's assistant at the Middlesex Hospital, are worth attention.

The average temperature of the bath is usually 75° F., but may vary, according to the effect produced, from 70° to 65° F. Fifteen minutes is about the time for a patient to remain in the bath, but a much shorter immersion will often decidedly reduce the temperature. The old plan of bathing the patient in water at 100° F., and then gradually cooling the bath down to 80°, 70°, 65°, is now quite superseded by the "cold plunge," by which much time is saved, and the effect on the patient is better than when he has been put through the graduated bath, which at times, from first to last, took up as much as two hours.

Dr. Cayley finds the fifteen minute plunge bath to help the pulse, and lessen any tendency to pulmonary congestion; it acts indeed as a true tonifying agent.

In cases of typhoid fever with hæmorrhage from the bowels, the cold bath is not advisable. I am able to testify to the excellence of the cold water treatment in cases of severe rheumatic fever with delirium and high temperature, and in some inflammatory affections of the chest the bath has answered well in the hands of Juergensen, and more lately of Dr. Finlay in Middlesex Hospital.

The temperatures of ordinary baths may be thus given :—

Cold Bath	from 33° to 60° F.
Cool Bath	„ 60° „ 75°
Temperate Bath	„ 75° „ 85°
Tepid Bath	„ 85° „ 92°
Warm Bath	„ 92° „ 98°
Hot Bath	„ 98° „ 112°

\* *Croonian Lectures at College of Physicians, 1880.*

The cool and cold baths should not be employed when the person is perspiring, nor yet when cold and shivery, or very soon after a meal, and their employment should be followed by a feeling of warmth and reaction, which can be promoted by friction of the surface and moderate exercise after the bath.

Compresses of soft linen wrung from cold water, applied across the abdomen under the dress, are often valuable in subduing visceral irritation, and promoting regular action of the bowels, in the case of persons who have been overdoing themselves with drastic aperients for the cure of constipation.

Water taken internally acts as a diluent to the juices of the stomach and to the blood, and appears to promote tissue change, so that much water drinking by weakly persons tends to cause wasting and nervous irritability in the system. Large quantities of cold water should not be taken with the food, but after a full meal a tumblerful of pure cold water gradually taken will stimulate the contractions of the stomach, disperse wind, and dilute any undue acidity. From the supposed efficacy of cold water as a drink in gouty or arthritic complaints, Heyden termed it *Arthritifugum Magnum*. Dr. Hancocke, in 1723, also spoke of cold water as *Febrifugum magnum*, it being, in his opinion, the best agent for the cure of fever.

**Hot Baths** act as stimulating agents to the cutaneous circulation, and tend to promote relaxation of the muscles and sweating.

Immersion of the body in a bath at 98° to 100° is employed by the surgeon in order to facilitate the reduction of a hernia. In kidney diseases, and renal dropsy after scarlet fever, hot baths given daily are most valuable in determining the flow of blood to the skin and so relieving internal congestion.

In infantile convulsions a warm bath at 98° is a most useful curative measure, cold water being at the *same* time applied by a sponge to the head.

*Warm poultices* and fomentations are very soothing

and useful applications over an inflamed organ, as the lung in pneumonia, or over the bowels in enteritis or dysentery.

The steam of warm water inhaled acts as a soothing agent in acute inflammation of the tonsils and larynx. Various inhalers may be used, and one of the best appears to me to be Dr. Lee's steam draught inhaler, through which a current of steam, the velocity and temperature of which can be controlled, is thrown well into the throat without the necessity of effort on the part of the patient.

Always after using a steam inhalation great care must be taken not to take cold. At the Victoria Park Hospital for Diseases of the Chest, we give these steaming inhalations to patients after they have retired to bed for the night, so as to guard against their taking cold by subsequent exposure.

When poultices or hot flannel fomentations are applied during the course of an inflammation, great care is necessary that these are not allowed to grow cold on the patient, and when they are changed care also is necessary to guard against a sudden chill of the warm surface. Warm water taken internally acts as an emetic, and is useful to promote vomiting in cases of poisoning.

### Peroxide of Hydrogen. $H_2O_2$ .

This body was first prepared by Thénard in 1818; its formula is that of water plus an additional equivalent of oxygen; hence it has been called oxygenated water. Peroxide of hydrogen is a colourless liquid, sp. gr. 1.452; it easily gives up oxygen, and hence it has been employed in medicine as an oxidizing agent. The solution of peroxide of hydrogen in ether forms ozonic ether—a stable compound, which in doses of  $\mathfrak{m}\times$  to  $\mathfrak{m}\text{xxx}$ , has been given in strumous disease, and also in diabetes. Given for diabetes, it appears to check the excessive amount of urine secreted, and to *diminish* the amount of sugar therein, but it

has no curative action over the malady. In conjunction with tincture of guaiacum ozonic ether is used as a test for blood, forming with it a blue colour.

#### Nitrogen. N = 14.

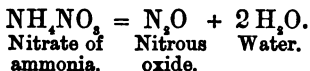
Nitrogen gas forms 79 per cent. of the air we breathe; it serves as a diluent to the oxygen of the air.

Combined with oxygen nitrogen forms acids, and with hydrogen it forms the important alkaline base ammonia. With oxygen, also, nitrogen combines to form the nitrous oxide, laughing gas, ( $N_2O$ ), much used as an anæsthetic.

#### Nitrous Oxide Gas. $N_2O$ .

This gas is obtained by heating nitrate of ammonia, AMMONIÆ NITRAS of B. P., in a flask or bolthead at a temperature of 400° F.

The salt is decomposed into nitrous oxide gas and water thus—



By passing the escaping gas through a solution of caustic potash in one bottle, and a solution of proto-sulphate of iron in a second, carbonic acid and certain noxious oxides of nitrogen are absorbed, and a pure gas fit for inhalation is collected.

Under strong pressure of fifty atmospheres nitrous oxide can be condensed into a colourless fluid, and by simultaneous cooling it solidifies.

The liquid nitrous oxide, in small wrought iron bottles, each of which is equal to fifteen gallons of gas, can be conveyed to the house of any one who requires its use.

**Inhalation of Nitrous Oxide.**—Nitrous oxide may be inhaled from a gasometer standing over water, *or, when required for use at the house of the patient,*

some of the liquid may be allowed to escape as gas from the iron bottle into an inhaling bag.

The inhaler should fit well over the mouth and nostrils of the patient, so as to prevent admixture of air, and should be provided with inspiratory and expiratory valves. Care should be taken that the patient has not very recently taken food, and all constricting articles of dress should be removed.

The inhaler should be adjusted, and before the valve be turned to exclude air and admit the gas, the patient should be told to breathe freely and deeply; when he has done this a few times the gas is turned on, and in twenty or thirty seconds the face will be seen to become somewhat livid; with sensation of throbbing in the head, there will also be twitching of the limbs, and latterly the respiration becomes slow and snoring, and the pupil slightly dilated, while the conjunctiva loses its irritability; thus the stage of anæsthesia is reached, and any small and short operation can be performed without the patient feeling any pain. From 63 to 81 seconds is the average time required to produce anæsthesia, and recovery usually is complete in from 100 to 120 seconds. Wide dilatation of the pupil, failure of pulse, or stoppage of breathing, are all signs of danger; and if any of these be observed the inhaler must be at once removed and fresh air freely admitted, and, if need be, artificial respiration should be used. A little nervous excitement occurs sometimes when the patient is recovering from the effects of the inhalation, but it soon passes off.

**Mode of Action of Nitrous Oxide.**—Nitrous oxide acts as an anæsthetic by preventing oxidation of the nervous centres. During its inhalation carbonic acid is found in the expiratory products, though very little decomposition of the nitrous oxide takes place.

Nitrous oxide destroys life by paralysing the medulla and stopping the respiration, while chloroform kills by *paralysing* the cardiac ganglia and stopping

the action of the heart. Artificial respiration usually restores an animal apparently dead from inhaling nitrous oxide, if the heart be still pulsating, but when the heart has ceased to beat the chances of recovering the patient are very small. When the interval since stoppage of breathing was first noted, and the adoption of artificial respiration does not exceed thirty seconds recovery is nearly always possible.

After death from nitrous oxide the lungs are found moderately gorged with blood, and both sides of the heart contain blood.

A solution of nitrous oxide gas in water is known as Searle's oxygenous water, and has been drunk as a stimulating beverage.

#### Acids of Nitrogen. Nitrous Acid $\text{HNO}_2$ , Nitric Acid $\text{HNO}_3$ .

Nitric acid in combination forms salts known as Nitrates ; and if a nitrate, as for example the nitrate of potash or of soda, be strongly heated, oxygen gas is driven off and a nitrite remains, the acid radical of which is  $\text{HNO}_2$  or nitrous acid.

Nitrous acid exists as an impurity in common nitric acid ; it possesses disinfecting powers ; but, as an acid, is not used in pharmacy, though certain nitrites are of importance.

Nitrite of potash exists in the nitre, or sal prunella, balls made by fusing nitrate of potash, and then casting it in round moulds. These nitre balls are a common remedy for some forms of sore throat.

In the Spiritus Ætheris Nitrosi of the B. P. (sweet spirit of nitre) there occurs the nitrite of ethyl ( $\text{C}_2\text{H}_5\text{NO}_2$ ).

Another nitrite recently used in medicine is the nitrite of amyl ( $\text{C}_5\text{H}_{11}\text{NO}_2$ ).

Nitrites are distinguished from nitrates by the property they possess of liberating iodine from its combinations.\*

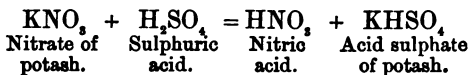
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\* *Attfield's "Chemistry,"* 4th edition, p. 355.

**Nitric Acid**,  $\text{HNO}_3$ , contains 70 per cent. of real acid.

The Pharmacopœia directs that this acid be prepared from nitrate of potash or nitrate of soda by distillation with sulphuric acid and water.

The decomposition that takes place is thus represented—



Nitric acid distils over and acid sulphate of potash is the residuary product.

*Properties.*—The nitric acid of the B. P., prepared as above, has a specific gravity of 1.42, and contains 70 per cent. of real acid ( $\text{HNO}_3$ ), or 60 per cent. of  $\text{N}_2\text{O}_5$ , anhydrous nitric acid, more correctly called nitric anhydride. It is a definite hydrous acid, fumes in the air, and distils at  $250^\circ \text{F}$ . without change and without leaving any residue. When poured on copper filings nitric acid is decomposed and red vapours of certain lower oxides of nitrogen are produced. If the acid be diluted with water, and then added to the copper, colourless nitric oxide gas ( $\text{N}_2\text{O}$ ) is evolved, which forms red fumes of nitric peroxide ( $\text{N}_2\text{O}_4$ ) on coming in contact with the oxygen of the air. If the nitric oxide be caused to pass through a solution of protosulphate of iron, ferrous sulphate, it causes the solution to become dark in colour, from being converted into the persulphate of iron or ferric sulphate. It is on this reaction of free nitric oxide on the ferrous salts that the method of testing for a nitrate with a few drops of sulphuric acid and a fragment of ferrous sulphate depends. To the solution of the nitrate a crystal of ferrous sulphate is added and then a few drops of sulphuric acid; soon a dark brown colour around the crystal shows that it is being converted into a ferric sulphate. Nitric oxide is set free from the nitrate by the hydrogen of the sulphuric



acid, and the sulphuric radical thus set free converts the ferrous into ferric sulphate.

Pure nitric acid should be free from traces of sulphuric and hydrochloric acids, in which case it gives no white precipitate with solution of chloride of barium or nitrate of silver.

The strength of the nitric acid of the B. P. is measured by means of the volumetric solution of soda.

1000 grain measures of this solution contain one equivalent in grains of hydrate of soda, *i.e.*, forty grains, and this will therefore neutralize one equivalent in grains of any monobasic acid; so as ninety grains by weight of nitric acid contains one equivalent, or sixty-three grains, of real nitric acid; this amount of acid will be exactly neutralized by 1000 grains, or one equivalent, of the hydrate of soda.

#### Acidum Nitricum Dilutum.

This acid is prepared by diluting six fluid ounces of the strong acid with water till the mixture, at temperature of 60°, measures thirty-one fluid ounces.

The dilute acid has sp. gr. 1.101. Six fluid drachms correspond to 54 grains of anhydrous nitric acid and are neutralized by 1000 grain measures, or one equivalent, of the soda solution, corresponding to 14.95 of anhydrous acid.

5 minims = 1 minim of the strong acid.

Dose 10 to 30 minims.

**External Uses of Nitric Acid.**—As a caustic the strongest nitric acid is of much value. This strongest acid, *Acidum Nitricum Fumans*, contains 93 per cent. of real nitric acid, and is an orange-coloured unstable liquid, sometimes called anhydrous nitric acid.

It is used by surgeons to destroy small vascular growths, such as cutaneous nævi. Care should be taken not to let the acid touch the surrounding healthy skin, and the best instrument to use is a piece of wood cut to a point; with this the acid can be thoroughly *applied to the vascular spot*, and there is not that

danger of a drop of acid running down over the sound skin than there is when a glass rod is used. Dr. Houston, of Dublin, and Mr. Henry Smith, of London, have had much success in destroying hæmorrhoidal tumours by the application of strong nitric acid.

Strong nitric acid is at times used to destroy sloughing and phagedænic action when extending in an ulcer.

The surrounding skin being protected by a layer of lard, and the ulcerous surface dried, the strong acid is mopped well over it with a pledget of lint at the end of a rod; a good deal of pain results, but when the eschar formed by the acid is removed a healthy granulating surface remains, the phagedænic action having been arrested.

Nitric acid lotion, with or without the addition of an equal quantity of tincture of opium, is an excellent dressing for sloughing ill-conditioned ulcers. Fifty to sixty minims of the acid to one pint of water for a lotion.

Dr. Ringer observes, that syphilitic warts and condylomata may be painlessly removed by keeping them constantly moist with a lotion of sixty minims of dilute nitric acid mixed with half a pint of water. The pain of piles is also relieved by this same lotion.

Nitric acid falling on the healthy skin causes always a distinctive yellow stain, due to the formation of xanthoproteic acid. Hydrochloric acid produces a white stain on the skin, and sulphuric acid chars and blackens it.

Nitric acid is a well-known test for albumen, which it coagulates at once.

**Internal Uses of Dilute Nitric Acid.**—Nitric acid, like the other acids, acts internally as a refrigerant and tonifying agent, quenching thirst and keeping up the moisture of the mouth, hence its value in many febrile complaints.

Nitric acid appears to exercise specific action on the mucous surfaces. In some forms of ulceration of the

cavity of the mouth and throat it is a very good medicine, comparable here with the chlorate of potash.

In many forms of dyspepsia with imperfect action of the liver nitric acid proves useful, and may be advantageously combined with some of the bitter infusions. A tendency to phosphatic deposit in the urine is a great indication for the use of nitric acid.

In chronic bronchitis nitric acid is often of service; and it has been used with benefit in whooping-cough. In dysentery, and in inveterate syphilis, nitric acid has been commended; in the latter complaints a favourite way of giving the acid is in the compound decoction of sarsaparilla. For internal use the dilute nitric acid is always employed: the dose ranges from 10 to 20 minims well diluted. Five-minim doses of the acid may be given with great benefit in the chronic diarrhoea of young children. The teeth can be protected from the action of this, as well as of other mineral acids, by sucking the medicine through a glass tube.

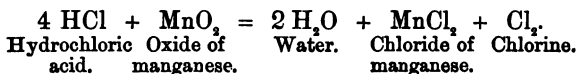
## CHAPTER II.

**CHLORINE.—HYDROCHLORIC ACID.—NITRO-HYDRO-  
CHLORIC ACID.—IODINE.—BROMINE.**

**Chlorine.** Cl = 35.5.

Chlorine gas can be readily obtained from common salt (chloride of sodium NaCl), more than one-half of which is chlorine. When black oxide of manganese, salt, and sulphuric acid are mixed and warmed, chlorine gas is evolved. Hydrochloric acid is set free from the salt by the sulphuric acid, and this being decomposed by the oxide of manganese yields free chlorine.

The Pharmacopœia directs us to prepare chlorine by means of the oxide of manganese and hydrochloric acid. In this process the hydrochloric acid is decomposed by the oxide of manganese, according to the following formula—



Chlorine is a heavy yellow gas, with a suffocating odour, very soluble in water ( $2\frac{1}{2}$  vols. in 1 at  $60^\circ$ ), and is used in its gaseous form chiefly as a disinfectant and bleaching agent.

Diluted chlorine has been tried as an inhalation in some pulmonary affections, but for this purpose it has fallen now into disuse. Under the influence of chlorine inhalations the urine acquires bleaching properties.

The Pharmacopœia preparation of chlorine is the **Liquor Chlori**, made by passing chlorine gas into cold water. The solution thus obtained, when fresh, has a yellowish green colour, and quickly bleaches

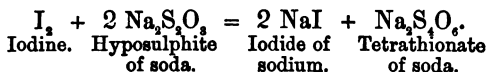
a solution of sulphate of indigo. Sp. gr. 1.003. Evaporated it leaves no solid residue. If kept exposed to the light, the solution loses its yellow colour, and becomes acid, from the chlorine combining with the hydrogen of the water to form hydrochloric acid (HCl), while oxygen is liberated.

The bleaching property of chlorine is referred to this oxidizing effect which it produces in the presence of water, for dry chlorine does not bleach.

Chlorine will set iodine free from its combinations, and on this property is based the process for the volumetric estimation of the strength of the liquor chlori.

When 20 grains of iodide of potassium, dissolved in one ounce of distilled water, are added to 439 grains (one fluid ounce) of liquor chlori, the mixed solution acquires a deep red colour, from the iodine set free; this requires for its discharge 750 grain measures of the volumetric solution of hyposulphite of soda, corresponding to 2.66 grains of chlorine.

The chemical change is thus explained. When iodine and hyposulphite of soda react, two atoms of iodine remove two of sodium from two molecules of the hyposulphite, tetrathionate of soda being formed, and the solution losing colour.



One thousand grain measures of the volumetric solution of the hyposulphite of soda contain 24.8 grains of the hyposulphite, or one-tenth of a combining equivalent (248 being the equivalent of hyposulphite of soda), and will correspond to one-tenth of an equivalent of iodine (127 being the combining equivalent of iodine), or to one-tenth of an equivalent of chlorine.

The proportion of chlorine in the liquor chlori is equal to the amount of iodine that it sets free from

the solution of iodide of potassium, so that knowing the amount of iodine set free, we know the amount of chlorine required to set it free.

Liquor chlori has been used as a lotion to fetid suppurating wounds with advantage by M. Hervieux. One part of liq. chlori to five parts of water may be used as a lotion, wash, or gargle, in cases of ptyalism and ulcerated throat.

Liq. chlori may be given internally in doses of  $x$  to  $mxx$  well diluted, in cases of malignant fevers, as an antiseptic.

**Vapor Chlori.**—The chlorine inhalation of the B. P. is obtained from the calx chlorata, or chlorinated lime, moistened with water. The vapour of chlorine that rises may be inhaled, and also may serve as a convenient deodorizer and disinfectant.

The real product given off by the hypochlorite of calcium, or chlorinated lime, moistened with water, is hypochlorous acid ( $HClO$ ); this acid speedily decomposes into free chlorine and chloric acid, so that practically a vapour of chlorine is obtained.

The unpleasant odour of sulphuretted hydrogen,  $H_2S$ , is at once destroyed by vapour chlori—the chlorine taking the hydrogen of the  $H_2S$  to form  $HCl$ , while sulphur is set free as a deposit.

### **Acidum Hydrochloricum. HCl.**

Acidum Muriaticum Purum, Ph. Edin. and Dub. Chlorine and hydrogen combine to form an acid gas, chloride of hydrogen or hydrochloric acid. This gas is very soluble in water, and a 31·8 per cent. solution forms the hydrochloric acid of the B. P. The old name of this acid was muriatic acid and spirit of salt, in allusion to its derivation from salt or chloride of sodium.

The Pharmacopœia instructs us to prepare the acid by acting on chloride of sodium with dilute sulphuric acid; thus a sulphate of soda is the residuary product, while hydrochloric acid gas passes off, and is absorbed in a vessel of cold water.

When properly made, the pure acid should be colourless, and of sp. gr. 1·16, fuming in the air, and forming, with solution of nitrate of silver, a white chloride of silver, soluble in ammonia, but insoluble in nitric acid.

The strength of the acid is measured by means of the volumetric solution of soda. When pure it gives no precipitate with chloride of barium, indicating absence of sulphuric acid, and it does not tarnish a piece of bright copper when boiled with it; thus showing the absence of arsenic, and other metallic impurities. To ascertain the absence of sulphurous acid, a little of the hydrochloric acid is warmed with a piece of zinc in a test tube; pure hydrogen gas is given off, unless there be sulphurous acid present, when sulphuretted hydrogen is formed—a gas known by its foul smell, and by its forming with lead a black sulphuret, so that if a piece of paper wet with solution of acetate of lead be held near the mouth of the test tube, the sulphuretted hydrogen will blacken it, while sulphur in a free state may be deposited in the acid which is in the tube.

**Acidum Hydrochloricum Dilutum** is the strong acid diluted with water. It has a sp. gr. 1·052. Six drachms contain one equivalent, or 36·5 grains of hydrochloric acid,  $3\frac{1}{4}\text{m}$  equal  $1\text{m}$  of the strong acid.

**Uses of Hydrochloric Acid.**—The strong acid is a powerful caustic; it stains the skin white, and produces troublesome ulceration. Mixed with honey the strong acid has been used locally in diphtheria by the late Dr. Hillier.

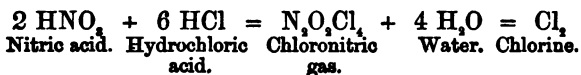
Internally the diluted acid is employed—the dose being  $\text{m}\text{x}$  to  $\text{m}\text{xxx}$  well diluted.

It is a useful medicine in cases of atonic dyspepsia, where there are no inflammatory symptoms. A feeling of heaviness and weight at the stomach after food is often greatly relieved by  $\text{m}\text{x}$  to  $\text{m}\text{xv}$  of acid. hydrochlor. dil., given in water, or in some *bitter infusion*.

In low fevers, with petechial eruption on skin, hydrochloric acid is useful. It aids much to quench the thirst of patients with fever, and may be given for this purpose in dose of  $\mathfrak{mxx}$  in water, or in infusion of cascarilla bark, as advised by the late Dr. Graves, of Dublin.

Dr. Duncan has found hydrochloric acid very serviceable in correcting gouty dyspepsia. In the dyspepsia and debility of phthisis it has been much commended by Dr. Cotton.

**Acidum Nitro-hydrochloricum Dilutum.**—Nitric acid three, and hydrochloric acid four parts, are mixed and set at rest for twenty-four hours in a partially closed bottle before adding the twenty-five parts of water. A decomposition of the acids takes place, and free chlorine is formed in the mixture with chloronitric gas thus—



These two acids containing free chlorine, form a liquid possessing power to dissolve gold, and form a chloride of gold; hence the acid mixture is called aqua regia.

**Uses of Dilute Nitro-hydrochloric Acid.**—This acid may be given internally in doses of  $\mathfrak{mv}$  to  $\mathfrak{mxx}$ ;  $\mathfrak{mxx}$  contain  $\mathfrak{mjss}$  nitric acid, and  $\mathfrak{mij}$  of hydrochloric acid. It is a tonic and stomachic, with special action on the liver, rousing this organ to a more free secretion of bile; hence the acid is of great value in cases of dyspepsia with defective action of the liver; it is most efficacious when given in pure water, but often it is combined with taraxacum, as this medicine also tends to promote hepatic action. In the chronic hepatitis and congested liver, of hot climates, baths of nitro-hydrochloric acid are employed. Dr. Scott, Sir J. M'Grigor, and Sir Ranald Martin speak most highly of these baths in cases of chronic liver disease.



A mixture is made of fl.  $\zeta$ ij of hydrochloric acid with fl.  $\zeta$ ij of nitric acid, and fl.  $\zeta$ v of water; of this mixture fl.  $\zeta$ ij may be added to one gallon of water as the proportion for the bath. The general bath is not often used, but the above is employed as a foot-bath for ten or fifteen minutes at a time. If much irritation of skin follow the bath, then the amount of acid must be diminished. Metallic vessels must not be used, and the sponges and towels employed should be placed in water after use, to prevent corrosion.

A flannel compress, wet with the lotion made of fl.  $\zeta$ vij of the dilute acid in one gallon of water, may be worn round the body; this may be kept on constantly, and has been found of service in chronic dysentery with liver disorder.

In cases of dyspepsia, with tendency to oxalic and phosphatic deposits in the urine, the nitro-hydrochloric acid is a good remedy.

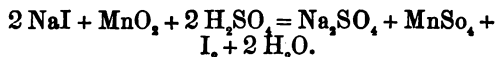
#### Iodine. Iodum. I = 127.

This element, named from the violet colour ( $\iota\acute{o}\delta\eta\varsigma$ ) of its vapour, is largely diffused in Nature. It is found in various waters, as in those of Woodhall, in Lincolnshire; Purton in Wiltshire; Kreuznach in Rhenish Prussia; existing usually as an iodide of sodium or magnesium.

The chief source of iodine is from the "kelp," or ash resulting from the burning of sea-weeds, gathered chiefly on the coasts of Ireland, Scotland, and some parts of France. After most of the salts have been removed by crystallization from the solution or lixiviation of the kelp in water, a liquor remains containing the iodides of sodium, potassium, and magnesium.

This liquor is mixed with sulphuric acid, when it gives off sulphurous acid and sulphuretted hydrogen, and sulphate of soda separates in crystals. Hydriodic acid is formed in the solution, and after adding binoxide of manganese the mixture is heated in a

leaden retort, and the product condensed in a series of glass globe receivers. Iodine is then obtained as a sublimate, and is purified by resublimation. The decomposition of the iodide of sodium is thus represented—



Iodine occurs in scales or laminæ with metallic lustre.

The vapour of iodine is the heaviest aëriiform body known; and iodine, if pure, can be volatilized without leaving any residue. In re-subliming crude iodine any cyanide of iodine that may be present comes off early in the process in slender, colourless prisms, having a pungent odour. Iodine dissolves freely in alcohol and ether, forming brown solutions. One part of iodine will dissolve in 7000 of water; but if the iodine remains some time in contact with water some hydriodic acid (HI) is formed, and this acts as a solvent of the iodine. In alkaline solutions iodine dissolves freely, forming iodides and iodates. Solutions of the iodides will act as simple solvents for iodine without combining with it. Glycerine also will dissolve iodine.

The action of iodine, on hyposulphite of soda has been explained at p. 16.

Free iodine is readily detected by cold starch mucilage, with which it forms a blue iodide of starch; a body that loses its blue colour when it is heated, recovering it again on cooling. This test is so delicate that it will detect 1 of iodine in 450,000 times its weight of water.

When iodine is in combination it must be set free by means of chlorine, or nitrous acid, before the blue starch reaction can be obtained.

Iodine can be separated from other compounds by means of chloroform. Thus, if solution of iodide of

potassium be mixed in a test-tube with chlorine water, the brown iodine will be set free ; then, by adding chloroform this free iodine can be dissolved, the heavy chloroform sinking to the bottom of the tube as a violet-coloured liquid holding the iodine in solution.

**Uses of Iodine.**—Iodine in solution when applied to the skin stains it yellow, and produces more or less irritation, according to the strength of the solution and the frequency with which it is applied. After a while the cuticle desquamates, and if the application be persisted with a blister may be formed, which on healing is apt to leave a permanent and objectionable mark on the surface.

Iodine is absorbed rapidly by the skin, as well as by the mucous surfaces of the body, and can be readily detected in the urine by means of chlorine\* water and starch.

Enlarged and indurated glands are commonly treated by application of iodine solution or tincture, with a view to promoting their absorption ; and for the same purpose iodine is applied round joints that are chronically enlarged by deposit, or by effusion within the capsule.

In phthisis and pleuritic effusion tincture of iodine is painted over the chest wall as an absorbent.

As an antiseptic, tincture of iodine, containing one of iodine in forty, is applied to diphtheria of the throat, and also to some forms of sloughing sore, with decided advantage.

The solution of iodine in glycerine, in the proportion of five grains to one ounce, is a good application in chronic affections of the throat and larynx.

The **Linimentum Iodi** of the B. P. is a very strong solution of iodine with camphor and iodide of potas-

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\* In using this test the chlorine must be very gradually added, or a colourless chloride of iodine will be formed and *free iodine fail to appear.*

sium in rectified spirit, it contains one of iodine in nine, and may be used as a paint to apply to indolent glandular enlargements.

The *Unguentum Iodi* (1 of iodine in 31), is a dark-brown ointment, and useful as a means of applying iodine locally by friction. For the same purpose also the liniment of the iodide of potassium and the unguent of iodide of potassium of the B. P. may be used; neither of these preparations stains the skin brown, while their action is similar to that of the preparations of crude iodine.

Iodine in solution is injected sometimes into the tunica vaginalis of the testicle, in order to cause adhesive obliteration of the sac, and thus prevent any further effusion of serous fluid in the form of hydrocele. A radical cure of the hydrocele is thus effected. In cases of effusion into joints, as well as into the cavity of the pleura, a weak solution of iodine has been employed as an injection. Dr. Ringer says that four or five grains of iodine and iodide of potassium in one pint of water will make a solution that may be safely employed as an injection in cases of chronic pleurisy with fetid purulent collection in the chest.

Iodine is used as an application to the mucous surface in the form of vapour.

*Vapor Iodi* of the B. P. is obtained by warming one drachm of tincture of iodine with one ounce of water, and the vapour inhaled is of use in some obstinate catarrh affections of the throat and nasal passages. I have tried the vapor *iodi* in cases of summer catarrh or hay asthma, but have never seen any marked benefit result from its use. In one case the effect of the inhalation was to produce excessive drowsiness. In another case great facial *oedema*, lasting for twenty-four hours, seemed to result from the iodine inhalation. In more than one case of chronic enlargement of the liver I have employed the vapor *iodi* with great success.

**Internal administration of Iodine.**—Solid iodine is rarely given internally, as it is likely to produce irritation of the stomach. The dose would be a quarter to half of a grain.

When it is desirable to administer free iodine internally, the **Liquor, or Tinctura, Iodi**, may be used. The first of these preparations is identical in composition with Lugol's solution of iodine, and consists of iodine dissolved by means of iodide of potassium. It is a deep red liquor (1 iodine in 24), and may be given in a dose of three to ten minims well diluted.

**Tinctura Iodi** or tincture of iodine, made with rectified spirit and iodide of potassium, contains one of iodine in forty, and may be given internally as an absorbent in a dose of five to twenty minims. Usually iodine is given internally as iodide of potassium, ammonium, or iron. These compounds will be found described hereafter, though their medicinal properties, being due to iodine as the active ingredient, are here mentioned.

The iodides of potassium and ammonium are given as absorbents, and are valuable medicines in cases of serous effusions in various parts of the body, as the head or chest; promoting also the absorption of chronic indurations and glandular enlargements. In that enlargement of the thyroid gland in the neck known as bronchocele, iodine and iodides are largely and successfully employed.

In chronic rheumatic pains in the muscles, tendons, and bones, iodide of potassium is valuable; especially so if the pains are severe at night when the patient is warm in bed.

In the pains due to syphilis iodine is a very certain remedy, and large syphilitic nodosities melt away speedily under a course of iodide of potassium, in doses of ten to twenty grains three times a day.

Iodine helps to eliminate such metallic poisons as lead and mercury from the system, forming with

them soluble compounds which pass away in the urine.

In asthma, chronic bronchitis, and aneurysm, the iodides are often of great service, especially when these complaints are connected with gout, rheumatism, or syphilis in the system.

In some forms of vomiting and dyspepsia, with defective salivary secretion, iodides have proved useful. There are indeed few chronic diseases in which iodide of potassium has not been tried as a remedy.

The iodide of iron is used in cases of phthisis, and also in strumous cases, where a pale, bloodless state indicates the use of chalybeate remedies. The syrup of iodide of iron is given in doses of ten to sixty minims, this last quantity being equivalent to rather over four grains of iodide of iron.

The iodides of potassium and ammonium are given in doses varying from two to ten or twenty grains, three times a day, with bark, sarsaparilla, or in plain water with ammonia added, as this is thought to aid the action of the iodide. When iodides or iodine are administered for too long a time, or in too large a dose, frontal headache, with running from the eyes and nose, is produced, a condition known as "iodism." A pustular eruption (acne) is also observed at times as an effect of the iodides on the cutaneous system.

#### **Bromum. Bromine. Br = 80.**

This element is a dark, brownish-red liquid, very volatile, and of a disagreeable odour; hence its name, from the Greek, *βρῶμος* which means a stench.

Bromine occurs in Nature as bromide of magnesium in the bittern, or uncrystallizable residue of sea water after the salt has been removed. A current of chlorine passed through the bittern combines with the magnesium, and sets the bromine free. If the liquor containing the liberated bromine be shaken with ether, the ether rises up to the top of the solution holding the bromine in solution.

When a solution containing a bromide is distilled with binoxide of manganese and sulphuric acid, then bromine is set free, just as iodine is when a solution of an iodide is distilled in a similar way with manganese and sulphuric acid.

Bromine is a dark volatile brownish-red liquid, and boils at  $117^{\circ}$ . With starch it forms a yellow colour. In commercial bromine there is sometimes found an oily liquid, as an impurity, which is a bromide of carbon.

**External Uses of Bromine.**—Bromine has been used as a lotion by Dr. Goldsmith, of America, in cases of hospital gangrene, with great success.

Ten to forty minims of bromine to one pint of water make a good antiseptic lotion.

A solution of two minims of bromine in sixty of alcohol has been applied by Dr. Routh in cases of uterine cancer.

Landolfi, of Naples, has tried the chloride of bromine as a caustic in cancer, and also in small doses—gr. one-tenth internally—in this same disease, but with no very marked results.

The inhalation of the vapour of bromine is very dangerous, and has caused nearly fatal asphyxia.

**Internal Uses of Bromine.**—Pure bromine has been given in drop doses, by Magendie and others, in cases where iodine had been tried without benefit as an absorbent and anti-strumous agent.

M. Pourché gave six minims of bromine in three ounces of distilled water, in twenty-four hours, without doing harm to the patient.

Owing to the irritating action of pure bromine, it is found best in practice to administer this body in combination, and the two saline combinations of bromine most generally used are the bromides of potassium and ammonium.

These salts will be described in the chapters on Potash and Ammonia. Their therapeutic powers will be here briefly detailed.

The bromides were originally used as absorbents in cases where iodides did not agree ; producing that state of running from the eyes and nose known by the name iodism. Bromides given in large doses do not produce this condition of the mucous surfaces, provided the salt used be pure, and free from contamination with any iodine salts. Prolonged administration may cause eruption of acne (Garrod).

The bromides of potassium and ammonium are now chiefly employed in affections of the nervous system. In excitability and sleeplessness bromide of potassium, in doses of gr. x to xx, may be advantageously tried, and will often succeed in inducing sleep when opium and other narcotics have entirely failed.

In many spasmodic and convulsive disorders of the nervous systems, as for example, in epilepsy, hysteria, chorea, pertussis, spasmodic asthma, &c., bromide of potassium or ammonium has been given with signal benefit.

In epilepsy the fits can be kept off for months by a persistent course of bromide of potassium, in doses of gr. x to xx, three times in the day.

I believe the bromide acts best when there is a manifest tendency of blood to the head ; it may act as a depleting agent in cases of cerebral plethora and congestion. Hence it causes sleep by inducing a certain amount of anæmia of the brain ; this being the condition of brain on which healthy sleep seems to depend, as has been shown in the researches of Mr. Durham.

The long-continued use of the bromides appears sometimes to impair the nutrition of the brain, and produce a semi-idiotic state. If the bromide be an anæmiating agent to the brain, we can conceive the possibility of this.

In cases of sexual excitement bromide of potassium is a very satisfactory and efficient sedative, acting here as an aphrodisiac.

In *menorrhagia* of active character, due to undue



determination of blood to the uterus, bromide of potassium is a valuable remedy.

Bromide of potassium will act well often in combination with iron in cases where it is desirable to obtain the tonic effect of iron without much excitement.

**Hydrobromic Acid (HBr)** is thus prepared according to the formula of Dr. Fothergill: 10oz. 6drms. 28grs. of bromide of potassium dissolved in 2 pints of water; 13oz. 1dr. 37grs. tartaric acid in 2 pints of water, mix the solutions and filter from the deposit of acid tartrate of potash.

The dose of this solution is xxx to lx minims in water with syrup. The acid is a good solvent for quinine, and prevents headache when thus combined with the quinine.

In rheumatic headache attended by noises in the ears, I have found xx minim doses of hydrobromic acid in water decidedly beneficial.

## CHAPTER III.

**CARBON.—SULPHUR.—BORON.—PHOSPHORUS.****Carbon, C = 12.**

The element Carbon exists in its purest form in the diamond, a body which, when burnt in oxygen gas, becomes entirely converted into carbonic acid gas.

Three varieties of carbon are found in the B. P. :

1. **Carbo Ligni**, or Wood Charcoal; 2. **Carbo Animalis**, or bone black; and 3. **C. Animalis Purificatus**, this last being bone-black, from which the earthy salts have been removed by hydrochloric acid.

**Carbo Ligni**, or Wood Charcoal, is best made from beech or hazel, by burning these woods with imperfect access of air. Good wood charcoal, when entirely consumed, should not leave more than 2 per cent. of ash.

Powdered wood charcoal is used as an absorbent and antiseptic; it will absorb various gases in varying proportions. Thus, one volume of boxwood carbon absorbs 1.75 volumes only of hydrogen gas, but 90 volumes of gaseous ammonia. The gases so absorbed are condensed within the pores of the charcoal.

Charcoal will also absorb colouring matter from various solutions, such as infusion of litmus, log-wood, or brown sugar.

**Cataplasma Carbonis.**—**Carbo ligni** is used in preparing the charcoal poultice, or **cataplasma carbonis** of the B. P., and this poultice is applied to offensive sloughing sores as a deodorizer and disinfectant.

Internally, wood charcoal is given with great advantage to correct flatulence in the stomach and bowels, and to absorb acrid matters. Given thus, the

charcoal seems to have a tonifying action on the mucous membrane, for troublesome bleeding piles can be cured by the administration of one teaspoonful of vegetable charcoal in water every evening.

Charcoal, as a remedy for fetid gaseous collections in stomach and bowels, was first introduced by Mr. James Bird. Mr. Bragg, of Wigmore Street, has brought the preparation of the charcoal in powder, biscuits, and lozenges, to great perfection.

The French charcoal lozenges, prepared by Belloc, are composed of finely levigated charcoal, held together by very strong pressure. They are a very pleasant and efficacious form for the administration of the charcoal.

In giving powdered charcoal it is best to place the powder in a wineglass, and moisten it with brandy or whisky, then to pour in the water, and it will be seen that the whole mixes up well and forms a draught that is easily taken.

2. **Carbo Animalis** is the residue left on burning bones without access of air. In the process a brown ammoniacal liquor, called bone-spirit, distils off from the bones with a fetid inflammable gas. Animal charcoal contains 90 per cent. of earthy salts; it is largely used by sugar refiners as a decolorizing agent.

**Carbo Animalis Purificatus** is the bone-black deprived of its earthy salts by digestion in dilute hydrochloric acid.

This charcoal is less powerful as a decolorizer and deodorizer than the bone-black, but it possesses marked power of abstracting active principles from their solutions. It will absorb strychnia, morphia, and aconitia from any mixture, and the gastric juice does not seem to be able to separate the alkaloid from its combination with the charcoal. Observing this property, Dr. Garrod has proposed *carbo animalis purificatus* as an antidote in cases of poisoning by any of the alkaloids above named. Dr. Rand, of Philadelphia, states that a poisonous dose of any one of the

alkaloids may be swallowed with impunity if mixed beforehand with a due proportion of purified animal charcoal.

**Carbonic Acid.**—Carbon combines with oxygen to form a gas commonly termed Carbonic Acid,  $\text{CO}_2$ . The present formula for true carbonic acid is  $\text{H}_2\text{CO}_3$ .

Carbonic acid gas is heavier than air, and in its pure state is poisonous, causing when inhaled spasmodic contraction of the glottis and consequent asphyxia.

When mixed with air and breathed this gas produces vertigo and somnolency.

M. Herpin found that the inhalation of carbonic acid gas mixed with 80 or 90 per cent. of air produced gradual anæsthesia.

Locally a current of carbonic acid gas has proved of use as a sedative in painful affections of the uterus. Dr. Clutterbuck, Sir James Simpson, and others have proved the value of this gas when thus used.

In obstinate vomiting and gastric irritability carbonic acid given in the form of the effervescing draught has a most soothing and sedative effect.

If there be acidity of the stomach the draught may be so arranged as to contain a slight excess of alkali.

In the Pharmacopœia is found a *Liquor Sodæ Effervescens*, which is a true soda water, made by passing washed carbonic acid gas into a solution of bicarbonate of soda under a pressure of seven atmospheres.

This liquor forms an agreeable drink in cases of gastric irritability, where there is not much flatulence present.

At times milk is given in conjunction with soda water, and when given thus is grateful to the stomach and easy of digestion.

At times such tonics as solutions of iron, or of quinine, are given mixed in effervescing soda or potash water, for the purpose of enabling these tonics to remain quietly on the stomach.

In prescribing extemporaneous effervescing mixtures it is well to remember, that—

17 grs. of citric acid, or half a fluid oz. of fresh lemon juice	}	neutralize	{	25 grs. bicarbonate of potash, 20 grs. bicarbonate of soda, 15 grs. carbonate of ammonia, 13 grs. carbonate of magnesia.
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The combining a little syrup with the draught aids to prolong the effervescence.

Carbonic acid is supposed to be the active ingredient in the Yeast Poultice, or Cataplasma Fermenti of the B. P.

This poultice is made by mixing yeast with flour and water at 100°. It is applied, when cool, to fetid and sloughing sores as an antiseptic and stimulant.

It requires renewal twice or thrice in the day, and sometimes will cause much pain.

#### Sulphur. S = 32.

Sulphur or Brimstone is a very ancient element, mentioned by Homer, and also by Moses.

Sulphur occurs in all the kingdoms of Nature: it is found as a sulphurous oil, sulphide of allyl, in many cruciferous plants, as mustard, horseradish, &c.

In the minerals known as sulphurets, or sulphides, sulphur occurs abundantly; and by heating iron or copper pyrites the sulphur can be sublimed off and collected. Sulphur so obtained is very apt to contain arsenic.

What is called *native* or *virgin sulphur* occurs in two forms: either imbedded in rocks (*common native sulphur*) or produced by sublimation (*volcanic native sulphur*).

In America a mine or bed of native sulphur has been found in California, near the borax-lake, being in some parts 100 feet thick. In Sicily too sulphur beds are found lying in blue clay.

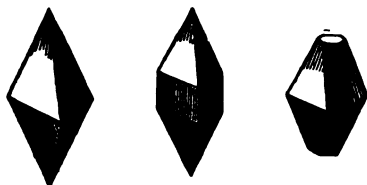
Volcanic native sulphur of great purity has been obtained from the Solfatara, a kind of half extinct volcano near Naples. Native sulphur is purified by

a rough fusion and distillation. The fused sulphur is known as crude sulphur, and comes over chiefly from Messina in Sicily in blocks or masses, which, if good, do not contain more than 3 per cent. of impurity in the shape of earthy matter. This sulphur is free from arsenic.

Formerly the crude sulphur was purified by fusion and decantation from such impurities as might settle in the fusion pot. At present the process followed is that of distillation and sublimation. When heated, sulphur boils and distils as a liquid, and this distillate, collected into masses or cast into moulds, forms refined sulphur, roll sulphur, or lump sulphur. When the vapour of the heated sulphur is received into a chamber instead of in the condensing vessel, then sublimated sulphur (flowers of sulphur) deposits on the walls of the chamber as a yellow powder, mixed sometimes with small crystals of sulphur; these appear to form where the small globules of freshly sublimed sulphur are exposed to the light.

Sulphur crystallizes in two forms, and is therefore said to be dimorphous. It crystallizes in acute

FIG. 1.



rhombic octahedrons from its solution in sulphide of carbon, and this crystal occurs also as the form of native sulphur, apparently formed by sublimation. (Fig. 1.)

When melted and slowly cooled, sulphur takes the crystalline form of the oblique rhombic prism. (Fig. 2.)

In prescribing  
tures it is —

17 gr  
acid, o  
oz. of  
juice

When sulphur is heated to 340° it becomes viscid; and by increasing the heat the viscosity increases, until the temperature rises to between 400° and 500°.

FIG. 2.



t

If while in this state the sulphur be suddenly cooled by pouring it into water it remains quite soft and ductile. In this state it is called *soft amorphous sulphur* or *plastic sulphur*.

Pure sulphur is soluble in boiling oil of turpentine. The *Oleum Sulphuratum* of the Ph. Lond., 1824, is a solution of sulphur in olive oil, in the proportion of one of sulphur to eight of oil.

The bisulphide of carbon will also dissolve sulphur readily.

In the Pharmacopœia we find—

1. Sulphur Sublimatum (Flowers of Sulphur).
2. Sulphur Præcipitatum (Lac Sulphuris, or Milk of Sulphur); and as a compound, the Sulphuris Iodidum.

Pure sublimed sulphur burns with a blue flame when heated to 300°, is tasteless, odourless, and free from acidity. Solution of ammonia agitated with it, and filtered, does not, on evaporation, leave any residue. This shows it to be free from sulphide of arsenic.

The sulphur preparations are all made from sublimed sulphur.

Sulphur Lotum, or Washed Sulphur, is *S. sublimatum*, washed with water to get rid of all traces of acid.

**Sulphur Præcipitatum.**—(Milk of Sulphur, or Precipitated Sulphur), is made by boiling flowers of sulphur with solution of lime. A sulphide and hyposulphite of calcium are thus formed in the solution, and by adding hydrochloric acid these compounds are

decomposed, chloride of calcium being formed, and the milk of sulphur separating as a precipitate. There is not much odour of sulphuretted hydrogen, as the hyposulphite of calcium that is formed, by subsequent decomposition, yields sulphur and sulphurous acid; this last decomposes the sulphuretted hydrogen. Good precipitated sulphur is found free from any crystals of sulphate of lime, and is therefore entirely volatilized by heat. The presence of sulphate of lime shews that sulphuric, in place of hydrochloric, acid has been used to precipitate the sulphur.

**Uses of Sulphur.**—Sulphur is used externally as an ointment. The **Unguentum Sulphuris** contains 1 oz. of sublimed sulphur to 4 oz. of lard.

Sulphur ointment is specially employed as a cure for the itch. This disease is kept up by the presence of the itch insect, or *Acarus scabiei*. The female insect burrows in the skin, and deposits its eggs; and in order to expose her to the action of the sulphur ointment, the skin surface should be first thoroughly cleansed by friction with soft soap and water. After the soap is washed off the sulphur ointment must be well rubbed in, and seldom fails of curing the disease.

M. Hardy recommends an ointment of 2 parts of sulphur, 1 of carbonate of potash, and 8 of lard; this is a strong and somewhat irritating application, apt to cause eczematous eruption on the skin. In cases of troublesome acne of the skin, where stimulation is required, Dr. Tilbury Fox reckons sulphur to be of use. A lotion may be made with sulphur ℥j, glycerine ℥j, water Ojss, and this applied two or three times a day.

Powdered sulphur, sprinkled on flannel, has been used with advantage as a local application over muscles affected with rheumatism. Sulphur has been applied to diphtheria of the throat with beneficial results.

**Internal Employment of Sulphur.**—Sulphur, taken internally, acts as a laxative, diaphoretic, and resolvent. It is supposed to be rendered soluble by the *soda of the bile*, and it increases the amount of



sulphur compounds secreted in the urine. Sulphur is eliminated also by the lungs and skin, and any silver carried about the person becomes blackened by the action of the sulphur, it being eliminated in the form of sulphuretted hydrogen. Sulphur acts on the muscular coat of the intestine as a laxative, producing soft motions. In affections of the lower bowel, piles, fissure, and prolapsus, sulphur is much used as a mild laxative, the precipitated sulphur being usually prescribed in these cases in combination with magnesia or acid tartrate of potash.

Dr. Graves and others have found sulphur in dose of 5 to 10 grains three times a day, useful in chronic bronchitis. In phthisis also it has been employed in the same way, and also in asthma. In very chronic rheumatic affections sulphur is often administered, in combination with resin of guaiacum; 10 to 20 grains of each for one dose.

In palsy from lead or mercury sulphuretted baths, and sulphur internally, are both much commended.

In some of the disorders attendant on the cessation of menstruation in women; headache, nervous perturbation, &c., Dr. Tilt speaks favourably of sulphur as a remedy. In angina pectoris powdered sulphur has at times been of service in relieving pain.

The dose of the sublimed or of the precipitated sulphur ranges from 10 to 60 grains.

The **Confectio Sulphuris** contains sulphur with acid tartrate of potash, 1 of sulphur in  $2\frac{1}{4}$  of confection. The dose is 60 to 120 grains. It is a preparation somewhat apt to gripe, and hardly superior to a mixture of sulphur with magnesia.

**Sulphuris Iodidum.**—4 of iodine and 1 of sulphur warmed together readily combine, and a black iodide of sulphur,  $S_2I_2$ , is formed.

The iodide of sulphur, like iodine, is soluble in glycerine. It does not dissolve in water, but when boiled therein is decomposed, iodine passing off as *vapour* and a residue of sulphur remaining.

Iodide of sulphur, 30 grs., with 1 oz. of lard forms the *Unguentum Sulphuris Iodidi*; an ointment used in acne and other chronic skin affections, where there is not much active inflammation. In *Tinea capitis* Dr. Donovan has obtained excellent results from the use of this ointment.

The author has used powdered iodide of sulphur, with five parts of powdered liquorice-root, as an application to enlarged tonsils.

Sulphur combines with chlorine to form a chloride. This chloride, mixed with sulphur, forms a canary-yellow powder, the hypochloride of sulphur, used sometimes for the preparation of an ointment.

**Combinations of Sulphur with Oxygen.**—In the *Pharmacopœia* two acid compounds of sulphur with oxygen are found.

1. **Sulphurous Acid**; 2. **Sulphuric Acid.**

Sulphurous acid gas, in strict chemistry sulphur anhydride,  $SO_2$ , is formed when sulphur is burned; and, formed in this way, is of use as a disinfecting agent.

The *Pharmacopœia* directs that sulphurous acid be made by the deoxidation of sulphuric acid by means of charcoal.

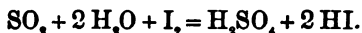
Sulphuric acid and carbon, or charcoal, are heated together, and the following change occurs—



The carbonic acid gas escapes, and the sulphurous acid gas is absorbed by cold distilled water, and thus the solution of sulphurous acid is obtained. The B. P. solution is a 9·2 per cent. solution; and 34·7 grains by weight of this solution, mixed with dilute starch mucilage, do not acquire a permanent blue colour with the volumetric solution of iodine until 1000 grain measures of the latter have been added.

By this process the strength of the sulphurous acid is ascertained, for the sulphurous acid converts the

iodine which is added into hydriodic acid, HI, while it is itself converted into sulphuric acid. Thus—



As soon as the whole of the sulphurous has become sulphuric acid, then iodine, if added, remains as free iodine, and turns blue with the starch mucilage.

Sulphurous acid very rarely corresponds in strength to this volumetric test. 1·020, Mr Squire states, is the sp. gr. of the best sulphurous acid, instead of 1·040, as given in the B. P.

Pure sulphurous acid scarcely precipitates with barium chloride; but if chlorine water be added, hydrochloric acid is formed, and the sulphurous acid oxidized into sulphuric acid, and then a white precipitate of sulphate of barium appears.

**Uses of Sulphurous Acid.**—Sulphurous acid is notably destructive of vegetable life; and in diseases of the skin caused by fungoid sporules the acid may be applied as a lotion with every prospect of a cure resulting.

In various forms of Tinea capitis, due to fungoid growths, a lotion of one of sulphurous acid to five of water may be applied.

The same lotion is good for Pityriasis versicolor.

The acid, diluted with one or two of water, may be inhaled as a spray from an atomizer in cases of very chronic sore throat and loss of voice. Dr. Dewar, of Kirkaldy, has met with much success from this employment of the acid.

**Internal Uses of Sulphurous Acid.**—In typhoid fever sulphurous acid has been a good deal commended. Infants may take from three to five minims of the acid in syrup and water, and to adults twenty to thirty minims may be given every four hours.

In dyspepsia with vomiting of acid frothy fermenting matters containing torulæ and that peculiar fungus of the stomach, the *Sarcina ventriculi*, sul-

phurous acid, in doses of twenty or thirty minims, is a valuable medicine.

Instead of the acid, the sulphite of soda, in doses of five to ten grains, is often given; this salt, acted on by the acid of the stomach, evolves sulphurous acid. The medicine should be given before each meal.

Sulphurous acid diluted, with water and glycerine, makes a good wash for the mouth when affected with aphthæ and aphthous ulceration.

#### Acidum Sulphuricum. $H_2SO_4$ .

When sulphur is burnt in the air, sulphurous acid gas is formed, which with water forms  $H_2SO_3$ , or sulphurous acid. This, plus another equivalent of O, makes  $H_2SO_4$ , or sulphuric acid.

To obtain sulphuric acid sulphur is burnt in contact with nitre in a leaden chamber. The combustion of the nitre evolves nitric oxide, NO; this gas by taking oxygen from the air becomes  $NO_2$ , or nitric peroxide, and the sulphurous acid reducing this  $NO_2$  back again to NO, converts itself into sulphuric acid by means of the oxygen taken from the nitric peroxide.

$SO_2$ , sulphuric anhydride, has been isolated as a white crystalline solid, having no acid properties till in contact with water, when it at once forms  $H_2SO_4$ , true sulphuric acid.

The strong fuming sulphuric acid of Nordhausen in Saxony, made by distilling green vitriol, or sulphate of iron, gives off the vapour of  $SO_3$ , sulphuric anhydride, when heated. The sulphuric acid of the B. P. contains 79 per cent. of anhydrous sulphuric acid. Sulphuric acid is an oily liquid with sp. gr. 1.843. It becomes very hot when mixed with water, and forms, with soluble salts of barium, a very insoluble white precipitate of sulphate of baryta.\*

Evaporated it leaves no residue, and when solution

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\* Sulphate of barium,  $Ba_3SO_4$ , of the new nomenclature.

of ferrous sulphate is poured over the surface no purple colour is produced, proving absence of nitric acid.

Diluted with water it is unchanged by a current of sulphuretted hydrogen, if it be free from arsenic and lead.

The strength of the acid is ascertained by means of the volumetric solution of soda.

Diluted in certain proportion with water it forms **Acidum Sulphuricum Dilutum** of the B. P., and digested with rectified spirit, ginger, and cinnamon bark, it forms the **Acidum Sulphuricum Aromaticum**.

**Uses of Sulphuric Acid.**—The strong acid has a great affinity for the elements of water; it cauterizes the animal tissues powerfully, producing a black eschar after it has been some time in contact with a tissue.

Mixed with charcoal it has been used by surgeons as a caustic to destroy small growths, or infecting syphilitic sores.

*Internally* the aromatic and dilute sulphuric acids are used.

They act as refrigerants and tonics, with some amount of astringency.

Hence both these acids are of use to check undue secretion. In the profuse sweating of phthisis, and in passive diarrhoea, without much pain, they are valuable remedies.

In hæmoptysis, and hæmorrhage generally, the Acid. Sulph. Dilut. in the infusion of roses often acts very satisfactorily.

One oz. (℥.ʒj) of the Inf. Rosæ Acidum contains six minims of dilute sulphuric acid.

The aromatic sulphuric acid is best given in plain water, and thus administered is of great service in epidemic diarrhoea of choleraic type.

The usual dose of the aromatic and dilute sulphuric acid is five to twenty minims properly diluted. In a case of alkaline urine, Dr. Dickinson found sixty

minim doses of sulphuric acid well diluted render the urine acid. Many other acids when given did not equal the sulphuric in this respect. (*Path. Trans.*, vol. **xxi**. p. 399.)

Decoction of logwood is turned brown by sulphuric acid; hence, in appearance, it is not a good vehicle for the acid.

In poisoning by sulphuric acid, the best antidotes are such alkalies as chalk or magnesia.

### Boron. B = 11. Borax.

Is an element somewhat allied to carbon; it is only of interest as the radical of Boracic Acid.

This acid, in the form of metaboracic acid,  $\text{HBO}_2$ , exists in the jets of steam that issue from the earth in some parts of Tuscany.

The boracic acid of Tuscany, when saturated with soda, evolves very considerable quantities of pure ammonia. Thus is obtained the purest form of ammonia, known as volcanic ammonia (Squire).

**Borax.**—Combined with soda boracic acid forms the Sodæ Biboras,  $\text{Na}_2\text{B}_4\text{O}_{10}$ ,  $10\text{H}_2\text{O}$ , or Borax, an alkaline salt imported from India.

Borax is sometimes given internally, in a dose of 5 to 40 grains, as an emmenagogue.

Its chief use is in the form of the **Glycerinum Boracis**, borax 1, glycerine 4, and of the **Mel Boracis**, borax 1, honey 7.

Either of these preparations diluted with water forms an excellent wash or gargle for sore mouth with aphthæ. The **Glycerinum Boracis** may be given in dose of  $\frac{1}{2}$  to  $1\frac{1}{2}$  drachms.

### Boracic Acid. $\text{H}_2\text{BO}_3$ .

When an acid is added to borax, decomposition takes place, and boracic acid separates in crystals.

Ordinary boracic acid,  $\text{H}_2\text{BO}_3$ , dissolved in alcohol, forms one of the test solutions of the pharmacopœia.

Its use is to detect the adulteration of powdered rhubarb with turmeric.

Turmeric turns red with boracic acid, while with pure rhubarb there is no change of colour produced.

The best way to study this test is to add to any borate a few drops of hydrochloric acid, immerse the turmeric paper in the liquid, warm it to dissipate the acid, and the paper will become brown red in colour. Paper soaked in pure infusion of rhubarb will not be thus affected by boracic acid. Lint dipped in a saturated solution of boracic acid and dried, forms an excellent antiseptic dressing for sores. Boracic acid ointment contains 1 of the acid to 8 of lard. 80 grs. of boracic acid dissolved in 1 oz. of glycerine and water is an excellent application to the throat in cases of diphtheria.

#### Phosphorus. P = 31.

This element is obtained from calcined bones, by the action of sulphuric acid and water. An acid phosphate, or superphosphate, of lime is thus produced, by the sulphuric acid taking some of the bone lime to form an insoluble sulphate, which is separated from the solution, previous to this being evaporated and then heated with sand and charcoal. By this process water is driven off and a metaphosphate of lime formed, which is heated in a retort with sand. The silicic acid of the sand takes the lime, and phosphorus distils off, while carbonic oxide gas escapes at the same time.

Phosphorus occurs in wax-like sticks, having a sp. gr. 1.77, soft at ordinary temperatures, melts at 110°, and ignites at a somewhat higher temperature. Phosphorus is always kept under water. It is soluble in ether, oil, and in bisulphide of carbon.

**Red or Amorphous Phosphorus.**—This is phosphorus in an allotropic state, and it is made by keeping phosphorus at a temperature not exceeding 450°, air being excluded, till it becomes opaque, red,

and insoluble, and only ignites when heated to near 500°.

This red phosphorus has been used in medicine, but has no active properties.

The inhalation of the vapour of phosphorus is known to produce necrosis of the lower jaw bone, especially in the case of persons who have carious teeth in the lower jaw.

**Medicinal Use of Phosphorus.**—Phosphorus acts as a powerful irritant, and comparatively small doses have proved fatal. Thus Christison mentions an instance where one and a half grains was a fatal dose. The phosphorus appears to be oxidized in the system, for the phosphates are increased in the urine of those who take phosphorus in medicinal doses. In poisonous doses phosphorus causes great prostration, and jaundice, with disorganization of the liver.

In a remarkable case, given by Caspar, a lady, twenty years old, took three grains of phosphorus at six in the evening of August 16th. Late in the evening she was perfectly rational, and seemed to those about her to exhale sulphur in her breath. She complained that the light blinded her. During the night she vomited once, and died quietly at six in the morning, just twelve hours after taking the poison.

The body after death exhaled luminous vapours from the vagina and rectum. Post mortem the stomach was neither softened nor corroded, but there were small hæmorrhagic spots seen on the fundus. The intestines were pale, and the liver gorged with blood. Brain somewhat congested, as were also the lungs.

No certain antidote to phosphorus as a poison is known; oil of turpentine arrests the oxidation of the phosphorus, and has been proposed as an antidote.

Medicinally, phosphorus has been employed as a special stimulant to the nervous system, and lately has become rather a popular remedy with physicians.



The dose of phosphorus is one-thirtieth or one-fortieth of a grain, and it may be given dissolved in oil, or incorporated with melted fat into a small pill. These pills should be silvered, and then will keep good many months.

The **Oleum Phosphoratum** is made by dissolving phosphorus in almond oil, previously heated to 300 to expel air, and allowed to cool. One ounce of oil holds three grains of phosphorus, and this phosphorated oil may be given in a dose of five minims ( $\frac{1}{3}$  grain of phosphorus) mixed in emulsion, or in a capsule of gelatine.

Cod liver oil is an excellent solvent for phosphorus, and is generally employed in preference to a vegetable oil.

**Pilula Phosphori.** — Dose 3 to 6 grains =  $\frac{1}{30}$  to  $\frac{1}{15}$  phosphorus, is not often prescribed, as this pill is said not to dissolve in the stomach. The gelatine capsule form is a more certain way of giving phosphorus.

As a stimulant and restorative in many exhaustive diseases of the nervous system phosphorated oil is useful. Dr. Radcliffe, Dr. Anstie, and others have found it a remedy of much value. Dr. Bennett, of Edinburgh, has used the phosphorated oil in paraplegia; the only effect, however, was heat and nausea at the stomach and increase in the phosphates excreted by the urine. In some cases of bronchitis with tendency to congestion of the lungs, I have for some years been in the habit of using phosphorus, and am disposed to value it highly in these cases. In cases of extreme nervous exhaustion and want of sleep I have found Tisy's capsules of phosphorated oil very effective. In pulmonary phthisis the remedy is a useful one, but it has no claim to the rank of a specific in any form of this disease.

M. Tavignot has employed frictions of phosphorated oil over the forehead in cases of cataract with a view to promote absorption.

**Compounds of Phosphorus with Oxygen.**—The red film which is seen on sticks of phosphorus that have been turned towards the light is believed to be an oxide of phosphorus; it is of no pharmaceutical interest.

The most important compound of phosphorus with oxygen is phosphoric acid. In the preparation of this acid by the B. P. process phosphorus is oxidized by means of nitric acid. Phosphorus, water, and nitric acid are heated together in a retort, and the nitric acid that distils over it from time to time returned to the retort till all the phosphorus is dissolved. The contents of the retort are concentrated by evaporation till all the nitrous vapour is driven off, and the remaining acid is diluted with water to form **Acidum Phosphoricum Dilutum**. In this process any deficiency of nitric acid must be avoided, or phosphorous acid ( $H_2PHO_2$ ) will be formed instead of phosphoric acid ( $H_2PO_4$ ).

If the heat employed in evaporating be high enough to remove the elements of water, pyrophosphoric and metaphosphoric acids will be formed.

$H_2PO_4$  is the formula of the trihydric phosphate or ordinary phosphoric acid. This is the acid existing in ordinary tribasic phosphate of soda, but if this salt be heated then two molecules of the salt yield one molecule of water, and a bibasic salt is formed, called the *pyrophosphate of soda*, distinguished from ordinary phosphate by yielding with nitrate of silver a white precipitate, whereas the ordinary phosphate forms a yellow phosphate of silver.

By heating a pyrophosphate a metaphosphate is obtained, a monobasic salt; and the metaphosphoric acid can be prepared by evaporating ordinary phosphoric acid and heating it till it congeals on cooling into a clear glassy mass, known as *glacial phosphoric acid*.

This metaphosphoric acid is distinguished from the other modifications of phosphoric acid by its property of precipitating solution of albumen. The Pharma-

coposia directs us to apply this albumen test to the dilute phosphoric acid to see if it contain any metaphosphoric acid.

If pyrophosphoric acid be present, then a white precipitate is formed on adding solution of perchloride of mercury to the phosphoric acid and heating the mixture.

Phosphoric acid is estimated by a gravimetric method as phosphate of lead.

355 grains of the acid are poured upon 180 grains of oxide of lead, and the amount of phosphate so formed should amount to 215.5 grains.

Free phosphoric acid occurs in the *Syrupus Ferri Phosphatis*.

**Uses of Phosphoric Acid.**—Phosphoric acid, diluted with eight parts of water, has been used locally as a wash in osseous caries, under the idea that the disease was due to a deficiency of this acid. Some amount of benefit is said to have followed this use of phosphoric acid.

**Internal Uses.**—In calculous disease, with alkalescence of the urine, phosphoric acid, like the other mineral acids, has been given with good effect. It agrees well with the stomach, and in doses of ten to twenty minims is a useful tonic to the digestive organs.

In colliquative sweating, and also in hæmoptysis, phosphoric acid has been used as a tonic and astringent.

The dose of the dilute acid is ten to thirty minims. It may be given in water, or in some of the bitter infusions, as the infusion of cascarilla, with some syrup of ginger or orange added.

The other acids of phosphorus known, as the phosphorous acid and the hypophosphorous acid, are not in the B. P.

The former of these results from the slow oxidation of phosphorus in the air, the latter occurs in the *hypophosphite* of lime formed when phosphuretted

hydrogen gas is made by heating together lime, phosphorus, and water.

The active combustion of phosphorus under a glass bell jar produces a cloud of white flakes of *phosphoric anhydride* ( $P_2O_5$ ), which, on combining with water, forms phosphoric acid of the monobasic variety.

The empirical formulæ for the various acids of phosphorus and the modifications of phosphoric acid are given in this convenient way by Professor Attfield\*—

$H_4P_2O_4$  = hypophosphorous acid.

$H_5P_3O_6$  = phosphorous acid.

$H_6P_4O_{10}$  = phosphoric acid.

$H_4P_2O_7$  = pyrophosphoric acid.

$H_5P_3O_9$  = metaphosphoric acid.

Hypophosphorous acid in combination with lime, soda, potash, quinia, iron, is often used in medicine, and syrups of these hypophosphites are kept in most pharmacies.

The hypophosphite salts are so rich in phosphorus that they burn when warmed on the tip of a knife. Well made hypophosphite of potash shows this combustibility well.

Bodies so rich in phosphorus form a good medium for the supply of this element to the system; hence these hypophosphites are largely prescribed in affections of the nervous system as restoratives. Since 1863 I have used the hypophosphites as remedies in pulmonary phthisis. My experience of the use of these salts at the Victoria Park Hospital for Diseases of the Chest has been considerable, and in bronchitis and consumption, I have certainly found the hypophosphites of soda and lime most valuable medicines.†

\* Attfield's "Pharmaceutical Chemistry," 4th edition, p. 356.

† See 3rd edition of pamphlet "On the Use of Hypophosphites in Consumption," by the Author, published in 1880.

Various phosphates are employed in medicine, and will be mentioned in due course in this work. The neutral phosphate of lime, the lactophosphate of lime, and the hypophosphite of lime syrup, are all very eligible preparations for the administration of lime as a promoter of the nutrition of weak and softened bones in young rickety children. The syrup of the lactophosphate of lime is in these cases especially useful.

## CHAPTER IV.

THE ALKALIES :—POTASH.—SODA.—LITHIA.—  
AMMONIA.

**Potash**,  $\text{KO}$ , is the oxide of the metal Kalium, or Potassium. The hydrate of potash, existing in liquor potassæ, is thus represented,  $\text{KHO}$ , as if one H of water  $\text{H}_2\text{O}$  (or  $\text{HHO}$ ) was replaced by K.

The source of the preparations of potash is primarily the carbonate of potash,  $\text{K}_2\text{CO}_3$ . \* Carbonate of potash is, to some extent, obtained from the native chloride of potassium, which occurs as a mineral in Prussia, under the name of *Carnallite*, but the chief source is from *Pearlash*, which is the crude potash obtained from wood ashes, purified by calcination in a reverberatory furnace.

Pearlash comes over from America and Prussia in bluish-white blocks, packed in casks; and by solution in distilled water and evaporation a fine carbonate of potash is prepared from this pearlash.

**Potassæ Carbonas**,  $\text{K}_2\text{CO}_3$ , Salt of Tartar.—Pure carbonate of potash is a white crystalline or granular powder, insoluble in alcohol, very soluble in water, alkaline, caustic, and deliquescent. It contains 16 per cent. of water of crystallization.

With perchloride of platinum solution, this, in common with potash salts generally, forms a yellow insoluble double chloride of potassium and platinum;  $\text{K}_2\text{PtCl}_6$ .

Carbonate of potash, free from chloride of sodium,

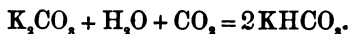
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\*  $\text{KK}$  or  $\text{K}_2$ , as  $\text{CO}_2$  is a bivalent acid, while  $\text{K}$  is a univalent base.  $\text{CaCO}_3$  is the formula for carbonate of lime as  $\text{Ca}$ , calcium, is bivalent. For this reason  $\text{Ca}_2\text{HO}$  = hydrate of lime, while  $\text{KHO}$  = hydrate of potash.

gives a reddish precipitate with perchloride of mercury, and in this way it is distinguished from the bicarbonate. Dissolved in nitric acid and evaporated, the solution in water of the residue should give very slight precipitate with chloride of barium or nitrate of silver. The dose of carbonate of potash is from 5 to 15 grs. In mixture with cochineal it is a popular and useful medicine for whooping-cough.

Carbonate of potash is used in making various preparations of the Pharmacopœia, but it is not often given internally, owing to its causticity. Twenty grains of carbonate of potash are neutralized by seventeen grains of citric acid or eighteen grains of tartaric acid.

**Potassæ Bicarbonas,  $\text{KHCO}_3$ ,** is a double carbonate of potassium and hydrogen; it is made by passing a current of carbonic acid gas through a solution of carbonate of potash, when the bicarbonate forms in crystals.



Bicarbonate of potash crystallizes in right rhombic prisms, not deliquescent, and of feebly alkaline taste.

Solubility in water, one in three. Insoluble in rectified spirit.

Fifty grains heated leave thirty-four and a half grains of carbonate of potash, equal to saturating 500 grain measures of the volumetric solution of oxalic acid.

Twenty grains of bicarbonate of potash are neutralized by fourteen grains of citric acid or fifteen of tartaric acid.

The bicarbonate of potash is of use as an antacid and antilithic. It is rapidly absorbed, and renders the urine strongly alkaline, and is a remedy of much value in acute rheumatism with profuse acid sweats. As much as  $\text{ʒjss}$  to  $\text{ʒij}$  of the bicarbonate may be given during twenty-four hours in the course of severe rheumatic fever. Whether the bicarbonate of potash

in twenty-grain doses every two hours, actually reduces temperature and shortens the duration of rheumatic fever is doubted by some authorities. Patients, however, seem to pass with less discomfort through an attack of rheumatic fever under the alkaline treatment, and complications do not arise so often as under other plans of treatment.

Potash salts are sedative to the circulation, and they promote oxidation; if pushed too far, extreme anæmia is caused, and this condition renders the brain and nervous system unduly irritable—a condition to be avoided in the treatment of rheumatic fever.

The dose of bicarbonate of potash is from ten to forty grains; it may be given in aerated water, or in a bitter infusion.

Salts of potash, containing a vegetable acid, as the citrate, tartrate, and acetate, undergo oxidation, or combustion, in the animal system, and appear in the urine as carbonates, rendering that fluid alkaline.

**Liquor Potassæ Effervescens**, or *Potash Water*, is a solution of bicarbonate of potash in carbonic acid water in the proportion of thirty grains to one pint.

This water is an agreeable sedative in nausea and irritation of the stomach. It suits well persons liable to gout or lithic acid gravel, and may be used as a medium for the administration of large doses of potash salts in rheumatic fever. If it contains carbonate of potash, then it will form a white precipitate with sulphate of magnesia.

**Liquor Potassæ**.—This is a solution of hydrate of potash in water, one fluid ounce of liquor potassæ containing twenty-seven grains of  $KHO$ , or hydrate of potash.

The liquor is made by mixing together hydrate of lime and carbonate of potash; an insoluble carbonate of lime is formed, and the pure liquor potassæ is drawn off by a siphon, and preserved in green glass bottles.

Liquor Potassæ, containing no carbonic acid, does not effervesce with acids; and, diluted with water, it



should undergo no change on addition of solution of lime or of oxalate of ammonia. The first of these tests shows the absence of free carbonic acid, which would form a white precipitate of carbonate of lime; the second shows the absence of lime, with which it would form an insoluble oxalate.

Liquor Potassæ, neutralized by nitric acid, gives but very faint precipitates with chloride of barium, nitrate of silver, and ammonia, showing absence of sulphates, chlorides, and the earth alumina.

**Uses.**—Liquor Potassæ is used externally sometimes to form an alkaline lotion for cleansing the skin from thickened secretions. Dr. M'Call Anderson uses, in mild eczema with infiltration of skin, a wash of two grains caustic potash to one ounce of water. Internally it is used as an antacid and gastric sedative. Absorbed into the blood, it appears to increase its alkalinity, and to promote tissue change and excretion; hence it is often given to promote the absorption of glandular enlargements and tumours. In obesity, liquor potassæ is often prescribed as an absorbent of the excess of fatty tissue.

Liquor Potassæ does not, in ordinary doses, render the urine alkaline, but, according to the experiments of Dr. Parkes, the excretion of urea, uric, and sulphuric acids is increased during its administration; as if it aided in disintegrating the nitrogenous and sulphur-holding tissues of the body.

In some forms of dyspepsia with excess of acidity and irritation of stomach, due at times to excess in the use of alcoholic fluids, liquor potassæ is a good remedy. It may be given in doses of ten to thirty minims in pure water, or bitter infusion.

#### **Potassa Caustica. Potassæ Hydras. KHO.**

To obtain Caustic Potash, liquor potassæ is evaporated till it becomes of an oily thickness; it is then run into moulds, and so cast into sticks of caustic, or *fused, potash*.

It is for its caustic properties that this preparation of potash is chiefly valued. As a caustic it is powerful and very penetrating, dissolving the animal tissues rapidly and extensively from its deliquescent properties. Caustic potash is applied sometimes to the skin, for the purpose of making an issue.

The mixture of caustic potash with an equal part of lime, *potassa cum calce*, occurs in firm sticks, with no great tendency to deliquesce. These sticks, made into a paste with alcohol, form the so-called *Vienna paste*, used by surgeons as a caustic.

Pure potash is soluble in alcohol; impurities, such as oxide of iron and silica, remaining undissolved.

#### Potassæ Permanganas. $KMnO_4$ .

Permanganate of potash is a compound of permanganic acid with potash. The Pharmacopœia prepares it by heating together in a basin with water chlorate of potash, caustic potash, and black oxide of manganese. The mixture is evaporated, and then heated in a crucible. The mass, cooled and taken from the crucible, is powdered and then boiled with water.

The effect of heating in the crucible is to decompose the chlorate of potash with liberation of oxygen, which converts the manganese into manganic acid, and this, with the potash, forms manganate of potash.

The mixture forms a green solution, but as this is boiled its colour changes to violet, permanganate of potash being formed, while oxide of manganese settles as a sediment. The liquid poured off from this sediment is alkaline from free potash. When this has been neutralized by sulphuric acid the liquor is evaporated till a pellicle forms on its surface, and is then set aside for the dark purple permanganate of potash to crystallize out from its solution.

**Liquor Potassæ Permanganatis** contains four grains of permanganate in one fluid ounce; it is

stronger than the liquid known as Condy's fluid, which contains two grains to one fluid ounce. When acid solution of ferrous sulphate is added to solution of permanganate of potash, the ferrous becomes a ferric salt, and the permanganate is deoxidized with loss of colour in the solution. The application of this reaction with a volumetric solution of ferrous sulphate is used as a means of ascertaining the strength of the permanganate solution.

Five grains of permanganate in solution are completely decolorized by forty-four grains of ferrous sulphate dissolved in water mixed with two drachms of diluted sulphuric acid.

**Uses of Permanganate of Potash.**—This salt readily gives up oxygen, hence is of service as a deodorizer and disinfectant.

In the form of lotion,  $\text{fl.}\overline{\text{z}}\text{j}$  to  $\text{fl.}\overline{\text{z}}\text{viiij}$  of water, it may be used as an application to gangrenous ulcerations. In ozæna, with chronic inflammation and fetid discharge from the nasal passages, the lotion of permanganate thrown into the nostrils by a nasal douche, is a remedy of much value. It destroys the foul smell of the discharge, and acts as a curative agent on the diseased mucous surfaces.

*Internally*, the salt may be given in dose of one to two grains, but it is very rarely so employed. It has been used in diabetes on theoretical grounds as an oxidizing agent, but has failed of doing any good.

In the stomach doubtless the permanganate is decomposed; oxide of manganese separating, and oxygen being given off.

#### **Potassæ Chloras. $\text{KClO}_2$ .**

Chloric acid, combined with potash, forms the chlorate of potash. In the B. P. process, chlorine gas is passed into a mixture of slaked lime and carbonate of potash in water.

*Thus are formed chlorate of potash,  $\text{KClO}_2$ , chlo-*

ride of calcium,  $\text{CaCl}$ , and carbonate of lime,  $\text{CaCO}_3$ . After removal of the insoluble carbonate of lime, the chlorate of potash is obtained in crystals by evaporating the solution.

The crystals form in plates, sparingly soluble in cold water. When the chlorate is perfectly pure, its solution is not affected by nitrate of silver or oxalate of ammonia.

When heated, the chlorate is decomposed, giving off about 39 per cent. of oxygen gas, while  $\text{KCl}$ , or chloride of potassium, remains behind.

Rubbed with sulphur, chlorate of potash explodes; and mixed with sugar it is acted upon with some violence by sulphuric acid, combustion taking place.

**Uses.**—Chlorate of potash, taken by the mouth, has been shown by Wöhler to pass in an unchanged state out of the body in the urine.

In ulcerative inflammation of the mouth, chlorate of potash, in doses of five to fifteen grains, is very effectual.

Dr. West recommends three grains in sweetened water for a child aged three years, every four hours. In two or three days, ulcerative stomatitis may be thus cured.

The solution of the chlorate has been given in scarlet fever, and in diphtheria; but though often of service, its effect is not so specifically curative as it is in ulcerative stomatitis.

In extending phagedænic ulcerations, syphilitic or not, the chlorate given in decoction of bark is a good remedy.

An extemporaneous *mistura chlorig* can be made by adding 60 mm. of hydrochloric acid to 20 grs. of chlorate of potash, then gradually add 18 oz. of water and 2 oz. of syrup. The dose of this chlorine mixture is one drachm or more, and in ulcerated sore throat it is most valuable.

In scrofula and in phthisis the remedy has some *amount of reputation*. In chronic irritation of the

throat, so distressing often to patients in confirmed consumption, the following linctus, invented by Dr. Douglas Powell, is very serviceable:—Chlorate of Potash, 40 gr.; Glycerine,  $\frac{1}{2}$  oz.; Morphia,  $1\frac{1}{2}$  gr.; Syrup, to 4 oz. A teaspoonful swallowed slowly eases the throat and cough.

Sometimes injections of chlorate of potash are employed. Thus  $\mathfrak{zj}$  of the chlorate in  $\mathfrak{zviij}$  of water has been used by Dr. Bedford Brown, in leucorrhœa.

In chronic cystitis with putrescent urine, Dr. Braxton Hicks uses an injection of 4 grs. of the chlorate in 1 oz. of water, with advantage.

**Trochisci Potassæ Chloratis** are useful lozenges in many forms of chronic sore throat.

A gargle of chlorate of potash is very useful in pytalism from excess of mercury, or from any other cause.

#### **Potassæ Nitras = $\text{KNO}_3$ .**

Nitrate of potash, or prismatic nitre, is obtained from India. Incrustation of crude nitre, scraped from waste places, is mixed with crude potash, in the form of wood ashes, to decompose the nitrate of lime that is always present, and then the filtered liquor on evaporation deposits crystals of nitrate of potash in striated six-sided prisms.

These, purified by recrystallization from distilled water, form the nitrate of potash of pharmacy. Nitrate of potash deflagrates when heated in the fire; first it undergoes fusion, and by loss of oxygen becomes converted into a nitrite of potash. This nitrite of potash forms *Sal Prunella*, and when cast into round balls form the nitre balls of pharmacy, which are used to relieve inflammatory sore throat.

Warmed with copper wire and sulphuric acid, the acid of the nitrate of potash is decomposed. Nitric oxide gas is formed, which, coming in contact with air, forms ruddy fumes of nitric peroxide.

Chloride of platinum precipitates the potash of the

nitrate as a double chloride of platinum and potassium.

When nitre is free from all trace of chlorides and sulphates, its solution is unchanged by the addition of nitrate of silver or chloride of barium.

**Uses.**—Nitrate of potash is given in dose of five to twenty grains, as a cooling saline and diuretic remedy. In a dose of one ounce it has proved an irritant poison.

The nitrate is speedily absorbed, and passes out of the body by the urine. It increases the arterial hue of the blood, and impedes its coagulability. On the heart and vascular system its action is that of a sedative.

Nitrate of potash may be combined with the bicarbonate in the treatment of acute rheumatism. As a diuretic in dropsy it is of much value, and may be given in dose of five to ten grains, with infusion of digitalis, or combined with spirit of nitre.

Dr. Young used to praise nitrate of potash as a remedy for incontinence of urine in children. Thirty grains may be given in the day to a child aged seven years.

Paper made by soaking white blotting-paper in solution of nitre, and then drying it, has been often used with great benefit in spasmodic asthma. The paper is ignited, and the patient inhales the fumes.

From thirty to sixty grains of nitre may be dissolved in one ounce of water, according as a strong or weak paper be required.

Often the paper is medicated with various essential oils and other ingredients, as in the *Papier Barral* and *Papier Fruneau*. I have in some forms of bronchitic asthma used a nitre paper washed over with tincture of benzoin; and nitre papers prepared with benzoin, oil of sandal, and tincture of sumbul, are in frequent use as inhalations at the Hospital for Diseases of the Throat. A very useful nitre paper, washed with benzoin, is made by Mr. Dowling, of Reading.

In asthma complicated with true bronchitis, the nitre fumes are apt to cause increase of irritation; so that a weak paper, or one rendered sedative with benzoin, should be first tried in cases of asthma, believed to be bronchitic in their nature.

**Potassæ Prussias Flava.** Ferrocyanide of Potassium.  $K_4FeC_6N_6 \cdot 3H_2O$ .

The salt known by the above names is made by fusing various nitrogenous animal matters, as horns, hoofs, and skins, with carbonate of potash in an iron pot, lixiviating the crude product with water, and purifying the salt by crystallization.

In this process the carbon and nitrogen of the animal matter combine to form *cyanogen*, CN, or Cy, in contact with iron this becomes *ferrocyanogen*, and combining with the potash it forms the yellow salt known as the ferrocyanide of potassium. This salt occurs in large yellow crystals, soluble in water, not poisonous. Its solution forms a dark blue precipitate (Prussian blue), with per-salts of iron or ferric salts. One quarter of an ounce dissolved in five fluid ounces of water forms the test solution of the Pharmacopœia.

When chlorine gas is passed through a solution of this ferrocyanide of potassium for some time, the solution ceases to form a blue precipitate with ferric salts, while it acquires the property of forming a very dark blue (Turnbull's blue), with proto-salts of iron or ferrous salts. In this process two atoms of potassium are removed by the chlorine, and a new radical, called *ferridcyanogen*, is formed, the salt now in solution being the ferridcyanide of potassium, or red prussiate of potash, used in the Pharmacopœia as a test for the proto-salts of iron, or ferrous salts.

The yellow prussiate of potash is used as the source of hydrocyanic or prussic acid, and this acid may be thus prepared.

**Acidum Hydrocyanicum Dilutum. HCy.**

Yellow prussiate of potash is dissolved in water to which diluted sulphuric acid is added, and this mixture being placed in a flask is distilled into eight ounces of distilled water kept cold in the receiver.

The process is carried on till the liquid in the receiver is increased to seventeen ounces. Add to this three ounces of distilled water, or as much as may be sufficient to bring the acid to the required strength, so that 100 grains (or 110 minims) of it, precipitated with a solution of nitrate of silver, shall yield ten grains of dry cyanide of silver.

In this process acid sulphate of potash ( $\text{KHSO}_4$ ) remains in the flask with ferrocyanide of potassium and iron ( $\text{FeK}_2\text{FeCy}_6$ ); known as Everitt's yellow salt, from the name of the chemist who first explained the reaction. This salt gradually becomes green from absorption of oxygen.

The cyanide of hydrogen,  $\text{HCy}$ ,  $\text{HCN}$ , or hydrocyanic acid, being volatile, distils over into the cold receiver.

The hydrocyanic acid thus obtained is colourless, volatile without residue, and but feebly acid. Sp. gr. 0.997.

Treated with a minute quantity of mixed solution of sulphate and persulphate of iron, afterwards with potash, and then with a little hydrochloric acid, it forms Prussian blue. In using this test it is necessary to be cautious not to add too much of the potash, as Prussian blue is decomposed by excess of potash.

Hydrocyanic acid forms a white precipitate with nitrate of silver, soluble in strong boiling nitric acid.

270 grains, rendered alkaline by the addition of solution of soda, require 1000 grain measures of the volumetric solution of nitrate of silver to be added before a permanent precipitate begins to form, which corresponds to 2 per cent. of real acid.

*In this process a double cyanide of silver and soda*



is formed, which is soluble ; when all the hydrocyanic acid has been thus consumed by the nitrate of silver, its further addition to the alkaline liquid causes a precipitate of oxide of silver to appear. This process was invented by Liebig. The object of this volumetric process is to prove that the acid contains 2 per cent. of real acid. The acid known as Scheele's acid (Scheele was the chemist who, in 1782, first obtained prussic acid from Prussian blue) is a 4 per cent. acid.

By keeping, hydrocyanic acid changes in strength, hence from time to time its strength should be tested.

**Uses.**—*Externally*, the acid is at times used to form a sedative lotion to allay itching of the skin and neuralgic pain. A lotion of two drachms to eight ounces of rose-water may be applied for this purpose, care being taken that there is no abrasion of the surface.

For neuralgia, diluted hydrocyanic acid four drachms, glycerine and rose-water of each two drachms, may be painted over the pain with a brush. In pruritus pudendi Dr. West speaks of the lotion of the acid as very valuable.

*Internally*, the acid, in large dose, kills instantly, by stopping heart and breath. Smaller doses paralyze the respiratory centre, and cause death by apnoea and cardiac palsy, with convulsions and dilated pupils. One drop placed on the tongue of a rabbit killed it in eighty-three seconds.

Lonsdale and Kölliker believe that the acid paralyzes first the brain, then the cord, and lastly the motor and sensory nerves.

In the event of an over-dose of the acid, artificial respiration must be promptly had recourse to, while ammonia is given internally, and by olfaction. Chlorine vapour and chlorine water internally are also valuable antidotes.

In medicine, hydrocyanic acid is employed as a sedative in doses of two to six minims.

In *gastralgia*, *gastrodynia*, and *enterodynia*, the

acid is most serviceable, severe pains in stomach and intestines being often relieved speedily and decidedly by a few drops of the acid; vomiting may at the same time be checked.

The acid may be given with soda and calumba, or in an effervescing draught with citrate of potash. When given with an alkali the acid combines with it and forms a cyanide.

In nervous cough and whooping-cough it is a useful medicine, and may be given in almond emulsion. In this last complaint, however, as a rule, belladonna is more efficacious and safer than hydrocyanic acid.

In the cerebral excitement of acute mania I have seen the hydrocyanic acid given with conspicuous success in calming the violent excitement of the patient.

Hydrocyanic acid is known to exist in the essential oil of bitter almonds, being formed from the decomposition of the crystalline amygdaline which exists in these almonds. (See "Rosaceæ.")

The acid also occurs in the Aqua Laurocerasi, or Cherry-laurel Water of the B.P.—an uncertain preparation, of which the dose is from five to ten minims.

**Vapor Acidi Hydrocyanici.**—Used as a sedative inhalation in some forms of spasm and irritation of chest and lungs. Ten to fifteen minims with one drachm of cold water, is the proper strength for inhalation, mixed with warm water in a suitable inhaler.

#### **Potassæ Sulphas. $K_2SO_4$ .**

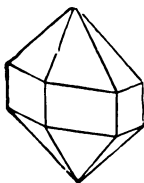
This salt, the neutral sulphate of potash, can be prepared from the acid sulphate of potash,  $KHSO_4$ , which is the residuary product in making nitric acid, by dissolving this last salt in water, and adding to the solution carbonate of potash till effervescence ceases.

When crystallized, the sulphate of potash appears in hard, six-sided prisms, terminated by six-sided

pyramids (Fig. 3), crepitating when heated, and but sparingly soluble in water. It is sometimes called

*Polychrest salt.*

FIG. 3.



**Uses.**—Sulphate of potash, in dose of fifteen grains to one drachm, acts as a purgative and diuretic, but has more of a stimulating and less of a cooling effect than many other neutral salts.

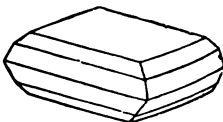
From five to ten grains of rhubarb with fifteen or twenty of the sulphate of potash, forms a mild and efficient purgative dose.

Preparations containing sulphate of potash are—

Pilula Colocynthis Composita,  
 ” ” et Hyoscyami,  
 Pulvis Ipecacuanhæ Compositus.

FIG. 4.

The form of the crystal of the hydrous acid sulphate of potash, or bisulphate of potash, is seen in Fig. 4.



### Potassæ Acetas. $KC_2H_3O_2$ .

Prepared by adding carbonate of potash to acetic acid, evaporating to dryness, and then heating the product till it melts. When it has cooled break it up, and put it into bottles. In this reaction the acetic acid displaces the carbonic acid of the carbonate, and the hydrogen of the acid being replaced by potassium (kalium), we get  $KC_2H_3O_2$ , acetate of potash, in place of  $HC_2H_3O_2$ , acetate of hydrogen, or acetic acid.

Acetate of potash occurs in white satiny masses, very deliquescent. Its solution is neutral, and forms a deep red with perchloride of iron, while with tartaric acid it gives a crystalline precipitate of the acid tartrate of potash. Sulphuric acid, added to acetate of potash, sets free the vapour of acetic acid.

lorides and sulphates present can be detected by  
 on of nitrate of silver and chloride of barium.

etate of potash is soluble in rectified spirit.

es.—The dose of acetate of potash ranges from  
 , sixty grains. It is best given in simple solution  
 , syrup added and a drop of oil of lemon as a flavour-  
 djunct. It may also be given in potash water.

etate of potash is soon absorbed, and acts as a  
 tic, passing out by the urine in the form of carbo-  
 of potash. It is given as a diuretic in various  
 of dropsy, and it has also been employed in  
 rheumatism.

doses of five or six grains it has been found ser-  
 ble in gastric disturbance with vomiting, and  
 us catarrh of the stomach where there is no active  
 amation going on.

some obstinate skin diseases, suspected to be  
 o lurking gout, the acetate of potash is a remedy  
 using.

#### Potassæ Citras. $K_2C_6H_5O_7$ .

is salt is prepared by neutralizing a solution of  
 acid, a crystalline acid made from lemon-juice  
 carbonate of potash. It is a white deliquescent  
 er, and the presence of citric acid in it can be  
 ed by boiling it with strong solution of chloride  
 lcium, when a white precipitate of citrate of lime  
 appear. This precipitate is soluble in acetic

es.—Citrate of potash, in dose of twenty to sixty  
 s, is sedative to the stomach, and is an agreeable  
 febrifuge. Becoming oxidized in the blood, it  
 s off by the kidneys as carbonate of potash, and  
 rs the urine alkaline.

allay sickness and gastric irritation, citrate of  
 h may be given in effervescence, it being re-  
 bered that fourteen grains of citric acid, or one  
 spoonful of fresh lemon-juice, will neutralize  
 ty grains of bicarbonate of potash. Sometimes

infusion or tincture of calumba is combined in the effervescing draught with a view to the sedative action of this bitter on an irritable stomach.

**Potassæ Tartras**  $K_2C_4H_4O_6$ .

This salt is prepared from the acid tartrate of potash (bitartrate of potash) by adding carbonate of potash till the solution becomes neutral, when it is filtered, and the tartrate crystallized out.

Tartrate of potash appears in small prisms, soluble in water, and forming with sulphuric acid a black tarry fluid with evolution of inflammable gas. Heated to redness it becomes converted into carbonate of potash.

**Potassæ Tartras Acida.**  $KHC_4H_4O_6$ .

This is an acid salt known as bitartrate of potash; it is chemically a tartrate of potassium and hydrogen, and when tartrate is prepared from it, basic H is replaced by K, and the acid character of the salt is destroyed.

The source of the acid tartrate of potash is the crude tartar or "Argol" which deposits during the fermentation of grape-juice. The purest kind is skimmed off from the solution of Argol in crystals, and hence is called "cream of tartar."

The salt occurs as a gritty powder, or as hard cakes, crystalline on one surface, sparingly soluble in water, insoluble in spirit; heated to redness it chars, gives off inflammable gas, and a residue of carbonate of potash remains.

Dose of acid tartrate, 20 to 60 grains.

Dose of tartrate of potash, 60 grains to  $\frac{1}{2}$  oz.

**Uses.**—Both the tartrates of potash act as refrigerants and diuretics, and the acid tartrate in dose of twenty grains is a good diuretic in the early stages of Bright's disease of the kidney.

In dropsy, dependent on renal, cardiac, or hepatic disease, the acid tartrate may be given in dose of one

to two drachms, as a hydragogue purgative to carry off water.

The compound jalap powder contains acid tartrate of potash, and is a valuable combination to produce watery purgation, in dose of twenty to sixty grains.

**Acidum Tartaricum** ( $H_2C_4H_4O_6$ ).—Tartaric acid is prepared from the acid tartrate of potash by decomposing it by means of lime. This acid is soluble in water and in spirit, it crystallizes in oblique rhombic prisms. The dose ranges from 10 to 20 grains, but it is rarely given internally.

**Potassa Sulphurata**, called also *Hepar Sulphuris*, or *Liver of Sulphur*, is made by heating together carbonate of potash and sulphur. The product is a tersulphide of potassium, containing more or less sulphate of potash; and appears in greenish masses, soon becoming whitish externally. The salt is alkaline, acrid, soluble in water; and, to the extent of three-fourths of its weight, in rectified spirit. When hydrochloric acid is dropped into the solution, sulphuretted hydrogen gas escapes and sulphur is deposited.

**Uses.**—Externally the sulphurated potash may be used as a lotion, or in the form of the B. P. ointment. In the proportion of one drachm of the salt to one pint of water it may be used as a wash in sycosis, acne and pityriasis of the skin.

In paralysis from lead the bath of sulphurated potash is highly efficacious in restoring power to the paralysed limbs. A bath of four ounces of this salt in thirty gallons of water is a sort of imitation of the Barèges water of the Hautes Pyrénées, and is useful in many chronic skin affections, and also in asthma.

Internally the sulphurated potash may be given in dose of one to three grains in solution or in pill. It is stimulating to the mucous follicles, and I have given it in cases of follicular tonsillitis with great benefit. I order a grain of the sulphurated potash to be made

into a pill with powdered cinnamon, or with liquorice-root powder and oil of anise, for by thus combining it the abominable odour of the salt is effectually overcome. In some cases of obstinate strumous ulcer in children I have used it internally with some amount of benefit. In asthma I can speak of the sulphurated potash as a remedy of considerable value.

**Unguentum Potassæ Sulphuratæ.**—Thirty grains to one ounce. Does not keep well. It may be used in some chronic skin affections and in ringworm.

#### **Potassæ Bichromas. $K_2Cr_2O_7$ .**

A red crystalline salt. First yellow chromate of potash is made from chrome ironstone; and then, by heating this with an acid, red bichromate of potash is obtained.

When sulphuric acid is added to solution of bichromate of potash, crystals of red chromic acid are obtained; these, when dried, are used as a caustic application to destroy warts, &c.

The red chromate of potash is not given in medicine; it is used in preparing the valerianate of soda.

In volumetric solution it is used to peroxidize the protosalts of iron.

When solution of bichromate is digested with sulphuric acid and rectified spirit it is decomposed, and green oxide of chromium is formed.

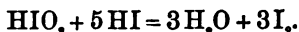
#### **Potassii Bromidum. KBr.**

Bromide of potassium is made by adding bromine to solution of potash till the mixture remains of a brown colour. Evaporate then to dryness, mix the dry residue with charcoal, and heat it in a crucible. Dissolve the cooled mass in water, filter, and set aside to crystallize. When bromine and potash combine, bromide of potassium, KBr, and bromate of potash,  $KBrO_3$ , are formed. The object of the treating with charcoal is to deoxidize the bromate of potash, and convert it into KBr, bromide of potassium

by the loss of oxygen,  $O_2$ , which it contains. Bromine is liberated from a bromide by a few drops of chlorine water, and chloroform agitated with the mixture falls to the bottom of a red colour, from its holding bromine in solution. Bromide of potassium should be free from iodide. In proof of this, its solution should not turn blue when mixed with starch mucilage and chlorine water. Dose five to thirty grains. For Uses, *see* Bromine, page 26.

#### Potassii Iodidum. KI.

The chemistry of the process for preparing this salt, as given in the Pharmacopœia, will be readily understood from what has been said under Bromide of Potassium. Attention should be given to the process for detecting any contamination of the salt with iodate of potash,  $KIO_3$ . If the iodide be free from iodate no blue colour will appear when tartaric acid and starch are added to its solution. If iodate of potash be present the tartaric acid causes liberation of,  $IO_3$ , iodic acid, from the iodate, and at the same time liberation of  $HI$ , hydriodic acid, from the iodide. The former acid by taking the  $H$ , or hydrogen, of the latter, sets  $I$ , or iodine, free, and a blue iodide of starch is at once formed. Thus—



Dose of iodide of potassium two to ten grains or more. Uses, *see* chapter on Iodine. Iodide of potassium is soluble in spirit of wine. One ounce of tincture of bark will dissolve thirty grains of iodide of potassium. Large doses of 15 to 20 grains of iodide of potassium are very efficacious in checking undue secretion of milk after childbirth. Iodate of potash will not dissolve in spirit. Preparations of iodide of potassium for external use are **Linimentum Potassii Iodidi c. Saponis** and **Unguentum Potassii Iodidi**.



**Soda.**

**Soda**,  $\text{NaO}$ , is the oxide of the metal Natrium or Sodium. The hydrate of soda, existing in *Liquor Sodæ*, is representend thus— $\text{NaHO}$ .

**Liquor Sodæ**, or Solution of Soda, is made by decomposing carbonate of soda by means of lime, just as liquor potassæ is made. Carbonate of lime settles in the vessel, and the clear liquor sodæ is drawn off by a siphon. The decomposition is thus represented— $\text{Na}_2\text{CO}_3 + \text{Ca 2HO} = 2\text{NaHO} + \text{CaCO}_3$ .

*Liquor Sodæ* is a clear, strongly alkaline liquid; it does not effervesce with acids, and each fluid ounce contains 18·8 grains of hydrate of soda. Its strength is ascertained by means of the volumetric solution of oxalic acid, one fluid ounce requiring for neutralization 470 grain measures of the volumetric solution of oxalic acid. The residue, after neutralizing with nitric acid and evaporating, does not form a precipitate when dissolved and mixed with ammonia, indicating absence of magnesia.

**Uses.**—*Liquor Sodæ* may be given internally as an antacid in dose of ten to thirty minims.

In pharmacy it is used in preparing the Antimonium Sulphuratum; and, evaporated, it furnishes solid caustic soda.

**Soda Caustica** is represented by the Formula  $\text{NaHO}$ , being a hydrate of soda.

One fluid ounce of the liquor sodæ, evaporated, furnishes 18·8 grains of caustic soda; a greyish-white alkaline salt, met with usually in sticks like caustic potash.

Caustic Soda is a less active caustic than the hydrate of potash, and is less deliquescent.

The preparation containing caustic soda is the *Liquor Sodæ*, already described.

**Sodæ Carbonas.**  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .

Carbonate of Soda is now largely obtained from chloride of sodium. The chloride is first converted

a sulphate, and then this sulphate is roasted coal and limestone. The resulting "black ash" is leached with water, and the water evaporated is crude carbonate of soda.

$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  is the formula for the Crystalline carbonate of Soda of the B. P. Exposed to the air it loses up its water of crystallization, and effloresces; it differs here from the carbonate of potash, which absorbs water from the air, and so becomes moist and efflorescent. Carbonate of soda is soluble in water, 1 lb. to 2, but is insoluble in rectified spirit.

Soda salts give a yellow colour to flame, and are precipitated by perchloride of platinum. Potash salts give a violet colour to flame, and form a precipitate of double chloride of platinum and potassium.

#### **Sodæ Carbonas Exsiccata. $\text{Na}_2\text{CO}_3$ .**

Carbonate of Soda is heated till all the water of crystallization is driven off and a dry carbonate remains.

Eighty-three grains of this dry carbonate are equal to 100 of the crystalline carbonate.

#### **Sodæ Bicarbonas. $\text{NaHCO}_3$ .**

To prepare this salt, two pounds of carbonate of soda and three pounds of the dry carbonate are mixed in a powder, and then a current of carbonic acid gas is passed into the mixture.

As the process advances, the mass becomes damp, the water of the carbonate being set free; and if the dried carbonate was not present, there would be a semi-fluid condition produced. To purify the bicarbonate distilled water is now added, and that which remains undissolved is drained and dried.

Bicarbonate of Soda is pulverulent, or in small pieces. Its solution effervesces strongly with acids, and with perchloride of mercury forms a white precipitate of oxychloride, soon passing into the red

carbonate. The salt should be free from carbonate and sulphate of soda.

**Uses of the Carbonates of Soda.**—The carbonates of soda act as antacids; they render the blood more alkaline, but they are not so depressing to the circulation as the corresponding salts of potash. Soda is believed to act upon the liver, and to increase the flow of bile, while potash acts more on the kidneys. The lithate of soda is not so soluble as the lithate of potash.

Dose of ordinary	Sodæ Carbonas,	5 to 30 grains.
”	”	Sodæ Bicarbonas, 10 to 60 grains.
”	”	Sodæ Carbonas Exsiccata, 3 to 10 grains.

One pint of the **Liquor Sodæ Effervescens**, or Soda Water, contains 30 grains of bicarbonate of soda.

The bicarbonate of soda agrees well with the stomach in cases of acidity after food. It may be given in infusion of calumba or gentian, and the best time for its administration is one hour before, or two hours after, food. In the former case, the alkali appears to determine a free secretion of gastric juice at the meal time; in the latter case, it corrects any excess of acid that may be present in the stomach.

Twenty grains of bicarbonate of soda are neutralized by sixteen grains of citric acid, or seventeen grains of tartaric acid.

Bicarbonate of Soda is the chief ingredient in the Vichy waters of Central France, so much used for drinking and bathing in cases of diabetes, gout, and hepatic derangements.

The waters of Vals and Fachingen (Nassau), also contain much bicarbonate of soda, and are of great value in cases of dyspepsia, with tendency to gout or gravel. **Trochisci Sodæ Bicarbonatis**. Each *lozenge* contains five grains of Bicarbonate.

**Sodæ Citro-Tartras Effervescens.**—A granulated powder effervescing when dissolved in water, given as a mild laxative and aperient, in dose of sixty grains to a quarter of an ounce.

If sulphate of magnesia be added, a more active aperient draught is obtained, with a bitter, disagreeable taste.

**Sodæ Nitras,  $\text{NaNO}_3$ ,**

is known in commerce as Chili Saltpetre. It occurs in obtuse rhomboids. It is rarely used in medicine, but is employed in making the arseniate of soda, and sometimes chemists use it as a source of nitric acid.

**Sodæ Phosphas.  $\text{Na}_2\text{HPO}_4, 12 \text{H}_2\text{O}$ .**

Phosphate of soda is made by neutralizing the solution of phosphoric acid, obtained when bone-ash is decomposed by sulphuric acid, with carbonate of soda, filtering from the precipitated carbonate of lime, and evaporating till the phosphate crystallizes in colourless rhombic prisms.

The solution of phosphate of soda in water is alkaline; it gives a yellow precipitate with nitrate of silver. When heated this salt loses water and becomes a bibasic pyrophosphate of soda, which forms a white precipitate with nitrate of silver, and with the chloride of barium.

If the solution of phosphate of soda be milky, it is a sign that it contains some phosphate of lime.

**Uses.**—Phosphate of soda acts as a mild saline purgative, with but little taste. In small doses it is diuretic.

Dose as a purgative, a quarter to one ounce in gruel or broth.

Phosphate of soda is used in preparing the phosphate of iron.

**Borax**, or Biborate of Soda, has been described at page 41.

**Sodæ Sulphas,  $\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$ ,** Sulphate of Soda, or Glauber's salt, can be prepared from the residue

of the process for hydrochloric acid where chloride of sodium is decomposed by sulphuric acid. The salt crystallizes in oblique prisms, is saline and bitter to the taste, and may be given as a purgative, in dose of a quarter to one ounce. Sulphate of soda exists in the Pullna bitter water of Bohemia, and in the Friedrichshall water.

**Sodæ Valerianas.**  $\text{NaC}_2\text{H}_3\text{O}_2$ .

A dry white salt, soluble in spirit, and smelling of valerian. Valerianic acid is prepared by the oxidation of Amylic Alcohol, by distilling it with bichromate of potash and sulphuric acid, and the valerianic acid that distils over is neutralized with solution of soda.

The salt is chiefly used in preparing valerianate of zinc.

**Sodæ Acetas.**  $\text{NaC}_2\text{H}_3\text{O}_2, 3\text{H}_2\text{O}$ .

This salt occurs in colourless crystals, forming a neutral solution, which is not precipitated by chloride of barium or nitrate of silver, showing absence of sulphates and chlorides.

Acetate of Soda in dose of twenty to sixty grains is a mild diuretic. It is used in preparing the phosphate and arseniate of iron.

**Soda Tartarata.**  $\text{NaKC}_4\text{H}_4\text{O}_6, 4\text{H}_2\text{O}$ .

This is the Tartrate of Potash and Soda, or Rochelle salt. It is made by adding carbonate of soda to the acid tartrate of potash till the solution is neutral. The solution, if strong, gives a crystalline precipitate of acid tartrate of potash when a little acetic acid is added.

The dry salt blackens when heated with sulphuric acid.

Dose as an aperient, a quarter to half an ounce.

Seidlitz powder consists of Rochelle salt two drachms, bicarbonate of soda forty grains, made to

effervesce by being stirred up in water with thirty-seven grains of tartaric acid.

### Sodii Chloridum. NaCl.

Common salt, or Chloride of Sodium, occurs in transparent cubes or in small grains. It is used in pharmacy to prepare the two chlorides of mercury and hydrochloric acid.

**Uses.**—Lotions of common salt are used to brace and invigorate weak and relaxed parts, and to promote absorption.

Injections of salt and water are good to destroy threadworms in the rectum.

Internally salt, itself a constituent of all the fluids of the body, is used against verminous affections. It is also recommended in fatty degeneration of the liver and in hæmoptysis. In infantile cholera Dr. Dewees used to speak very highly of warm salt and water injected into the bowels. One teaspoonful is the amount of salt sufficient for a child a year old.

A tablespoonful of salt in warm water acts as a speedy emetic.

Leeches are destroyed by solution of salt, a fact worth knowing, in case of a leech being swallowed or finding its way into the lower bowel.

**Sodæ Arsenias.**—See Preparations of arsenic.

### Liquor Sodæ Chloratæ.

Solution of Chlorinated Soda. Labarraque's Disinfecting Solution of Soda.

This solution is made by passing chlorine gas into a solution of carbonate of soda in water.

It is a colourless alkaline liquid, containing hypochlorite of soda, chloride of sodium, and bicarbonate of soda. In contact with an acid it effervesces, and evolves chlorine and carbonic acid.

The strength of this liquor is estimated on the same principle as that of the Liquor Chlorig, by seeing how much iodine it will liberate from a solution of

iodide of potassium: The liberated iodine being estimated by means of the volumetric solution of hyposulphite of soda.

**Uses.**—The solution of chlorinated soda is used in the B. P. for preparing the Chlorine Poullice, or *Cataplaema Sodæ Chloratæ*, being mixed for this purpose with linseed meal and hot water.

As a disinfectant and deodorizer the *Liquor Sodæ Chloratæ* is of great value. Some of the solution held on a sponge before the nostrils is a good antidote in cases of poisoning by sulphuretted hydrogen gas, or by hydrocyanic acid.

As a lotion one drachm may be mixed with two or three ounces of water.

Half an ounce with the same quantity of Tincture of Myrrh and water to fl.ʒviij makes a good disinfecting and cleansing mouth wash.

In ozæna and otorrhœa, with fetid discharge, xv—xxx ℥ in ʒj of water may be used as an injection.

Internally this liquor has been given in dose of x—xv ℥ in typhoid and malignant fevers with putrescent tendency, by Dr. Copland and others.

Dr. W. Budd considers the solution an excellent application in diphtheria of the throat. It should be applied with a brush three or four times daily.

#### **Sodæ Sulphis and Hyposulphis.**

These salts are not in the B. P., though the last occurs among the volumetric solutions in the Appendix,

Sulphite of soda is prepared by saturating solution of carbonate of soda with sulphurous acid gas.

It may be given in dose of twenty to sixty grains in cases of vomiting with gastric fermentation. The salt may also be employed in the form of a lotion, some acetic acid being added, gradually to liberate the sulphurous acid.

Hyposulphite of soda dissolves salts of silver, and

decolorizes solution of iodine. Medically its action is similar to that of the sulphite.

**Hypophosphite of Soda**,  $\text{NaPH}_2\text{O}_3$ , is a salt formed by decomposing solution of hypophosphite of lime with carbonate of soda. The phosphorus in the salt is at so low a degree of oxidation that it burns when the crystalline salt is warmed at the end of a spatula.

This salt, as well as the corresponding salts of lime and potash, are good as vehicles for the administration of phosphorus in an active state. In commencing and confirmed phthisis pulmonalis, I have found this salt a most valuable medicine.

Dose five grains, with syrup, or in infusion of calumba with bicarbonate of soda added.

### Lithia. LO.

The oxide of the metal Lithium, the lightest solid known, having a density 0.5936.

The Carbonate and Citrate of Lithia have been introduced into medicine by Dr. Garrod as solvents of lithic acid.

### Lithiæ Carbonas. $\text{L}_2\text{CO}_3$ .

Carbonate of Lithia is a white powder, soluble in hydrochloric acid, and in 100 parts of cold water. The solution evaporated yields chloride of lithium, which gives a red colour to flame; and, dissolved in water, forms a precipitate with phosphate of soda of the double phosphate of lithia and soda. Sulphate of lithia, dissolved in water, should not be changed by oxalate of ammonia or solution of lime, indicating absence of lime and magnesia.

Dose of Carbonate of Lithia three to six grains. It is best given in the form of **Liquor Lithiæ Effervescens**, or Lithia Water; half a pint of this water containing five grains of carbonate of lithia.



**Lithiæ Citras,  $L_2C_6H_4O_6$ ,**

is given in dose of five to ten grains in cases of obstinate gout, with tendency to lithic acid formations.

**Ammonia.**

Ammonium,  $NH_3$ , = 18, is the name given to the hypothetical basis of the ammonia salts. Neither ammonium nor its oxide,  $NH_4O$ , have ever been isolated, though an amalgam of mercury with ammonium has been often prepared.

**Ammonii Chloridum,  $NH_4Cl$ ,**

Chloride of Ammonium, Sal Ammoniac, or Muriate of Ammonia, is the chief source of the ammonia salts. In early times Sal Ammoniac was made near the Temple of Jupiter Ammon, in Egypt, by subliming camel's dung. Now the salt is made from the ammoniacal liquor of the gas-works, and also from the spirit obtained in burning bones to make animal charcoal. The ammoniacal liquor, containing a variety of compound ammonias, is neutralized by hydrochloric, or sulphuric, acid, and evaporated.

In this latter case sulphate of ammonia results, which is mixed with chloride of sodium, and heated; when volatile chloride of ammonium rises and condenses in a leaden dome, sulphate of soda remaining as a residue.

Chloride of Ammonium occurs in tough fibrous hemispherical masses, soluble in water and rectified spirit. Heated with potash, free ammonia is evolved. The solution forms with nitrate of silver a curdy white precipitate of chloride of silver. The crude salt may contain iron and lead as impurities. If it be deliquescent it probably contains some chloride of calcium.

**Uses.**—Chloride of Ammonium is used to form cooling and resolvent lotions. Indurations and chronic tumefactions often speedily disperse if

kept wet with a lotion of chloride of ammonium. Two to four drachms to eight ounces of water, or spirit and water.

Internally, Chloride of Ammonium is given in dose of five to fifteen grains in chronic bronchitis, in hepatic enlargements and congestions, and in facial neuralgia. In myalgia and chronic rheumatism, also, it is a remedy of some value. Lozenges of chloride of ammonium are very serviceable in chronic dry sore throat.

**Ammoniae Carbonas,  $N_4H_{16}C_3O_8$ ,**

called also sesquicarbonate of ammonia, is a volatile pungent salt made by subliming a mixture of chloride of ammonium, or sulphate of ammonia, with carbonate of lime.

The salt is soluble in water, sparingly soluble in spirit. The solution, neutralized with nitric acid, is not changed by adding either nitrate of silver or chloride of barium, showing absence of chlorides and sulphates.

If this sesquicarbonate of ammonia be exposed to the air all the volatile pungent neutral carbonate is volatilized, and an opaque friable powder of bicarbonate of ammonia, devoid of pungency, remains.

Carbonate of Ammonia exists in Sal Volatile, or **Spiritus Ammoniae Aromaticus** of the Pharmacopœia, which is made by distilling carbonate of ammonia with solution of ammonia, rectified spirit, and the oils of nutmeg and lemon. With this aromatic spirit of ammonia are prepared the ammoniated tinctures of guaiacum and valerian. The Liquor Volatilis Cornu Cervi, or Spirit of Hartshorn, is a saturated solution of carbonate of ammonia.

**Uses of Carbonate of Ammonia.**—Free ammonia and carbonate of ammonia alike act as stimulants to the pulse and vascular system, and as promoters of the cutaneous and bronchial secretions. Ammonia does not affect the brain as alcohol does,

and may be used to remedy the effects of alcoholic intoxication.

Ammonia is a good antispasmodic, and the aromatic spirit of ammonia, given internally and inhaled by the nostrils, is a popular remedy for fainting. Ammonia promotes the fluidity of the blood, and escapes from the system by the lungs, skin, and urine, but it does not produce alkalinity of this last secretion.

In epilepsy, carbonate of ammonia has been given with some benefit. In the exanthemata, measles, and scarlet fever, the carbonate of ammonia in dose of three to seven grains, according to age, has obtained a well-deserved repute. In erythema and erysipelas it is of use as a stimulant, and for the same purpose it is given in low pneumonia and in bronchitis. Dr. Barlow used to praise the salt highly in diabetes. Dose of carbonate of ammonia, three to ten grains. Thirty grains have been given as a stimulating emetic. Fifteen grains are neutralized by seventeen grains of citric acid.

Aromatic spirit of ammonia is given in dose of thirty to sixty minims. The so-called "Preston salts" consist of neutral carbonate of ammonia, usually prepared by adding liquid ammonia to the ordinary carbonate coarsely powdered.

#### **Ammonia Phosphas.** $(\text{NH}_4)_2\text{HPO}_4$ .

Made by neutralizing diluted phosphoric acid with strong liquid ammonia and evaporating the slightly alkaline solution till it crystallizes. The crystals are prisms more or less opaque if exposed to air, insoluble in spirit, and when twenty grains are dissolved in water and solution of ammonio-sulphate of magnesia added, a crystalline precipitate falls, consisting of phosphate of ammonia and magnesia. When this precipitate is dried and heated, the ammonia is driven off, and 16.8 grains of phosphate of magnesia left.

Dose five to twenty grains in solution. Used in *gout and rheumatism*, with lithic acid in the urine.

The insolubility of this salt in spirit is an objection to combining any tinctures with it in a mixture.

**Ammoniæ Benzoas.**  $\text{NH}_4\text{C}_7\text{H}_5\text{O}_2$ .

Benzoic acid is dissolved in dilute solution of ammonia, and crystals obtained by evaporation.

The crystals are laminar, soluble in water and alcohol, and the solution gives a copious precipitate with persalts of iron. Heated, the benzoate sublimes, leaving no residue.

Dose ten to twenty grains. A useful diuretic in catarrh of the bladder where there is alkaline urine and much mucus. It is more soluble than benzoic acid, and acts more speedily. Iron, liquor potassæ, and acids, are incompatible with benzoate of ammonia.

**Ammonii Bromidum.**  $\text{NH}_4\text{Br}$ .

Usually seen in yellowish crystals, which sublime unchanged. Solubility in water, one in one and a half; in rectified spirit one in thirteen. Starch mucilage mixed with the solution does not turn blue when a drop of solution of chlorine or bromine is added, thus showing absence of iodine salts.

This salt is, like bromide of potassium, a nervine tonic very useful in hysteria and sleeplessness. In epilepsy it is of great value given in full dose. In whooping-cough a dose of one to five grains three times a day is good against the spasmodic element of this disease. In asthma it is, in the author's experience, a valuable medicine. *See* also Bromine.

Dose of Bromide of Ammonium, five to twenty grains.

**Ammonii Iodidum,**  $\text{NH}_4\text{I}$ ,

is not official in the B. P. It is a white crystalline salt, and may be given as an absorbent in the same dose as iodide of potassium.

**Ammoniaë Oxalas.**  $(\text{NH}_4)_2\text{C}_2\text{O}_4\cdot\text{H}_2\text{O}$ .

Ph. Appendix. This is a poisonous salt, used in solution as a test for lime.

**Sulphide of Ammonium.**  $\text{NH}_4\text{HS}$ .

Ph. Appendix. A saturated solution of sulphuretted hydrogen in ammonia, rarely given in medicine, but used as a test for zinc, iron, and manganese.

**Liquor Ammoniaë Fortior,**

$\text{NH}_3$ , or ammoniacal gas, dissolved in water. One drachm contains 15·83 grains of ammonia. This preparation is made by passing ammoniacal gas, generated from chloride of ammonium and lime, into distilled water. The details of the B. P. process should be studied. Liquid ammonia diluted with water is not changed on adding solution of lime, oxalate of ammonia, sulphide of ammonium, or ammonio-sulphate of copper, showing absence of carbonates, lime, metals, and sulphides. It must also be free from sulphates and chlorides.

**Liquor Ammoniaë** is prepared by diluting the **Liq. Ammon. Fortior**, just described, till it is reduced to about one-third of its strength. One drachm of liq. ammoniaë contains 5·2 grains of ammonia.

**Uses of Liquid Ammonia.**—The strong solution of ammonia applied to the skin is a strong rubefacient and vesicant, and may be used to produce a blister. As a rubefacient it is employed in the **Linimentum Camphoræ Compositum** of the B. P., a powerfully stimulating liniment. Diluted ammonia is employed to arouse the system in cases of faintness, or poisoning from such sedative drugs as tobacco, prussic acid, or opium, being, in these cases, applied near to the nostrils. It has been applied to the pharynx in cases of asthma, but the practice is dangerous, tending to cause asphyxia.

Dr. Halford has employed injections of weak liquid ammonia into the veins in cases of snake-bite; and late Dr. Tyler Smith employed similar injections in bad forms of puerperal fever with success. Dr. Wees has used one drachm to one pint of water, as vaginal injection in pruritus of the vagina, with good effect.

Liquor Ammoniaë may be given internally as a stimulant in low states of system, in dose of ten to twenty minims well diluted.

The antispasmodic stimulant known as *Eau de Luce* is made of strong ammonia, oil of lavender, mastic, and alcohol spirit. Dose five to ten minims in water.

**Spiritus Ammoniaë Fœtidus** is gum assafœtida dissolved in spirit and distilled, the distillate being mixed with strong ammonia, 2 oz. in 1 pint.

Dose half to one drachm, as an antispasmodic and emollient, in cases of flatulence in the bowels.

**Linimentum Ammoniaë.**—Solution of Ammonia in olive oil mixed into a semi-solid soap, of use as a counter-irritant. Ammonia liniment with rosemary enters into the composition of many lotions to promote the growth of the hair.

#### Liquor Ammoniaë Acetatis.

Acetate of Ammonia,  $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ , is a highly efflorescent salt, not easily crystallized. The Liquor is made by neutralizing carbonate of ammonia with acetic acid, and diluting. Mr. Squire recommends that this solution should be made with Volcanic ammonia, a very pure ammonia, obtained as a by-product in making borax from boracic acid.

Liquor Ammoniaë Acetatis, called also Mindererus' spirit, was first used in medicine by Boerhaave, in 1722. The dose of this solution is two to six drachms, but it is a very valuable diaphoretic and febrifuge, reducing fever, removing congestions, and acting especially on the skin and kidneys. It is often given

with nitrate of potash, or with tartar emetic in camphor water.

**Liquor Ammoniae Citratis.**  $3\text{NH}_4\text{C}_6\text{H}_5\text{O}_7$ .

Solution of citric acid, neutralized with strong solution of ammonia. Dose two to six drachms, as a cooling refrigerant, very useful in gastric irritation, and in diabetes.

Twenty grains of carbonate of ammonia are neutralized by twenty-three of citric acid.

**Ammoniae Nitras**,  $\text{NH}_4\text{NO}_3$ , is a white deliquescent salt introduced into the B.P. as the source of  $\text{H}_2\text{O}$ , or nitrous oxide gas.

## CHAPTER V.

**LIME.—MAGNESIA.—BARYTA.—ALUMINA.****Calx, or Lime.  $\text{CaO}$ .**

The oxide of the white metal calcium is an alkaline earth, obtained by burning chalk or limestone to expel the carbonic acid.

Fresh burnt lime, quicklime, is an alkaline caustic; when water is added to it heat is given out, and it becomes hydrate of lime or slaked lime.

Lime is more soluble in cold than in hot water. Thus at  $32^{\circ}$  20 ounces of water will dissolve thirteen grains of lime; while at  $212^{\circ}$  the same quantity will only dissolve six and a half grains. Slaked lime dissolves in dilute hydrochloric acid, and the residue left after evaporating this solution, redissolved in water, gives a very scanty precipitate on the addition of saccharated solution of lime, indicating absence of phosphate.

**Calcis Hydras.  $\text{Ca2HO}$  or  $\text{CaH}_2\text{O}_2$ .**

Slaked Lime, or Hydrate of Lime, is prepared by pouring water on quicklime, and then sifting out the powder of the hydrate, which should be kept in a well-stoppered bottle to prevent absorption of carbonic acid from the air. Hydrate of Lime is used in preparing—

**Liquor Calcis**, or Lime Water, containing half a grain of lime in one ounce, and

**Liquor Calcis Saccharatus**, containing 7·11 grains of lime in one ounce. Lime is therefore much more soluble in syrup than in plain water.

**Uses.**—Externally the **Linimentum Calcis**, made by mixing equal parts of lime water and olive oil into a thickish cream, is used as an application to burns



and scalds, to allay inflammation and irritation. It has long been used for this purpose at the Carron ironworks, and hence is well known as Carron oil.

Internally lime is given as an antacid and absorbent. Lime water in dose of one to four ounces may be given mixed with milk to allay vomiting and correct acidity of stomach. For the same purpose the *Liquor Calcis Sacch.* may be employed in dose of fifteen to sixty minims. In either form also lime may be given to promote the growth of bone in weak and rickety children.

**Calx Chlorata, Chlorinated Lime.**—A dull white powder, possessing bleaching and disinfecting properties, made by exposing slaked lime to the action of chlorine gas so long as the latter is absorbed. Chemically the powder consists of hypochlorite of lime, chloride of calcium, and hydrate of lime. When an acid is added the powder evolves chlorine. The amount of chlorine contained in the powder is ascertained by adding iodide of potassium and a little hydrochloric acid. Iodine is set free in proportion to the amount of chlorine present, and the free iodine is measured by seeing how much of the volumetric solution of hyposulphite of soda it will decolorize. The reaction is similar to that described under *Liquor Chlori*.

The preparations made from *Calx Chlorata* are two:

**Liquor Calcis Chloratæ**, or solution of chlorinated lime, and

**Vapor Chlori**, or chlorine inhalation.

The solution of chlorinated lime is not given internally. Externally it is used sometimes as a lotion, and cloths soaked in the solution are hung about in sick rooms as disinfecting agents. Patients affected with hay asthma are often much relieved by being near the vapour of chlorinated lime.

Vapor Chlori is procured by mixing chlorinated lime with cold water and inhaling the vapour as it rises. First  $\text{HClO}$  or hypochlorous acid is evolved;

this decomposes into free chlorine and chloric acid,  $\text{HClO}_3$ , and this last named body by its decomposition yields more chlorine.

Chlorine inhalation may be used in fetid bronchitis and bad ulcerations of mouth and throat. In phthisis pulmonalis it has been tried, but with no satisfactory results. Chlorine vapour is a good antidote in poisoning by sulphuretted hydrogen or hydrocyanic acid.

#### **Calcis Phosphas.** $\text{Ca}_3\text{P}_2\text{O}_8$ .

Phosphate of lime is obtained as a white powder by dissolving bone-ash in dilute hydrochloric acid, and precipitating with ammonia. The powder is distinguished from carbonate of lime by not effervescing when dissolved in dilute nitric acid. After the addition of acetate of soda, perchloride of iron will precipitate a yellowish white phosphate of iron, from this solution.

Phosphate of lime is used in preparing **Pulvis Antimonialis**, and it is administered internally in dose of ten to twenty grains, with intent to improve nutrition.

A syrup of Lacto-phosphate of Lime, invented by Dr. Dusart, is considered a good form for administering phosphate of lime. The neutral phosphate of lime, prepared by M. Tisy in the form of syrup, and in pastilles, is a very good preparation; being free from excess of acid it does not affect the teeth; being soluble, it is readily absorbed.

#### **Calcis Hypophosphis.** $\text{Ca}_2\text{PH}_2\text{O}_7$ .

Hypophosphite of Lime is obtained by heating phosphorus with hydrate of lime and water until phosphuretted hydrogen gas ceases to be evolved, then filtering the liquid, separating excess of lime by means of carbonic acid gas, and evaporating the solution till the hypophosphite crystallizes out in pearly white crystals.

Hypophosphite of Lime is soluble in water as 1 in 6; it is insoluble in spirit. Heated to redness it ignites. When mixed with solution of carbonate of soda double decomposition takes place; carbonate of lime precipitates, and hypophosphite of soda remains in solution.

Hypophosphite of Lime, in dose of 5 to 10 grs. in syrup and water, is a very useful medicine in chronic phthisis with profuse discharge in the way of expectoration, sweating or diarrhoea.

#### **Calcis Carbonas Præcipitata, $\text{CaCO}_3$ ,**

is a white crystalline powder, obtained by precipitating solution of chloride of calcium with carbonate of soda. This powder, being gritty, should not be employed in making chalk mixture. In the Pharmacopœia it is used in preparing the **Trochisci Bismuthi**, or bismuth lozenges. Dose ten to twenty grains.

**Creta Præparata** is a carbonate of lime, prepared in small conical masses from ordinary chalk (**Creta**, B.P.) by elutriation with water to separate insoluble matter. It is made in the same way as the *Whiting* used in cleaning plate.

Neutral solution of Carbonate of Lime, or of **Creta Præparata**, in dilute hydrochloric acid, should undergo no change on addition of saccharated solution of lime, showing absence of alumina, magnesia, phosphates and metallic impurities. Prepared chalk is given as an absorbent and antacid in dose of ten to sixty grains. It is used in preparing **Hydrargyrum c. Creta**.

**Mistura Cretæ**, or chalk mixture, containing chalk, gum acacia, syrup, and cinnamon water, is given in dose of one to two ounces in diarrhoea with acidity. **Pulvis Cretæ Aromaticus**, containing chalk, cinnamon, nutmeg, saffron, cardamoms, cloves, and sugar, and **Pulv. Cretæ Aromat. c. Opio**, are powders given in diarrhoea with acidity and griping. Dose of the first twenty to sixty grains; of the second, which contains one of opium in forty, ten to  
v grains.

**Calcii Chloridum.  $\text{CaCl}_2$ .**

A crystalline deliquescent salt, rapidly absorbing water, and used for this purpose in preparing chloroform and pure ether.

In dose of five to ten grains it has been given, dissolved in water, to allay vomiting, and sometimes reduce indolent tumours. Solutions of chloride of calcium are used in testing. *See B. P., Appendix.*

**Magnesia.  $\text{MgO}$ .**

**Magnesia** occurs in Nature as carbonate in the minerals Dolomite and Magnesite. Sulphate of magnesia occurs as Epsom salt in the water of many springs. Solution of sulphate of magnesia can be prepared from Magnesite by dissolving it in sulphuric acid, and from the solution of the sulphate the pure carbonates of Magnesia are obtained.

**Magnesiae Carbonas,  $(\text{MgCO}_3)_2 \cdot \text{MgO} \cdot 5 \text{H}_2\text{O}$ ,**

consists of Carbonate and Hydrate of Magnesia, and a heavy white powder, *Magnesiae Carbonas Ponderosa*, obtained by precipitating a strong, hot solution of sulphate of magnesia by carbonate of soda, evaporating the whole to dryness, and washing away from the dry residue all the sulphate of soda. If the sulphate is clean washed out, the magnesia, dissolved in dilute hydrochloric acid, will give no precipitate with chloride of barium. Another portion of the solution may be tested for lime with oxalate of ammonia, and for metallic impurity by sulphuretted hydrogen. With ammonia and phosphate of soda a crystalline precipitate, phosphate of magnesia and ammonia ( $\text{MgNH}_4\text{PO}_4$ ) is produced. The solution of carbonate of magnesia in dilute acid, after admixture with chloride of ammonium, should not be changed by the addition of ammonia, indicating absence of stryta and lime.

**Liquor Magnesiae Carbonatis** consists of carbonate of magnesia dissolved in water by the aid of

carbonic acid gas. Each fluid ounce contains thirteen grains of carbonate. This is the same strength as Murray's fluid magnesia. Dinneford's magnesia is a carefully made solution of carbonate of magnesia in carbonic acid water. When kept, crystals of the hydrated neutral carbonate of magnesia deposit from the solution in prisms as the carbonic acid escapes. Chemically, the solution is one of the Bicarbonate of Magnesia, and it forms an agreeable way of giving magnesia as an antacid and mild laxative.

Ten drachms of Liq. Mag. Carb. mixed with thirty grains of citric acid dissolved in two ounces of water, with syrup added, make a good effervescing draught of Citrate of Magnesia.

**Liquor Magnesiae Citratis**, Effervescing Solution of Citrate of Magnesia. Dose 5 to 10 oz. in gastric irritation. It is slightly purgative.

**Magnesiae Carbonas Levis.** ( $MgCO_3$ ),  $MgO, 5H_2O$ .

Light carbonate of magnesia is made by mixing cold dilute solutions of carbonate of soda and sulphate of magnesia; double decomposition occurs, and on boiling the mixture the light carbonate of magnesia separates as a precipitate, which is collected, washed, and dried. Slender prisms are seen in light carbonate of magnesia under the microscope. Other characters and tests similar to those of carbonate of magnesia. One of light carb. magnes. dissolves in 2493 of cold, and 9000 of hot water.

The carbonates of magnesia are antacid and laxative. Dose ten to twenty grains as antacids; thirty to sixty grains as purgatives. The persistent use of large doses of magnesia has given rise to collections of the substance and blocking up of the intestines.

**Magnesia.**  $MgO$ .

Heavy carbonate is heated till all the carbonic acid gas is driven off, and a heavy white powder scarcely soluble in water, but soluble without effervescence in acids, remains. Dose ten to twenty

grains as an antacid and gastric sedative; twenty to sixty grains purgative. This powder in mixture with sulphate of magnesia is apt to form a solid mass. Not being a carbonate it gives off no gas on meeting with acids in the stomach. It is known as *Magnesia Usta*, or *Calcined Magnesia*.

**Magnesia Levis, MgO.**

Light Magnesia is a white powder, obtained by heating the light carbonate. In dose and use similar to Magnesia, from which it differs only in degree of levity, the volumes corresponding to the same weight being as three and half to one. Magnesia Levis enters into the composition of the **Pulvis Rhei Compositus**.

**Magnesiae Sulphas.  $MgSO_4, 7H_2O$ .**

A bitter purgative salt, familiar as *Epsom Salts*, made usually from Dolomite (carbonate of magnesia and lime), by dissolving out the magnesia as sulphate by means of sulphuric acid, and leaving the insoluble sulphate of lime. Usually met with in acicular crystals, tending to effloresce in the air. The solution of sulphate of magnesia should give no indication of lime on adding oxalate of ammonia. It should not give a brown precipitate with chlorinated lime or soda, indicating absence of iron. It should be free from chlorides, and not deliquesce in the air. Sulphate of magnesia, in doses of sixty grains to one half ounce, acts as a watery hydragogue purgative, useful in some congestions of stomach and liver, with imperfect and scanty intestinal secretion. Sometimes small doses of the sulphate act decidedly on the kidneys. Sulphate of magnesia may often be combined with the sulphate or tincture of iron with advantage; and the disagreeable taste of the sulphate can be overcome by means of ten or twenty drops of Spiritus Chloroformi added to each dose. The Pullna water of Bohemia contains sulphate of magnesia with sulphate of soda, and is a useful purga-

tive water in cases of constipation with torpor of the liver.

**Enema Magnesiae Sulphatis.**—A purgative enema, containing one ounce of the sulphate.

**Mistura Sennae Composita.**—Senna black draught contains one of sulphate in five of draught. Dose one to one and a half ounces.

*Sulphite of Magnesia*, in doses of twenty grains, has been recommended as an antiseptic, by virtue of its sulphurous acid, in pyæmia and putrescent diseases.

### Baryta. BaO.

The oxide of the metal Barium is not used in medicine. **Barii Chloridum**,  $BaCl_2 \cdot 2H_2O$ , or Chloride of Barium, occurs among the test solutions in the Appendix, being used as a test for sulphates and sulphuric acid, with which it forms a white sulphate insoluble in acids. Chloride of barium in dose of half to one grain has been given as an alterative medicine in glandular enlargements and struma. If long continued it tends to cause nervous symptoms and paralysis.

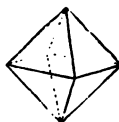
### Alumen, or Alum. $NH_4Al(SO_4)_2 \cdot 12H_2O$ .

The earth Alumina, from which metallic aluminium is made, is not found in the B. P. Fuller's Earth and Armenian Bole contain alumina, but the only preparation found in the B. P. is **Alumen**, or the double sulphate of alumina and ammonia. It is made by exposing Aluminous Schist to the air; thus sulphate of alumina is produced by oxidation of the sulphide contained in the schist.

Water is added to dissolve out the sulphate of alumina, and to this solution sulphate of ammonia is added; on concentrating the solution the alumen crystallizes out, leaving iron salts in solution.

Alum crystallizes in an octohedron, or double pyramid, and there are several alums all having similar form (Fig. 5). Solution of alum should be free from

FIG. 5.



iron when tested with the prussiates of potash. With caustic potash or soda, the solution evolves ammonia, while alumina is precipitated, soluble in excess of the potash of soda.

**Alumen Exsiccatum**, or Dried Alum, is alum that has been heated till all the water of crystallization is driven off. The powder of burnt alum is used as an escharotic.

Alum is used in medicine externally and internally. As an astringent lotion or gargle, one drachm or more of alum will go well with six ounces of water. To make a good gargle, two drachms of honey or half a drachm of tincture of myrrh may be added. Alum poultice, used in some inflammatory affections of the eyelids, is made by mixing sixty grains of alum with the white of two eggs. Internally alum is absorbed into the blood, and acts as a direct and remote astringent, checking profuse secretion or hæmorrhage. Dose ten to fifteen grains. In lead colic alum in dose of 20 to 120 grains is very effectual in relieving spasms and opening the bowels. In chronic bronchitis with profuse secretion alum is often of much service, and it has been highly commended in the treatment of whooping-cough. In croup, Dr. Meigs recommends sixty grains of alum with honey as a safe and effectual emetic. Bretonneau has used insufflation of alum in diphtheria with good effect. Alum is incompatible with alkalies and astringents. Powdered alum is a good application to stop the bleeding from leech bites.

What is called **Rock Alum** is usually common alum covered with a red facing of Venetian red or Armenian bole, which is readily washed off by water.

**Iron Alum** is a sulphate of peroxide of iron and sulphate of ammonia or potash; it is very astringent, and of use in passive hæmorrhages. Dose five to ten grains.

**Chlor Alum** is chloride of aluminium, used as a disinfectant.



## CHAPTER VI.

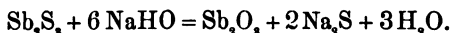
## THE METALS PROPER.

**Antimonium.** Stibium, or Antimony. Sb = 122.

Antimony, though not used in the metallic state, forms the basis of several important Pharmaceutical preparations.

**Antimonium Nigrum** is prepared from the native sulphide of antimony,  $Sb_2S_3$ , by fusion, whereby siliceous matter is separated. This black antimony of the Pharmacopœia is used as the source of the antimonial preparations. From it is prepared **Antimonium Sulphuratum**, the Golden Sulphide of Antimony, containing a variable amount of oxide of antimony.

In the B. P. process black antimony is boiled in solution of soda, and the solution strained off. Oxide of Antimony and Sulphide of Sodium are formed in the boiling thus—



The sulphide of sodium formed dissolves some of the undecomposed sulphide of antimony, and the subsequent addition of sulphuric acid precipitates the sulphide of antimony from its solution in the sulphide of sodium. The precipitate is collected and dried, and appears as a bright orange powder, soluble in caustic soda or potash, and soluble in hydrochloric acid with evolution of sulphuretted hydrogen and deposition of sulphur. Sulphurated Antimony is not much employed in medicine, being uncertain in action. The dose is one to five gr., and it is contained in the **Pil. Hydrargyri Subchloridi Comp.** as one *grain in five.*

**Liquor Antimonii Chloridi.  $\text{SbCl}_3$ .**

Solution of Chloride of Antimony is made by boiling black antimony in hydrochloric acid; sulphuretted hydrogen gas is evolved, and a solution of chloride of antimony remains. This solution is identical in composition with the *Butter of Antimony*, sometimes used as an active caustic. True butter of antimony is obtained by distilling the chloride. The use of the Liquor above mentioned is to prepare the oxide of antimony.

**Antimonii Oxidum.  $\text{Sb}_2\text{O}_3$ .**

When solution of chloride of antimony is poured into water a heavy white precipitate of oxychloride of antimony is formed. This precipitate is known as *Powder of Algaroth*; it is unstable in composition, and the reaction by which it is formed may be thus written,  $12 \text{SbCl}_3 + 15 \text{H}_2\text{O} = 2 \text{SbCl}_3 + 5 \text{Sb}_2\text{O}_3 + 30 \text{HCl}$ . This white precipitate is collected and washed, and then stirred with solution of carbonate of soda. After half an hour the precipitate is again washed, till all the chloride is got out of it, and dried at a temperature not exceeding  $212^\circ$ . Thus is obtained the Oxide of Antimony,  $\text{Sb}_2\text{O}_3$ . If the heat exceed  $212^\circ$ , a higher oxide results. Oxide of antimony, if quite free from trace of iron, is white, but usually it is rather grey in colour. It melts when heated, is insoluble in water, but soluble in hydrochloric acid. It is quite soluble in acid tartrate of potash. If arsenic, or any of the higher oxides of antimony are present, they will not dissolve in the acid tartrate.

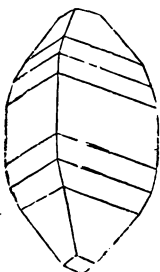
The dose of Oxide of Antimony is one to four grains. It is usually given in the form of **Pulvis Antimonialis**, one of oxide of antimony mixed with two of phosphate of lime. This powder is an imitation of Dr. James's fever powder. It is uncertain in action, according to its composition and the amount of acid present in the stomach to dissolve the

oxide of antimony. The dose is two to six grains as a sedative and febrifuge.

**Antimonium Tartaratum.**  $\text{KSbC}_4\text{H}_4\text{O}_7 \cdot \text{H}_2\text{O}$ .

Tartar emetic is a Tartrate of Potash and Antimony, and is made by first mixing and then boiling oxide of antimony with acid tartrate of potash, and setting aside to crystallize. The crystals (Fig. 6) are rhombic

FIG. 6.



octohedrons, whose lateral planes are striated. Solubility of this salt is one in twenty of cold water and one in two of boiling water; it is partially soluble in proof spirit. As it contains an organic acid it blackens when heated; and if, to its watery solution, hydrochloric acid be added, a white precipitate of terchloride with acid tartrate of potash falls, soluble in excess of tartaric acid. A crystal of tartar emetic dropped into solution of sulphuretted hydrogen is surrounded by an orange-coloured deposit of sulphide of antimony.

Tartar emetic is met with in pharmacy as a white powder; if yellowish it contains iron. The watery solution if kept develops a fungus, the *Sirocrocis Tartarica*.

**Uses of Tartar Emetic.**—Externally, in the form of solution or ointment, tartarated antimony acts as a *pustulant* and strong counter-irritant, producing an eruption of large pustules, like those of small-pox.

**Unguentum Antimonii Tartarati** is used for the above-named purpose in some affections of joints. Rubbed over the spine it has been of use in paralytic affections of children.

Internally tartar emetic is given as a diaphoretic and expectorant in dose of one-sixteenth to one-sixth of a grain; as a vascular depressant or sedative, *one-sixth to one or two grains*; and as an emetic one

grain to three grains. It should never be combined with acids, alkalies, or astringent infusions.

**Vinum Antimoniale** contains two grains in one ounce of sherry and may be given in dose of five to thirty minims.

As a general relaxant and sedative, tartar emetic is very useful, and it is employed in various inflammatory affections of the substance of organs. In pneumonia it is of much value, when employed early in the disease, before much exudation has taken place.

In old times it used to be given largely in pneumonia, till "tolerance" of the drug was established. Rasori and Laennec have thus given tartarated antimony in dose of one and half drachms in twenty-four hours without injurious effect. It is not now often employed on this "contra-stimulant" principle. Magendie believed tartar emetic to have a specific action over the lungs, for he found on opening the chests of animals killed by it, that the lungs were engorged. If this be so, large doses may prove dangerous in pneumonia, while small doses may be very serviceable. The great value of small ( $\frac{1}{12}$  to  $\frac{1}{8}$  gr.) doses of tartar emetic in the early stages of pneumonia I have often proved, and am also satisfied as to the very injurious effect of large doses of the drug. The small doses should be given first at short intervals of 2 or 3 hours.

On the alimentary canal tartar emetic acts as an irritant, and it provokes vomiting, attended with much exhaustion of system. If solution of emetic tartar be injected into the blood, it will cause vomiting. In dose of one-sixth grain every two hours I have seen it prove very useful in convulsions with albuminuria after scarlet fever.

A small dose (one-sixth of a grain) may often be combined in a purgative pill in cases of obstinate constipation, with defective secretion from the intestines.

**Argentum.** Ag = 108.

**Argentum Purificatum**, or Refined Silver, is quite soluble in nitric acid, the solution being unchanged when excess of ammonia is added.

**Argenti Nitras.** AgNO<sub>3</sub>.

Nitrate of Silver occurs in crystals, or, if fused, in white sticks. It is soluble in water, and in rectified spirit.

The solution gives with hydrochloric acid a curdy precipitate of chloride of silver, soluble in ammonia; any lead would remain undissolved. Ten grains of the nitrate dissolved in two drachms of water give, with hydrochloric acid, a precipitate which, when washed and dried, weighs 8.44 grains. The filtrate when evaporated should yield no residue, any residue would consist of nitrate of potash and other impurities.

**Uses.**—Fused nitrate of silver is well known as *Lunar Caustic*, and it is applied to destroy proud flesh in wounds; and, cut to a point, it is thrust into poisoned wounds with a view to its caustic action. In solution the nitrate is used as an astringent to weak congested vessels. Twenty grains, with one drachm of distilled water, and seven drachms of sp. nitrous ether, form a useful astringent lotion, that may be applied to parts affected with erysipelas. Stronger solutions are often employed locally for the throat and larynx when congested and inflamed.

Solution of nitrate of silver is used for the quantitative estimation of hydrocyanic acid, and also as a test for the presence of chlorides.

Internally, in dose of one-quarter to one-half of a grain, nitrate of silver is given in a pill with bread as a remedy in many gastric affections, attended with chronic inflammation of the mucous membrane of the stomach, pain, and vomiting.

*The salt* is also employed in epilepsy, and other

nervous, convulsive affections ; but the objection to its use for a length of time is the fact of its changing the skin to a slate colour, giving the patient a livid blue look, which remains permanently. This coloration is due to a reduction of the metal ; it takes three months of the nitrate to produce this effect on the skin.

#### Argenti Oxidum. $\text{Ag}_2\text{O}$ .

This preparation is made by adding solution of nitrate of silver to lime water ; the brown oxide of silver settles, and nitrate of lime remains in solution. Oxide of Silver is an olive brown powder ; heated it gives off oxygen, and from twenty-nine grains twenty-seven grains of metallic silver may thus be obtained. The oxide dissolves in nitric acid and in ammonia without giving off any gas.

**Uses.**—Oxide of silver, in dose of half a grain to two grains, is given as a gastric sedative, and as a nervine tonic. In some chronic inflammatory affections of the womb it seems of service ; and, occasionally, I have found it a very useful remedy in sudden severe attacks of spasmodic asthma. Creasote and oxide of silver must never be combined in a pill, for the oxide is decomposed with such violence as to cause combustion of the mass. With bread, or with extract of stramonium or hop, the oxide will go very well.

#### Arsenicum. $\text{As} = 75$ .

Arsenic, in the metallic form, is not used in medicine. The B. P. preparation is **Acidum Arseniosum**,  $\text{As}_2\text{O}_3$ , called also **Arsenicum Album**, or **White Arsenic**.

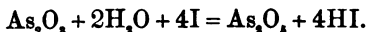
This Arsenious Acid is obtained as a sublimate by roasting arsenical ores, and is purified by resublimation and condensation on a cold surface.

Arsenious Acid occurs as a white powder, or in sublimed masses, which at first are translucent, but under exposure to air become opaque and enamel-like

in appearance. When mixed with charcoal and heated, metallic arsenic sublimes with a garlic-like odour.

Solubility of arsenious acid in cold water one in one hundred, in boiling water one in twenty. Solution of arsenious acid forms a yellow sulphide with sulphuretted hydrogen. Four grains dissolved in boiling water with eight grains of bicarbonate of soda will discharge the colour of 808 grain-measures of the volumetric solution of iodine.

The decoloration of the iodine solution is effected by the conversion of the brown iodine, by means of hydrogen, into colourless hydriodic acid, HI, while the arsenious acid obtains oxygen and becomes  $As_2O_3$ , arsenic acid. This formula shows the nature of the change that occurs—



On this principle the amount of arsenious acid in the Liquor Arsenicalis and Liquor Arsenici Hydrochloricus is ascertained by means of the volumetric solution of iodine.

**Uses of Arsenic.**—Arsenious acid, or white arsenic, has been employed externally as a caustic. Applied to an ulcerated surface, in the form of arsenical paste, arsenic has, by becoming absorbed, produced death in forty-eight hours. Cautiously used, arsenical applications have proved very serviceable in ulcerated cancer. The arsenic should constitute one-fifth, or one-sixth part, of the powder, it will then excite sufficient inflammation to prevent the absorption of the poison. In *onychia maligna*, an ointment of arsenious acid two grains, simple ointment one ounce, has been much praised by Mr. Luke. Liquor Arsenicalis, from three to twelve minims, has been employed hypodermically in chorea by Dr. Radcliffe with much success.

Internally arsenious acid may be given in a pill, with bread mass or manna, in dose of  $\frac{1}{60}$  —  $\frac{1}{15}$  of a grain. **Liquor Arsenicalis** consists of arsenious acid dissolved in solution of carbonate of potash in

the proportion of four grains per ounce, and coloured with compound tincture of lavender. This Liquor is well known as *Fowler's Solution*; it is also called *Liquor Potassæ Arsenitis*, a name implying that it is a definite chemical combination of arsenious acid with potash, which it is not, for it is only after long boiling that the arsenious acid will decompose carbonate of potash. *Liquor Arsenici Hydrochloricus*, known as *De Valangin's solution*, is a solution of arsenious acid in dilute hydrochloric acid in the proportion of four grains to one ounce. The original solution of Dr. De Valangin contained one and a half grains to one ounce. The dose of either of these solutions is from 2 to 8 minims.

The Pharmacopœia directs the amount of arsenic contained in the above-named solutions to be ascertained by boiling one ounce with bicarbonate of soda, mixing with cold starch mucilage, and then adding gradually the volumetric solution of iodine. No blue colour is produced till 808 grain-measures have been added, corresponding to four grains per ounce of arsenious acid.\*

The diseases in the treatment of which arsenical medicines are most often used, are of a chronic kind. The medicine is likely to do harm in cases of acute or inflammatory disease. If the use of arsenic be continued for too long a time, irritability of stomach and inflammation of the conjunctiva of the eye are likely to be produced. Arsenic should always be commenced in small dose, and it is best to give it after food.

As a medicine, arsenic has been found of service in the treatment of intermittent and periodic diseases. The Tasteless Ague Drop is a solution of arsenic, and a celebrated remedy for ague. It is in old chronic cases of intermittent fever and ague that arsenic is so useful, especially if combined with ammonia. In

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\* Test explained on preceding page.



more recent cases bark and quinia are preferable medicines.

In chronic skin disease of a scaly kind, such as lepra and psoriasis, arsenic is much praised as a remedy. In that affection of the small joints known as rheumatoid arthritis, arsenic has been recommended by Dr. Fuller and others; and the author can testify also to its being of service in these very troublesome rheumatoid affections. In chorea and epilepsy arsenic has been employed as a nervine tonic. In gastrodynia, with vomiting of food, I have often employed arsenic, in the form of one drop of Fowler's solution, with strikingly good effect.\*

In spasmodic asthma, as well as in chronic bronchitis, the arseniate of soda, by the mouth and by inhalation in a cigarette, has proved in my hands a very excellent medicine.† In hay fever arsenic internally is of great service in checking the troublesome coryza. For this purpose two drops of *Liquor Arsenicalis* may be given three times daily.

In apoplectic congestions of the head in strong plethoric people, small doses of *Liq. Arsenicalis* are recommended by Waring and by Lemaire Piquet. In menorrhagia arsenic is at times useful, and in chronic strumous ophthalmia it is a first-rate remedy.

In some obstinate forms of neuralgia arsenical remedies are of great service.

#### **Sodæ Arsenias.** $\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$ .

Arseniate of Soda is made by fusing arsenious acid with nitrate and carbonate of soda. The arsenious acid is oxidized, by means of the nitrate of soda into Arsenic Acid, and the product of the fusion is a Pyro-arseniate of Soda ( $\text{Na}_4\text{As}_2\text{O}_7$ ). Dissolved in water and crystallized this salt becomes the Arseniate of Soda. Heated to 300° F. the crystals lose all

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\* See an article in *The Practitioner*, July, 1870, p. 21.

† See "Notes on Asthma," 3rd edition, p. 97.

water and an anhydrous salt ( $\text{Na}_2\text{HAsO}_4$ ) remains. Solution of four grains of which in one ounce of water forms the **Liquor Sodæ Arseniatis**.

Arsenate of Soda is given for the same purpose as other arsenical preparations; it appears to be a form of arsenic that agrees well with the stomach. Dose  $\frac{1}{8}$  to  $\frac{1}{2}$  of a grain.

The arseniate of soda is found in the mineral springs of Mont Dore and Bourboule: and both these waters have a great repute for the relief and cure of various forms of asthma.

Iodine and arsenic combine to form  $\text{AsI}_3$ , Iodide of Arsenic, given internally in dose of  $\frac{1}{60}$  to  $\frac{1}{15}$  of a grain in cancer, and in many skin affections. Donovan's solution of the teriodide of arsenic and mercury contains in one fluid drachm  $\frac{1}{15}$  grain arsenic,  $\frac{1}{4}$  grain mercury,  $\frac{3}{4}$  grain iodine. It is the **Liquor Arsenici et Hydrargyri Hydriodatis** of the Dublin Pharmacopœia, and it is given in syphilitic skin affections in doses of ten to thirty minims.

#### **Bismuthum.** Bi = 210.

Commercial Bismuth has to be purified before it is fit for use in pharmacy.

**Bismuthum Purificatum** is made by fusing bismuth in a crucible with nitrate of potash. The salt fuses into a slag, and carries with it arsenic and other impurities from the bismuth. Purified bismuth dissolved in equal parts of nitric acid and water forms a solution from which crystals of nitrate of bismuth can be obtained by evaporation. These crystals are decomposed by water, and a white precipitate of subnitrate of bismuth is produced. It is important that purified bismuth be free from arsenic, lead, and copper.

#### **Bismuthi Subnitratis.** $\text{BiNO}_2\text{H}_2\text{O}$ .

Solution of bismuth in nitric acid is poured into water, and a white precipitate of subnitrate falls, just as the oxychloride of antimony falls when the liquid

terchloride is poured into water. This precipitate must be washed and dried at a temperature not above  $150^{\circ}$ , and then consists of a hydrous oxynitrate of bismuth, commonly called the subnitrate.

The Subnitrate of Bismuth, or white bismuth, is a finely crystalline powder blackened into a sulphide by sulphuretted hydrogen. The presence of nitric acid is shown by the blackening of its solution in sulphuric acid by sulphate of iron. The nitric acid solution is unchanged by sulphuric acid and by nitrate of silver, showing absence of lead and chlorine. Subnitrate of bismuth, boiled in water with solution of soda, is converted into a yellowish powder of oxide of bismuth,  $\text{Bi}_2\text{O}_3$ , **Bismuthi Oxidum** of B. P. Dose five to fifteen grains.

**Uses.**—Subnitrate of Bismuth is used externally as a sedative powder to dust over irritations of the skin; it is also applied with advantage to burns and irritable sores in the form of an ointment, sixty grains to one ounce of lard. Suspended in mucilage, it has been advantageously used as an injection in gonorrhœa and in leucorrhœa.

Internally bismuth may be given in dose of three to thirty grains or more, and is a valuable remedy in many gastric affections, attended with pain, and vomiting of sour acrid fluid. It agrees best where the tongue is red and clean. In cancerous affections of the stomach white bismuth, given with magnesia and a little morphia, is very efficacious in relieving pain. Bismuth, like iron, blackens the fœces, from being converted into a black sulphide. M. Monneret recommends bismuth in doses of one or two drachms, and believes it acts best in these very large doses. After awhile a blue line forms along the gums of those who take very large doses of bismuth, similar to the line observed on the gum in cases of lead poisoning. Concrete masses of bismuth have been found post mortem in the intestines of those who have taken it in large doses.

**Trochisci Bismuthi**, or Bismuth lozenges, contain two grains of subnitrate of bismuth in each lozenge, with carbonates of magnesia and lime.

**Bismuthi Carbonas.**  $2(\text{Bi}_2\text{CO}_3)\cdot\text{H}_2\text{O}$ .

This salt is rather an oxycarbonate than a true carbonate; and it may be thus represented:— $\text{Bi}_2\text{O}_3\text{CO}_3$ . It is made by gradually adding solution of bismuth in nitric acid to solution of carbonate of ammonia. The precipitate is collected, washed, and dried. It is a white powder, soluble with effervescence in nitric acid; the solution is unchanged by nitrate of silver or sulphuric acid, and does not bleach solution of sulphate of indigo.

**Uses.**—The carbonate is a more soluble salt than the nitrate of bismuth; it dissolves in the stomach, and is absorbed into the blood. In dose of five to twenty grains it may be employed in a similar way to the nitrate.

**Liquor Bismuthi et Ammoniae Citratis.**

This solution of Citrate of Bismuth and Ammonia is clear, colourless, and feebly alkaline to test-paper. It mixes with water without change, but if heated with potash it evolves ammonia, and a white precipitate falls. With hydrochloric acid it forms a white precipitate soluble in excess. This liquor is a good form for the administration of bismuth; the dose is one-half to one drachm in water; one drachm containing three grains of oxide of bismuth.

**Cadmium** Cd = 112.

Cadmium is a metal resembling tin; it combines with iodine to form **Cadmii Iodidum**,  $\text{CdI}_2$ . This Iodide of Cadmium occurs in pearly crystals, soluble in water and spirit, and fusible at  $600^\circ$ .

**Unguentum Cadmii Iodidi.**—The iodide of cadmium ointment is apt to irritate the skin, and should therefore be diluted with lard, it may then be used as

an absorbent ointment to remove indolent tumours and indurations.

**Cerium.** Ce = 92.

**Cerii Oxalas.**  $CeC_2O_4 \cdot 3H_2O$ .—Oxalate of Cerium is obtained as a white granular powder on adding oxalate of ammonia to a soluble salt of cerium such as the nitrate. Oxalate of cerium is sometimes contaminated with oxalates and carbonates, in which case the salmon-coloured ash, obtained by incinerating the oxalate, dissolves in acids with effervescence. The solution of the salt in potash should not be changed by chloride of ammonium, indicating absence of alumina. With sulphate of potash it forms an insoluble crystalline double salt. Chloride of calcium shows the presence of oxalic acid by forming a white precipitate.

Oxalate of Cerium is given in dose of one to two grains, as a sedative in cases of obstinate vomiting, and is said to be of great service in arresting the severe vomiting of pregnancy. The salt has also been employed as a nervine tonic in epilepsy. It is allied in action to zinc, and also to bismuth.

**Cuprum.** Cu = 63·5.

Metallic copper appears in the Pharmacopœia as fine copper wire, and it is used in preparing the Sulphate of copper, and also in making the Spiritus Ætheris Nitrosi.

**Cupri Sulphas.**  $CuSO_4 \cdot 5H_2O$ .

Sulphate of copper is a blue crystalline salt, forming, with water, an acid solution. This solution gives a reddish brown precipitate with yellow prussiate of potash. If solution of chlorine be mixed with sulphate of copper solution and ammonia added, a precipitate forms which dissolves on adding more of the alkali, and a clear blue solution of ammonio-chloride of

copper is obtained; any undissolved residue would show the presence of iron.

**Uses.**—Externally sulphate of copper is used as an astringent and escharotic to check growth of proud flesh in wounds. A lotion of from one to ten grains to one ounce may be used to check excessive mucous discharges. Internally in dose of five to ten grains sulphate of copper is a prompt emetic. In dose of one quarter to two grains it is a valuable astringent in diarrhoea of chronic character. In chorea and epilepsy it is sometimes used as a nervine tonic. The German physicians think highly of sulphate of copper, in repeated small doses, for the treatment of croup.

Dr. Squire recommends emetic dose of sulphate of copper in diphtheria; five grains should be dissolved in one ounce of water, and one teaspoonful given repeatedly to a young child till free vomiting is induced.

**Subacetate of Copper.** *Ærugo* or *Verdigris*, a green crystalline salt, is used as a test for the presence of butyric acid in valerianate of zinc. The salt has been used mixed with honey as an escharotic.

### **Ferrum.** Fe=56.

Iron is said to have been the first mineral used in medicine, more than 3000 years ago. Wrought iron in the form of wire or nails, free from rust (oxide), is considered pure enough for pharmaceutical uses. Iron filings contain many impurities.

The persalts of iron, as, for instance, the perchloride, pernitrate, persulphate have very marked astringent power, herein differing from the proto-salts of iron. These last are now often called *Ferrous Salts*, containing protoxide, or ferrous oxide, while the first-named are called *Ferrio Salts*, and contain the peroxide of iron.

Ferrous Salts are distinguished chemically from Ferric Salts by giving a very dark blue precipitate with solution of red prussiate of potash, or ferrid-

cyanide of potassium. This precipitate looks like Prussian blue, but it is known as Turnbull's blue.

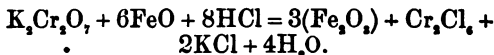
When solution of yellow prussiate of potash (ferrocyanide of potassium) is added to a ferric salt, such as the persulphate of iron, a dark blue precipitate of Prussian blue appears at once.

When solution of the ferrocyanide is added to a ferrous salt, as the protosulphate of iron, a white precipitate appears, which gradually becomes blue as the iron salt increases in degree of oxidation.

These tests are frequently referred to in the Pharmacopœia. Ferrous Salts can be raised in degree of oxidation in various ways; one is by means of a solution of the Bichromate of Potash. A volumetric solution of this salt is employed in the Pharmacopœia to convert protoxide into peroxide of iron.

Two equivalents of chromic acid ( $\text{Cr}_2\text{O}_3$ ) yield three equivalents of oxygen, which convert six equivalents of protoxide of iron,  $6(\text{FeO})$  into three of peroxide,  $3(\text{Fe}_2\text{O}_3)$ .

One thousand measures of the volumetric solution contain one-twentieth of an equivalent in grains of the bichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ ), and are capable therefore of converting one-twentieth of six equivalents of iron from prot- to peroxide. Supposing the protosalt of iron to be held in solution by hydrochloric acid, the following formula exhibits the nature of the oxidizing process (Garrod)—



When all the iron is converted into a persalt, a drop of the solution will no longer strike a blue colour with red prussiate of potash.

Iron acts on the blood as a tonic and hæmatinic. It increases the number of the red corpuscles, and the amount of hæmatin in the blood. Iron is a normal constituent of healthy blood, the pure colouring matter of blood containing about 6 per cent. of

iron; but it is not yet known in what form of combination iron exists in blood.

Iron, when taken, has the effect of blackening the tongue, and also the fæces, from the formation of sulphide of iron. The metal appears to be absorbed as a soluble albuminate. Very little iron passes into the urine: it has been found in the milk. The body temperature is said to be raised by the administration of iron.

In full-blooded plethoric persons, iron is not often required as a remedy; and if given, is likely to cause pain and congestion of the head. As a rule, the preparations of iron are best administered shortly after a meal.

**Preparations of Iron.—Ferrum Redactum.** Ferri Pulvis, Fer. Réduit. Quevenne's Iron. Reduced Iron is a dark greyish-black powder, obtained by passing dry hydrogen gas over hydrated peroxide of iron heated to redness in a gun barrel. The hydrogen combines with the oxygen of the peroxide to form water, and the iron is left in a metallic state in the gun barrel. Practically, the reduced iron contains about half its weight of magnetic oxide of iron ( $\text{Fe}_3\text{O}_4$ ). This magnetic oxide forms the undissolved residue when reduced iron is acted upon by solution of iodide of potassium and iodine in the Pharmacopœia testing process.

Reduced iron may be given in powder on bread, or made into a pill with balsam of Peru—three grains to one minim of the balsam. In dose of one to five grains it acts as a hæmatinic and blood restorer. Sometimes it may cause pain in the stomach, and unpleasant eructations of sulphuretted hydrogen.

**Trochisci Ferri Redacti.** Each lozenge contains one grain of reduced iron.

**Ferri Sulphas.**  $\text{FeSO}_4, 7\text{H}_2\text{O}$ .

Sulphate of Iron is made by dissolving iron wire in dilute sulphuric acid. Hydrogen gas is given off,



and this being replaced by iron, the compound remaining is a solution of sulphate of iron, which on evaporation yields the salt in pale green rhombic prisms. Solution of sulphate of iron (ferrous sulphate) gives a dark blue precipitate with red prussiate of potash, and a very pale blue with the yellow prussiate. With sulphuretted hydrogen it gives no precipitate; but if sulphide of ammonium is used, then a black precipitate of sulphide of iron ( $\text{FeS}$ ) falls.

**Uses.**—Sulphate of iron has been employed externally as a lotion in erysipelas, one drachm to one pint of water, by Velpeau, Hulke, and others. A weaker solution has been used in cases of prolapsus of the womb, and piles.

Sulphate of iron is given internally, in dose of one to three grains. It is somewhat astringent, and apt to irritate a delicate stomach. In solution with sulphate of magnesia or soda, it forms a tonic aperient draught, of use in cases of anæmia with constipated bowels.

**Pilula Aloes et Ferri** contains one and a half grains of sulphate of iron to two grains of Barbadoes aloes. A tonic aperient pill, of use in anæmia with constipation and defective menstruation.

#### **Ferri Sulphas Exsiccata.** $\text{FeSO}_4\text{H}_2\text{O}$ .

A greyish coloured powder, prepared by heating sulphate of iron and so expelling six of its seven atoms of water of crystallization. Of this salt three grains are equal to five grains of crystallized sulphate of iron. The dried sulphate may be given in pill with manna, in dose of one to three grains.

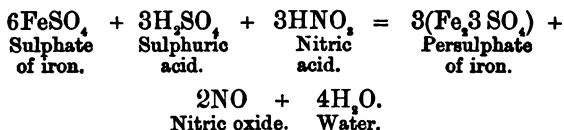
#### **Ferri Sulphas Granulata.** $\text{FeSO}_4,7\text{H}_2\text{O}$ .

The preparation of this salt depends upon the fact that sulphate of iron is insoluble in rectified spirit. A solution of sulphate of iron is filtered into a jar of *rectified spirit*, so that the salt separates in granular

crystals. The medicinal properties of this salt are similar to those of ordinary sulphate of iron; it keeps well, and is not apt to become brown like the common sulphate. It is used in making the Syrupus Ferri Phosphatis.

#### Liquor Ferri Persulphatis.

This Liquor is made by boiling solution of sulphate of iron with nitric acid. The nitric acid is decomposed, and part of its oxygen passing to the iron raises it to a persulphate, the remainder as nitric oxide becomes absorbed in the solution, and aids to give it its dark colour. This formula (Attfield) illustrates the decomposition—



This solution mixes with alcohol and water readily. It gives a dark blue precipitate of Prussian blue with yellow, but not with red, prussiate of potash. When ammonia is added a red precipitate of peroxide of iron falls. The liquor is used for making several preparations of iron; it is a strong styptic, but is not given internally.

#### Ferri Peroxidum Humidum, $\text{Fe}_2\text{6HO}$ ,

is made by mixing solution of persulphate of iron with solution of soda. Ferric hydrate ( $\text{Fe}_2\text{6HO}$ ) falls as a precipitate, and sulphate of soda remains in solution. The precipitate is hydrated peroxide of iron with 86 per cent. of uncombined water, it appears as a moist reddish-brown mass, and in its fresh moist state is a good antidote in cases of poisoning by arsenic, as it converts the soluble arsenic into an insoluble ferrous arseniate. If kept long, or if dry, the ferric hydrate becomes an oxyhydrate, and is

useless as an antidote to arsenic. This preparation may be given in dose of a quarter to half ounce.

**Ferri Peroxidum Hydratum,  $\text{Fe}_2\text{O}_3\text{H}_2\text{O}$ ,**

is the humid peroxide dried at  $212^\circ$ , also known as *Ferrugo*, and as *Red* or *Sesquioxide of Iron*. It used to be called carbonate of iron, carbonate of soda being used as the precipitant. It is not a true peroxide of iron till it has been heated to dull redness, when it gives off moisture and the true  $\text{Fe}_2\text{O}_3$  or ferric oxide remains. In dose of five to thirty grains this salt is a gradual tonic and blood improver: it dissolves in the stomach, is absorbed into the blood, and is again secreted into the intestine. It has been given in dose of twenty to forty grains as a cure for neuralgia, but these large doses have led to serious obstruction in the bowels by forming hard insoluble masses therein. Externally it is used in the form of **Emplastrum Ferri**, strengthening plaster, or **Emplastrum Roborans**.

**Ferri Oxidum Magneticum,  $\text{Fe}_3\text{O}_4$ ,**

forms about half the bulk of the *Ferrum Redactum*, but the B.P. process for obtaining it is by precipitating mixed solutions of ferrous and ferric sulphate by solution of soda. The tests of the B. P. show the collected precipitate to be a mixture of the two oxides of iron, and the amount of ferrous oxide present is ascertained by seeing how much solution of bichromate of potash is required to convert it into ferric oxide. 230 grain-measures of the volumetric solution of bichromate is the correct quantity required. Dose as a gentle tonic five to ten grains.

**Ferri Carbonas Saccharata.  $\text{FeCO}_3$ .**

When solution of carbonate of ammonia is added to sulphate of iron, sulphate of ammonia is formed in solution, while a whitish-green precipitate of carbonate of iron falls, which gradually darkens, and if

exposed long to the air loses its carbonic acid, so that brown oxide of iron alone is left. It will be observed that the B. P. process guards against this change in the carbonate by preventing exposure to the air. Sugar is added to the powder to prevent oxidation. Ferrous carbonate with sugar is a brownish powder, dissolving with effervescence in acids, and twenty grains dissolved in hydrochloric acid will reduce 208 grain-measures of the volumetric solution of bichromate of potash, showing that 5·6 grains of ferrous oxide are present. Dose five to twenty as a non-astringent soluble chalybeate that rarely disturbs the stomach, and is readily taken by children. This preparation does not constipate the bowels, but often will maintain regular and steady alvine evacuations.

**Pilula Ferri Carbonatis** is the saccharated carbonate mixed with confection of roses. Dose five to twenty grains as a tonic. The pills get black and hard if kept long.

**Mistura Ferri Composita.** This mixture is known as Griffith's green mixture. It is of a bluish-green colour when fresh, but very soon changes to brown from the carbonate of iron becoming converted into oxide. The mixture is made of sulphate of iron, carbonate of potash, myrrh, spirit of nutmeg, and rose water. It obviously contains, therefore, sulphate of potash and carbonate of iron made into an emulsion with the myrrh and rose water. The dose is half to one ounce, and it is a pleasant medicine of great repute in amenorrhœa and the green sickness of females. In suppression of the menses a dose of this mixture may be given twice a day, and a pill of aloes and myrrh every other night, with often a satisfactory result.

**Mistura Ferri Aromatica** is distinct from the above, and comes from the Dublin Pharmacopœia. It will be seen that the chalybeate property of this mixture is derived from iron wire, which is digested for three days in peppermint water along with

calumba, pale bark, and cloves. Dose one to two ounces.

### Ferri Iodidum. $FeI_2$ .

Iodine and iron boiled in water till the froth is white combine to form Iodide of Iron, a greenish-brown crystalline deliquescent salt, soluble in water, and forming a solution which soon decomposes, yielding a sediment of oxide of iron. To form the syrup the Pharmacopœia orders the solution of iodide of iron, obtained by digesting together iodine, iron wire, and water, to be mixed with syrup. A coil of iron wire should be kept in the syrup, in order to preserve the compound from change.

**Syrupus Ferri Iodidi** contains  $4\frac{1}{2}$  grains iodide of iron to one drachm, and the dose is thirty to sixty minims. When iodide of iron is injected into the blood both the iron and iodine can be detected in the saliva. In cases of anæmia complicated with syphilis, or with strumous enlargement of glands, iodide of iron is a proper medicine. In phthisis, given with glycerine, or cod-liver oil, iodide of iron is a remedy of much value.

**Pilula Ferri Iodidi** resembles Blancard's pill of protiodide of iron; three grains contain one grain of iodide, and the dose is three to eight grains in strumous affections, and in chronic phthisis, two or three times a day.

### Ferri Phosphas. $Fe_2P_2O_8$ .

The blue Phosphate of Iron is formed as a precipitate on mixing together solutions of sulphate of iron with phosphate and acetate of soda. The use of the acetate of soda is to insure the presence of acetic acid in the solution where otherwise there would be free sulphuric acid, which would dissolve the precipitate of phosphate of iron; so free acetic acid and sulphate of soda remain in the liquor filtered *off from the phosphate of iron*. Ferrous phosphate

is at first white, but it becomes blue by oxidation. The presence of phosphoric acid is shown by adding tartaric acid, excess of ammonia, and then some ammonio-sulphate of magnesia; a crystalline precipitate of ammonio-magnesian phosphate falls. When the salt is digested with hydrochloric acid a piece of bright copper introduced is not tarnished; test to show absence of arsenic.

Phosphate of iron is given as a nervine tonic in dose of five to ten grains on bread, or in treacle or honey.

**Syrupus Ferri Phosphatis**, when fresh, is a colourless syrup containing one grain of phosphate of iron to each drachm. Dose, one to two drachms. Parrish's chemical food is a syrup containing phosphate of iron, lime, soda, and potash. Dose, one to two drachms.

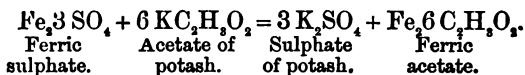
#### **Ferri Arsenias.** $\text{Fe}_3\text{As}_2\text{O}_8$ .

The process for the preparation of this salt is similar to that just described for preparing phosphate of iron, only arseniate replaces phosphate of soda. Arseniate of iron contains arsenic acid, and is a greenish insoluble tasteless powder, containing both protoxide and peroxide of iron. When the salt is decomposed by nitrate of silver, as in the B. P. process, red arseniate of silver is formed. Twenty grains should contain enough protoxide of iron to reduce or deoxidize 170 grain-measures of the volumetric solution of bichromate of potash. When the whole of the protoxide is exhausted a blue precipitate is no longer formed with ferricyanide of potassium. Arseniate of iron is given internally in dose of  $\frac{1}{15}$  to  $\frac{1}{2}$  grain, and is supposed to combine the virtues of both arsenic and iron; it is used in cancerous affections.

#### **Ferri Acetatis Tinctura.**

This is a port-wine coloured tincture which deposits much on keeping; it is made by decomposing acetate of potash with persulphate of iron and alcohol.

The alcohol causes the insoluble sulphate of potash to separate, and tincture of acetate of iron is filtered off. The decomposition is thus represented—



Tincture of acetate of iron is an agreeable medicine, and may be given in dose of five to thirty minims, with syrup and water.

### Liquor Ferri Perchloridi Fortior.

Iron wire is dissolved in hydrochloric acid, and the solution heated with nitric acid till, on the sudden evolution of red fumes, the liquid becomes of an orange-brown colour, the iron being peroxidized by the nitric acid, so that this liquor gives no blue colour with red prussiate of potash. This strong solution of perchloride of iron has sp. gr. 1.44, and is very styptic and astringent; it is rather acid, but if evaporated to five instead of ten ounces as in the B. P. process, it is rendered almost neutral, and this neutral solution diluted with one or two of water, may be used as a styptic and as an application to diphtheria of the throat.

**Liquor Ferri Perchloridi** is the above solution diluted, and may be given as an astringent tonic in dose of ten to thirty minims. Dialysed iron is prepared by separating by dialysis the acid from solution of chloroxide of iron prepared by adding oxide of iron to the solution of the perchloride.

**Solution of Dialysed Iron**, contains 2 grs. of oxide of iron in a drachm. The dose is 10 to 30 minims in distilled water as a mild non-astringent chalybeate.

**Tinctura Ferri Perchloridi** is of the same strength as the liquor; one of Strong Solution of Perchloride of Iron to three, but here three of rectified spirit are used in place of three of water.

*This Tincture*, in dose of ten to thirty minims, is of

great repute as an efficacious preparation of iron. It is astringent, and is good in passive hæmorrhage from bladder or kidneys. In chronic gleet and in spermatorrhœa it is of great service, for it seems to give tone to the bladder and urethra. In erysipelas and diphtheria, in frequently repeated doses, it is an excellent remedy.

**Liquor Ferri Pernitratis.**—A solution made by dissolving iron wire in dilute nitric acid. When ammonia is added, a precipitate of red ferric oxide falls. Dose of this Liquor ten to forty minims, in chronic diarrhœa, and in leucorrhœa and other passive discharges where no inflammatory action is present.

**Ferrum Tartaratum.**—This is one of the *scale* preparations of iron, the exact chemical composition of which is uncertain, for none of these scale compounds will crystallize. Tartarated iron is made by dissolving fresh ferric hydrate in solution of acid tartrate of potash and evaporating to dryness and then collecting the dried flakes or scales. Sometimes it does not scale nicely, and is collected as an olive-brown powder. In dose of five to ten grains this is a mild preparation of iron; soluble in water, but sparingly soluble in spirit.

**Vinum Ferri.**—When iron wire is digested in sherry or Malaga wine, the acid tartrate of potash of the wine dissolves some iron, and the wine acquires tonic properties. Steel wine may be given in dose of one to four drachms, and is an excellent tonic for feeble and pallid children.

**Ferri et Ammonia Citras.**—This is a scale salt of deep red colour, made by mixing freshly made oxide of iron with citric acid, and then adding liquid ammonia to the cold mixture. Heated with potash it gives off ammonia and deposits peroxide of iron; and the alkaline solution filtered off, when supersaturated with acetic acid, gives no precipitate, showing the absence of tartaric acid. From this salt is made.



**Vinum Ferri Citratis**, (8 grs. to 1 oz.) of which the dose is one to four drachms as a mild non-astringent chalybeate. The ammonio-citrate itself may be given in dose of five to ten grains in water flavoured with *Tinctura Aurantii*.

**Ferri et Quiniae Citras.**—This is a scale salt of golden-yellow colour, containing citric acid combined with the two oxides of iron, quinia, and ammonia. Freshly precipitated quinia is added to solution of oxide of iron in citric acid, ammonia is gradually added to the cold solution, which is then slowly evaporated. When fifty grains are dissolved in water and treated with excess of ammonia, a white precipitate of pure quinia falls amounting to eight grains, and its purity from *Cinchonia* and *Quinidia* is shown by its dissolving in ether. Alkalies will precipitate the quinia in this salt. The dose is five to twenty grains; it combines the tonic properties of iron with the tonic and antiperiodic virtues of quinia, six grains equal one of quinia.

In prescribing soluble preparations of iron, it must be remembered that with any infusion containing tannin iron will form a black inky mixture. Hence iron is usually given in such infusions as those of calumba root or quassia wood, which contain no tannin.

Alkalies will decompose iron salts and cause separation of oxide of iron.

*Lactate of iron* is a yellowish-white powder, used sometimes as a mild chalybeate.

*Bromide of iron* has been given in the form of syrup; one drachm containing four and a half grains of bromide. Dose thirty to sixty minims. When iron is digested in a bottle of cider a *Malate of iron* solution is obtained, the malic acid of the cider apples combining with the iron.

**Hydrargyrum.** Hg = 200.

**Hydrargyrum**, Mercury, or Quicksilver, is obtained by distillation from Cinnabar, the native sulphide of mercury. Mercury at ordinary temperatures gives off vapour which will affect the system of those exposed thereto. When swallowed in bulk it has no action on the economy further than by its mechanical weight; but if given in minute division it is absorbed into the blood and produces marked effects.

In small doses mercury tends to increase the secretions generally. It acts as a *sialagogue* by increasing the flow of saliva, and sometimes it produces such a profuse flow of this secretion that the patient is said to be *salivated*, or in a state of *ptyalism*; the salivary glands and gums become sore and painful, the teeth get loose, and necrosis of the jaw-bone has occurred in some rare instances. A peculiar susceptibility to the action of mercury is seen in some persons both young and old, hence care should be taken in applying mercurial ointments or giving mercury inwardly in any case where there is reason to suspect this *idiosyncrasy* of constitution. Interesting illustrations will be found under "Mercury" in vol. i. of Pereira's "Materia Medica." Mercury acts on the intestinal canal and on the liver, and from its causing increased flow of bile into the intestine it is called a *cholagogue*. Dr. Handfield Jones has shown that mercury increases the production of yellow matter in the cells of the liver, and experience proves that under the influence of mercury much yellow bile is found mixed with the motions. Experiments by Dr. Hughes Bennett tend to show that in healthy animals mercury has little action in promoting the flow of bile. Mercury acts on the blood as a defibrinating agent, it diminishes the amount of the red corpuscles, so inducing an anæmic state. If the use of mercury be persisted in, it not only may cause salivation, but also a red rash on the skin, called *Eczema Mercuriale*: further it

may affect the nervous system, producing tremors, neuralgic pains, and much prostration. Mercury has been detected in the blood, bile, saliva, and urine, and occasionally has been found, reduced to the metallic state, in the bones.

**Uses of Mercury.**—Mercurial medicines are employed internally to relieve local congestions of organs by increasing secretion. Hence in congestion of liver, kidneys, and lungs, small doses of mercury are often beneficial.

In inflammations of serous membranes, as of the pleura or peritoneum, mercury is used with a view to prevent the deposition of plastic fibrinous lymph and exudations on these membranes.

In syphilis mercury is of great value; especially in the primary form of the disease with indurated chancre. In syphilitic skin disease, of papular or scaly form, mercury may be used; but where the tendency is to ulceration and sloughing, mercury is often injurious. In infantile syphilis mercury, in the form of grey powder, is invaluable. In syphilis mercury is given by the mouth; by inunction in the form of mercurial liniment or ointment; and sometimes by fumigation. The patient is exposed for twenty minutes to a mercurial fume raised by placing twenty or thirty grains of oxide or sulphide of mercury on a hot brick. Mercurial solutions have been employed hypodermically in the treatment of syphilis.

Mercurial medicines should be avoided in persons of feeble or of strumous constitution; and in Bright's disease of the kidney, with dropsy and albumen in the urine, mercury is very injurious. Children and very old persons are not readily salivated by mercury.

**Preparations of Mercury.**—**Hydrargyrum c. Creta**, made by rubbing metallic mercury with chalk till all metallic globules have disappeared, and a uniform grey powder remains. This powder is *insoluble* in water, but dilute hydrochloric acid will *dissolve* out the chalk, leaving the mercury. The

hydrochloric acid solution gives no precipitate of subchloride of mercury when solution of chloride of tin is added; showing the absence of corrosive sublimate in the grey powder. The proportion of mercury in grey powder is as one to three; gradually the mercury becomes oxidized, so the older the specimen of grey powder the more mercurous oxide will it contain. Dose of grey powder two to eight grains. Acids and acidulous salts are incompatible with its administration. This preparation is better given in powder than in pill, and it may be combined with rhubarb or jalap powder as a cholagogue purgative for children. In some forms of obstinate and violent vomiting in young children one half to one grain of grey powder is of great service (Ringer). In diarrhoea too, where the child passes pale, clay-like motions, this same remedy is one of great value.

**Pilula Hydrargyri.**—This preparation contains finely divided mercury more or less oxidized, in the same proportion as the grey powder, one in three. Mercury is rubbed up with confection of roses, and then liquorice root powder added, and the whole mixed into a mass known as *Blue Pill*.

Blue pill, like grey powder, is a mild mercurial. In dose of three to six grains it is absorbed into the system, and acts as an alterative in syphilis and other chronic affections. In dose of ten grains it proves purgative. Often two or three grains of blue pill are combined with the compound colocynth pill as a purgative, to act on the liver and relieve biliousness and headache.

**Unguentum Hydrargyri** is a lead-coloured ointment of mercury with lard and suet in the proportion of one to two. When this ointment is rubbed into the axilla the mercury is absorbed into the system, and may produce ptyalism. Applied in moderation, the ointment of mercury is of service to remove troublesome itching in pruritus ani and pruritus pudendi. In inflammation of the pleura I have been in the habit of applying a mixture of mercurial and

belladonna ointment, spread on lint, and this application has seemed to me of great service in easing pain and checking the inflammation. Once when the surface had been abraded by an incompletely healed blister, I saw slight ptyalism caused by the application. In peritonitis after the operation for hernia, I have seen the mercurial ointment applied to a blistered surface on the abdomen, of great service in checking the disease.

In inflammation of the tonsils I have often used the ointment of mercury and belladonna with great success. It should be gently rubbed over a small space near the angle of the jaw. I never saw ptyalism caused by this proceeding, though I have seen the eye-pupil dilated as an effect of the belladonna.

**Unguentum Hydrargyri Compositum.**—This is made of ointment of mercury, camphor, yellow wax, and olive oil, and resembles that known to surgeons as Scott's ointment. It is of use as a stimulating application to chronic tumours, and indurations about joints.

**Linimentum Hydrargyri.**—This liniment is made with mercurial ointment, solution of ammonia, and liniment of camphor, and is a lead-coloured, creamy mixture. It may be used as a stimulating liniment to indolent tumours. Rubbed into the skin of the armpit, it is a ready means of causing salivation.

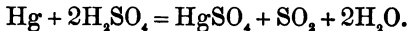
**Emplastrum Hydrargyri, and Emplastrum Ammoniaci cum Hydrargyro.**—These plasters, both of which contain sublimed sulphur, are useful as discutients and absorbents applied over indolent tumours and indurations. In chronic synovitis they are of good service.

**Suppositoria Hydrargyri.**—Each suppository contains five grains of mercurial ointment. May be used in chronic thickening of syphilitic nature, about the rectum or vagina.

This completes the list of the preparations of uncombined mercury: we now come to the chemical combinations of mercury and their uses.

**Sulphate of Mercury.**  $\text{HgSO}_4$ .

This salt is introduced for the preparation of Calomel and Corrosive Sublimate; it is not given internally. Sulphate of Mercury is made by dissolving mercury in sulphuric acid, sulphurous acid gas being given off and a white crystalline sulphate of mercury remaining. Thus—



When water is added the sulphate of mercury turns yellow, a soluble acid salt and an insoluble yellow oxysulphate ( $\text{Hg}_2\text{O}_2\text{SO}_4$ ) being formed. This yellow salt was formerly employed in medicine as a snuff, or *errhine*, and was called Turpeth mineral.

**Hydrargyri Subchloridum.**  $\text{HgCl}$ .—Calomel.

The Subchloride of Mercury is prepared from the sulphate by first rubbing this with metallic mercury and water till the mercury globules are no longer visible. Thus, by adding mercury, we make a subsulphate of mercury  $\text{Hg}_2\text{SO}_4$ , or mercurous sulphate; and then by mixing this with chloride of sodium and heating we obtain mercurous chloride or calomel as a fine white powder, falling on the floor of the sublimation chamber. This formula shows the decomposition,  $\text{Hg}_2\text{SO}_4 + 2\text{NaCl} = 2\text{HgCl} + \text{Na}_2\text{SO}_4$ . Sulphate of Soda therefore remains as the residuary product. Calomel is a white, heavy, tasteless powder liable to become fawn-coloured by the action of light unless it has been sublimed into steam.

The name Calomel is said to be derived from the Greek *καλός* good, and *μέλας* black; because it is reputed good as a cure for black bile. It is important that calomel be free from trace of perchloride of mercury or corrosive sublimate, and the test for this impurity is warm ether, which will dissolve out the corrosive sublimate from the calomel and leave it as a residue on evaporation. Mixed with potash solution

calomel turns black from the formation of mercurous oxide, or suboxide of mercury,  $Hg_2O$ . Contact with hydrocyanic acid converts calomel into a mercuric salt, with separation of metallic mercury. Pure calomel is quite insoluble in water, alcohol, and ether, while corrosive sublimate is soluble in all these fluids.

**Uses.**—Externally calomel is used in the form of ointment in chronic skin affections. The **Unguentum Hydrargyri Subchloridi** contains eighty grains of calomel to one ounce of lard.

**Lotio Hydrargyri Nigra**, or Black Wash, is made by mixing 30 grains of calomel with 10 ounces of lime water, when the black suboxide of mercury is formed. This Wash, having been well shaken up, is applied as a lotion to syphilitic sores. In herpes zoster, or shingles, it is a very useful application.

In some forms of ophthalmia, with opacity of cornea and photophobia, powdered calomel has been introduced into the eye with great success by Dupuytren, Siebold, Brudenell Carter, and others.

Internally calomel is employed in dose of two to five or ten grains as a purgative, to act on the duodenum and liver, and so promote the flow of bile. It is often combined with powdered jalap; or at other times two or three grains of calomel are given at night and a senna draught in the morning to assist the purgative action of the calomel. Recent experiments by Stricker have shown that calomel, in common with purgatives generally, tends to promote the flow of bile.

When it is desired to bring the system under the influence of calomel with a view to controlling inflammation of serous membranes, then it is usual to give the calomel in repeated small doses, as a quarter to one grain every two hours, with some opium combined with it. In some forms of diarrhoea and dysentery calomel may be thus given with great advantage; it will often stop obstinate sickness. In cases of cerebral inflammation it is not well to give **opium with calomel**, as the opium may tend to increase

congestion of the brain. Calomel used to be very freely given to promote resolution in the consolidated stage of pneumonia, and to promote the absorption of fluid effusions, but it is not now given so largely in these cases as formerly. Professor Bellini, from observation and experiment, believes that calomel is, in the stomach and small intestines, changed into a soluble mercurial compound by the agency of lactic acid and alkaline chlorides and carbonates. Acid drinks should be avoided by those who are taking calomel, but magnesia promotes its beneficial action.

**Pilula Hydrargyri Subchloridi composita.** Compound Calomel pill, Plummer's pill, contains calomel and sulphurated antimony, of each 1 in 5, with guaiac resin and castor oil. The dose is 5 grains as an alterative.

The administration of chloride of ammonium with calomel should be avoided; it may cause symptoms of poisoning.

The soluble compound formed from calomel in the stomach does not appear to coagulate albumen, and is not precipitated by alkaline carbonates, differing therefore from corrosive sublimate.

#### **Hydrargyri Perchloridum. $HgCl_2$ .**

Corrosive Sublimate, called also Bichloride of Mercury, is made from the sulphate of mercury mixed with chloride of sodium and some 2 or 3 per cent. of black oxide of manganese, and then subliming the mixture. The oxide of manganese prevents any calomel forming, as it aids to eliminate chlorine from the excess of chloride of sodium, and this chlorine converts any calomel into perchloride of mercury. ( $HgSO_4 + 2 NaCl = Na_2SO_4 + HgCl_2$ ), Perchloride of Mercury is a heavy crystalline powder, soluble in water, alcohol, and ether; when mixed with lime water (eighteen grains of perchloride of Mercury, Lime water ten ounces) it forms **Lotio Hydrargyri Flava**, or yellow wash. Yellow  $HgO$ , or mer-



curic oxide, is formed in the mixture. **Hydrargyri Oxidum Flavum**, made by precipitating solution of perchloride with soda, is officinal in the B. P. addendum.

**Liquor Hydrargyri Perchloridi** is a solution in water of perchloride of mercury with an equal quantity of chloride of ammonium. Each drachm of solution contains  $\frac{1}{8}$  of a grain of perchloride, and is an average dose of the medicine. This liquor is given with tincture of bark, or in decoction of sarsaparilla, in chronic syphilitic affections. It is of service also in many cases of indolent chronic enlargement of organs, as of the uterus for example. In larger dose than one-eighth of a grain it becomes an irritant to the stomach, and may produce unpleasant symptoms. A dose of three grains has proved fatal to a child. Corrosive sublimate in solution, one grain to one ounce of water, has been used as an eye collyrium; and in the form of ointment (two grains to one ounce of lard) it has been used in porrigo, but it may when thus used become rapidly absorbed and produce mercurial poisoning. It is very rarely that ptyalism is produced by the internal administration of the perchloride of mercury. This medicine should be avoided in cases of kidney disease and pulmonary irritation. In the event of poisoning by corrosive sublimate the clear albumen of the egg should be given, as with this the salt forms an insoluble compound.

#### **Hydrargyri Iodidum Viride. HgI.**

Mercurous Iodide, or Green Iodide of Mercury, is formed by rubbing together iodine, mercury, and alcohol in a mortar. The salt may contain mercuric iodide,  $HgI_2$ , and this can be dissolved out of it by ether, just as mercuric chloride is dissolved out of calomel. Heat decomposes the green iodide into mercuric iodide and mercury, the former appearing as a yellow sublimate which on friction turns red.

*Dose of green iodide of mercury, one to three*

grains, in pill, as a remedy in syphilitic and tubercular affections of the skin.

**Hydrargyri Iodidum Rubrum.  $HgI_2$ .**

Mercuric Iodide, or Red Iodide of Mercury, is made by decomposing solution of perchloride of mercury by iodide of potassium.

The yellowish precipitate at first formed redissolves, but becomes permanent when the solutions are fully mixed in equivalent proportions. The precipitate is of a bright red colour, turning to yellow if warmed. Red iodide of mercury is freely soluble in ether, differing here from the green iodide.

Dose one-sixteenth to one-fourth of a grain, in pill, or held in solution by excess of iodide of potassium. It is an active preparation of mercury, and is given in syphilis, and some chronic skin affections, as an alterative and absorbent.

**Unguentum Hydrargyri Iodidi Rubri**, is of use in chronic glandular swellings. In bronchocele it has proved very valuable, if the patient be exposed to bright sunlight after the ointment has been rubbed over the tumour (Dr. Frodsham).

**Hydrargyri Oxidum Rubrum.  $HgO$ .**

Nitric Oxide of Mercury. An orange-red powder, prepared by dissolving mercury in nitric acid, evaporating to dryness, then triturating with metallic mercury and heating till all nitrous vapour is driven off. When heated in a test tube no nitrous fumes should appear, and the salt is decomposed into mercury and oxygen gas.

**Uses.**—Oxide of Mercury is a powerful irritant, and very seldom given internally. Externally it is used as the **Unguentum Hydrargyri Oxidi Rubri**, or Red Precipitate Ointment, as a dressing to indolent ulcers. Applied, much diluted, to the eyelids in ophthalmia tarsi and purulent ophthalmia, it is decidedly serviceable. Trousseau has advised it

in otorrhœa after scarlet fever ; a small quantity to be introduced into the meatus of the ear.

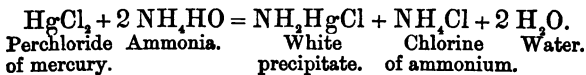
The Black Suboxide of Mercury is given as a mild mercurial, in dose of one to two grains.

**Liquor Hydrargyri Nitratis Acidus**, is a solution of Mercury in Nitric Acid. Potash precipitates mercuric oxide if added in excess to this liquor, and the presence of nitric acid is proved by its forming a dark colour with ferrous sulphate. Forms no precipitate of insoluble calomel when added to dilute hydrochloric acid.

This Liquor is applied as a strong caustic. One minim to two ounces of water has been used as a gargle in syphilitic sore throat, and as an injection also in gonorrhœa.

**Unguentum Hydrargyri Nitratis**, is known as *Citrine Ointment*. It is when fresh of a lemon colour, and if in its preparation white vaseline be used in place of the olive oil and lard it will keep well and bear dilution with more vaseline without change of colour (Squire). It is used in cutaneous and ophthalmic affections.

**Hydrargyrum Ammoniatum**, is made by pouring solution of perchloride of mercury into solution of ammonia. A white precipitate falls, consisting of a chloride of ammonium in which two of hydrogen are replaced by one of mercury. Thus—



If the order of proceeding be reversed, and the ammonia added to the perchloride, then what is known as "fusible white precipitate" is produced. The true Ammoniated Mercury of the B. P. volatilizes entirely, without first fusing, when heat is applied. Digested with potash, ammonia is given off and yellow oxide of mercury left; and the liquid filtered from this, after being made acid with nitric

acid, gives a white precipitate of chloride with nitrate of silver. Boiled with solution of chloride of tin (Stannous Chloride) it loses chlorine and becomes grey with reduction of mercury into the metallic state.

Ammoniated mercury is not given internally, but it is used as the **Unguentum Hydrargyri Ammoniati**, to destroy pediculi, and to cure many skin diseases.

The Sulphides of Mercury are not found in the Pharmacopœia. The Red Sulphide (Cinnabar)  $HgS$  is entirely volatile, and condenses in scarlet crystals (Vermilion). It is used occasionally in the form of ointment, and twenty grains may be employed as a means of mercurial fumigation. The Black Mercurous Sulphide, mixed with sulphur, forms the substance formerly used in medicine under the name of *Æthiops mineral*.

**Oleate of Mercury**, as introduced into Pharmacy by Mr. Martindale, at the suggestion of Mr. Marshall, is made by dissolving the yellow oxide of mercury in oleic acid. The resulting 5 or 10 per cent solution, is easily applied by a brush, over an inflamed or thickened part. If pain be present, *pure* morphia may be dissolved in the oleic acid and mercuric oxide.

#### **Manganeseum.** Mn = 55.

**Manganesii Oxidum Nigrum.**  $MnO_2$ .—Black oxide of manganese is used in various processes of the Pharmacopœia, such as the preparation of chlorine, of perchloride of mercury, and of the permanganate of potash.

Internally, oxide of manganese has been given by Dr. Leared and Dr. Goddard Rogers in cases of gastric irritation. Dose of the purified oxide ten to twenty grains. It acts as a sedative, like bismuth, but does not cause so much constipation.

Sulphate of manganese has been employed as a cholagogue purgative.

Manganese exists in small quantity in the blood;

hence in anæmic conditions preparations of manganese have been given; but they will not cure anæmia without the aid of iron.

A mixture of oxide of manganese, permanganate of potash, and oxalic acid, moistened with water, evolves oxygen as ozone. One ounce of such powder is said to refresh the air of a sick-room perceptibly. Permanganate of potash has been described under potash.

#### Plumbum. Pb = 207.

Lead is usually obtained from the native sulphide, PbS, known as *Galena*; in the metallic form lead is not used in medicine. If lead be absorbed into the system certain symptoms of poisoning are produced.

Painful colic with constipation of the bowels is not uncommon among painters, and usually is accompanied by the appearance of a blue line along the gum, very significant of poisoning by lead. In other cases lead acts on the nervous system, and causes symptoms of paralysis and of epilepsy. Printers from handling lead types, get a peculiar dropping of the wrist, due to paralysis of the extensor muscles, the hands becoming bent on the arms, which dangle by the sides. Pains, too, are felt in the joints; lead arthralgy, or saturnine rheumatism. Lead has been detected in the muscles, brain, and spinal cord, in cases of poisoning; and it has been proved to be gradually eliminated from the system by the urine, skin, milk, and bowels. Dr. Hilton Fagge has observed blackening of the intestines in cases of lead poisoning, with colic, and lead has been detected in this blackened portion of gut. When the subject of lead poisoning, is exposed to the action of sulphur the skin is blackened from formation of sulphide of lead. Solution of hypochloride of soda is said to remove such black colour.\*

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\* *Practitioner*, April, 1870, p. 251.

Lead preparations check oxidation in the system, and are given as sedatives and powerful astringents to check hæmorrhage, diarrhœa, &c.

### Plumbi Oxidum. PbO.

There are several oxides of lead, as the yellow oxide, Massicot, and the red oxide, red lead, or Minium, both of which are used by painters. The yellow oxide, fused and cooled, yields bright reddish scales known as *Litharge*, and the oxide in this form finds a place in the Pharmacopœia, and is used for the preparation of various lead compounds.

Good oxide of lead is required to be free from copper, and it also must be free from iron, or it will not make a white plaster.

**Emplastrum Plumbi.**—Lead exists in this plaster combined with oleic acid as an oleate of lead. To make a good plaster, Italian oil is boiled for five hours with oxide of lead and water. Oleate of lead and glycerin are then produced. The former forms the ordinary diachylon, and is of service as the basis of eleven out of the fourteen plasters of the B.P.

### Plumbi Iodidum. PbI<sub>2</sub>.

Iodide of Lead is a yellow powder more or less crystalline in appearance according to the degree of heat at which the solutions of nitrate of lead and iodide of potassium are mixed. The iodide of lead is soluble in boiling water, and deposits in crystals on cooling.

Iodide of lead has been rarely given internally in dose of one-quarter to one grain as an absorbent. Externally it is used as the **Unguentum Plumbi Iodidi**, for dispersing chronic enlargements and indurations. The ointment stains the skin yellow, and, if used for a long time, the lead gets into the system in such quantity as to produce symptoms of poisoning.

**Emplastrum Plumbi Iodidi.**—This plaster is applied as a discutient absorbent.

**Plumbi Nitras.**  $\text{Pb}(\text{NO}_3)_2$ .

Lead dissolves readily in nitric acid, and by evaporating the crystals of nitrate of lead are obtained. Nitrate of Lead has disinfecting properties, bleaches solution of sulphate of indigo, and with sulphuric acid forms a white insoluble sulphate of lead, and with sulphuretted hydrogen a black sulphide. It is used in the B. P. for the purpose of preparing the iodide of lead. In powder it is a good application to cure onychia maligna (Howard Marsh).

**Plumbi Carbonas.**  $2(\text{PbO}, \text{CO}_2) + \text{HOPbO}$ .

The substance known as *White Lead* or *Ceruse* is a mixture of carbonate and hydrate of lead, and it is formed by exposing lead to the action of air and vapours of acetic and carbonic acid. Carbonate of lead dissolves with effervescence in acids, and from its solution sulphuretted hydrogen throws it down as a black sulphide, while the liquor filtered off gives no precipitate with oxalate of ammonia, thus showing that the carbonate of lead is not mixed with chalk or lime.

**Unguentum Plumbi Carbonatis.**—A cream-coloured ointment, of use to excoriated and inflamed surfaces.

**Plumbi Acetas.**  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$ .

Acetate of Lead, made by dissolving oxide of lead in dilute acetic acid and evaporating, is a white mass of acicular crystals with an acetous odour, astringent, and sweet to the taste; hence it is called *Sugar of Lead*. Acetate of lead is soluble in water as 10 in 25, and its solution feebly reddens litmus paper.

Internally acetate of lead is often given to restrain diarrhoea and various forms of hæmorrhage. Dose one to four grains in pill, or it may be given in solution with acetic acid. Given thus in solution, I have found one grain three times daily to be well borne for *three or four weeks*, and to prove eminently beneficial

in recurring hæmoptysis and also in aneurism. Opium is frequently combined with acetate of lead, as in the **Pilula Plumbi cum Opio** of the B. P. Of this pill four grains contain three grains Pb. Acet. and half a grain Pulv. Opii.

In cases of obstinate obstruction of the bowels, due to spasm and invagination of intestine, I have more than once employed the acetate of lead. In one case the bowels had been for eight days obstinately confined, and neither opium nor injections thrown up with a long tube produced any effect. Belladonna alone had no effect, but on combining it with acetate of lead, after five grains of acetate had been taken, copious relief was obtained. Soon after I had related the history of this case before the Medical Society of London, Mr. Harvey Hill met with a case of obstructed bowel of eight days' duration, and he administered the belladonna and lead pill with satisfactory result.

Acetate of lead and opium are combined in the astringent sedative suppository of the B. P. Each **Suppositoria Plumbi Co.** containing three grains acetate and one of opium. Externally lotions and ointments containing acetate of lead are much employed as sedative and astringent agents. **Unguentum Plumbi Acetatis**, 12 of acetate in 103 of lard, is a sedative ointment, but soon turns rancid if kept.

**Plumbi Subacetatis Liquor.**—Acetate of lead and oxide of lead are boiled together in distilled water, and the clear liquor filtered off. It must be kept in well-closed bottles, as it soon becomes turbid from formation of a hydrated carbonate of lead. This Liquor is known as *Goulard's Extract*; it is alkaline in reaction, sweet in taste, and with starch mucilage it forms an opaque white jelly.

It is used with camphor, wax, and oil in preparing the **Unguentum Plumbi Subacetatis Compositum**, an ointment that does not keep well, and is not often used.

**Liquor Plumbi Subacetatis Dilutus**, or *Goulard*



water, contains *Liquor Plumbi Subacetatis* and rectified spirit, of each 1 part, in 78 of distilled water. It is used as a sedative lotion to inflamed, bruised, and irritable surfaces. As a lotion for inflamed eyes it is sometimes employed.

*Cremer Lithargyri* is made by mixing one of the *Liquor Plumbi Subacetatis* with eight of cream: it is an excellent sedative application in pruritus vulvæ.

#### **Stannum.** Sn = 118.

Tin is not used now in medicine, but the solution of Chloride of Tin,  $\text{SnCl}_2$ , has a strong affinity for chlorine, and is placed in the Appendix as a test for gold and as an agent to reduce mercury from the perchloride. Ammoniated mercury boiled with chloride of tin is reduced in globules of metallic mercury.

#### **Zincum.** Zn = 65.

Zinc occurs native as Carbonate and Sulphide, and is separated from impurities by sublimation.

**Zincum Granulatum.**—Granulated Zinc is made by pouring melted zinc into cold water; from it are prepared the sulphate and chloride of the metal.

#### **Zinci Sulphas.** $\text{ZnSO}_4, 7\text{H}_2\text{O}$ .

Zinc is dissolved in dilute sulphuric acid, and when the effervescence due to escape of hydrogen gas has ceased the solution is filtered, and agitated with chlorine water and carbonate of zinc. By this part of the process iron is precipitated, from the chloride first formed, as ferric hydrate, and lead as peroxide; pure solution of sulphate of zinc is filtered off and evaporated to obtain the salt in crystals.

The B. P. tests sulphate of zinc for iron, lead, and copper, and observes that the precipitate of oxide of zinc, thrown down by ammonia, dissolves in excess of that reagent without formation of any colour, indicating absence of iron and copper.

Sulphate of zinc, in the proportion of one or two grains to one ounce of water, or rose water, is used as a collyrium for weak eyes, as a stimulating lotion to dress sores, and as an injection in gleet.

Internally sulphate of zinc in dose of ten to thirty grains is a rapidly acting emetic. In dose of one to three grains it is used as a nervine tonic in chorea, epilepsy, and various nervous disorders. If continued for too long a time preparations of zinc produce an earthy pallor of the skin and marked anæmia.

#### **Zinci Carbonas.** $\text{ZnCO}_3(\text{ZnO}_2)3\text{H}_2\text{O}$ .

This salt is a mixed carbonate and hydrate of zinc, obtained as a white precipitate, by a double decomposition when solutions of sulphate of zinc and carbonate of soda are mixed together. The carbonate should be dissolved in dilute nitric acid and tested for chlorides and sulphates, in the usual way, by nitrate of silver and barium chloride.

The flesh-coloured powder, known as *Calamine*, used in preparing *Turner's cerate*, is a mixture of carbonate with more or less of oxide, according to the degree of heat to which it has been submitted. It used to be much adulterated with sulphate of baryta. The action of carbonate of zinc is like that of the oxide.

#### **Zinci Oxidum, $\text{ZnO}$ ,**

is made by heating the Carbonate of Zinc till all its carbonic acid is expelled, and it therefore no longer effervesces with acids. Prepared thus oxide of zinc is of a somewhat buff tinge; a pure white oxide is formed when zinc is burnt in the air, *Flowers of Zinc*. Pure oxide of Zinc is soluble without colour in excess of carbonate of ammonia, proving absence of alumina and metallic impurities.

Oxide of zinc is much employed in the form of the **Unguentum Zinci**, a mild healing ointment.

Internally it is given as a tonic and astringent to

check profuse sweating in phthisis, to check diarrhoea in children and adults, and to correct the nervous symptoms due to excessive use of alcohol. Dose two to ten grains in pill with extract of henbane or hop.

### Zinci Chloridum. $ZnCl_2$ .

Zinc is dissolved in hydrochloric acid, and agitated with chlorine water and carbonate of zinc to peroxidize and precipitate any lead and iron; then the filtered liquid is concentrated and poured into moulds that shape it into rods or tablets. It is very deliquescent and caustic, and readily dissolves in water, alcohol, and ether. Sulphide of ammonium throws down white sulphide of zinc when added to the solution. Sulphuretted hydrogen does not affect the acid solution of the chloride.

**Liquor zinci Chloridi.**—This liquor resembles that known as Sir W. Burnett's solution; it is antiseptic and disinfecting. One grain to one ounce of water is the proportion of chloride of zinc for a collyrium, or for an injection in gonorrhoea. Twenty grains to one ounce makes a good solution to apply to chronic ulceration of the tonsils, and such a solution may be used as an antiseptic wash for wounds.

Chloride of zinc mixed with starch or gypsum is used as an application to lupus and cancerous ulcerations.

Mixed with oxide of zinc the chloride hardens, and this mixture forms the white stopping for teeth used by dentists.

### Zinci Acetas. $Zn(C_2H_3O_2)_2 \cdot 2H_2O$ .

Acetate of Zinc is made by dissolving carbonate or zinc in acetic acid, and evaporating to obtain the salt in thin pearly crystals. In dose of one to two grains it acts as a tonic, like the sulphate of zinc, and in dose of ten to twenty grains it resembles the *sulphate in being a speedy emetic.*

**Zinci Valerianas.**  $Zn(C_5H_9O_2)_2$ .

Valerianate of Zinc is made by mixing boiling solutions of sulphate of zinc and valerianate of soda. As the mixture cools, crystals of valerianate of zinc are skimmed off.

The crystals are pearly white, with an odour of valerianic acid; they are soluble in hot water and in alcohol. This salt has been much adulterated, and an important test of its purity is that of distilling it with sulphuric acid, and mixing the distillate, which is valerianic acid, with solution of acetate of copper. The solution remains clear at first, but soon oily drops appear, passing gradually into a bluish crystalline deposit of valerianate of copper. If there be any butyrate of zinc present, the butyric acid at once forms a bluish-white deposit with the copper solution.

The dose of valerianate of zinc is one to three grains. By some it is thought to combine the nerve powers of both valerian and zinc, and to be good for neuralgia, chorea, and epilepsy. Whether, however, valerianic acid has any effect as a nerve tonic is by no means proved; and whatever virtue this salt may possess, is probably due to the zinc.

There are other salts of zinc, as the *Lactate*, *Iodide*, *Phosphate*, and *Phosphide*, which have been employed as nerve tonics and sedatives; but they have no place in the Pharmacopœia.

The metals **Gold** (Aurum), and **Platinum**, are very rarely used in medicine. They will be found mentioned among the Test Solutions.

## CHAPTER VII.

**ALCOHOL.—ETHER.—CHLOROFORM.—CHLORAL.**

Alcohol is the hydrate of a basylous radical, *ethyl* ( $C_2H_5$ ), hence the formula for alcohol is  $C_2H_5HO$ , or  $C_2H_6O$ . Thus alcohol is analogous in constitution to hydrate of potassium (KHO), and there are other compounds of the radical ethyl analogous to inorganic salts. The oxide of ethyl,  $C_2H_5O$ , is common, or sulphuric ether, and the nitrite of ethyl is the basis of the Spiritus Ætheris Nitrosi, or Sweet Spirit of Nitre, of the B. P.

Alcohol results from the fermentation of grape-sugar, thus—



The grape-sugar, under the influence of a ferment, such as the yeast plant, being decomposed into alcohol and carbonic acid gas. Three forms of alcohol are found in the Pharmacopœia:—1. Absolute Alcohol; 2. Rectified Spirit; 3. Proof Spirit. Absolute alcohol is used only for chemical testing. It is made by shaking rectified spirit in a bottle with carbonate of potash, then separating the spirit from the dense solution of the carbonate of potash and water which settles at the bottom of the vessel, and distilling it from freshly burnt lime. In this way the purest and strongest alcohol is obtained, of sp. gr. 0.795. Absolute alcohol is not rendered turbid when mixed with water, showing absence of trace of fousel oil; and it does not turn anhydrous sulphate of copper *blue*, showing absence of water.

**Spiritus Rectificatus**, Rectified Spirit, sp. gr. 0·838, contains 84 per cent. of pure alcohol. It should remain clear when diluted, showing absence of oily or resinous matter. Four fluid ounces, when mixed with thirty grain-measures of the volumetric solution of nitrate of silver (containing nearly  $\frac{1}{2}$  grain of nitrate), and exposed to light, will reduce this amount of silver to a black powder of oxide; but with this quantity of the nitrate the reducing power of good rectified spirit is exhausted. If its reducing power be not then exhausted, it probably contains some amylic alcohol, or some aldehyde. In the B. P. will be seen a list of twenty-two tinctures,\* which are made with rectified spirit. It is employed where a resin or volatile oil is present in the substance of which the tincture is made. The **Spiritus**, Spirits, of the B. P. are, with the exception of Sp. *Armoraciæ* Co., prepared with rectified spirit. When eighteen measures of rectified spirit are mixed with eighteen of water, the mixture condenses into thirty-four measures.

**Spiritus Tenuior**, or Proof Spirit, contains forty-nine per cent. pure alcohol. The sp. gr. of proof spirit is 0·920. If lighter than this, it is over proof; if heavier, under proof; and the percentage of water, or of rectified spirit, that must be added to any sample to bring it to the standard of proof spirit indicates the number of degrees the sample is above or below proof.

Proof spirit is used in preparing forty of the Pharmacopœial tinctures. Alcohol, in the form of spirit of wine, is used externally as a lotion to bruises and sprains. One of proof spirit to six or eight of water forms a good evaporating cooling lotion. **Spiritus Vini Gallici**, or Brandy, is used to harden the skin, and prevent bed-sores; it is used also by women as an application to the nipple, to prevent this becoming sore from suckling. Brandy one ounce, water eight ounces, make a good mouth wash in cases of ptyalism.

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\* Twenty-two including Tinct. Chloroformi Co.

**Spiritus Vini Gallici**, or French brandy, contains about 50 per cent. of alcohol; it is a convenient form for the administration of alcohol, and is used in preparing the brandy-and-egg mixture, or **Mistura Spiritus Vini Gallici**, of the B. P.

**General Effects of Alcohol on the System.**—Alcohol is classed therapeutically as a general or diffusible stimulant. When taken into the stomach it soon enters the circulation, and increases the power of the heart's action; in cases of extreme debility, when the action of the heart is rapid, alcohol will reduce the rate, while it augments the strength of the pulse; hence the great value of alcohol as a remedy in acute disease where the symptoms of failure in action of heart are imminent.

What actually becomes of alcohol in the system is at present not settled; it appears to lessen destructive change in the tissues, for both the carbonic acid given off by the lungs and the urea excreted by the kidneys are diminished when alcohol is taken. By large quantities of alcohol the temperature of the body is reduced. Some of the alcohol taken is separated by the lungs, skin, and kidneys, but a good deal appears to be consumed in the body. Subbotin\* reckons about seven per cent. of the alcohol taken to be eliminated from the body. In administering alcoholic stimulant in an acute disease, or in a fever, it may be noted that if dryness of tongue, heat of skin, rapidity of pulse and respiration, are increased, then the stimulant is doing more harm than good.

Alcohol in great excess acts as a narcotic poison, causing stertorous breathing with sensory and motor paralysis. The pulse becomes very slow, and death takes place from paralysis of the respiratory centre in the medulla oblongata.

In chronic disease alcohol is of service to those who are weak and have poor appetite and digestive

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\* *Lancet*, June, 1872.

power. Spirits taken on an empty stomach produce gastric catarrh and increased mucous secretion, with vomiting and retching in the morning; gradually the growth of connective tissue in the coats of the stomach is increased, and stomach and liver become seriously diseased by this overgrowth of connective tissue.

Further observation is yet required as to the effect of alcohol on the capillary circulation. Its ultimate effect seems to be to impair, first, the tone, and, secondly, the nutrition of the capillary vessels. In some constitutions the tendency of this mal-nutrition is to cause a degenerative brittle state of the small vessels, in others the tendency is rather to induce arterio-capillary fibrosis. These two conditions have seemed to me to be brought forward in what one observes among patients affected with pulmonary phthisis.

In some, who allow themselves to be great tipplers, one observes a consolidated lung to become softened and disorganized in a remarkably rapid manner, frequent attacks of hæmorrhage occurring in the progress of the case. In other cases of chronic phthisis it certainly does seem that the tendency of the disease to settle into inactive fibroid phthisis is promoted by the known proclivity of the individual for alcoholic drinks.

Alcohol affects the system exactly in the same way that old age affects it; alcoholic change and senile change being in a way convertible terms. In advancing years the nutritive tendencies of the system are towards fibroid and atheromatous development. Phthisis, as years advance, tends to the fibroid form, and alcohol appears at times to act curatively, by doing for the patient in a few months what otherwise might be effected slowly by advancing years.

Alcoholic fluids in moderation appear to aid digestion; and when a variety of food is taken the purest alcohols, such as sherry and brandy, will tend



to prevent fermentation and acidification of the mass in the stomach, proving that there is truth in the saying, that good eating requires good drinking.

By dyspeptics having tendency to the oxalic or lithic acid diathesis, both sweet and acid wines should be avoided, and brandy with water, or dry sherry, preferred to sweet or effervescent wines. In cases of cardiac dropsy unsweetened gin, whisky or hollands are drinks that, given well diluted, are often serviceable, as they stimulate the kidneys and promote diuresis. If albumen be present in the urine, however, alcohol is always badly borne and is more or less injurious.

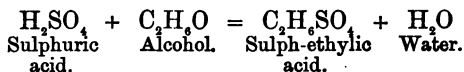
Sherry wine appears in the B. P. as **Vinum Xericum**; it contains 18 per cent of alcohol with colouring matter, ceanthic ether, and acid tartrate of potash. Of the eleven medicinal wines (**Vina** of the B. P.) all are prepared with sherry excepting the **Vinum Ferri Citratis**, and **Vinum Quiniæ**, which are made with British Orange Wine; or **Vinum Aurantii** of the B. P. containing 12 per cent of alcohol.

The following table, by Sir R. Christison, gives an average amount of absolute alcohol by weight and proof spirit (Brandy) by volume, in the following wines &c.:—

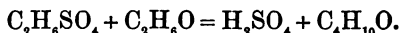
	Alcohol by weight.	Proof spirit by volume.
Port . . . .	16·20 . . . .	33·91
Sherry . . . .	15·37 . . . .	33·59
Madeira . . . .	14·09 . . . .	30·80
Claret . . . .	7·78 . . . .	17·06
Strong ale . . . .	5·70 . . . .	12·60
London porter . . . .	5·36 . . . .	11·91

**Æther.** *Æther Sulphuricus.*  $C_4H_{10}O$ .

When alcohol and sulphuric acid are heated together at 300° there is formed, first, sulpho-vinic or *sulph-ethylic acid*, as will be seen by this formula—



Then, secondly, the sulph-ethylic acid is decomposed with production of sulphuric acid and ether; thus—



It will be observed, on looking at the ether process of the Pharmacopœia, that there is a continuous supply of alcohol kept up, and the sulphuric acid, as fast as it is set free, makes from the alcohol more sulph-ethylic acid, which again is resolved into ether and free sulphuric acid.

Ether is purified by redistilling it from a mixture of chloride of calcium and slaked lime, which absorbs all water. Ordinary ether boils below 105°, has sp. gr. .735, is soluble in water as 1 in 10, freely soluble in rectified spirit. Ether dissolves the volatile and fixed oils, many resins and balsams, and most of the vegetable alkaloids. It dissolves corrosive sublimate freely. Unlike alcohol, it is not a solvent of potash and soda.

**Æther Purus** has sp. gr. .720; boils at 96°; vapour density 2.586; is perfectly free from water, alcohol, or trace of sulphurous acid.

**Uses.**—Ether is used as spray, to freeze the skin by its rapid evaporation, and so produce local anæsthesia. When inhaled, ether produces anæsthesia like chloroform, but it does not depress the action of the heart as this last-named agent does; and it may be given more rapidly, and in a more concentrated form. Attention must be paid to the respiration during the inhalation of ether; and if the breathing cease and signs of asphyxia appear, the inhaler must be at once removed. Ether is apt to produce excitement, struggling, and irritation of the throat when first inhaled, and the patients often feel rather drunk after the inhalation, and may vomit matters smelling strongly of ether. Ether produces

great muscular relaxation, and hence is preferable to chloroform where this state of the muscles is specially desired. If bronchitis be present it may be notably increased by the ether inhalation. About  $2\frac{1}{2}$  oz. of ether is the average quantity required for anæsthesia in an adult.

Internally ether is given as a diffusible stimulant in cases of syncope and nausea. It is antispasmodic, and often gives notable relief in asthma, and various forms of dyspnoea. It may be given enclosed in a capsule of gelatine, as in Tisy's Perles of Ether, or in the form of the *Spiritus Ætheris*, known as Hoffman's Anodyne Spirit. Of this the dose is thirty to ninety minims. Dose of ether twenty to sixty minims. Pure ether has been injected hypodermically in cases of extreme dyspnoea.

*Spiritus Ætheris Nitrosi*, commonly known as Sweet Spirit of Nitre, is a solution of nitrite of ethyl,  $C_2H_5NO_2$ , in alcohol.

The B. P. process for spirit of nitrous ether is that of Professor Redwood; in it rectified spirit, sulphuric and nitric acids, and copper wire are distilled at a temperature of  $175^\circ$ . The nitric acid is deoxidized by means of the copper, the nitric being thus reduced to the nitrous radical. Water and sulphate of copper are formed in the retort, while nitrite of ethyl distils over with a good deal of aldehyde ( $C_2H_4O$ ) resulting from the oxidation of the alcohol.

The nitrous radical is easily detected in the nitrous ether by means of sulphate of iron and sulphuric acid, a deep brown colour being produced in the liquid. The further oxidation of the aldehyde into acetic acid ( $C_2H_4O_2$ ) causes a feeble acid reaction in most specimens of spirit of nitrous ether; this acidity increases with age. Two per cent. of nitrous ether should separate at the top when the spirit is shaken with twice its volume of saturated solution of *chloride of calcium*. Dose one-half to two drachms *as a diaphoretic and diuretic, and as an adjunct to*

saline and febrifuge mixtures. Spirit of nitrous ether should not be given with emulsions, iodide of potassium, sulphate of iron, or alkaline or earthy carbonates.

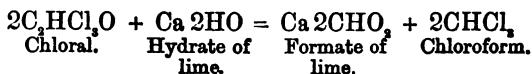
**Æther Aceticus,  $C_2H_5C_2H_3O_2$ ,**

is made by distilling acetate of soda with rectified spirit and sulphuric acid. It has sp. gr. 0.910, boils at  $166^\circ$ , is soluble in spirit, ether, and sparingly in water. Dose twenty to sixty minims. Acetic ether is a good solvent for the active principle of *Ipecacuanha*.

**Iodic Ether, Iodide of Ethyl,** is a clear liquid, soon decomposing and turning brown, very useful as an inhalation in dose of ten drops on lint in cases of *Asthma*.\* It is not in B. P.

**Chloroformum.  $CHCl_3$ .**

Chloroform is the trichloride of a radical formyl. It may be regarded also as the chloride of dichlor methyl, and it may be obtained from methylic, as well as from ethylic alcohol. In the Pharmacopœia it is made from ethylic alcohol by distilling this with hypochlorite of lime and caustic lime. In this process the hypochlorite of lime gives up oxygen and chlorine; the alcohol is converted into aldehyde, while hydrochloric acid and chloral are at the same time produced by the action of the chlorine on the aldehyde. The hydrochloric acid forms with the lime chloride of calcium, and the free hydrate of lime decomposes the chloral with production of chloroform and formic acid. This last, combining with the lime, forms formate of lime. The decomposition of chloral is thus shown—




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\* See the Author's "Lettsomian Lectures on Bronchial Asthma;" *Lancet*, January, 1879.

Chloroform is purified by agitation with water, and then for five minutes with pure sulphuric acid, which chars and removes hydrocarbons, but does not affect pure chloroform.

Pure chloroform has sp. gr. 1.49, is soluble in olive oil, alcohol, and ether; soluble in water as 1 in 200, and burns with a sluggish smoky flame. It dissolves most organic alkaloids, also iodine and bromine. Alcoholic solution of potash decomposes chloroform into formate of potash and chloride of potassium. Good chloroform, rubbed on the skin, evaporates and leaves no odour. **Aqua Chloroformi** is a simple solution of chloroform in distilled water (1 in 200). The dose one-half to two ounces.

The dose of chloroform, as a sedative in vomiting, and as an antispasmodic, is two to six minims. Usually it is given dissolved in alcohol as **Spiritus Chloroformi** (Chloric Ether), in dose of twenty to sixty minims. Solutions of chloroform have a sweetish taste, and cover well the taste of saline medicines. **Tinctura Chloroformi Composita** contains chloroform, rectified spirit, and compound tincture of cardamoms. It is of a red colour, and the dose is twenty to sixty minims.

Internally chloroform acts as a narcotic poison if taken in large dose. Inhaled by the lungs, it is absorbed into the blood, depressing the action of the heart, and so affecting the blood corpuscles as to prevent them from conveying oxygen to the nerve centres, hence we get anæsthesia produced.

In the early stage of chloroform inhalation a slight degree of inebriation is not uncommon, the pulse is quickened, the patient hears noises in his head, and he may become excited. As inhalation proceeds common sensibility is lost, and soon all power of voluntary motion also goes; the eyes turn upwards, and there is muscular rigidity more or less evident. *After this, relaxation of muscles comes on with perfect anæsthesia* and slight stertor in the breathing,

and then the patient is narcotized to the utmost degree. The greatest danger in the inhalation of chloroform is cardiac syncope; hence the pulse and the respiration should be carefully watched. Dr. Harley has shown that the heart of the frog, if suspended in the vapour of chloroform, ceases to beat much sooner than it does in watery vapour.

If chloroform be administered on a piece of lint, not more than fifteen or twenty minims should be at first used, and the lint should be held about one inch from the mouth. In the apparatus invented by Mr. Clover chloroform is mixed with air in a bag, and from this the patient inhales an atmosphere carrying from 2 to 5 per cent. of chloroform vapour. The quantity should never exceed 5 per cent. If, during the administration, the patient's face grow livid, the pulse fail, or the respiration become gasping or stertorous, there is danger, and the chloroform must be at once removed, the chin raised and drawn forward, or the tongue pulled forward with forceps. At the same time the face and chest should be smartly struck with a wet towel, and if these means fail of arousing the patient, then artificial respiration by the Sylvester method must be at once employed. Death-like pallor of the face and dilated pupils are signs of great peril. In five deaths from chloroform post-mortem examination showed more or less congestion of the lungs, and in two cases the cavities of the heart were quite empty.

A proportion of chloroform over 5 per cent. in the air breathed may cause death in a few minutes. If the chloroform enter the blood slowly, the heart will go on beating after the breathing has ceased. If, on the contrary, the blood be quickly and strongly charged with chloroform, then the heart stops suddenly and the breathing continues for some time afterwards.

Mr. Clover observes (see *British Medical Journal*, Feb. 14, 1874) that the blood never takes up the

maximum amount of chloroform from a given atmosphere, except when the most effective respiration and the slowest circulation of blood concur with muscular exertion and closed glottis. When a person inhaling chloroform fills his lungs deeply and then struggles with closed glottis, we must remember that the chloroform is entering the blood very rapidly, and must be careful accordingly how further inhalation be pressed. Mr. Clover thinks there would be less danger in giving chloroform to the out-patients of a consumption hospital than to the same number of athletes. The reason is obvious from what has been said.

For moderate narcotism a mixture of—alcohol one, chloroform two, and ether three, is safe and convenient.

Chloroform is very diffusible, and readily penetrates the skin or mucous membranes of the body. It is used locally in the form of the *Linimentum Chloroformi*, as an anodyne. This liniment is of a straw colour, and consists of chloroform with camphorated oil. The oil prevents the evaporation of the chloroform.

*Bichloride of Methylene* was introduced as an anæsthetic by Dr. Richardson, in 1867. It is a dense fluid, sp. gr. 1.395, and is used sometimes in place of chloroform.

*Tetrachloride of Carbon*, sp. gr. 1.590, has also been used as an anæsthetic vapour by Dr. Protheroe Smith. The boiling points of these three anæsthetics are as follows—

Chloroform boils at 142° F.

Bichloride of Methylene at 89° F.

Tetrachloride of Carbon at 170° F.

Pure Ether at 96° F.

The following table given by Dr. Lambert Ormsby in the *Lancet*, for March 11, 1882, shows the relative *safety* of the anæsthetics named.

Agent employed.	Deaths.	Adminis- trations.	Deaths.	Adminis- trations.
Ether . . . . .	4	92,815	or 1	23,204
Chloroform . . . .	53	152,260	„ 1	2,873
Chloroform and ether . . . . .	2	11,176	„ 1	5,588
Bichloride of Me- thylene . . . . .	2	10,000	„ 1	5,000

### Chloral Hydras, $C_2HCl_3O.H_2O$ .

Hydrate of Chloral is met with in small granular crystals, and also in large masses or cakes resembling loaf sugar; it is soluble in water, and the solution has an acrid taste. In ether, alcohol, and glycerine also it will dissolve. The cake chloral is often impure and uncertain in action.

Chloral is made by passing dry chlorine gas for some days through absolute alcohol, sp. gr. .795. Gradually the alcohol increases in density, becoming thick and viscid, the sp. gr. rising to 1.570.

In the formation of chloral, some of the hydrogen of the alcohol is carried off in the form of hydrochloric acid vapour. The alcohol thus losing hydrogen, becomes aldehyde ( $C_2H_4O$ ), while the chlorine, taking the place of some of the hydrogen of the aldehyde, converts it into chlor-aldehyde, or chloral ( $C_2HCl_3O$ ).

The liquid chloral combines with water to form the crystalline hydrous chloral, or chloral hydrate ( $C_2HCl_3O.H_2O$ ), so named by Liebreich, who introduced its use into medicine in 1869.

Good chloral hydrate is a colourless volatile crystalline solid, soluble in water, ether, and chloroform. It does not decompose or deliquesce on exposure to the air, does not leave oily spots when pressed between blotting paper, and gives no evidence of free chlorine when tested with nitrate of silver and nitric acid. Pure chloral is said not to act upon cork. Some however, that I had every reason to believe to be



perfectly pure, in twelve months' time had quite destroyed the cork of the bottle, making it into a soft black paste.

Chloral hydrate should not fume when the bottle is opened. 100 grains distilled with water and 30 grains of lime should yield not less than 70 grains of chloroform.

**Uses.**—Liebreich showed that chloral is decomposed by an alkali into chloroform and formic acid; this last combining with the alkali. The blood being an alkaline fluid, is supposed to decompose chloral, and set chloroform free. Injected hypodermically, solution of chloral is decomposed in the blood, chloroform is set free, and anæsthesia is produced. Given by the mouth, the same change occurs; and thus chloral acts as a sedative and hypnotic. Given in dose of ten to sixty grains, with syrup, chloral induces sleep, tends to arrest spasmodic and convulsive movements, and quiets excitement of respiration and pulse. In over dose chloral causes cramps, flushed face, injected eyes, prolonged sleep, and it has caused death; though in one case, reported by Dr. Rodman, 270 grains were taken in two hours without fatal result. An eruption of urticaria has been known to be caused by the administration of chloral hydrate. In poisoning by strychnia, chloral is the best known antidote.

In convulsive affections of children it is of some value, and in puerperal convulsions chloral has been injected into the rectum with excellent effect. In spasmodic asthma a dose of chloral hydrate with ether is often very efficacious; and in delirium tremens and puerperal mania it is a remedy of great value, efficiently supplying the place of opium. **Syrupus Chloral** contains ten grains in one drachm.

Chloral acts locally as an antiseptic; and rubbed up with an equal quantity of camphor, it forms a thick liquid of value as a local application in neuralgia.

**Croton, or Butyl, Chloral Hydrate**,  $C_4H_9Cl_2O$ , is

a white crystalline powder, not readily dissolved by water. Dr. Althaus has drawn attention to the value of this medicine in neuralgia of the fifth nerve. The brain may be narcotized by the croton chloral hydrate without the rest of the nervous system being affected. Dose five to ten grains.\* Croton chloral is made by passing chlorine gas through acetic aldehyde, whereby this is converted into crotonic aldehyde; which, by taking more chlorine, becomes croton chloral.

It may be right to mention that the action of chloral by virtue of its decomposition into chloroform in the blood, is not accepted by all observers. Dr. R. Amory, of Boston, has failed to discover chloroform in the blood of animals poisoned by chloral. See Horatio Wood, "New Remedies," October, 1872, p. 124.

Iodoform (Methenyl Iodide)  $\text{CHI}_3$ , occurs in greenish yellow scales, and is made by mixing solutions of potassium hydrate and of iodine in alcohol, the excess of alcohol is removed by evaporation and the yellow iodoform remains.

Iodoform is insoluble in water, and is used as an ointment, 1 drachm to 1 oz. lard, for cancerous and syphilitic sores. Thus employed it is most valuable, as it destroys the fetid odour of the sore most completely. It is not officinal in B. P.

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\* An excellent paper on Croton Chloral, by Dr. Burney Yeo, is in the *Lancet*, January, 1874.

## CHAPTER VIII.

**AMYLIC ALCOHOL.—ACETIC ACID.—YEAST.—  
CREASOTE.—CARBOLIC ACID.****Alcohol Amylicum, C<sub>6</sub>H<sub>12</sub>O.**

Amylic Alcohol, called also Fousel Oil and Potato Spirit, always exists in spirit derived from sugar prepared from starch; hence its name Amylic alcohol, from *Amylum*, starch. The sugar of potato starch yields much amylic alcohol. It is a colourless liquid of sp. gr. 0.818, boiling at 270°, soluble in alcohol and ether, but sparingly soluble in water; when oxidized it yields valerianic acid, just as ethylic alcohol yields acetic acid. Amylic alcohol is used in preparing the Valerianate of Soda, NaC<sub>6</sub>H<sub>11</sub>O<sub>2</sub>, a salt rarely given internally, but used in making Valerianate of Zinc.

**Amyl Nitris**, or Nitrite of Amyl, C<sub>6</sub>H<sub>11</sub>NO<sub>2</sub>.

In the *Pharmaceutical Journal*, November 25, 1871, Mr. A. B. Tanner describes a good process for the preparation of nitrite of amyl on a small scale by distilling very pure amylic alcohol with copper wire and one-tenth of its bulk of sulphuric acid. The same quantity of diluted nitric acid is next put in, and the whole gently warmed till reaction commences; it will proceed without violence, and the distillate will be an impure nitrite of amyl. This can be purified from free acids by mixture with potash and redistillation. Nitrite of amyl has sp. gr. 0.877, and boils at 205°. It is insoluble in water, but dissolves in rectified spirit. Added drop by drop to fused caustic potash, it forms valerianate of potash.

**Uses.**—Impure nitrite of amyl inhaled causes violent cough and irritation of the larynx. The pure nitrite has a remarkable effect in causing rapid fall of blood-pressure, with dilatation of the blood-vessels and intense flushing and congestion of the head and

face, the skin feeling full and tense. Temporary glucosuria follows inhalation of the nitrite of amyl, the heat of the body is also lowered. From two to five drops of the nitrite inhaled from lint will give speedy relief in purely neurotic angina pectoris, and in some forms of asthma with pallor of the face. The inhalation has been recommended in epilepsy, hemi-  
 v crania, tetanus, cholera, and in cases of impending death from chloroform. Nitrite of amyl speedily loses its power if kept for any length of time. The inhalation should be used with extra caution in the case of old persons with rigid brittle arteries.

**Acetum, Vinegar; Acidum Aceticum,  $HC_2H_3O_2$ .**

**Acidum Aceticum.**—This acid exists ready formed in certain plants and animal fluids in small proportion, and it exists to the extent of about  $5\frac{1}{2}$  per cent. in the **Acetum**, or Vinegar, of the B. P. Infusion of malt and unmalted grain are fermented together, and instead of the process being arrested when alcohol only is formed, it is suffered to go on till the acetous fermentation takes place, and the alcohol first formed is oxidized into acetic acid. First, by loss of  $H_2$ , alcohol becomes  $C_2H_4O$ , or aldehyde, and then the aldehyde by absorbing oxygen becomes,  $C_2H_4O_2$ , acetum or acetic acid. The Pharmacopœia Acetic Acid is obtained by the destructive distillation of wood, hence its name of *Pyroligneous* or *Pyroxylic acid*. In the distillate from the wood are found tarry matter and wood naphtha, or pyroxylic spirit, and in order to obtain the acetic acid in a state of purity the distillate is neutralized with carbonate of soda; an acetate of soda is thus formed which, after purification, is distilled with dilute sulphuric acid, pure acetic acid distils over, sulphate of soda remaining in the retort. Ordinary brown vinegar usually contains traces of sulphuric acid; ten minims of the chloride of barium solution ought to precipitate all the sulphuric acid from one ounce of vinegar. Acetic acid is colourless and volatile, on evaporation it

leaves no residue, and must be free from lead, sulphates, and chlorides. The absence of sulphurous acid is proved by observing that no sulphuretted hydrogen is evolved when the acid is mixed with zinc and hydrochloric acid, and the escaping gas tested for  $H_2S$  by means of paper wet with solution of acetate of lead. It will be observed that a large number of preparations of the B. P. are made with acetic acid. Vinegar is only used in making *Emplastrum Cerati Saponis*.

**Acidum Aceticum Dilutum** is about the same strength as the *Acetum*, or Vinegar; it contains, as tested volumetrically with the solution of soda, 3.63 per cent. of anhydrous acetic acid, while the acetic acid contains 28 per cent. of anhydrous acid, and the glacial acetic acid 84.

**Acidum Aceticum Glaciale** is a very strong monohydrated acid, prepared by distilling anhydrous acetate of soda with sulphuric acid.

If this acid, when tested with the lead test is found to contain any sulphurous acid, it is redistilled after admixture with oxide of manganese; thus the sulphurous acid is made into sulphuric acid, and remains in combination with the manganese.

Glacial acetic acid forms crystals when cooled down to  $34^{\circ}$  F. It is three times as strong as acetic acid.

Glacial acetic acid is used in preparing the **Acetum Cantharidis**, and the **Mistura Creasoti**.

Repeatedly applied to warts and corns it dries them up so that the warts drop off. On the skin it acts as a vesicant. In *Tinea capitis* it is a useful application to destroy the diseased patches.

**Acidum Aceticum Dilutum** is used to make cooling and astringent lotions, to arrest bleeding, and to allay feverish irritation of the skin. *Acetum*, or Vinegar, may be used for the same purpose. Acetic Ether has been already mentioned.

Internally, dilute acetic acid may be given in dose of one to two drachms in water, as a refrigerant, and to check profuse sweating. The diluted acid has

been used as a hypodermic injection in cases of tumours and cancers, the absorption of which it is thought to promote. Vinegar and water is an excellent wash for the eyes if injured by particles of lime; it is good, too, as a ready internal remedy in poisoning by the caustic alkalies.

**Cerevisiæ Fermentum**, or Beer Yeast, may be here described. Yeast consists of round or oval cells, forming a growth or plant called *Torula cerevisiæ*. On the organization of the yeast plant depends its power of exciting fermentation in saccharine solutions; for if the yeast be crushed by rubbing in a mortar, it will no longer work as a ferment.

Yeast has been given internally in dose of one-half to one ounce in putrid fevers, in cases of troublesome boils on the skin, and in diabetes. It is not often used, but there is evidence to show that it has some value as a remedy in the two first of the above quoted instances. In diabetes yeast seems of very little service.

**Cataplasma Fermenti**, or Yeast Poultice. See page 32.

### Creasote, $C_8H_{10}O_2$ ,

is one of the bodies produced along with acetic acid in the distillation of wood. The best creasote is made from wood-tar, and was first isolated by Reichenbach; its name is derived from its power, as an antiseptic, to preserve flesh.

Impure creasote is the carbolic acid made from coal, and this gives a jelly when shaken with collodion, which pure creasote does not. Further, pure creasote is distinguished from its analogue carbolic acid by the facts, that it is insoluble in commercial glycerine; that when cooled by a freezing mixture of hydrochloric acid and sulphate of soda it still remains fluid, and that it turns the polarized ray to the right. Phenic or carbolic acid possesses none of these properties. Creasote and carbolic acid both coagulate

albumen. Creasote is used externally and internally in medicine ; it is readily soluble in alcohol, ether, and strong acetic acid.

**Unguentum Creasoti**, one of creasote to eight of simple ointment, is useful in cases of ringworm, as well as in lepra and impetigo. A creasote wash of one creasote to eighty of water is good to prevent bed-sores. Creasote is a styptic, or hæmostatic, and applied will check hæmorrhage.

**Vapor Creasoti**.—In the creasote inhalation 12 min. are inhaled mixed with 8 oz. of boiling water, and this vapour is very beneficial in cases of phthisis and chronic bronchitis. The vapour tends to check excessive expectoration, and to correct fetor. One drachm of rectified spirit, holding in solution 2 to 5 drops of creasote, poured over a piece of wool, as in Dr. Sinclair Coghill's antiseptic inhaling respirator, appears to me a most efficient way of employing creasote vapour in cases of phthisis with softening and purulent expectoration. I make the patient wear this respirator for one hour morning and evening, and have met with most satisfactory results in cases where cavities have been present in the lungs.

**Mistura Creasoti** contains creasote with acetic acid and spirit of juniper. This mixture, in dose of one-half to one ounce, is efficacious in some forms of phthisis and chronic bronchitis, especially if there be tendency to diarrhœa or hæmorrhage. Creasote is much used by dentists as an antiseptic dressing for carious teeth. It has been given in saccharine diabetes, with at times apparent benefit to the patient. Creasote given in dose of  $\frac{1}{4}$  to 1 min. in pill with bread mass, is very useful to check obstinate vomiting with fermentation in the stomach ; in diarrhœa, too, this pill three times a day is of value.

**Petroleum, or Barbadoes Tar**, is not in the B. P. It is a black bituminous liquid, used in the West Indies to make ointment for some chronic skin affections. *It has been given internally in chronic bronchitis.*

**Vaseline** is the residuum after the distillation of Petroleum or Rock Oil. Usually it is of a yellow colour, but by means of animal charcoal, it can be converted into white vaseline, and forms an excellent basis for ointments, as it keeps well and does not turn rancid.

**Acidum Carbolicum, C<sub>6</sub>H<sub>5</sub>HO,**

Carbolic or Phenic Acid, was obtained by fractional distillation from coal-tar by Runge, in 1834; and as it seemed to form salts with bases, he named it Carbolic Acid. The names Hydrate of Phenyl (Laurent), and Phenic Alcohol, have also been given to this substance, for as it does not redden litmus its acid character has been reasonably questioned. The solubility of the crystalline acid in water is one in fifteen, and this solution will bear dilution with more water. It is freely soluble in olive oil, chloroform, ether, alcohol, and glycerine. Pure creasote is insoluble in glycerine. Crystallized carbolic acid melts at 95°.

Carbolic acid has a sp. gr. 1.065; boiling point 370° F. With alcohol and ferric chloride, carbolic acid gives a brown colour. Creasote with the same re-agents turns green. With ammonia and ferric chloride, carbolic acid gives a violet colour.

Crystallized carbolic acid turns red if kept exposed to the light, from the formation of rosolic acid.

Impure carbolic acid contains cresylic and xylic acids, and turns brown when exposed to the air. By oxidation with chromic acid, carbolic acid yields *Resorcin*, a white crystalline body recently employed in medicine as an antiseptic agent. In the Breslau Hospital for infants, resorcin in doses of 20 to 30 centigrammes (1 centigramme = 0.15432 of a grain), in infusion of chamomile, has been given with remarkable success in ninety-one cases of vomiting and choleraic diarrhoea. Resorcin is said to be less irritating and intoxicating than carbolic acid. The average dose is 15 to 30 grs., at intervals, in 24 hours. Carbolic acid may be absorbed by the skin, and



cause symptoms of poisoning, with vomiting, giddiness, and delirium, while at the same time the urine becomes dark in colour, and develops a blue colour if ferric chloride be added. Carbolic acid taken internally produces great lividity and oppression, and it appears that the acid destroys the blood corpuscles. In one fatal case of poisoning in a two-year old child, transfusion of blood was tried with decided, but only temporary, relief. Milk and olive oil are the best agents for counteracting the poisonous effect of carbolic acid.

As much as twenty-four drops of carbolic acid have been given in error, but under the use of the means above indicated the patient recovered. In 1860 Lemaire first drew attention to carbolic acid as a remedy; and a few years later Lister and Sansom brought its virtues as an antiseptic and germicide prominently before the profession.

Carbolic acid is soluble in oil of vitriol, forming ( $C_6H_5HSO_3$ ) sulpho-carbolic acid, which combines with bases, and forms sulpho-carbolates. With nitric acid nitro-carbolic, or picric, acid is formed in yellow crystals. Picric acid forms explosive salts with many bases. Carbolic acid is destructive to septic poisons, and is much used as a disinfectant and deodorizer. Vapourized, by being allowed to fall drop by drop on a hot plate, the acid soon impregnates the air of a room, and its power when thus employed, of removing all fetid odour is most remarkable. In cases of gangrene of the lung I have employed the acid, volatilized from one of Savory and Moore's carbolic acid vapourizers, with most satisfactory results. Carbolic acid boils at  $370^\circ$ , a high temperature is therefore required to volatilize the acid efficiently.

Carbolic acid has been used by Professor Lister and others to form an antiseptic dressing for wounds and ulcers. Carbolic acid is soluble in water, as 1 in 15, and one part of the acid in 20 to 40 of water, makes a good carbolic lotion. One of acid to eight

of oil, forms a dressing for sores, and is also of service as a safe application to the face in variola. This mixture will, it is said, remove stains in the skin produced by particles of gunpowder. Mr. Henry Morris finds a mixture of 75 per cent. carbolic acid with gypsum, very useful as a painless application to syphilitic and cancerous sores; it gradually destroys diseased tissue, and leaves a healthy surface.

In Favus, Pityriasis, and various skin diseases of parasitic nature, Carbolic Acid lotions are useful.

**Suppositoria Acidi Carbolici cum Sapone**—a useful antiseptic and disinfecting suppository of carbolic acid, soap, and starch.

**Glycerinum Acidi Carbolici** is a very good application to some forms of ulceration of the throat and tonsils with fetor of breath. The glycerinum should be diluted with an equal part of water.

Two drachms of the glycerinum with eight ounces of rose water make a good carbolic gargle. When taken internally, carbolic acid appears to pass unchanged into the blood and urine, giving to this last fluid a dark colour. In large doses it acts as a poison on the nerve centres, producing great prostration and weakness. The crystallized acid acts locally as a caustic. An 85 per cent. solution applied to the skin causes burning, followed by local anæsthesia.

Carbolic acid has been administered internally in various complaints. In dyspepsia with pyrosis and fermentative action in the stomach, Dr. Haden has given the acid with success. He prescribes a solution of the crystallized acid gr. j, spt. vin. rect. l drm., in doses of ten to fifteen drops in water.

In phthisis, dysentery, various fevers and other diseases, carbolic acid has been employed with a view to its antiseptic operation. The remedy seems to me one that powerfully depresses the circulation, and to be an internal medicine of very limited power. In phthisis pulmonalis, internally or by inhalation, it is not so useful as its congener Creasote.

Carbolate of Lime, in dose of one to two grains, has been found useful by Dr. Habershon in checking the diarrhoea of phthisis, and the same drug made into a vaginal pessary, ten grains with stearine, has been found by Dr. Greenhalgh invaluable in correcting the fetor attendant on ulcerating cancer of the womb.

Dr. Sansom, being alive to the objections to the internal use of carbolic acid, has introduced salts of sulpho-carbolic acid, sulpho-carbolates, which promise to be of great service. These salts are decomposed in the system, carbolic acid being given off by the breath, while sulphate of sodium appears in the urine.

The dose of sulpho-carbolate of sodium is twenty to forty grains; it is freely soluble in water, and has but little taste. I have known this salt speedily curative of very obstinate flatulence connected with fermentative dyspepsia.

The dose of carbolic acid is one to two grains, or drops, with mucilage and water. The glycerine of carbolic acid may be given in dose of five to ten minims.

One of acid in 100 of water is a good strength for inhalation from a spray atomizer, in ozæna and throat affections. Another form is—

Tincture of Iodine . . .	1 drachm.
Carbolic Acid . . . . .	6 minims.
Water . . . . .	6 ounces.

This makes a colourless solution.

The relation of carbolic to salicylic acid will be mentioned under Salicine.

## PART II.

### ORGANIC MATERIA MEDICA.

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#### VEGETABLE PREPARATIONS.

Among the various preparations used in medicine, that are obtained from the vegetable kingdom, we find certain groups that require a word of notice. First

**Aquæ, or Waters.**—The ordinary Aqua, or Water of pharmacy, is filtered water, and will be more or less hard from containing sulphate and carbonate of lime in solution. The latter of these salts is deposited, when the water is boiled and the carbonic acid gas expelled from it, but the sulphate of lime still remains in the water, constituting what is called “permanent hardness.” For pharmaceutical purposes and making test solutions, where an absolutely pure water is required, we are instructed to use **Aqua Destillata**, or Distilled Water. This contains no matter in solution, and therefore leaves no residue when evaporated to dryness. The tests given in the B. P. are to prove the absence of lead and metallic impurity by sulphuretted hydrogen, of lime by oxalate of ammonia, of chlorides and sulphates by nitrate of silver and chloride of barium, and of carbonic acid by solution of lime.

All the thirteen **Aquæ** of the Pharmacopœia are made by distillation except Aqua Camphoræ, and Aqua Chloroformi, both of these are solutions of the active agent in distilled water. Some of the waters are made by distilling part of the plant with water in a retort; others by distilling volatile oil of the

plant with water. By this last process the waters of Peppermint and Spearmint are made, while the waters of Dill, Caraway, Cinamon, Fennel, Cherry Laurel, Pimento, Rose, and Elder Flower, are made by the first process.

**Decocta**, or **Decoctions**, are made by boiling, for a longer or shorter period, as directed, the medicinal substance with water. There are fourteen decoctions in the B. P., and of these, two, *Decoctum Sarsæ Compositum*, and *Decoctum Aloes Co.*, are compound decoctions.

**Essentiæ**, or **Essences**, are made by dissolving volatile oil in spirit. There are two essences in the B. P.: *Essence of Anise* and *Essence of Peppermint*.

**Extracta**, or **Extracts**.—The green extracts are made from the fresh juice of the plant. This is heated to 130°, to coagulate and separate the chlorophyll, or green colouring matter; filtered, and again heated to 200°, to separate the vegetable albumen; and, when this is filtered off, the remainder of the juice is gradually evaporated at a temperature not exceeding 140°, to the consistence of thin syrup, and the colouring matter again added. Thus are prepared the *Extracts of Aconite, Belladonna, Conium, Hyoscyamus, Lactuca.*

Other extracts are made from the drugs in the dry state by the action of water, hot or cold, and the subsequent concentration of the liquid to the consistence of an extract. Some extracts are made with spirit, some with ether; and in preparing the *Acetic Extract of Colchicum* acetic acid is used as the solvent body.

**Infusa**, or **Infusions**, twenty-eight in number, differ from Decoctions in not being boiled. Most infusions are made with boiling distilled water. The *Infusum Calumbæ* is made with cold water, in order not to dissolve out the starchy matter of the root. Thus made, the infusion keeps well. *Quassia infusion* is also made with cold water. There are two

compound infusions, Infusum Gentianæ Compositum, and Infusum Aurantii Compositum.

**Succi, or Juices,** are expressed from the fresh plant, and then one-third of the product thus obtained is added in the form of rectified spirit to make the juice keep well. Succus Conii, S. Taraxaci, S. Scoparii, S. Belladonnæ, and S. Hyoscyami are the officinal juices of the B. P.

In the following classification of the vegetable Materia Medica we take first—

CLASS I.—**EXOGENS.**

Exogens have leaves with branched veins. \* On cross section of the stem *medullary rays* are seen as lines passing from the pith to the bark.

The embryo of the seed has two *Cotyledons*, hence Exogens are called *Dicotyledons*.

Sub-Class I.—**Thalamiflorals.**

Thalamifloral Exogens. The flowers have both calyx and corolla, the latter consisting of distinct petals. Stamens hypogynous—*i.e.*, united to sides of ovary.

NATURAL ORDER.—**RANUNCULACEÆ.**

The Ranunculaceæ, or Crow-foot tribe, are mostly poisonous, possess acrid, sometimes also narcotic, properties, and some of them act as topical benumbing. As for example—

**Aconitum Napellus.** Wolfsbane or Monkshood.

**Aconiti Folia.** Aconite Leaves.—These leaves are smooth, palmate, and deeply cleft into five segments. The fresh leaves and blue flowering tops of the Aconite plant are used for preparing the—

**Extractum Aconiti.**—This is a dark-coloured extract prepared, after the manner of a green extract, from the juice expressed from the tops and leaves. 100 lb. of plant produce 50 lb. of juice = 7lb. extract.

Dose of Ext. Aconiti, one to two grains.

**Aconiti Radix.**—Aconite root is imported from Germany, and from Japan and Nepaul. The roots should be collected before the leaves have appeared.

FIG. 7.

Root of Nepaul Aconite, from *Year Book of Pharmacy*, 1870.

The Nepaul Aconite gives a large fleshy-looking tap-root, lighter in colour than the ordinary Aconite root, which is tapering, blackish in colour, but white internally.

The Nepaul Aconite (Fig. 7), *Aconitum Ferox*, or Bikh Root, has been shown by Mr. Grove to contain a large quantity of crystalline principle. This has been called Pseud-aconitine, as it does not correspond in chemical character with the pure aconitine. See *Year Book of Pharmacy*, 1870, and *London Medical Record*, Jan. 28th, 1874.

**Tinctura Aconiti** and **Linimentum Aconiti** are preparations of the root. The tincture is the colour of sherry. B. P. dose five to fifteen minims.

The Liniment contains camphor with aconite root and rectified spirit. It may be applied as a topical benumber to the skin with a brush, or rubbed on when mixed with an equal quantity of soap, or compound camphor, liniment. Thus used it is of service in the treatment of neuralgia.

**Aconitia.**—The chemical examination of the leaves and root of Aconite have shown that there exists in them an alkaloid, *Aconitia* or *Aconitina* ( $C_{20}H_{27}NO_7$ ) combined with an acid called *Aconitic Acid* ( $C_6H_5O_6$ ). Another crystalline base, *Aconella*, has also been found in aconite, but it does not seem to possess any active properties, save that it is somewhat narcotic. A body, *Napelline*, has also been obtained from aconite as a white alkaline powder. *Aconitia* is a decided alkali; usually it is obtained in an amorphous state, but the crystallized aconitia is the purest and most potent. M. Duquesnel, in *L'Union Pharmaceutique*, July, 1872, details experiments that he made with French and German amorphous aconitia in contrast with pure crystalline aconitia. The superiority of the crystalline over the amorphous aconitia was thoroughly proved. The Pseud-aconitine from Nepaul aconite is probably a mixture of various principles.

*Aconitia* is soluble in water, and very soluble in alcohol and ether. It is not given internally, being such a powerful poison. On the nerves it acts as a paralyzing and benumbing agent, but does



not act on the muscles except through the nerves supplying them.

**Unguentum Aconitiæ** is used as a sedative ointment; care being taken that it is not applied where the surface is abraded. It is a very costly medication, containing eight grains of aconitia to one ounce of lard.

When aconite, or aconitia, is taken into the system in poisonous dose, it causes faintness and fluttering action of the heart, with loss of sight, hearing, and feeling, followed by convulsions and death by syncope; the heart being paralysed, and ceasing action dilated in diastole. Thus most human beings poisoned by aconite appear to die, though experiments made on the lower animals tend to prove that with them aconite usually kills by causing asphyxia. Contraction of the pupil has been recorded as a phenomenon of aconite poisoning; it is, however, by no means a constant one.

A remarkable case of poisoning has been recorded by Dr. Dobie, in the *British Medical Journal* for December 21, 1872, where it appears one ounce of a very strong (Fleming's) tincture of aconite had been swallowed. The patient became so prostrate, that raising his head to give him brandy well-nigh caused fatal syncope. Things seemed very critical, when Drs. Dobie and Ramsay, acting on an idea obtained by reading Dr. Milner Fothergill's "Prize Essay on the Action of Digitalis on the Heart," gave one drachm of tincture of digitalis, after having first injected twenty minims under the skin. This treatment roused the heart to action and saved the patient's life; proving also the soundness of Dr. Fothergill's view as to the tonic action of digitalis on the heart.

**Internal use of Aconite as a Remedy.**—Aconite is best given in the form of tincture. It acts as a sedative to the heart and circulation, and is a remedy of very great value in commencing inflammations,

where the skin is hot and the pulse quick. In rheumatic fever with threatening of pericarditis, two minims of aconite tincture every hour is an excellent method, in my own experience, of averting the coming evil. I have seen a most marked change in the temperature chart of a young man with pericarditis follow on the administration of one minim of tincture of aconite every two hours, a good recovery ensuing. Given early in peritonitis aconite is most valuable.

In the early stages of pneumonia, bronchitis, tonsillitis, and croup, few remedies can compare with aconite. Many years ago Dr. Prosser James proved the great value of aconite in incipient tonsillitis. I have myself employed the tincture in erysipelas as much as twelve years ago with decided benefit, and in 1848 the late Mr. Liston tried aconite in cases of erysipelas in University College Hospital.

One drop, or even half a drop, in water every hour is quite enough of the medicine for a child threatened with croup or in a state of fever. This quantity acts on the skin and kidneys, and calms the excited circulation, helping often to induce sleep. Aconite tends to lessen tissue change; unlike blood-letting, which promotes decomposition of tissue, and induces fatty degeneration of organs (Voit and Bauer).

#### **Podophylli Radix. Podophylli Resina.**

Podophyllum Root is the rhizome of the *P. Peltatum*, or May-apple, of North America. The dark jointed rhizome sends up a herbaceous stem bearing a large palmate leaf, and between the leaves, on a peduncle one or two inches long, appears the solitary white flower. The powder of the root, in dose of ten to twenty grains, acts as a violent cathartic; it stimulates the liver and causes emptying of the gall bladder; hence, as a remedy, it resembles calomel. In this country the **Podophylli Resina** is usually employed. The resin forms about 3 per cent. of the root, and can be dissolved out by rectified spirit and precipi-

tated from its solution by water acidulated with hydrochloric acid; and this resin may be given in a pill with soap, or with extract of henbane to prevent griping. The dose is from a quarter to one grain. A tincture can be made by dissolving the resin in alcohol in the proportion of one grain to one drachm, as recommended by Ringer, and five or six drops of this tincture in water, or on sugar, is a good form of laxative to be given to children with sluggish bowels and inactive liver. I first employed podophyllin in 1860; to me it seems uncertain and variable in its action, and not a very important addition to our list of cholagogue purgatives. Chloride of sodium increases the purgative action of podophyllin.

The Black Hellebore, *Helleborus Niger*, is not now officinal. The tincture made from the rhizome, in dose of one drachm, acts as a very strong purgative, and has been given in some affections of the brain and in melancholia.

**Staphisagria** (not officinal).—The seeds of the Delphinium *Staphisagria* or *Stavesacre*. Brown triangular seeds, pitted on the surface, and containing an alkaloid, *Delphinia*. The powder of the seeds has been used to destroy lice, and in ointment it has been used for the treatment of scabies or itch. Mr. Balmanno Squire has shown that the oil of the seeds is of great value in the form of ointment (one of oil to seven of lard), in curing obstinate prurigo senilis.

**Actæa Racemosa**. *Cimicifuga Racemosa*, or Black Snake Root, is not officinal. The Tincture of the *Actæa* has been used in one-drachm doses with very good effect in some forms of chronic rheumatism and neuralgia. *Actæa* depresses the action of the heart, and is thought to be allied in action to aconite.

#### MAGNOLIACEÆ.

**Cortex Winteri**, or Winter's Bark, so named from having been found by Captain Winter, in 1578, on the coast of the Straits of Magellan, is not in the

**B. P.** This bark occurs in reddish-yellow quills, with dark red spots, longitudinally wrinkled on its inner surface. It is an aromatic tonic, somewhat resembling *Canella Alba*, though *Winter's bark* contains tannin and *Canella bark* does not. Dose thirty to sixty grains in powder or in infusion.

***Illicium Anisatum* (Star Anise).**—The distilled oil from the Chinese Star Anise is officinal in the B. P., closely resembling the true oil of anise obtained from the umbelliferous plant, the *Pimpinella Anisum*.

#### MENISPERMACEÆ.

***Calumbæ Radix.***—*Calumba*, or *Colombo*, Root. The transversely cut root of the *Jateorrhiza Calumba*, was first supposed to come from Colombo, a town of Ceylon, hence its name; it is now known to come from the forests of Eastern Africa. The root contains as much as one-third of its weight of starch, and this renders it an easy prey to insects, whose small holes may be seen in most pieces. Containing so much starch the decoction of the root, when cold, turns a bluish-black colour with iodine (iodide of starch). *Calumba* root on analysis yields a neutral crystalline principle, *Calumbine* ( $C_{21}H_{21}O_7$ ), slightly soluble in water and spirits. There is also found an acid, *Calumbic acid* ( $C_{21}H_{21}O_7$ ), and an alkaloid, *Berberine* ( $C_{20}H_{17}HO_4$ ), which gives the yellow colour to the root and to its infusion, and which exists also in the *podophyllum* root.

*Berberine* exists in the *Berberis vulgaris*, but it must not be confounded with the body *Beberia* obtained from the *Bebeeru* or *Green-heart* tree.

*Calumba* is of great use in medicine as a non-astringent tonic, it allays gastric irritation and vomiting; and the infusion, with or without the addition of the tincture, is a good medicine to restore tone to the stomach in convalescence from acute disease. In chronic diarrhoea it is often of great service. Alkalies, acids, and preparations of iron may be asso-

ciated with calumba in prescribing. The powdered root is sometimes given with soda and ginger, or rhubarb, as a stomachic tonic, in dose of ten to twenty grains.

The preparations of calumba are the **Infusion**, made with cold water, to avoid dissolving out the starch of the root, and thus insuring an infusion that will keep and of which the dose is one to two ounces. The **Tincture** may be given in dose of one to two drachms, with water or with the Infus. Calumbæ. The **Extract** may be given in the form of pill in dose of two to five grains. As made with water in the B. P., the Extract does not keep well, but soon turns mouldy.

**Pareiræ Radix.**—The dried root of the *Cissampelos Pareira*, Wild Vine or Velvet Leaf, from Brazil. A good deal of the stem of the Pareira is imported; this yields less extract, and is inferior in value to the root. The description of the root and its section should be studied in the B. P. Attention should be paid to the woody porous interior of the root with its well-marked, often incomplete, concentric rings and medullary rays. Sometimes the root has small rootlets adhering to it, and at times, on the stem, pieces of lichen may be found.

On analysis the Pareira root yields a crystalline basic body, *Cissampeline* ( $C_{18}H_{21}NO_8$ ), with resin, bitter matter, and starch.

Pareira acts on the system as a tonic with special determination to the bladder and kidneys. In chronic catarrh of the bladder, and in pyelitis of the kidney, with muco-purulent urine, a strong decoction of pareira is often of service. In the B. P. are found a **Decoction**, an **Extract**, and a **Liquid Extract**. The Decoction may be given in dose of one to two ounces, and the extract in dose of ten grains. The liquid extract, in dose of one to two drachms, may be added to the decoction to increase its power. Brodie used to order, in chronic bladder catarrh, that one-half ounce of the root, in three pints of water, should be boiled down

to one pint, and of this Decoction eight to twelve ounces taken daily.

Acids, or alkalies, may be combined with pareira, but not the salts of iron or lead. Hanbury doubts if the commercial root be derived from the *Cissampelos Pareira*; its botanical source is not known. The reputation of pareira as a remedy appears to have been founded on the use of the *Chondodendron Tomentosum*.

**Cocculus Indicus** belongs to the Menispermaceæ. The berries are not officinal in the B. P. They contain a principle, *Picrotoxine*, which acts as a poison to the cerebellum. An ointment made with *Cocculus* has been used to destroy pediculi.

#### PAPAVERACEÆ.

The plants of this order possess narcotic and acrid properties. At the head of the narcotic Papaveraceæ stands the genus **Papaver**, from which opium is made.

It is from the unripe capsule of the Somniferous, or White Poppy, that Opium is obtained in most abundance, though every species of poppy may yield it in greater or less amount.

**Papaveris Capsulæ.**—The Poppy Heads of pharmacy come before us as brownish-white capsules, surmounted by a persistent stigma; within are parietal placentæ and numerous small seeds (maw seed), from which, by expression, a bland oil, called *poppy oil*, is obtained. This oil is used by artists, but has no narcotic properties.

**Decoctum Papaveris** is made by boiling for ten minutes two ounces of poppy capsules in one and a half pints of water, and then adding water to make up one pint. This preparation may be used as a sedative application to a painful, swollen, or bruised surface.

**Extractum Papaveris** is made by exhausting poppy capsules with water, concentrating the liquor.

to one pint, then adding spirit and evaporating till it be of sufficient consistence to form into pills.

The dose of Ext. Papaveris is two to five grains, and such a dose will act as a mild narcotic and sedative.

**Syrupus Papaveris.**—This is a third preparation of the poppy capsule. Poppy capsules are infused for twenty-four hours in water, the liquor is concentrated, and, when cold, rectified spirit is added, as in preparing the extract; this coagulates the gummy matters, which are strained off, and the clear liquid, after the spirit has been distilled off, is made into syrup by the addition of sugar.

The dose of Syrup of Poppy for an adult is from one drachm. For a child, ten to twenty minims is a sufficient dose to be safe, as children are very susceptible to the action of all forms of opium. Occasionally a mixture of treacle and laudanum, or syrup and extract of poppy, has been used instead of Syr. Papav.: such an uncertain compound is most dangerous if given to young children.

**Opium**, the juice of the poppy capsule, is a very old medicine, known to Hippocrates, Dioscorides, and Pliny, and it is obtained now, as during the last 1800 years, by making incisions into the green, half-ripe poppy capsules, and collecting the juice. In Persia the capsule is incised crosswise; while at Behar the cuts are made from below upwards. The Smyrna and Persian Opium consists of small tears agglutinated together. The Indian and Egyptian opium has the look of a homogeneous paste. Opium is kneaded up with the aid of saliva, and is covered with the petals of the poppy flower, and often with the leaves and seeds of a kind of dock plant, or Rumex, as in the Smyrna opium. Dirt of various kinds, and sometimes flour, is mixed up with bad opium; a good deal of the first will remain insoluble when the opium is broken up in water. The presence of flour causes opium soon to turn sour, and to break

with a short ragged fracture, with dull edges, instead of being translucent, like good opium. Of Turkey opium there are two varieties: 1, Smyrna; 2, Constantinople opium.

1. **Smyrna Opium.**—This kind of Turkey opium occurs in irregular rounded or flattened masses, rarely exceeding two pounds weight, covered with leaves and with the reddish capsules of the *Rumex Orientalis*. When fresh this opium is soft and of reddish-brown colour, and made up of agglutinated tears; after keeping it gets hard and black. It is the best commercial opium, and usually contains from 7 to 10 per cent. of morphia.

2. **Constantinople Opium.**—The best of this kind occurs in large flat irregular cakes. Another kind is met with in small flat cakes, covered with a poppy leaf, the median nerves of which divide the cake into two parts, and the midrib often marks the cake distinctly. Pereira says, the cakes are never covered with *Rumex* capsules as those of the Smyrna opium are. The quantity of morphia obtained from it varies greatly in different specimens.

3. **Egyptian Opium** occurs in flattened cakes, more or less circular, covered with remains of some leaf; internally the cake is hard, dark reddish-brown in colour, with a musty odour, and if macerated in water a sour smell of acetic acid can be detected. Guibourt found this opium to yield only five-sevenths of the amount of morphia got from best Smyrna opium. It contains much meconic acid.

4. **East Indian Opium** (Bengal and Benares Opium) is met with in large balls, as big as a child's head, covered with a thick case of poppy leaves, stuck together with a paste of refuse opium. The contained opium is a black homogeneous paste, growing very hard by long keeping. Such is the *Benares opium*, and the *Chinese investment opium*.

East Indian opium occurs also in cakes, as the *Malwa* and *Garden Patna* opium.



Indian opiums are inferior to those of Turkey. Persian opium occurs in sticks, and English, French, and German opiums are known but not often met with.

**Composition of Opium.**—Certain alkaloids and neutral crystalline bodies have been found in opium, together with a tribasic acid, *Meconic acid* ( $C_7H_4O_7$ ), which can be crystallized, is soluble in water, easily decomposed, and forms with persalts of iron a blood-red meconate of iron. This colour is not destroyed on adding corrosive sublimate, and is thus distinguished from red sulphocyanide of iron. *Morphia* ( $C_{17}H_{19}NO_3$ ) is an alkaloid, crystallizing in six-sided prisms, and existing in opium in varying proportion, from 4 to 10 per cent. It is slightly soluble in water and ether, but dissolves readily in alcohol and in caustic alkalies without decomposition. Solution of morphia turns yellowish-red with nitric acid, and a strong solution forms a dirty-blue colour with *neutral* solution of perchloride of iron. If to solution of morphia a fragment of iodic acid ( $HIO_3$ ) be added, it is decomposed and iodine is set free. Siebold observes that morphia solution, heated with a few drops of sulphuric acid, turns deep brown if perchlorate of potassium be added. Under the action of hydrochloric acid, in a sealed tube at a high temperature, morphia by losing an atom of water,  $H_2O$ , yields *Apomorphia* ( $C_{17}H_{17}NO_3$ ), a body that acts as a very speedy emetic if one-quarter of a grain be taken by the mouth, or one-tenth of a grain be injected under the skin. Unlike morphia, apomorphia is soluble in ether, and its solution in water turns green in contact with the air.

Morphia combines with acids to form salts, and we find in the B. P. the Hydrochlorate and the Acetate of Morphia.

**Morphiæ Hydrochloras.**—In the process for preparing this salt, as given in the B. P., a strong watery infusion of opium is first made, which will contain the meconate and sulphate of morphia and codeia. To this, when concentrated to one pint, is

added chloride of calcium, which precipitates meconate and sulphate of lime, while the chlorine combines with the morphia and codeia. The solution is concentrated till it becomes a solid cake on cooling; this cake is squeezed as free from colouring matter as possible, and then broken up and mixed with boiling water, and again evaporated, cooled, and pressed. The pressed cake is then mixed with boiling distilled water and animal charcoal, and to the solution filtered off ammonia is added, and the pure crystalline morphia is thus precipitated. The pure morphia is mixed with boiling distilled water and dilute hydrochloric acid, and thus the hydrochlorate, or muriate, of morphia is obtained. It is described as a white acicular crystalline salt, and the Pharmacopœia gives the tests whereby it may be recognised. Twenty grains of the hydrochlorate yield 15·18 grains of pure morphia.

**Preparations of Hydrochlorate of Morphia.**—The salt is used in dose of half a grain to form sedative suppositories, **Suppositoria Morphiæ** and **S. M. c. Sapone**. In dose of one-thirty-sixth grain it is given in lozenges, **Trochisci Morphiæ** and **T.M.c. Ipecacuanha**. The **Liquor Morphiæ Hydrochloratis** contains one grain in two drachms. The average dose of hydrochlorate of morphia is one-eighth to half a grain.

**Morphiæ Acetas.**—Hydrochlorate of morphia solution is precipitated by ammonia and the precipitated morphia redissolved in acetic acid. The dry acetate is a white powder, soluble in water and spirit. By heat some of the acetic acid can be driven off.

**Liquor Morphiæ Acetatis** contains one grain in two drachms. A neutral solution of the acetate of morphia, one grain in twelve minims, is a very convenient form for hypodermic injection, and forms the **Injectio Morphiæ Hypodermica**, of which the hypodermic dose is one to six minims.

Alkalies and vegetable astringents must not be combined with morphia. There are a number of

other bodies found in opium which do not find place in the B. P., though they have been used in medicine.

**Codeia** ( $C_{16}H_{21}NO_3 + H_2O$ ), a crystalline alkaloid discovered by Robiquet in 1832. Soluble in water, ether, and alcohol; but, unlike morphia, insoluble in solution of potash. It is said to be a sedative. Dr Gregory took three grains without any effect. Six grains seemed to have some calming action. In diabetes it seems to be a remedy worth trial.

**Narcotina** ( $C_{21}H_{23}NO_7$ ), a crystalline neutral body insoluble in potash. Has no narcotic properties. Has been given in five-grain doses as an antiperiodic.

**Narceia** ( $C_{22}H_{29}NO_3$ ), a crystalline body of feeble basic powers, turns red with sulphuric acid. Has no marked action on the system.

**Paramorphia**, or **Thebaia** ( $C_{19}H_{21}NO_3$ ), is an alkaloid, not reddened by nitric acid, nor turned blue by persalts of iron. In doses of one grain it produces tetanic spasms.

**Meconine**, **Opianic Acid**, **Cryptopia**, **Laudanine**, **Protopine**, are among other bodies found in opium, of the action of which on the system but little is at present known. Resins with gummy and fatty matters have also been found in opium; the resin, amounting to 10 per cent., mixed with 40 per cent. gummy matter soluble in water. The resinous matter of opium, taken in large dose, produces giddiness, pain in head, and contraction of the pupils of the eyes.

Dose of Pulvis Opii  $\frac{1}{2}$  to 2 grains =  $\frac{1}{16}$  to  $\frac{1}{4}$  grain Morphiæ Hydrochloras.

**Effects and Uses of Opium.**—Opium, in small dose, acts as a stimulant, exciting the vascular and nervous systems, and increasing the rapidity and fullness of the pulse. It checks the secretions, with the exception of that of the skin, which it increases. In full doses it acts as a hypnotic and narcotic, producing sleep, and blunting the sensibility to pain; hence it may be called an anodyne. It diminishes

the frequency of respiration, and impedes oxidation of the blood. In poisonous doses opium causes slowness of respiration, feebleness of pulse, contraction of the pupils, coma, and death.

Age influences much the action of opium. Children are very susceptible to opium, and to young infants the drug must be only given with the utmost care. Slight tetanic symptoms are seen sometimes as an early sign of opium-poisoning in young children. Habit tends powerfully to enable persons to take large doses of opium. Dr. Garrod knew a young man who took sixty grains of Smyrna opium twice a day; also a man, aged thirty-five, who could take seventy-two grains of acetate of morphia in a day. Under the influence of disease and severe pain the tolerance of large doses of opium is greatly increased.

Opium is used to relieve pain, and to check excessive discharge, as diarrhoea and diuresis. After great loss of blood opium is of service to calm the disturbed system. To procure sleep opium is invaluable; and in the restlessness of some fevers, typhus and typhoid, opium in moderate doses at night is often a most suitable remedy, but it must never be given if there be reason to fear inflammation about the brain. In very troublesome cough, with copious expectoration, opium is good; and in painful affections of the bladder and kidneys it is often advantageously administered. A grain of opium, or ten minims of laudanum, at night, with some persons acts well in arresting incipient catarrh, with congestion of the mucous membrane. In bronchial affections opium goes well in combination with squill; but opium must not be given if the patient be livid in face and drowsy with much secretion in the air tubes.

Morphia and its salts, as the hydrochlorate, acetate, sulphate, and bi-meconate, possess the anodyne properties of opium, but morphia is not so exciting at first, nor so apt to induce vascular congestion, nausea, and headache as crude opium. With a few indivi-

duals morphia salts induce convulsive movements. The **Extractum Opii** is less stimulating than the powder, and is often preferred. In cases of senile gangrene there is no remedy better than the plain **Pulvis Opii**, for here its stimulating action is of much service, and it appears to restore the circulation, and so does good to the gangrene. For the same reason **Pulvis Opii** cures indolent ulcers of the legs, a fact pointed out by the late Mr. Skey.

Opium is used externally in the form of the **Lini-mentum Opii** as an anodyne embrocation. Hypodermically solutions of morphia are injected to relieve pain and promote sleep; for such purposes nothing is better than a neutral solution of acetate of morphia; or some of the solution of the bi-meconate of morphia which has been evaporated down to  $\frac{1}{30}$ th of its volume, and then 3 minims =  $\frac{1}{2}$  grain of acetate of morphia.

Among the preparations of Opium are—

**Confectio Opii.**—Compound powder of opium and syrup. An anodyne, containing one of opium in forty.

**Emplastrum Opii.**—Opium plaster, one in ten; to relieve local pain.

**Enema Opii.**—Half drachm of Tinct. Opii, with two ounces of starch mucilage. Useful in diarrhoea and dysentery, with pain and restlessness.

**Extractum Opii.**—One hundred of opium give fifty of extract. Dose one-half to one grain, or more. A non-stimulating anodyne.

**Extractum Opii Liquidum.**—One grain in twenty-two minims. Dose ten to thirty minims.

**Linimentum Opii.**—A dark liniment, one of tincture of opium to two of soap liniment, useful for pains and rheumatism.

**Pilula Saponis Composita.**—One of opium with four of hard soap to form a pill. Dose three to six grains as a soporific.

**Pulvis Opii Compositus.**—An olive brown powder

of opium with black pepper, caraway, tragacanth, and ginger. Contains one of opium in ten.

**Tinctura Opii, or Laudanum,** contains one grain of opium in fifteen minims, and in dose of ten to thirty minims acts speedily as an anodyne and soporific. Applied to the skin on a poultice, it is absorbed, and relieves pain.

**Tinctura Opii Ammoniata.**—The Scotch Paregoric. Dose half to one drachm. Contains one of opium in ninety-six minims with benzoic acid, oil of anise, saffron, spirit, and strong ammonia. It does not keep well. The caustic ammonia keeps the morphia in solution; carbonate of ammonia precipitates it.

**Trochisci Opii (Opium Lozenges).**—Each contains one-tenth of a grain of extract of opium.

**Vinum Opii.**—Dose ten to forty minims. Twenty-two minims equal one grain of extract. Used as an eye lotion when made without the cinnamon and cloves.

Other preparations of opium are known as *Liquor Opii Sedativus* (Battley's Sedative); the dose of this is ten to twenty minims, and it is much used as a sedative. Jeremie's Laudanum is about the same strength as Battley's. Messrs. Ferris, of Bristol, make a liquid preparation, *Nepenthe*, which may be given in the same dose as Tincture of Opium.

In cases of poisoning by opium, a stimulating emetic or the stomach-pump should be at once employed, and the patient roused and kept awake. Belladonna or atropia, the counter-poison of opium, may be administered by mouth or hypodermic injection. The **Pulv. Ipecac. Co.**, one of opium in ten; **P. Kino Co.**, one of opium in twenty; **P. Cretæ Aromat. c. Opio**, one of opium in forty, are treated of elsewhere in this work.

**Rhœados Petala.**—The fresh petals of the red corn poppy are used to form the red **Syrupus Rhœados** of the Pharmacopœia. This poppy does

not appear to contain any morphia, though an alkaloid, Rheadine, has been isolated. The syrup is used in dose of half to one drachm as a colouring ingredient.

#### CRUCIFERÆ OR BRASSICACÆÆ.

**Sinapis** (Mustard).—The seeds of *S. nigra* and *S. alba*, or Black and White Mustard. *S. alba*, White Mustard, has a stem 1 or 2 feet high, nearly smooth, with lyrate leaves, large yellow flowers, and a hispid, spreading *siliqua*, with an ensiform beak longer than the pod. The seeds are pale yellow and round. *S. nigra*, Black Mustard, has entire lanceolate upper leaves, the *siliqua* is smooth, tetragonal, and pressed close to the stalk. The seeds are small, dark, and veined on the surface; they have a bitter acrid taste. The meal of the mixed seeds is sometimes adulterated with starch, in the form of flour; also with turmeric powder. Starch, if present, turns blue with iodine. When the seeds are pressed, about 30 per cent. of bland, fixed oil, containing *erucic acid*, can be obtained from them.

The **Oleum Sinapis**, or *Essential Oil of Mustard*, can only be obtained from black mustard, and there it is not ready formed, but is produced from a principle called *Myronic Acid* which exists in black mustard, combined with potash. There also exists in the black mustard an albuminous body, *Myrosine*, and this acting on the myronic acid, breaks the latter up into volatile oil of mustard, glucose, and sulphate of potash. The volatile oil of mustard is chemically a sulphocyanide of the radical allyle ( $C_3H_5CN.S$ ); it is of a greenish-yellow colour, becoming darker by keeping, and is soluble in alcohol and ether. Applied to the skin it speedily vesicates; and ten minims in one ounce of alcohol, or spirit of camphor, on spongopiline, may be used as a rapid counter-irritant. This oil is used in preparing the **Linimentum Sinapis compositum**, a dark green, strongly stimulating

spirituous liniment, containing 1 of the oil in 40, with castor oil, mezereon, and camphor.

Mustard meal is used externally in the form of the *Cataplasma Sinapis*, or Mustard Poultice, and the *Charta Sinapis*, or Mustard Paper. The poultice may be applied as a counter-irritant and stimulant in inflammations and congestions of internal organs. In preparing a mustard poultice, the mustard should be mixed in a paste with warm water, as this extracts the stimulating power of the mustard better than boiling water doses.\* The mustard paste thus prepared may then be spread as a facing on a linseed poultice. Care should be exercised in applying mustard poultices to those who are insensible, lest the poultice remain too long, and cause ulceration.

Mustard baths are of use in causing a stimulating effect on the cutaneous circulation, and so aiding to bring out the eruption of the exanthemata, such as measles or scarlet fever.

In preparing the mustard bath, a handful of mustard should be made into a paste with cold water, and then tied up in a cloth, which should be moved about in the water of the bath.

Mustard pediluvia, or foot baths, are used to derive blood from the central organs of the body. The late Dr. Ashwell used to speak highly of the mustard hip-bath as a means of promoting menstruation.

Mustard leaves (Rigollot's) and *Charta Sinapis* or sinapized paper are used as counter-irritants.

Internally, mustard is used as a prompt and speedy emetic in cases of poisoning. Dose one tea-

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\* Vinegar and boiling water should be avoided in preparing a mustard poultice. The water should be at a temperature of 100° F. Aetius says *Acetum sinapis vim discutit*. Trousseau and Pidoux found that a sinapism made with black mustard meal and water produced as much rubefaction in six minutes as one made with vinegar did in fifty. English flour of mustard often contains pod pepper, the active principle of which, *capsicin*, is soluble in vinegar.



spoonful to one tablespoonful, stirred up in water.

As a condiment mustard promotes the flow of saliva and gastric juice, and so aids the digestion of the food. White mustard contains a crystalline body, *sinalbin*; a glucoside which in contact with water yields some acrid oil.

**Armoracæ Radix.**—The root of the Horseradish (*Cochlearia armoracia*), like mustard, is used as a condiment with the food. In the B. P. is found **Spiritus Armoracæ Compositus**, containing horseradish, orange-peel, nutmeg, and proof spirit. This spirit, in dose of one or two drachms, acts as a stimulating diuretic and sudorific, and is of use in dropsies as an adjunct to diuretic potions. The horseradish root, bruised in milk, I have found useful as an application to obstinate acne of the face.

Horseradish yields a volatile sulphurated oil identical in characters and composition with the oil of black mustard.

#### POLYGALACEÆ.

**Senegæ Radix.**—The dried root of the Polygala Senega, from North America. True senega root is known by a projecting line running the whole length of the root, as if a thread were placed beneath the bark. Thus it is distinguished from *Ginseng* and *Gil-lenia* roots, which are at times mixed with senega. The active part of senega resides in the root bark, it exists as a principle called *Senegin*, or *Polygalic Acid*, an acrid white powder which causes sneezing when applied to the nostrils. Senega yields its virtues to alcohol and water, and we have a **Tinctura Senegæ** which may be given in dose of one-half to two drachms, and an **Infusum Senegæ**, of which the dose is one to two ounces. Formerly a **Decoctum Senegæ** was used, but M. Quevenne has shown that some of the active matter is lost in the boiling of the decoction, and is carried down with some sediment of coagu-

lated albumen. The strongest infusion is made by using water at a temperature not exceeding 104° F.

Senega acts as a stimulating expectorant; in large doses it is emetic, and it may prove diuretic and emmenagogue. In chronic bronchitis, with absence of inflammatory symptoms, senega, with ammonia and squill, is a remedy of great value, aiding expectoration, and acting as a tonic to the heart. Infusion of senega with iodide of potassium makes a nauseous mixture, which has obtained great repute in America as a cure for asthma. Senega root contains some tannin, and its preparations are incompatible with those of iron.

**Kramerisæ Radix.**—Rhatany Root, from Peru and Chili. A dark red root-stock, with long roots attached. This root contains 40 per cent. of *tannin*; an acid, *kramerio acid*, and a red astringent colouring matter soluble in water and alcohol. An Extract, Infusion, and Tincture of Rhatany are official. **Extractum Kramerisæ** made with distilled water by maceration, percolation, and evaporation, is a dark red substance, used as an astringent, in dose of five to twenty grains. Lozenges made with the extract are useful for relaxed sore throat.

**Infusum Kramerisæ**, in dose of one to two ounces, with or without the addition of some of the tincture or extract, is a good astringent, and may be given in chronic diarrhoea, and in passive hæmorrhages and mucous discharges.

**Tinctura Kramerisæ** made like tincture of senega with proof spirit, in dose of one to two drachms, may be added to the infusion. This tincture with water makes a good mouth-wash when the gums are tender and spongy. Rhatany enters into the Compound Powder of Catechu. Alkalies, salts of iron and lead, and solutions of gelatine, are all incompatible with rhatany in prescribing.

## LINACEÆ.

**Lini Semina.**—Seeds of *Linum usitatissimum* (Linseed or Flax). The envelope of these oval shining brown seeds contains a gummy matter readily soluble in hot water. The oil exists in the kernel of the seed, to the extent of 20 per cent.

**Infusum Lini.**—Infusion of Linseed is used as a demulcent in irritative bronchitis and catarrh, and in affections of the bladder and kidneys. The infusion contains fresh liquorice root, and requires four hours to infuse; it may be taken *ad libitum*.

**Oleum Lini.**—Linseed oil is a useful emollient application to burns or scalds. Mixed with lime-water it forms the old *Linimentum Calcis* of the Ph. Edin. In the B. P. olive oil is now used to prepare *Lin. Calcis*. Fresh linseed oil has very little odour or taste. It contains palmitin and a glyceride of linoleic acid.

**Lini Farina** (Linseed Meal) is used for making poultices. The *Cataplasma Lini* of the B. P. is made with the meal mixed with olive oil and boiling water. The olive oil is added because all the oil has been pressed out of the linseed before it is ground to powder. The powder of linseed keeps better if quite freed from oil.

Linseed poultices are valuable applications to inflamed parts, and over inflamed organs, as over an inflamed lung or pleura for example. Sometimes, mustard is sprinkled over the linseed poultice to make it act as a counter-irritant. Charcoal may be added, as in *Cataplasma Carbonis*, to correct fetid discharge in the part poulticed. Of the six *Cataplasms*, or *Poultices*, which are officinal, five are prepared with the aid of linseed meal. The Yeast Poultice (*C. Fermenti*) is the one which contains no linseed.

## MALVACEÆ.

**Althæa.**—The *Althæa Officinalis*, or Marsh Mal-; is not now officinal. The root contains much ma-

cilage with sugar, and a principle, *Altheine*, identical with the body found in asparagus and known as Asparagine.

Decoction and syrup of marsh mallow have been used as demulcents to allay cough.

*Pâté de Guimauve*, marsh mallow lozenge, is much used in France to relieve cough.

**Gossypium** (Cotton Wool).—The tubular hairs of the seed-coat of various species of *Gossypium*.

Cotton wool is used to envelope inflamed joints, and to protect burnt parts from the air; also as a dressing to blisters.

**Pyroxylin** (Gun Cotton).—Discovered by Schönbein, and made by acting on cotton with a mixture of sulphuric and nitric acids. Some of the hydrogen of the cotton fibre is replaced by peroxide of nitrogen and the explosive body known as gun cotton results.

Gun cotton is used in pharmacy to prepare **Collodium**; for this purpose it is dissolved in a mixture of ether and rectified spirit. To make **Collodium Flexile** Canada balsam and castor oil are added. Collodium is used to form a thin skin over superficial wounds, and as an application over inflamed surfaces. It contracts in drying, and so constricts the small vessels. Collodium applied to the pustules of small-pox prevents subsequent pitting. The flexible or ricinated collodium does not crack in drying

#### AURANTIACEÆ.

**Aurantii Fructus**, and **Aurantii Cortex** (Fruit and Rind of Bitter Seville Orange).—This rind contains volatile oil, a bitter extractive matter, *Hesperidin*, and a trace of gallic acid. **Tinctura Aurantii Recentis**, is made from the fresh rind of the ripe fruit and rectified spirit. Dose 1 to 2 drachms.

Preparations of bitter orange act as mild tonics to the stomach. **Infusum Aurantii** and **Infusum Aurantii Co.**, containing lemon-peel and cloves, form *good vehicles* for the administration of the minerals

acids, excepting nitro-hydrochloric acid, the free chlorine of which destroys the flavour of the orange. Both require fifteen minutes to prepare, and tincture or syrup of bitter orange is often added. **Tinctura Aurantii** and **Syrupus Aurantii** are given in dose of one or two drachms.

**Vinum Aurantii** is used to prepare Quinine and Citrate of Iron Wine. It contains about 12 per cent. of alcohol and some free acid.

**Aqua Aurantii Floris.**—Orange Flower Water, distilled from the flowers of the Bitter Orange (*Citrus Bigaradia*), and Sweet Orange (*Citrus Aurantium*), contains a fragrant volatile oil (Oil of Neroli). Orange-flower water should be tested with sulphuretted hydrogen to ascertain absence of lead. This water, as well as the **Syrupus Aurantii Floris**, is used as a flavouring ingredient. Dose of Orange-flower water half to one ounce; of the syrup, half to one drachm.

**Limonis Cortex** (Lemon Peel).—This should be thin, and of uniform yellow colour; vesicles containing the volatile oil of lemon dot the surface of the rind.

**Limonis Oleum** is expressed or distilled from the fresh peel, and that prepared in the latter way keeps best, and is most valued. The oil comes chiefly from Sicily, and is composed of two isomeric oils, its formula is  $C_{10}H_{16}$ . Oil of lemon is used as a flavouring adjunct to some mixtures, in dose of one to four minims. It is used in making *Sp. Ammoniae Aromat.* and *Lin. Potass. Iodidi cum Sapone*.

**Ol. Limonis** is adulterated sometimes with oil of turpentine.

Rind of lemon is used in making the Compound Infusion of Orange Peel, and from it, in fresh state, with proof spirit, the pale brown **Tinctura Limonis** is prepared. The **Syrupus Limonis** is made with peel and juice of lemon. Dose of these preparations, half to two drachms.

**Limonis Succus.**—The fresh juice of the ripe

fruit of the *Citrus Limonum* is used in preparing the Syrup of Lemon, and is given internally in dose of one to six drachms. Lemon juice contains thirty-two grains of citric acid in one ounce.

Lemon juice is given as an antiscorbutic agent in scurvy; it is also given as a cure for rheumatism, both in its acute and chronic forms. In the chronic dyspepsia of gouty patients a dose of four drachms of fresh lemon juice twice a day is often most beneficial.

From Lemon juice is prepared Citric Acid.

**Acidum Citricum.**  $H_2C_6H_4O_7 \cdot H_2O$ .

This crystalline acid is made from Lemon Juice, and also from the juice of the *Citrus Limetta*, or Lime. The method of preparation is fully given in the Pharmacopœia. A precipitate of citrate of lime is formed by adding chalk (carbonate of lime) to lemon juice; this, after being washed, is diffused in water, and decomposed by sulphuric acid. The solution is concentrated to density 1.21; and then the insoluble sulphate of lime crystallizes out, and is separated from the solution; which, by further concentration, yields the pure citric acid in crystals of right rhombic prisms. A solution of pure citric acid is not darkened by sulphuretted hydrogen, showing absence of metallic matters, neither does chloride of barium cause a white precipitate, showing absence of sulphates. The solution causes no precipitate with any salts of potash, except the tartrate, from which it throws down the acid tartrate of potash. With *cold* lime-water no precipitate is formed; but if the mixture be heated, an insoluble citrate of lime is formed. (*See Potassæ Citras.*) Good citric acid when burned leaves no ash, thus proving the absence of lime and earthy impurities.

Citric acid, in dose of ten to twenty grains, with sweetened water, is given internally to allay feverishness and heat and irritability of the skin. Externally, it has been applied with success as a lotion to

cancerous ulcerations. One to two drachms to eight ounces of water.

Citric acid and citrates are well tolerated by the stomach, and effervescing draughts of citrate of potash, or ammonia, are often prescribed to allay sickness and vomiting.

Pure lemon juice is a good antidote in poisoning by certain acrid narcotics. Dr. Waring has seen it speedily allay the irritation caused by an overdose of croton oil.

Lemon juice has a sedative action on the heart, and reduces the pulse, as Dr. Owen Rees has shown.

The reader may be reminded that the substance known as *Salts of Lemon* has no connexion with lemons, but is an oxalate of potash, and poisonous.

**Belæ Fructus.**—The dried half-ripe fruit of the *Ægle Marmelos* of Malabar; appearing usually as fragments of the reddish-brown rind with dry pulp and seeds adhering. **Extractum Belæ Liquidum**, or Liquid Extract of Indian Bael, contains mucilage and astringent matter, and in dose of one to four drachms is thought by some to be useful in chronic diarrhoea and dysentery. In India its repute as a remedy stands higher than in Europe.

#### BYTTNERIACEÆ.

**Oleum Theobromæ** (Oil of Theobroma, or Cacao Butter).—A concrete oil, obtained by pressure and heat from ground nuts or seeds of the *Theobroma Cacao* tree of the West Indies and South America. It contains stearin, with some olein, and is used to form, with lard and wax, four of the seven suppositories of the B. P. When melted it begins to solidify at 72° F. Cleanly and effective suppositories can be made with glycerine of starch and curd soap (**Sapo Animalis**, in place of Cacao Butter, the greasy nature of which is sometimes objectionable. Three of the B. P. suppositories are thus made.

**GUTTIFERÆ.**

**Cambogia** (Gamboge).—A gum resin from the *Garcinia Morella* of Siam. Ceylon Gamboge is not official, and comes from the *Hebradendron gambogioides*.

Gamboge occurs in sticks marked externally by the bamboo reeds, in which the juice is collected. It contains seventy per cent. of resin, known as *gambogic acid*, soluble in alcohol and ether, but not in water; rubbed with water, it forms a yellow emulsion, the gummy matter dissolving, and the resin remaining in suspension.

Gamboge is a drastic hydragogue purgative, acting with violence on the intestinal canal. Dose one to three grains; or of the *Pilula Cambogiæ Co.* five to ten grains. In this pill the gamboge is combined with aloes and soap. The pill is a very irritating form of purgative, quite inadmissible in inflammatory states of stomach and bowels. Three grains of gamboge, with aloes and soap, make a good purgative suppository.

Gamboge may be adulterated with starch, in which case the cold emulsion turns green with iodine.

**CANELLACEÆ.**

**Canellæ Albæ Cortex.**—An aromatic bark from the West Indies, substituted at times for Winter's Bark, though the whiteness of its interior surface is very different from that of Winter's Bark. Canella contains volatile oil, resin, and bitter matter, but no tannin, and is used in the B. P. in preparing the **Vinum Rhei**. Mixed with aloes it forms the powder called *Hiera Picra*, given as a purgative and emmenagogue.

**VITACEÆ.**

**Uvæ.**—Raisins are the dried ripe fruit of the *Vitis vinifera*, and are imported from Spain. Raisins contain grape sugar and acid tartrate of potash.



They are nutritive, and are used in preparing Tinct. Cardamomi Co. and Tinct. Sennæ.

#### ZYGOPHYLLACEÆ.

**Guaiaci Lignum.**—Guaiacum Wood of Jamaica occurs in pharmacy in the form of shavings or raspings. The solid wood consists of a dark duramen, or heart-wood (*Lignum Vitæ*), with yellow alburnum outside. The heart-wood contains the resin, and when a piece of the wood is thrust into the fire the resin melts and exudes. When guaiacum chips are boiled with salt and water the resin exudes and rises on the surface. Guaiac Wood occurs in Decoctum Sarsæ Co.

**Guaiaci Resina.**—This resin is met with in round greenish or brownish masses; it is almost insoluble in water, but soluble in spirit, and this solution turns the inner surface of a fresh potato-paring blue; this is from the oxidating action of the guaiacic acid on the gluten. When tincture of guaiacum is poured into water a milkiness is produced from the precipitation of the resin. If now an alkali, such as potash, be added, the precipitate dissolves, provided the resin of guaiacum in the tincture is pure, but it does not dissolve if terebinthinate resin is mixed with the guaiacum. A crystalline acid, *guaiaretic acid*, with *guaiaconic acid*, are the chief components of guaiacum resin.

Guaiacum resin taken internally, in dose of ten grains or more, causes heat at stomach, and sometimes purgation. It acts on the skin as a diaphoretic, and on the womb as an emmenagogue. Guaiacum is chiefly valued as a remedy in chronic rheumatism of a cold kind. In syphilitic affections and periosteal swellings it is of service, especially in conjunction with alkalies and iodide of potassium.

In tonsillitis and inflammation of the throat, in an early stage, guaiacum is a remedy of proved value. It may be given with ammonia and chlorate of potash.

Mineral acids and spirit of nitrous ether do not combine well with guaiacum.

Guaiacum may be given, as **Mistura Guaiaci**, made with sugar, gum arabic, and cinnamon water, in dose of one-half to two ounces. This mixture is apt to deposit, for the mucilage of gum arabic does not suspend the resin so completely as one-fourth of the quantity of gum tragacanth would.

**Tinctura Guaiaci Ammoniata** is a dark tincture, which coats the sides of the bottle. It is a solution of the resin in aromatic spirit of ammonia (one in five). Dose half to one drachm in emulsion with mucilage. The tincture is a good form in which to administer guaiacum; in half-drachm doses it is given in incipient tonsillitis. Lozenges made of guaiacum resin, are valuable remedies in many forms of inflamed sore throat.

Guaiacum resin is found in Plummer's Pill, the Compound Calomel Pill of the B. P., given as an alterative in syphilis and skin affections.

#### RUTACEÆ.

**Rutæ Oleum.**—Oil of Rue is obtained by distillation from the fresh leaves and unripe fruit of *Ruta graveolens*. The leaflets are fleshy, pale green, oblong or ovate, and dotted. The oil is straw colour, with bitter taste and disagreeable odour. Oil of rue contains hydrocarbon ( $C_{10}H_{16}$ ) with rutic aldehyde ( $C_{10}H_{20}O$ ); it has been obtained as an artificial product in the distillation of acetate and caprate of calcium (Attfield).

Oil of rue is an antispasmodic and stimulant. It is given in hysteria, convulsions, amenorrhœa, and abdominal flatulence, in dose of two to six minims in emulsion. Given in enema it is an excellent remedy for flatulence and convulsions of infants. Externally oil of rue acts as a rubefacient. The prolonged handling of fresh rue has been known to cause great

swelling and vesication on the hands and arms (Pereira).

Herb rue is eaten on bread as a cure for worms; and is reputed good for weak eyesight.

**Buchu Folia** (Buchu or Bucco Leaves).—The Hottentots of the Cape of Good Hope employ the leaves of various species of *Barosma* to form a powder called *Buku*, with which they rub their bodies. The Buchu of pharmacy is composed of the leaves of *Barosma* or *Diosma*:—1, *B. betulina*; 2, *B. crenulata*; 3, *B. serratifolia*. The leaves of all three species are smooth and marked with pellucid dots (oil glands) at the indentation and apex. The B. P. description of each should be studied.

Buchu contains bitter matter, and a volatile oil of a yellow-brown colour. The bitter extractive, *Diosmin* or *Barosmin*, is insoluble in alcohol and ether, but soluble in water. **Infusum Buchu**, in dose of one to two ounces, is given as a tonic and diuretic. It acts on the bladder as a tonic, restraining undue secretion of mucus. **Tinctura Buchu**, Buchu leaves and proof spirit, is of a greenish-brown colour, and used as an adjunct to the infusion, in dose of one drachm or more.

**Cuspariæ Cortex**.—The Bark of *Galipea Cusparia*, *Angustura* Bark, from South America. In reading the description of this bark in the B. P., the statement will be noticed that the inner surface touched with nitric acid does not turn blood red. This test is to guard against the substitution of *Strychnos* bark for *Cusparia*. The former contains *brucia*, which turns red with nitric acid. *Strychnos Nux Vomica* bark, called false *Angustura* bark, occurs in short pieces, twisted, with no odour, more bitter than true *Angustura*, not separable into layers; epidermis whitish, with red spottings. False *Angustura* contains both *brucia* and *strychnia*, and mistakes in confounding it with true *Cusparia* have caused fatal incidents.

The genuine bark is in straight pieces of mottled yellowish grey colour, pared away at the edges.

Cusparia bark contains volatile oil, resin, and a crystalline body, *Cusparine*. The *Infusum Cuspariæ* is precipitated by tannin, and should not be combined with mineral acids or iron salts. The dose is from one to two ounces as an aromatic tonic, useful in dysentery and chronic diarrhœa. In South America Cusparia is used as an antiperiodic for the cure of intermittents.

#### SIMARUBACEÆ.

**Quassiæ Lignum.**—Quassia Wood, from the *Picræna excelsa* of Jamaica. Quassia contains a neutral crystalline principle, *Quassine* ( $C_{10}H_{12}O_2$ ), intensely bitter. Quassia contains no tannin, and therefore may be given with iron salts. The billets of the wood are greyish brown externally, internally light yellow.

The bitter principle of Quassia is soluble in water and spirit, and we have in the Pharmacopœia *Infusum Quassiæ*, which is given in dose of one to two ounces as a pure bitter tonic, devoid of astringency.

*Tinctura* and *Extractum Quassiæ* are also officinal. The former, made with proof spirit, may be given in dose of one to two drachms, the latter in dose of two to four grains. Cups are made of quassia wood, *bitter cups*, into which cold water is poured, and in half an hour it extracts a considerable amount of the bitter principle, and may be drunk as a tonic draught.

**Simaruba Bark**, from the root of *Simaruba amara*, or Mountain Damson, is not officinal; it is a tough fibrous bark, in long pieces, pale yellow in colour, with rough shaggy exterior, and very bitter to the taste. It is a bitter tonic like quassia, and contains *quassine* as its active principle, with much mucilage. Quassine is believed to be the bitter

principle of the seeds of the Simaba cedron, which are given as an antidote to the poison of venomous serpents.

#### Sub-Class II.—Calyciflorals.

*Calycifloræ*.—Flowers having both calyx and corolla, the latter usually consisting of distinct petals. Stamens always perigynous. Calyx gamosepalous—i.e., sepals more or less united at the base.

#### RHAMNACEÆ.

**Rhamni Succus**.—Buckthorn juice recently expressed from the ripe berries. These berries are the size of a pea, black and smooth, and contain four seeds. The berry of *Rhamnus frangula* contains but two seeds. The juice turns bright green (*sap green*), with alkalis, and contains a crystalline principle, *Rhamnine*, but whether this be the active part of the juice is not certain; some think the purgative principle to be *Cathartine*, or *Cathartic acid*.

Buckthorn juice is made into a red syrup, **Syrupus Rhamni**, with ginger and pimento. This syrup acts as a hydragogue purgative; it gripes much, and causes great thirst. Dodoens very properly says it is a medicine only fit for young and lusty people.\* Dose of the syrup half to one drachm.

#### ANACARDIACEÆ.

To this order belongs the *Rhus Toxicodendron*, or poison Sumach, at times given as a remedy for paralysis of rheumatic origin.

**Mastiche**.—Gum Mastiche, from Turkey and the Levant, occurs in small yellowish tears, and is an exudation obtained by incision from the stem of *Pistacia lentiscus*.

Mastiche is entirely soluble in ether and in chloroform; it contains a small quantity of volatile oil.

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\* Lyte's "New Herbal," 1619.

Ethereal solution of mastiche on cotton wool is used to stop decayed teeth. Internally mastiche is commonly used to divide active medicines in pills. Mastiche and aloes, or rhubarb, are sometimes combined as a mild aperient pill. Mastiche is mixed with mercurial pills when these have to be silvered, as it prevents the mercury acting on the silvering.

**Olibanum**, a gum resin from the *Boswellia serrata*, is not officinal. It comes from India in the form of pale yellow fragile tears, having a balsamic odour. It contains a volatile oil and two kinds of resin. As a fumigating agent it is burnt to overpower noxious odours. Internally it acts as a balsamic stimulant, but it is rarely given. Dose twenty to forty grains.

#### AMYRIDACEÆ.

**Myrrh.**—Myrrh is a gum resin that exudes from the bark of the *Balsamodendron Myrrha* of Abyssinia. The best myrrh comes by way of Egypt and the Levant. An inferior kind, known as Indian Myrrh, is dark in colour and usually mixed with earthy impurities and with Indian *Bdellium* from the *Amyris Commiphora*. Good myrrh has a pale reddish yellow colour, aromatic odour, and a dusty-looking exterior.

The pieces are fragile and semi-transparent, and present internally opaque whitish-yellow striæ.

Myrrh contains volatile oil, gum, and resin. This last is bitter and soluble in alcohol; it is composed of a soft and a hard resin, *Myrrhic acid*, and when myrrh is mixed with water the resin is held in suspension while the gum dissolves.

Myrrh possesses stimulant and tonic properties, but it is not, like galbanum and assafœtida, an antispasmodic.

In the excessive secretion of chronic bronchitis, Tincture of Myrrh may be advantageously given. Myrrh is often associated with iron and aloes; it is believed to modify and sustain the purgative action

of aloes. The dose of powdered myrrh is ten to twenty grains, but it is most commonly given in the form of a rectified spirit tincture in dose of one-half to one drachm. *Tinctura Myrrhæ* in proportion of two drachms to four ounces of water forms a milky mixture that may be used as a cleansing gargle for the throat, with or without the addition of borax. Tincture of myrrh is applied sometimes as a dressing to indolent ulcerations.

Myrrh, as may be seen, enters into the composition of many preparations of the Pharmacopœia.

**Elemi**, a concrete resin, imported from Manilla; usually soft and unctuous, and soluble in rectified spirit. Elemi is employed externally only in the form of the cream-coloured *Unguentum Elemi* as a topical stimulant, and to keep up action in issues and setons.

**Terebinthina Chia**, or Chian Turpentine, an oleo-resin, from *Pistacia terebinthus*, is not officinal; it is a greenish yellow semi-solid substance and resembles other turpentine in its properties.

Chian Turpentine has been tried as a cure for cancer; but the experience of extended trials at the Middlesex Hospital showed it had no remedial value in this disease.

#### LEGUMINOSÆ OR FABACEÆ.

**Glycyrrhizæ Radix**, the root, or underground stem, of the *Glycyrrhiza glabra*, grown in England. The plant grows four or five feet high, and bears bluish-purple flowers.

Liquorice root is brown externally, yellow within, and contains a small quantity of resinous oil, and a large amount of uncrystallizable sugar, called *Glycyrrhizin* ( $C_{24}H_{26}O_9$ ). This sugar will not ferment, and, with acids, it forms insoluble compounds. Hence the precipitate, which dilute sulphuric acid is said in the B. P. to form, with infusion of liquorice.

**Extractum Glycyrrhizæ**. This is a water extract

made from the dried root; it becomes soft by warmth—an objection to its use as a pill basis. **Ext. Glycyrrhizæ Liquidum** contains  $\frac{1}{8}$  of spirit. The dose, as a sweet flavouring adjunct, is one drachm. Liquorice acts as a demulcent in catarrhal affections of the mucous surfaces, and enters into several preparations. In the form of stick liquorice and liquorice lozenges (*Pontefract Lozenges*) it is much used as a domestic remedy for cough. Extract of Liquorice serves to conceal the taste of bitter aloes in the decoction of aloes. The saline taste of chloride of ammonium, in a mixture, is also well covered by the addition of eight or ten grains of **Ext. Glycyrrhizæ** to each dose. Dose of the Extract is ten to thirty grains. What is known as Solazzi juice is made from *Glycyrrhiza echina*.

**Pulvis Glycyrrhizæ Compositus** contains senna and sugar, and in dose of thirty to sixty grains acts as a mild aperient.

**Tragacantha.**—Tragacanth is a gummy exudation from the stem of *Astragalus verus*, or Milk Vetch, of Asia Minor. This gum occurs in white, wavy, shell-like pieces, swelling in water into a gelatinous mass. The fluid strained off from the mass is not precipitated by rectified spirit. This test is to prove the absence of gum acacia. The gelatinoidal matter of tragacanth, insoluble in water, is called *Bassorine*. The bulk of the part soluble in water, about 53 per cent., is *Arabine*. Tragacanth is demulcent, and the **Pulvis Tragacanthæ Co.**, tragacanth gum acacia, starch, and sugar, is used to suspend insoluble powders in a mixture. Bismuth, for example, can be held suspended in a liquid if an amount of compound tragacanth powder equal in weight to the bismuth be added.

**Mucilago Tragacanthæ** is used also for the same purposes as the Compound Powder. One of Tragacanth gives more viscosity to water than twenty-five parts of Gum Arabic (Squire).



**Scoparii Cacumina.**—Broom Tops, from the *Sarothamnus scoparius*, or *Spartium scoparium*. Grown in England. Broom tops when fresh, have a peculiar odour, and contain a neutral yellow tasteless principle, called *Scoparine* ( $C_{21}H_{22}O_{10}$ ), and an oil, called *Sparteine* ( $C_{15}H_{24}N_2$ ), which is a rather poisonous alkaloid, discovered by Stenhouse. *Scoparine* is not poisonous, and on it probably depends the diuretic property of broom tops.

**Decoctum Scoparii**, Decoction of Broom, or Broom Tea, made by boiling 1 of broom tops in 20 of water, for 10 minutes, in dose of two to four ounces, is a very useful diuretic in dropsical complaints connected with heart or liver disease. Neutral salts, Taraxacum, or Spirit of Juniper, may be given with the decoction to promote its action on the kidneys.

**Succus Scoparii**, the dark-brown juice pressed from fresh broom tops, is given in dose of one to two drachms. It may be added to the decoction. Broom is a very certain diuretic; sometimes it produces purging and vomiting. Dr. Stenhouse found five grains of crystalline Scoparine to produce a decidedly diuretic effect. Broom must be avoided in all inflammatory affections of the kidneys, being too stimulating.

**Pterocarpi Lignum.**—Red Sandal-wood of Ceylon. Occurs in dense, heavy, dark-brown billets, red internally. The powder of the wood has a blood-red colour, and it is used for colouring the **Tinct. Lavandulæ Co.** The essential Oil of Sandal-wood, in dose of thirty minims, has been given for the cure of gonorrhœa.

**Kino.**—Juice obtained by incision from the trunk of the *Pterocarpus Morsupium* of Malabar. Occurs in small, angular, dark, translucent fragments. There are other varieties of kino, known as the African and the Botany Bay kino. The first of these is a product of *Pterocarpus erinaceus*; the second of *Eucalyptus resinifera*. Of 100 grains of Tellicherry kino eighty-eight will dissolve in cold water, and thirty-five

grains of isinglass will precipitate the whole of the astringent matter, known as *Mimotannic Acid*,  $C_{18}H_{18}O_8$ , from this solution.

Kino is more soluble and astringent than Pale Catechu.

The dose of kino, as an astringent in diarrhoea or passive hæmorrhage, may be ten to twenty grains, the reddish-brown *Tinctura Kino* made with sp. rect., is a good form of administration; dose half to two drachms. The *Pulvis Kino Co.* contains cinnamon and one grain of opium in twenty of powder. In dose of five grains, or more, this powder is useful in atonic relaxed states of the stomach with morning water-brash.

Mineral acids, alkalies, metallic salts, and gelatine must not be prescribed with kino.

**Balsamum Peruvianum.**—Balsam of Peru is an exudation from a tree, the *Myroxylon Pereiræ* of Central America, after the bark has been scorched and removed. It is a nearly black thick liquid, soluble in rectified spirit and bitter to the taste. Balsam of Peru is sometimes adulterated with fatty oils, in which case a drop of it does not sink in a strong solution of salt. A factitious substance, made by dissolving Balsam of Tolu in alcohol, has been substituted for the genuine\* Peruvian Balsam. This, however, is known by its taking fire readily and burning with a blue flame; and undergoing diminution in volume when mixed with water. Balsam of Peru contains a

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\* Experiments made by Mr. Challice and myself at Middlesex Hospital, show that a drop of the best Balsam of Peru (sp. gr. 1.145) will scarcely sink in a solution of salt of sp. gr. 1.141. The test is a ready way of getting some idea of the density of the Balsam, with a view to judging how much water a specimen may contain. Of four apparently genuine specimens of the Balsam, all, mixed with strong sulphuric acid, formed, on addition of water, a firm, consistent purple resin, which, when dry, was brittle. If the balsam be mixed with Castor Oil or Copaiva, a smeary mass results on admixture with sulphuric acid and water.

neutral oil, *Cinnamein*; a crystalline solid, isomeric with the oil, called *Metacinnamein*, and about 7 per cent. of *Cinnamic acid*. Resins, varying in amount with the age of the balsam, are also present.

**Uses.**—Balsam of Peru is used as an application to indolent ulcers. Mixed with an equal quantity of castor oil it forms an excellent dressing for bed-sores after fever. Internally, in dose of ten minims to half a drachm, it is given with mucilage as a stimulating balsamic expectorant.

**Balsamum Tolutanum.**—Balsam of Tolu is an exudation from the incised bark of *Myroxylon Toluiferum*. When fresh it is soft, but becomes hard by age. It is imported from Tolu, New Granada. Balsam of Tolu is transparent, and of a reddish-yellow colour. Heated, it melts and burns, diffusing an agreeable odour. It is entirely soluble in alcohol and volatile oils. Boiling water extracts cinnamic acid from it, and it also contains resinous matter. Cinnamic acid was once thought to be identical with benzoic acid, till Frémy proved the distinctness of the two acids.

**Uses.**—Balsam of Tolu is a tonic expectorant, and is often added to pectoral mixtures.

The *Tinctura Tolutana* made with sp. rect. is given in dose of half to one drachm. Of *Syrupus Tolutanus* the dose is one to two drachms. Compound Tincture of Benzoin contains Balsam of Tolu.

**Physostigmatis Faba**—Calabar Bean of Western Africa.—These beans are about an inch long, reniform, with dark shining integument; they yield their virtues to alcohol, and imperfectly to water. The active principle, *Physostigmine* or *Eserine* ( $C_{14}H_{21}N_2O_2$ ), a yellow amorphous body, can be extracted from the bean by alcohol; it forms with water an alkaline bitter solution. The B. P. *Extractum Physostigmatis* is made by acting on the beans with rectified spirit. **Forty-five grains of powder give one grain of extract.**

Calabar bean possesses the property of destroying muscular contractility, and when applied to the heart it weakens, and at last stops the action of that organ. On the spinal cord it acts as a paralysing agent by destroying the excitability of the ganglionic elements of the cord, and it has been used in traumatic tetanus with some success. Applied in the form of a gelatine disc to the conjunctiva, Calabar bean is seen to cause contraction of the pupil of the eye, with myopia and astigmatism. The blood-vessels of the conjunctiva also dilate under its influence. The contraction of the pupil is effected probably by paralysis of the radiating fibres of the iris, which antagonize the circular ones.

It will be observed that Calabar bean acts on the pupil in the opposite way to belladonna and atropia, and experiments show that it is a counter-poison to these bodies. Numerous careful experiments on rabbits, made by Dr. Fraser, and published before the Royal Society of Edinburgh, tend to demonstrate this antagonism of the two poisons.

Extract of Calabar bean is given in dose of one-sixteenth to one-fourth of a grain.

Dr. Milner Fothergill has had favourable experience of the use of this bean in cases of insanity, connected with vascular excitement of the brain, and increased cardiac action. At Wakefield, Dr. Crichton Browne has tried the Calabar bean largely in motor excitement, with increased cardiac action and high arterial tension, occurring among the insane, and tending to general paralysis. The sedative action of the bean over the excited cardiac ganglia has been most satisfactory.

#### CÆSALPINÆ

**Hæmatoxyli Lignum.**—The sliced heart-wood of the Logwood of Campeachy, Honduras, and Jamaica. The colouring and astringent matter of logwood is soluble in water and alcohol: the solutions are

deepened in colour by alkalies, rendered pale and rather turbid by acids. A white crystalline body, *Hæmatoxyline* ( $C_{16}H_{14}O_2$ ), has been obtained from logwood; it becomes red when acted upon by alkalies and oxidizing agents. Tannin also exists in logwood.

Logwood acts as a mild astringent, not unpleasant to the taste. In the *Decoctum Hæmatoxyli* logwood chips and cinnamon are boiled together in water, and the decoction thus made may be given in dose of one to two ounces. For an infant, affected with chronic diarrhoea, one drachm of *Decoct. Hæmatoxyli*, five minims *Tr. Catechu*, one minim *Acid. Sulph. Dil.*, form a good dose. Lime-water and logwood are often given together, though they form a thick mixture.

*Extractum Hæmatoxyli* is of a liver colour; it is given in dose of five to twenty grains as an astringent. Sulphate of Copper, Opium, and *Extract of Logwood* are often combined as an astringent pill in the chronic diarrhoea of phthisis.

Logwood passes into the urine of those who take it, and when an alkali, as ammonia, is added to the urine, a distinct pink colour is produced.

#### SENNA.

There are two kinds of Senna named in the *Pharmacopœia*—viz., Alexandrian and Indian.

1. *Senna Alexandrina*.—Alexandrian Senna is gathered twice a year in Upper Egypt, beyond Sienne. The leaflets and pods, packed in bales, are sent to Boulac, near Cairo, and formerly were mixed with leaves of *Cynanchum*, or *Solenostemma Argel.* Leaves of the *Tephrosia Apollinea* were also occasionally mixed with senna.

Alexandrian senna leaves are the product of *Cassia lanceolata* and *obovata*. The leaflets are about an inch long, and are unequally oblique at the base.

See Fig. 8 (from Royle). A, *C. lanceolata*; G, *C. obovata*; H, *C. obtusata*; c, *C. acutifolia*.

FIG. 8.



*Solenostemma Argel* leaves, D, are equal at the base, pale in colour, thick, and coriaceous. Their effect on the system is to cause griping and nausea.

*Tephrosia Apollinea* of Nubia is silky on the under surface of its leaf, with parallel transverse veins, *f.*

*Coiriaria myrtifolia* leaves, *ε*, sometimes mixed with senna, have a strongly marked lateral nerve on each side of the midrib. Leaves of *Colutea arborescens*, or Bladder Senna, are distinguished from the leaflets of *C. obovata* by their being equal at the base. Alexandrian senna, as now imported, is far purer than it formerly was.

2. **Senna Indica.**—The best Indian senna is that known as Tinnivelly senna, and consists of leaflets of *Cassia elongata*, *β*. This senna is free from the stalks and pods seen in the common kinds of Indian Senna.

The leaves are about two inches long, and unequally oblique at the base. Indian senna comes from Madras to England. Mr. Groves believes it is not so active a medicine as the Alexandrian senna.

There are other varieties of senna, such as Tripoli senna; a cheap variety, of which the leaves are much broken up. Mecca senna is also met with in oblong-lanceolate leaflets, and when seen in mass it has a yellowish hue. The dried flowers of senna are pale-yellow. Leaves of senna with flowers are seen at Fig. 8, drawn from *Cassia elongata*, a bushy annual, growing two or three feet high.

Senna contains a non-crystalline deliquescent matter called *Cathartine*, or *Cathartic acid*, a glucoside of rather complex constitution, with chlorophyll, or green colouring matter, and a small amount of volatile oil. Senna pods also contain cathartine, and it is to this principle that the purgative action of senna is commonly attributed. Water and alcohol extract the active principle of senna, and we have an *Infusum* and a *Tinctura Sennæ*. Senna acts rather quickly as a purgative, increasing watery secretion and stimulating peristaltic action in the small intestines. Often it is combined with a saline purgative; some aromatic being also added to prevent the griping tendency of

the senna. In febrile and bilious affections senna is a good purgative, and in hæmorrhoidal affections and piles it is preferable to those purgatives, which, like aloes, act powerfully on the lower bowel. In dyspepsia with constipation, senna may well be combined with gentian; for bitters aid the action of senna.

In the B.P. we find a **Confectio Sennæ** containing nine ingredients, and known as *Lenitive Electuary*, which may be given in dose of one to two drachms as a laxative in cases of piles. Sulphur and jalap are sometimes combined with this electuary to increase its purgative action. **Infusum Sennæ** made in one hour with senna ginger and boiling water, is given as a purgative in dose of one to two ounces. **Mistura Sennæ Composita** forms the Senna Black Draught, and exemplifies the old method of prescribing. It contains sulphate of magnesia as its *basis*; and inagnesia forms, with cathartic acid, a very soluble compound (Groves). **Tinctura Sennæ** is the adjuvant, or *adjuvans*; **Tinctura Cardamomi Co.** is the *corrigen*s or corrective to the griping property of the senna; the Liquorice disguises the taste, while Infusion of Senna is the *vehiculum* for all the above ingredients. Dose one to one and a half ounces as a brisk active purgative.

**Syrupus Sennæ** in dose of one to two drachms, is a good purgative for children. It contains oil of coriander.

**Tinctura Sennæ** in dose of two to three drachms, may be added to Infusion of Senna or to Infusion of Gentian. The tincture is made with proof spirit, and contains raisins with caraway and coriander seeds.

The dose of senna-leaf powder is from half a drachm, but it is not often given in this form, and the powder does not keep well, soon turning mouldy. The powdered leaf occurs in the compound liquorice powder p. 195.

**Cassiæ Pulpa.**—The pulp obtained from the long



black pods of the *Cassia fistula*, or Puddin Tree of India. The pods of the Purgin Cassia from one to two feet long, and are divided into each one of which contains a seed surrounded by black pulp. Cassia pulp enters into the composition of *Confectio Sennæ*. The pulp is rarely given as it causes flatulence and griping.

**Tamarindus.**—Tamarind is the pulp of the *Tamarindus indica*. These pods are four inches long, flat, curved, and divided into cells containing seeds, surrounded by the pulp. This contains *pectin*, or vegetable jelly, with acid tartaric and potash. It is used to prepare a cooling draught for patients with fever, and it enters into the composition of the *Confectio Sennæ*.

**Copaiba.**—Balsam of Copaiva, from the Indies and Brazil. Many species of Copaiba are mentioned by botanists as sources of the balsam. The balsam issues freely from incisions made in the bark of the trees in the summer. Balsam of Copaiva resembles olive-oil in appearance, it forms a soap with alkalis, and it is soluble in alcohol, ether, a fixed and volatile oils. *Oleum Copaibæ*, when distilled from the oleo-resin, or balsam; a residue remains, from which a yellow brittle substance known as *Copuivic acid*, can be separated. Copuivic acid will dissolve one-fourth of its weight of carbonate of magnesia by the aid of heat, and the solution is transparent. Copuivic acid is soluble in benzol; free from East Indian wood oil, remains clear when heated to 270°. Brazilian copuivic acid is paler than that from the West Indies.

Copaiva taken by the mouth passes into the urine and can be detected there by adding nitric acid when a cloudiness appears. The cloudiness vanishes on heating the urine, and it does not settle on standing; by these two signs it is distinguished from albumen in the urine.

*Copaiva* acts as a stimulant to the mucous

branes, and has been given in chronic pulmonary catarrh, and also in chronic affections of the intestinal mucous membrane. Its chief use is in the chronic stage of gonorrhœa and in gleet. It should not be given if any active inflammation be present. In some constitutions copaiva produces a red rash on the skin. Dose of the balsam twenty minims to one drachm with syrup; or in emulsion with thick mucilage or yolk of egg. One ounce of copaiva and one ounce of carbonate of magnesia after some hours will form a solid mass that can be moulded into pills. A copaiivate of magnesia is here formed which absorbs the volatile oil.

**Oleum Copaibæ** resembles oil of turpentine; it forms a camphor with hydrochloric acid. Dose twenty to thirty minims.

*Resin of Copaiva*, in dose of ten to fifteen grains in emulsion, has been given with great advantage as a diuretic in abdominal dropsy by Dr. Wilks. The balsam itself has also been employed with good results in this form of dropsy by Dr. Henry Thompson. See Clinical Society's Report for 1870.

#### MIMOSEÆ.

**Acaciæ Gummi.**—Gum Arabic, or Turkey Gum. A natural exudation from various species of acacia. It occurs in rounded tears; the larger and darker of these are tears of Senegal and Barbary gum. Gum Acacia comes chiefly from Eastern Africa. Gum is soluble in hot and cold water, but insoluble in alcohol. It is composed of an acid, *Gummy acid*, in combination chiefly with lime. Oxalate of ammonia causes a precipitation of oxalate of lime if added to mucilage. Acetate of lead throws down a white precipitate of gummate of lead.

Gum acts simply as a demulcent and soothing agent to irritable mucous membranes. It is doubtful if it passes away by the kidneys, for Dr. Garrod gave half a pound of gum daily to a diabetic patient, and

could find no evidence of its presence in the urine. Gum cannot be converted into grape-sugar.

Gum is used in preparing lozenges. The **Mucilago Acaciæ** serves to suspend insoluble powders, and to form emulsions with oils and ethereal extracts.

Mucilage has always an acid reaction. If kept long it becomes sour and useless.

Powder of Gum should be free from starch, and therefore give no blue colour with iodine.

Among *Leguminosæ* is found the *Terra Japonica*, or Black Catechu,\* an extract from **Acacia Catechu** of Pegu. This Catechu is not in the B. P. It occurs in black shiny masses, enveloped in a leafy covering. Of 100 parts only eighty-eight are dissolved by cold water, forming a turbid astringent solution. Black Catechu contains nearly twice as much astringent matter as Pale Catechu (Squire).

Dose of black Catechu five to fifteen grains.

**Indigo**, is used for preparing the test solution of Sulphate of Indigo—a blue liquor, containing an acid, Sulph-indigotic Acid. The colour of this liquor is at once destroyed by free chlorine and by Nitrate of Lead solution.

#### ROSACEÆ.

**Rosæ Centifoliæ Petala**, Fully expanded petals of the Cabbage, or Damask Rose.—Rose petals contain a trace of fragrant volatile oil, known as *Attar of Roses*, with a small quantity of tannic acid.

**Aqua Rosæ**, or Rose Water, is made from the *Rosa centifolia* by distilling the fresh petals with water. Rose water may be given internally, in dose of one or two ounces, and enters into the Compound Iron Mixture, and into the Bismuth Lozenges. It is much used in preparing collyria for the eyes, and various lotions.

**Rosæ Gallicæ Petala**.—The unexpanded petals

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\* Catechu means juice.

of the Red, or French, Rose, contain tannin, volatile oil, and red colouring matter. With them is prepared the violet-coloured *Confectio Rosæ Gallicæ* used as a pill basis; and, mixed in a linctus with chlorate of potash, may be applied to aphthæ and thrush in the mouth. *Mel Rosæ*, or Honey of Roses, is not now in the *Pharmacopœia*.

*Syrupus Rosæ Gallicæ*, in dose of one or two drachms, is employed as a colouring ingredient in mixtures.

*Infusum Rosæ Acidum*.—A bright-red infusion containing 1 in 80 of dilute sulphuric acid. It is employed as a vehicle for the administration of sulphates of magnesia and quinia. The addition of glycerine tends to dissolve any precipitate of tannate of quinia, and so keeps the infusion clear. Borax and alkalies turn this infusion green. Acid Infusion of Roses eight ounces, and Tincture of Capsicum one drachm, form an excellent gargle for relaxed sore throat.

*Rosæ Caninæ Fructus*.—The fresh fruit (hips) of the Dog Rose.

*Confectio Rosæ Caninæ*, Confection of Hips.—A yellowish-brown waste, refrigerant and slightly astringent; added sometimes to cough linctuses, but chiefly used as a basis for the preparation of pills, as *Pil. Quinise*. The pulp contains citric and malic acid. The confection has a tendency to crystallize if kept.

The *Potentilla Tormentilla*, or Septfoil, is not now official. The rhizome contains much tannin; and, in powder or decoction, has been given as an astringent.

*Cydonium*, the seed-coat of the Quince, or *Cydonia vulgaris*, contains much mucilage. Decoction of Quince Seed is applied externally to cracks and excoriations of the skin. It is not now official.

*Amygdala Amara*, *Amygdala Dulcis*.—Both the Bitter and the Sweet Almond are found in the *Pharmacopœia*. The former comes from Mogadore; the latter, Jordan Almond, from Malaga. Both kinds of almond yield on pressure a bland yellow oil, the *Oleum Amygdalæ*. This oil is used in preparing

the **Unguentum Cetacei** and the **Unguentum Simplex**, as it makes a whiter ointment than olive oil.

Oil of Almonds is sometimes given internally, with mucilage and sugar, as a cough mixture, the dose being about one drachm.

**Pulvis Amygdalæ Co.**, is a straw-coloured, coarse powder, made of almonds, sugar, and gum; it used to be called **Confectio Amygdalæ**. The dose of this powder is one to two drachms, and in the proportion of one to eight of water it forms the **Mistura Amygdalæ**, or Milk of Almonds, of pharmacy.

Milk of Almonds is a bland emulsion, useful as a vehicle for such cough medicines as Tartarated Antimony or Ipecacuanha wine.

Emulsion of bitter almonds is not often given; it contains prussic acid, and was once a common vehicle for Tartarated Antimony.

Both kinds of almond contain about fifty per cent. of fixed oil, and an albuminous matter called *Emulsine*; the bitter almond contains, in addition, a glucoside crystalline body, *Amygdaline*,  $C_{20}H_{27}NO_{11} + 3H_2O$ , soluble in water and spirit. Under the influence of the emulsine and moisture together, this amygdaline is decomposed and furnishes glucose, hydrocyanic acid, HCN, and essential oil of bitter almonds, hydride of benzoyl,  $C_6H_5O.H$ . Each molecule of amygdaline yields one of hydrocyanic acid. The reaction resembles that by which the essential oil of mustard is formed by the decomposition of myronic acid. *See Mustard.*

The essential oil of the bitter almond is highly poisonous, as also are the almonds themselves. With sulphuric acid essential oil of almonds forms a red colour.

**Lauro Cerasi Folia**—Leaves of the Cherry Laurel, a native of Asia Minor, but cultivated in English gardens. Bruised laurel leaves are some-

times used as a sedative cataplasm in pericarditis. The distilled water of Cherry Laurel, **Aqua Lauro Cerasi**, contains volatile oil, with prussic acid, formed from the amygdaline in the leaves. The proportion of these poisons in the Aqua varies according to the time when the laurel leaves are gathered; hence Aqua Lauro Cerasi is of variable strength. The dose is from five to twenty minims, and it is given for the same purposes as the hydrocyanic, or prussic, acid. For the account of this acid and its uses *see* page 59.

**Cusso**, or **Koussou**.—The reddish-brown dicecious flowers of the *Brayera anthelmintica*. The Koussou tree grows in Abyssinia at an elevation of 6,000 or 7,000 feet above the sea level. The flowers are gathered before the seeds are quite ripe, and the red cusso is that produced by the female flowers. Both male and female flowers are mixed for importation to this country in boxes; and when one of the boxes is opened the tea-like odour of the cusso is very distinct. Powdered cusso has been found much adulterated with powder of pomegranate bark. Volatile oil, gum, and a crystalline matter, *Koussine*, have been found in cusso. For two hundred years cusso flowers have been used by the Abyssinians as a remedy against intestinal worms; and in 1823 the medicine was introduced into Paris by Dr. Brayer. Cusso is not purgative, but in large dose it often causes vomiting. It is specially efficacious against tapeworm, the *Tænia solium*, and it should be taken in the morning fasting. Dose of the flowers half an ounce for an adult. The **Infusum Cusso** may be given up to a dose of four ounces, and its use should be followed by a purgative dose of castor oil, with lemon-juice added. Koussou is a true *vermicide*, killing the tapeworm. It does not prevent reproduction of the worms, and is not therefore radically curative.

**Prunum**.—The dried drupe of the *Prunus Domestica* is a mild laxative, and occurs in the *Confectio Sennæ*.

## MYRTACEÆ.

**Caryophyllum.**—Cloves are the unexpanded flowers of the *Caryophyllus aromaticus*, the corolla forming the ball at the top of the clove between the four teeth of the calyx. The Bencoolen cloves from East India are reckoned the best. Good cloves emit oil when indented by the nail.

Cloves contain resin, tannin, and a volatile oil which is colourless when fresh, but becomes brown by age. A crystallizable body, isomeric with camphor, and called *Caryophylline*, with *Eugenic acid*, can be obtained from the oil.

**Infusum Caryophylli**, in dose of one to two ounces, acts as a warm stomachic. **Oleum Caryophylli**, in dose of one to three minims, is added sometimes to purgative pills and mixtures, to prevent griping.

**Pimenta.**—Pimento, or Jamaica Pepper, consists of the unripe berries of the West Indian Allspice Tree. Small, rough, brown berries, crowned with teeth of the calyx. The tree grows to a height of about thirty feet. Pimento yields a volatile oil resembling the oil of cloves; it also contains a species of tannin, which turns green with persalts of iron. **Oleum Pimentæ**, oil of pimento, becomes brown by keeping. It sinks in water. Dose one to three minims.

**Aqua Pimentæ**, made by distilling the bruised fruit with water, in dose of one to two ounces, is a warm stomachic. Bruised pimento occurs in the Syrup of Buckthorn.

**Oleum Cajuputi.**—Cajeput Oil is distilled from the leaves of the *Melaleuca minor* of the Molucca Islands. Two sacks of leaves yield about three drachms of the oil. The oil has a green colour, and camphoraceous odour and taste, and in some samples M. Guibourt discovered copper by shaking the oil with solution of ferrocyanide of potassium, when a red deposit of ferrocyanide of copper was formed. The blue colour is not, however, due to the copper,

for Dr. Pereira and Mr. Brande tested many specimens of the oil, and found no trace of copper. When first distilled cajeput oil is colourless, and contains the hydrate of a body, Cajeputine, which constitutes about two-thirds of the crude oil.

Cajeput oil is a powerful stimulant. Externally it is used in the **Linimentum Crotonis**. Internally it is given in dose of one to five minims; or, as **Spiritus Cajuputi**, in dose of half to one drachm as an antispasmodic in flatulence, colic, and hysteria. In 1831 cajeput oil was much used as a remedy for cholera, and its price rose from two to fourteen shillings per ounce.

A spurious compound of oil of rosemary, flavoured with camphor and cardamoms, was at that time sold as an imitation of the genuine oil.

*Eucalyptus globosus* (non-off.), the Blue Gum Tree of Australia, belongs to Myrtaceæ. It is a large tree, and the leaves are rich in volatile oil and resinous extractive. The leaves vary in size; some that I have are two or three inches long, and ovate; others are lanceolate leaves, four or five inches long. The odour is strong and aromatic. Infusion of the leaves is given very effectually for the cure of intermittent fevers, and the remedy may be given during the actual pyrexia.

The antiseptic and apyretic action of *Eucalyptus* depends on the clear colourless volatile oil (eucalyptol) contained in the glands of the leaves. This oil with an equal part of soap liniment forms a useful embrocation in chest affections. Cigarettes made of the leaves are sometimes used to relieve asthma.

There are other species of *Eucalyptus*, as the *E. resinifera*, which yields Botany Bay kino; and *E. rostrata*, which furnishes red astringent gum, valuable in the form of lozenge for relaxed throat, and superior in this affection to any other astringent, as far as my observation goes. The dose of tincture of *Eucalyptus* leaf is 30 to 100 minims, and of the oil 5 to 15 minims.



## GRANACEÆ.

**Granati Radicis Cortex.**—The dried bark of the root of the pomegranate tree contains tannin with mucilage, and a body called *Punicine*. A resinoid matter is also found in the bark, to which its power as an anthelmintic may be due.

**Decoctum Granati Radicis** is given in dose of one to two ounces as a remedy against tapeworm. This preparation often causes severe griping, and the maceration, or infusion, recommended by Niemeyer is preferable to the decoction. A pint or two of water should be poured over two to four ounces of the bark and allowed to stand for twenty-four hours; of this a third part should be taken, fasting, every morning. Such an infusion does not distress the patient, and usually succeeds in expelling the tapeworm dead and entire.

## UMBELLIFERÆ.

**Conii Folia et Fructus.**—The fresh leaves and young branches of the *Conium Maculatum*, or Spotted Hemlock, and also the fruit gathered in July. The leaves are tripinnate with pinnatifid leaflets; petioles furrowed and sheathing at the base. The stem is green, shining, and spotted.

Traces of volatile oil and two alkaloids have been found in hemlock, one of these last is a volatile liquid, colourless when pure and of a strong mouse-like odour. It is soluble in ether and alcohol, contains  $C_8H_{11}N$ , and is called *Conia*. With it is usually associated a portion of a very similar basic body, *Methyl Conia*. Hemlock also contains a volatile crystalline body *Conhydrine*.

When the leaves or seeds of hemlock are rubbed with solution of potash the odour of conia should become evident, and the vapour should cause white fumes with hydrochloric acid, just as ammonia does. Dried hemlock leaves soon lose all the conia they may

have contained ; but the seeds, even when dried and kept, retain the conia well. The vapour of conia is inflammable.

Hemlock has been used as a remedy from the earliest ages. It acts as a resolvent in dispersing glandular enlargements, and I have found an ointment of the extract, with an equal quantity of lard, decidedly efficacious in reducing glandular swellings.

The **Cataplasma Conii** is used as an anodyne application to cancers and painful tumours. The use of hemlock juice I believe to be preferable to that of the powder of dry hemlock leaves in making this poultice ; the dry leaf often containing no conia if it happen to have been kept over one year in stock.

Internally, hemlock acts as a sedative to the spinal cord, and in large doses it produces paralysis. In convulsive affections due to over-excitation of the spinal cord, it is a useful drug. In chorea, Dr. John Harley and others have employed juice of conium in large doses, half to one ounce, with much success in checking excessive motory excitement.

In irritative cough the tincture or juice in 10-minim doses is a valuable remedy, and agrees remarkably well with children.

The **Vapor Coniæ** or Inhalation of Conia, is of great use as a sedative in pulmonary affections. Liquor potassæ is mixed with the extract of hemlock in order to set free its volatile active principle, the conia. With regard to the preparations of conium, the powder of the dry leaf is, as already said, not to be depended on as a remedy. The **Extractum Conii** is, when fresh, a bright green extract ; by keeping it loses activity, and may be swallowed in dose of seventy grains without producing any effect (Orfila).

When fresh the dose of the Extract is from two to eight grains.

**Succus Conii.**—The light-brown juice of the fresh hemlock leaf appears an excellent preparation.

Twelve minims are equal to one grain of Extract. The usual dose is thirty to sixty minims, and in cases of troublesome cough it may well be combined with Vinum Ipecac., just as the Pulv. Ipecac. is combined with Extract of Hemlock in Pil. Conii Co.

**Tinctura Conii.**—Tincture of Hemlock Fruit is a preparation that keeps well, and may be depended on. The dose is half to one drachm usually; but both Dr. Garrod and Dr. John Harley have shown that all the preparations of hemlock may be given safely in larger doses than those indicated in the B. P.

The mericarps, or half fruits, of the conium are ovate, with crenulated edges, and have no vittæ in their channels. Anise seeds have three vittæ in each channel. The fruit of Fool's Parsley, *Cethusa Cynapium*, is not undulate or crenate, and has vittæ.

The odorous matter of hemlock seems to reside chiefly in a volatile oil, that has been isolated by Bertrand. The distilled water of hemlock possesses the odour of the plant, but does not seem to be poisonous. See Pereira's "Materia Medica," vol. iii. 1724.

**Assafœtida** is a fetid gum resin, which exudes from incisions made in the living root of the *Narthen assafœtida* of Persia. The root is sliced three or four times in the year, and the juice scraped off and dried in the sun. Gum assafœtida is soluble in alcohol; and burns with a white flame. Assafœtida is usually met with in lumps, made up of agglutinated tears of a pinkish-brown colour, and with a strong garlic-like odour. Assafœtida contains 3 to 6 per cent. of volatile oil, with about 60 per cent. of resin, and 30 of gum, arabin and bassorin. The volatile oil is a sulphide of allyl,  $C_2H_3S$ .

Assafœtida acts on the system as a stimulant and antispasmodic. In chronic bronchial catarrh it is often useful, and in flatulent colic the **Pil. Assafœtidæ Co.** is an excellent medicine. In functional disorders of the heart, palpitation, &c., I have found

five grains of assafœtida at bedtime an efficacious remedy.

**Enema Assafœtida** is an emulsion, made by rubbing thirty grains of assafœtida with four ounces of water. The gum dissolves, and holds the resin suspended; thus a milky emulsion is formed.

This enema, in half the above quantity or less, is a good remedy for convulsions in young children. In extreme flatus of the bowels it is also very serviceable. **Tinctura Assafœtida**—a deep brown tincture—is given as an antispasmodic, with mucilage, in dose of half to one drachm. It may be given with Aromatic Spirit of Ammonia, as a substitute for the **Sp. Ammoniæ Fœtidus**, of which the dose is half to one drachm. **Pil. Assafœtidæ Co.** made of Assafœtida with Galbanum Myrrh and treacle is given in dose of five to ten grains as an antispasmodic. **Pil. Aloes et Assafœtidæ** is aperient and antispasmodic; it contains Socotrine aloes, and the dose is 4 to 10 grains.

**Galbanum.**—The umbelliferous plant from which the gum resin Galbanum is obtained is not certainly ascertained. Gum galbanum comes from the Levant and India, and is the juice of the plant hardened in the air.

Galbanum occurs in greenish-yellow tears, agglutinated together into masses. Distilled at 250°, galbanum yields a volatile oil of fine blue colour; this oil is derived from the resin, which also yields a yellow oil. With water galbanum forms an emulsion. In dilute alcohol it is wholly soluble with the exception of impurities.

Galbanum occupies an intermediate position as a remedy between assafœtida and ammoniacum. It is used as a stimulant, antispasmodic, and expectorant. In amenorrhœa and in chronic rheumatism it is sometimes used. Dose ten grains or more.

**Emplastrum Galbani** (Plaster of Galbanum and Ammoniacum).—A warm stimulating plaster, used for

chronic joint affections, and to disperse indolent swellings.

Galbanum occurs in the Compound *Assafoetida* Pill. *Opoponax* and *Sagapenum*, gum resins resembling galbanum in properties, are not now officinal. *Sagapenum* is darker in colour than galbanum, and in odour it slightly resembles *assafoetida*. Its oil, however, contains no sulphur.

**Ammoniacum.**—A gum resinous exudation, hardened in the air, from *Dorema ammoniacum* of Persia and the Punjaub. Cinnamon-brown brittle tears breaking with a smooth, opaque, white surface, and forming with water a nearly white emulsion. A volatile non-sulphurous oil, with gum and resin, are the chief components of ammoniacum.

Ammoniacum is given as a stimulating expectorant in chronic bronchitis. The **Mistura Ammoniaci**, made by rubbing one quarter of an ounce of ammoniacum with eight ounces of water, is often given in chronic bronchitis in dose of half to one ounce. Squills, Lobelia, or *Sp. Ammoniacæ Foetid.*, may be often advantageously given with this mixture.

**Emplastrum Ammoniaci cum Hydrargyro.**—Mercury and Ammoniacum Plaster is used for dispersing indolent swellings and thickenings about joints. This plaster sometimes causes a good deal of redness and irritation about the skin.

The *Pil. Scillæ Co.* and *Pil. Ipecac. c. Scillæ* both contain ammoniacum.

From the Umbelliferæ there are certain seeds obtained which furnish volatile oils that are of use in medicine.

**Anisi Oleum.**—Oil of Anise is distilled from the fruit of the *Pimpinella anisum*, as well as from that of the *Illicium anisatum* (Magnoliaceæ), or Star Anise, from China. This oil is known as *Oleum Badiani*. The greyish-green seeds, or mericarps of the anise, have five primary ridges, and three vittæ in each channel. The anise is the only one of the umbel-

liferous seeds here to be described that has multi-vittate channels. The contents of the vittæ are an oleo-resin, resulting probably from oxidation of the essential oil.

Seeds of conium resemble those of anise, but may be distinguished by their crenate or notched ridges, and they are broader in proportion to their length. One hundredweight of aniseed will yield by distillation about two pounds of oil. The oil of anise consists of two portions: one is isomeric with oil of turpentine ( $C_{10}H_{16}$ ), the other is a stearopten, which crystallizes at a low temperature and has the formula  $C_{10}H_{12}O$ . It yields by oxidation *Anisic acid*, and hydride of a radicle, *Anisil*.

Oil of anise is stimulant and carminative; it relieves flatus and griping in the stomach. Dose two to six minims.

**Essentia Anisi.**—Essence of anise is one of the two Essences of the B. P.; it is a solution of oil of anise in rectified spirit. Dose ten to twenty minims, as a pleasant flavouring ingredient, with stomachic and expectorant properties. *Aqua Anisi* of the Ph. Dublin is not officinal. Oil of anise deodorizes sulphurated potash. Five grains of this salt, rubbed to an ointment with a drachm of lard, and one drop of oil of anise, has scarcely any unpleasant odour of sulphur. Oil of anise enters into the **Tinct. Camphoræ Co.** and **Tinct. Opii Ammoniata.**

**Fœniculi Fructus.**—Sweet Fennel fruit from Malta. The mericarps—convex on one side, flat on the other—are of a greyish-green colour, with yellowish ridges on the convex surface. The seeds contain no fixed oil, but by distillation with water the essential oil, *Oleum Fœniculi*, can be separated. Wild Fennel is not official in the B. P. The oil of fennel resembles oil of anise, and may be given in the same dose, and for the same purposes. **Aqua Fœniculi**, in dose of one or two ounces, acts as a warm carminative.

**Cuminum.**—The fruit of the Cumin of Egypt is not in the B. P. This fruit yields a volatile oil, and its properties are those of a warm carminative.

**Coriandri Fructus.**—The round dried fruit of *Coriandrum sativum*, native of Italy, but cultivated in Britain. The **Oleum Coriandri** is a mixture of various oils. The oil is stimulant and aromatic; the dose is one to four minims. It is not often given alone, but enters into *Syrupus Sennæ*. Coriander fruit, it will be seen, occurs in four preparations.

**Carui Fructus** (Caraway Fruit).—Grown in England and Germany. The seeds are brown, with five pale ridges, with one vitta in each channel. The essential oil is of a straw colour, and consists of two portions *Carvene* ( $C_{10}H_{16}$ ), and an oxidized body, *Carvol* ( $C_{10}H_{14}O$ ). **Oleum Carui**, in dose of two to five minims, is an agreeable stomachic and carminative. **Aqua Carui**, in dose of one to two ounces, has similar properties.

**Anethi Fructus.**—Fruit of *Anethum Graveolens*, or Dill. The seeds are brown and flat, with five primary ridges, and one vitta in each channel. Pale membranous alæ.

**Oleum Anethi** resembles oil of caraway in appearance and properties. **Aqua Anethi**, or Dill Water, in dose of one to two drachms, is much used to correct flatulence in infants. A little magnesia, or a few drops of aromatic spirit of ammonia, may often be advantageously added to the dose.

**Carota.**—The well-known root of *Daucus carota*, or Carrot, contains a little volatile oil with crystallizable matter, and *Pectin*, or vegetable jelly. Made into a poultice, carrot is sometimes applied to phagedænic ulcers. I have known it cause sharp pain when thus used, being probably too stimulating.

**Sumbul Radix.**—Sumbul, or Musk Root. This is the root of some unknown umbelliferous plant (*Euryangium Sumbul?*), and is said to be the spikenard of the ancients. Grown in Nepal, Bootan

and Bucharest, the root comes into England through Russia and St. Petersburg. The slices of the root are from two to five inches across, porous, and with a dusky brown bark. Analysis shows the root to contain volatile oil, resin, and a crystallizable acid. The oil tastes like peppermint, and the musk-like odour of the root depends on the resinous matters.

In Russia *sumbul* is often employed as a nerve stimulant; it is much used in the treatment of delirium tremens, and the delirium of low fevers. In epilepsy and various nerve affections it seems of some service. **Tinctura Sumbul**, made with proof spirit, is of a reddish-brown colour, and may be given in dose of ten to twenty minims. The white resin of *sumbul* may be given in pill in dose of one or two grains.

### Sub. Class III. Corolliflorales.

**Corolliflorales.**—Flowers having both calyx and corolla, the latter consisting of united petals.

#### CUCURBITACEÆ.

**Colocynthis Pulpa.**—Colocynth fruit formerly was imported from Mogador, unpeeled, as a hard brown pepo, the size of an orange. The peeled fruit, Turkey colocynth, free from seeds, is the part now used. The pulp is very bitter, and contains a crystallizable glucoside, *Colocynthin*,  $C_{86}H_{84}O_{23}$ , soluble in water, alcohol, and ether, and decomposed by acids into resin and glucose.

Colocynth acts as a powerful drastic purgative, producing watery stools and causing much griping. It is not often given alone. The dose of the powdered pulp would be two to eight grains.

**Extractum Colocynthis Compositum.**—This is a black extract, formerly known as Pil. Colocynthis Co.; made of extracts of colocynth and Socotrine aloes, with scammony resin, hard soap, cardamoms, and proof spirit. It may be given as a purgative, in dose of three to eight grains.



**Pilula Colocynthis Composita** is made of powdered colocynth, Barbadoes aloes, scammony sulphate of potash, oil of cloves, and water. This pill is often prescribed with calomel or blue-pill as a cholagogue purgative in bilious affections.

**Pil. Colocynthis et Hyoscyami**—A very useful combination from the Ph. Edin. The hyoscyamus prevents griping, and at the same time promotes a regular and moderate purgation.

**Enema Colocynthis** is not now in the Pharmacopœia. It used to contain thirty grains of Extract of Colocynth mixed in a pint of soap-and-water, and was used as a very active purgative injection.

**Elaterium** is the green sediment deposited from the juice of the pepo of *Ecbalium officinarum*, *Ecbalii Fructus*, or Squirting Cucumber. When ripe the soft green prickly pepo, becoming greatly distended by the endosmosis of fluid from the pericarp into the interior of the fruit, separates from its stalk, and expels its seeds with violence. Elaterium originally came from Greece; it is now grown at Mitcham. Dr. Clutterbuck found that the active part of the pepo lay in the juice surrounding the seeds. From forty fruits Dr. C. obtained only six grains of quite pure elaterium. On reading the characters of good elaterium, as given in the B.P., it will be observed that the pure drug does not effervesce with acids. The impure elaterium, such as that often imported from Malta, is pale in colour, has fragments of paper adhering to it, and being composed chiefly of chalk and starch, effervesces readily with acids. Elaterium was formerly described in the Ph. Lond. as an extract. A crystalline active principle, *Elaterine*, insoluble in water but soluble in hot alcohol, exists in elaterium. Tincture of *Elaterine* has been given as a purgative by the late Dr. Golding Bird.

Pure elaterium is used as a powerful hydragogue cathartic for the relief of dropsy and cerebral affections. Hypercatharsis, syncope, and death have fol-

lowed the use of the drug, and it is very dangerous to use it in cases of extreme debility. The dose of good elaterium is one-eighth to one-fourth of a grain; more than this commonly causes vomiting as well as purging. Elaterium may be given in pill with extract of gentian or hyoscyamus, and half a grain of capsicum is often a good addition to prevent nausea. It may also be given powdered, with sugar of milk, as in *Pulv. Elaterii Co.*, containing 1 of elaterium in 10 of powder. The chief use of elaterium is for the relief of cardiac dropsy. In the event of hypercatharsis from an over-dose, emollient drinks should be given with opium and ammonia.

#### CAPRIFOLIACEÆ.

**Sambuci Flores.**—Elder Flowers from the *Sambucus Niger*. The flowers grow in five-parted cymes; their odour is due to a volatile oil, which can be separated by distillation. **Aqua Sambuci**, or Elder Flower Water, is prepared by distilling the flowers with water. This water is seldom given internally, but is employed externally as a cooling wash or lotion for the skin. Elder Flowers boiled in lard form a very good cooling and soothing ointment for irritable sores. The inner bark of the tree and the juice of the root possess powerful hydragogue cathartic properties.

#### CINCHONACEÆ.

Peruvian Bark was first known in Europe in 1640. It was then called Jesuits' Bark, because the Jesuits first brought it from Peru to Spain. A variety of species of *Cinchona* are now known to exist, but only three are retained in the Pharmacopœia, and these are distinguished by their colour.—*Cinchona flava*, *C. pallida*, and *C. rubra*.

**Cinchonæ Flavæ Cortex** (Yellow Bark of *Cinchona calisaya*).—Of this bark there are two known varieties, *Cinchona vera* and *Cinchona Josephiana*. This last is a shrub, and Mr. Weddell thinks it may

succeed as a stunted after-growth where forests of *C. vera* trees have been cut down.

Yellow bark occurs usually in flat fibrous pieces denuded of epidermis, rarely in single longitudinally wrinkled quills: its particular characteristics should be studied in the B. P. while specimens are before the student.

Yellow Bark contains tannin with red colouring matter, starch, kinate of lime, and kinate of quinia, with a little kinate of cinchonia. 100 grains of yellow bark should yield by the Pharmacopœia process two grains of pure quinia, soluble in ether and in dilute sulphuric acid.

**Cinchonæ Pallidæ Cortex** (Pale Crown, or Loxa, Bark) is produced by the *C. condaminaea*, the tree being so named by Humboldt in honour of La Condamine, who discovered it in 1738. This bark occurs in long grey quills, speckled over with lichens, and it yields a pale-brown bitter astringent powder.

Pale bark contains tannin and kinic acid in combination with lime, cinchonia, and quinia, this last being in small amount. 200 grains tested in the manner directed for yellow cinchona bark, with the substitution of chloroform for ether, should yield one grain of alkaloids; chiefly cinchonia and quinidia, which are soluble in chloroform. Ether only dissolves quinia.

**Cinchonæ Rubræ Cortex**.—Red Cinchona Bark comes from the *Cinchona succirubra* (red-juiced bark) growing on the slopes of Chimborazo. Usually this bark is met with in flat or bent pieces, rarely in quills; the outer surface is brown or reddish-brown, frequently warty and cracked transversely. Powder is red-brown, and astringent. Red bark contains quinia and cinchonia in about equal proportions.

Formerly Yellow Bark was called *Cinchona cordifolia*; Pale Bark, *C. lancifolia*; and Red Bark, *C. obtusifolia*; but these names are now abandoned.

There are a large number of barks besides those

official in the B. P. Fibrous Carthagena bark, or Bogota bark, yields Quinia with Quinidia and Cinchonina.

Cinchona Cinerea, grey or Huanuco bark, used to be more common in the markets than it is at present. The quills of this bark are sometimes spirally twisted, and they are larger and coarser than those of brown bark.

*C. nitida* and *C. micrantha* are grey barks, and are rich alkaloids.

East Indian red bark is now a good deal employed in pharmacy, and contains all the alkaloids. This bark occurs in thin brown pieces, with epidermis not covered by lichens, and on it may be seen small crystals.

As to the yield of alkaloids from the *C. succirubra*, as grown in India, 5,000 feet above the sea-level, Mr. Markham says that the bark of a tree two years and a half old gives 2.43 per cent. of alkaloids, but if the stem be packed round with moss for a year then the yield of alkaloids may be increased to 11.35 per cent. This process of *mossing* the cinchona tree, so as to exclude sunlight, was introduced into India by Mr. McIvor. This observer found that if, instead of cutting down a whole tree for the purpose of barking, a slip of bark was peeled off, and then the bare surface packed with moss, a new growth of bark would take place, which always proved rich in alkaloids. If too much surface be barked and mossed, the process may lead to the death of the tree.

In chemical composition the different barks are in a great measure similar.

The styptic and astringent taste of a bark is in proportion to the amount of *Quino-tannic acid* which it contains. This acid differs from tannic acid in striking a green colour with persalts of iron. By oxidation this acid produces a red colouring matter soluble in alcohol, ether, and acids, and known as *Cinchona Red*.

A bitter taste is essential to all good barks ; and it is observed that this taste is more quickly perceived in the cinchonine than in the quinine barks. The taste of cinchonine resembles that of sulphate of magnesia. An aromatic taste in a bark indicates the presence of volatile oil or resin.

Among the constituents of bark occur the following bodies :—

*Quinic* or *Kinic Acid*,  $C_7H_{12}O_6$ , a crystallizable acid soluble in water, and yielding by oxidation a crystalline volatile body, called *Quinone*,  $C_6H_4O_2$ . In bark kinic acid exists combined with lime and with alkaloids.

*Quino-tannic Acid* is an astringent principle, that precipitates persalts of iron of a dark-green colour.

*Quinovic Acid* is produced from an amorphous body, *Quinovin* ; it is a crystalline feeble acid, insoluble in water, soluble in alcohol and ether.

*Quinia* or *Quinine*,  $C_{20}H_{24}N_2O_2$ , a white crystalline alkaloid, soluble in 400 parts of cold and 250 of hot water. Soluble in alcohol, ether, warm glycerine, and fixed and volatile oils. Quinia and its salts are known from all other vegetable alkaloids and their salts—*Quinidia*, an isomer of Quinia, excepted—by the beautiful emerald-green colour which results when their solution is treated first with chlorine water and then with ammonia, and which changes to white or violet upon saturation with a dilute acid. Quinia was discovered, in 1820, by Pelletier and Caventou.

To prepare Sulphate of Quinia the Quinia is dissolved out of the bark by means of diluted hydrochloric acid, and from this solution the alkaloid is precipitated by solution of soda, then dissolved in dilute sulphuric acid, and evaporated till crystals appear.

**Quiniæ Sulphas.**—This salt is a disulphate, or subsulphate ; and, as such, is scarcely soluble in water. When dilute sulphuric acid is added a neutral sulphate is formed, soluble as 1 in 12 of water, and

which may be crystallized in rectangular prisms, having the composition  $C_{20}H_{24}N_2O_2 \cdot H_2SO_4 \cdot 7H_2O$ .

Sulphate of Quinia exists, with confection of hips, 1 in 1 $\frac{1}{3}$ , in the **Pilula Quiniæ**, and in the **Vinum** and **Tinctura Quiniæ**. The salt is soluble in sixty parts of alcohol. The tincture contains 1 gr. in 60 min. of tincture of orange peel.

**Tinctura Quiniæ Ammoniata**.—Sulphate of Quinia is dissolved in proof spirit, and solution of Ammonia is added. One fluid ounce of this tincture evaporated to dryness, re-dissolved, in one ounce of water and slight excess of ammonia added, gives a precipitate which, when quite dry, will weigh not less than 5–6 grains.—*Pharm. Journal*, April, 1874. This tincture contains 1 of quinia in 60. Dose  $\frac{1}{2}$  to 2 drachms.

Sulphate of quinia is soluble in 740 parts of cold, or in 30 of boiling water, from this last it deposits on cooling. The cold solution of the sulphate has a blue look, called opalescence or fluorescence. Dr. Bence Jones observed this fluorescence present in the fluids of animals, especially if quinine had been administered. To the substance causing this fluorescence in the animal fluids Dr. Bence Jones gave the name of *Animal Quinoidine*, and it is said that under the influence of remittent fever and ague this quinoidine disappears from the animal fluids.

Sulphate of Quinia is sometimes adulterated. Excess of water may be present; hence the B. P. tells us that twenty-five grains of sulphate of quinia should not lose more than 3·6 grains of water when dried at 212°. Gum and starch if present in the sulphate are not dissolved by alcohol. Stearic, or other fatty acids, are insoluble in dilute sulphuric acid. Salicin (a bitter crystalline body from willow bark), if over one-tenth be present, turns blood-red with strong sulphuric acid. Earthy impurities remain when the specimen of sulphate is incinerated, and if boracic acid be present the sulphate burns, when moistened

with alcohol, with a greenish flame. Pure sulphate of quinia is entirely soluble in ether: crystalline matter floating in the solution indicates the presence of quinidia.

Alkalies and astringents are incompatible with sulphate of quinia.

Tannate of Quinia is insoluble in dilute sulphuric acid; hence when the sulphate is given in acid infusion of roses the mixture is always turbid. By adding glycerine, or by using nitric instead of sulphuric acid (Squire), in making the rose infusion this turbidity is prevented. In Germany a neutral hydrochlorate of Quinia is used in preference to the sulphate.

The following alkaloids of cinchona bark are not noticed in the B. P.

*Cinchonine*,  $C_{20}H_{24}N_2O$ , occurs chiefly in pale bark; it is a crystalline body, insoluble in water and ether. It unites with acids to form soluble salts, and these solutions are not fluorescent, and do not turn green with ammonia and chlorine like quinia salts. Sulphate of cinchonia crystallizes in good-sized prisms. Cinchonine turns the polarized ray to the right. Quinine turns it to the left.

*Cinchonidine*,  $C_{20}H_{24}N_2O$ , is a crystalline alkaloid; isomeric with cinchonine.

*Quinidine* is a bitter alkaloid, isomeric with quinine; its solutions turn green with chlorine and ammonia, and are fluorescent like those of quinine. Quinidine is scarcely soluble in ether; with sulphuric acid it forms a very soluble sulphate.

In Arica bark, a crystalline alkaloid, *Aricine*  $C_{23}H_{28}N_2O_4$ , has been found. In the *Cinchona Succubra* of India, Dr. O. Hasse has found an alkaloid which he believes to be new, and which he calls *Chinamia*.\*

*Quinoidine* is obtained from the residuary liquors the barks after the alkaloids have been prepared fr

\* See Horatio Wood's "New Remedies," vol. ii. p. 28

them. It occurs as an amorphous mass of a dark brown or green colour. From it the amorphous quinine is prepared.

*Uses and Properties of Bark and Quinine—*

Bark in decoction, infusion, or tincture, acts on the system as a tonic with more or less astringency. It promotes appetite, and tends to check excessive secretion. Further than this, bark is an antiperiodic remedy, and has marked power over diseases that are intermittent, and return at intervals. Thus bark is employed against remittent fevers and agues with conspicuous success. Externally, powdered bark is used as a dusting powder for unhealthy ulcers; and jackets of bark have been used as articles of covering for children affected with ague.

Quinia and its salts do not possess the astringency of the bark preparations, and can be given in small bulk, so as not to oppress the stomach. Quinia, taken by the mouth, is in part excreted unchanged in the urine. It does not increase the rapidity of the pulse, but gives it greater firmness. The production and excretion of lithic acid are checked by the administration of quinia. Lewitzky observed that quinia injected into the jugular vein of a rabbit lessened the temperature, and retarded the beats of the heart. In the lower animals, after poisonous doses of quinine, intense congestion of the brain and its membranes has been observed. In large doses, of twenty grains, it lessens temperature slightly. When the system is getting under the influence of quinine, noises are perceived in the ears, and there is deafness, with disordered vision and feeling of congestion about the head. To such symptoms, the name of *quinism*, or *cinchonism*, has been given. Cinchonine, Quinidine, and Cinchonidine seem to possess similar properties to quinine, but of more feeble character. Dr. Garrod has observed cinchonine to cause great dryness of the mouth.

*Uses of Quinia.*—Solutions of the sulphate and other salts of Quinia, have been proved by Binz and



Buchanan Baxter, to act as poisons to the development of protoplasm, and also powerfully to arrest fermentation and putrefaction. Weak solutions of quinia are strong enough for these purposes, for Binz\* finds that the living microscopic inhabitants of putrid vegetable infusions are dead a few hours after the addition of a neutral solution of quinia containing one part in 20,000. Krukenberg found a solution of one in 100,000 potent enough to destroy living organisms. A watery solution of sulphate of quinia snuffed up into the nostrils, is efficacious in relieving the catarrh of hay fever, by destroying the vitality of the pollen granules, on the inhalation of which this complaint depends.

Sulphate of quinia is much used as an antiperiodic to cure ague; and its power in reducing the enlarged spleen, so common in this complaint, has been completely proved. Before administering bark or quinia, to cure ague, a purgative dose with calomel should be given, if the tongue be coated and the bowels confined. The methods of employing quinia in treating ague differ much: some give frequent small doses; others prefer a large dose of the medicine before the ague fit, with a long interval before repetition. Repeated small doses of two or three grains I believe to be the safest method, and certainly as successful a method as the other. Many of the worse forms of malarial fever do not exhibit periodic paroxysms, and yet repeated doses of quinia act curatively.

In neuralgia, hemicrania, &c., of intermitting character, quinia is a very certain remedy, the stomach and bowels being in a healthy condition. Belladonna and, at times, tincture of capsicum, are two drugs I have found excellent adjuvants to quinia in curing facial neuralgia.

In pulmonary phthisis, with great weakness and

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\* Paper by Binz, of Bonn, read in *Materia Medica Section of the International Medical Congress. 1881. Vol. i. p. 456, of Transactions.*

sweating, quinia is of some service, but it has no specific curative power over the malady. In febrile tuberculosis it may be given with digitalis for the purpose of abating the fever. In hay fever quinine, applied in solution of 1 gr. of the neutral sulphate, or hydrochlorate, in 2 ozs. of distilled water, to the nasal passages, often proves a very efficacious remedy. The power of large dose, 10 to 20 grs. of sulphate of quinia, to reduce temperature, appears to be due to its checking oxidation in the body (Binz).

As a general tonic quinia is much used: it may be given with the infusion of bark; and sometimes it is a good plan to give one or two grains of sulphate of quinia as a powder, mixed in sherry wine; the bitter taste is not much perceived, and the drug dissolves in the acid secretions of the stomach. Milk, too, is a very good vehicle for a large dose of sulphate of quinia.

**Vinum Quiniæ** contains Sulphate of Quinia dissolved in orange wine by the aid of citric acid in proportion of 1 in 1 oz. Dose half to one ounce.

A variety of salts of quinia are in use besides the sulphate, such as the hypophosphite, often of service in phthisis; the hydriodate, an orange-yellow salt, given in one- or two-grain doses for rheumatism. The arseniate, kinate, and valerianate of quinia are also known and used.

It will be observed that, with the exception of the **Tinctura Cinchonæ Co.** and the **Mistura Ferri Aromatica**, all the preparations of bark in the B. P. are made from the *Cinchona flava*. **Decoctum** and **Infusum Cinchonæ** in dose of one to two ounces, are useful tonic vehicles for the administration of alkalies, acids, and iodide of potassium.

**Extractum Cinchonæ Liquidum**, of which one part is equal to four of bark, is added sometimes to the infusion, the dose being ten to thirty minims. Mixed in water, the extract settles to the bottom as a dirty sediment. With port wine it mixes well.

**Tinctura Cinchonæ, and Tr. Cinchonæ Co.**, which last contains orange peel, serpentary, saffron, and cochineal, are proof spirit tinctures, used in dose of one to two drachms. In cardiac weakness, the compound tincture, with ammonia, is very efficacious.

The crystalline body known as *Quinetum* consists of the mixed alkaloids. It is a useful tonic, not so liable to cause headache as the pure sulphate of quinia.

Warburg's Tincture contains a large quantity of quinia dissolved in spirit with an addition of a number of aromatics. This tincture, in dose of 1 to 4 drachms, is certainly a powerful restorative in low and exhausted states of system.

**Ipecacuanha.**—The dried root of *Cephaelis Ipecacuanha* from Brazil. The root is marked by rings, hence it is called Annulated Ipecacuanha. The wild Striated Ipecac. root is not used. The active principle of the root resides in the cortex or bark, and is composed of a yellowish amorphous alkaloid, *Emetina*,  $C_{20}H_{26}NO_4$ , united with *Ipecacuanhic* or *Cephaelic Acid*. *Emetina* is precipitated by tannin, and cephaelic acid turns dark green with iron persalts. It is soluble in water and in wine.

In dose of fifteen or twenty grains, the pale brown powdered ipecacuan acts as an emetic, producing some nausea, but not much irritation of the stomach, and not followed in its action by such depression and collapse of system as follow the use of antimonium tartaratum. Emetic doses of ipecacuan powder are of use in cases of poisoning, and are especially indicated in cases where the chest is much clogged and oppressed by collection of phlegm and mucus. In recurring hæmoptysis, Trousseau speaks highly of ipecacuan in emetic doses. In the early stages of cholera, in 1854, Dr. Clapton found ipecacuan, given as an emetic, of decided service.

Ipecacuanha appears to act chiefly on the mucous membranes of the body, it increases secretion and so relieves congestion, hence it is useful in bronchitis

with deficient secretion ; and it is a remedy of well established repute for the treatment of chronic diarrhoea and dysentery. In obstinate chronic diarrhoea I have found it most useful.\* In acute dysentery a dose of twenty or thirty grains is commonly resorted to now by Indian physicians with so good an effect in curing the disease that cases of chronic dysentery are comparatively rare.

In dyspepsia with weight after food, nausea, and slow digestion, half a grain of Ipecacuan with Extract of Rhubarb and Gentian in a pill, is often of great assistance. The addition of quinine to this pill is not advisable, as quinine appears to check the action of the pepsine of the stomach.

In asthma, with or without bronchitis, Vinum Ipecacuanhæ in repeated ten-minim doses is useful ; and in pulmonary hæmorrhage a similar method of treatment with ipecacuan till nausea is induced, is decidedly good. Among the preparations of ipecacuan the *Pilula Ipecac. c. Scilla* is one much used in chronic bronchitis as a slightly stimulating expectorant. This pill contains 1 of opium in 23, or 3 of Dover's powder in 7. *Pulvis Ipecac. Co.*, Dover's Powder (so called from its inventor, Dr. Dover), contains Pulv. Opii, one grain ; Pulv. Ipecac., one grain ; Sulphate of Potash, eight grains ; and ten grains is an ordinary dose of this powder as a sedative. Dover's Powder in conjunction with warm drinks tends to promote diaphoresis, and five grains at night will sometimes cut short an incipient cold. In dysentery the simple powder of ipecacuan seems more curative than Dover's Powder.

*Vinum Ipecacuanhæ* contains one of Ipecacuan in twenty of Sherry. Dose five to forty minims, as an expectorant ; one to four drachms as a safe emetic. When kept, the wine deposits much of the emetina it

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\* "See cases in "Transactions of Clinical Society," vol. vi. p. 171.

contains,\* along with bitartrate of potash, and so loses power. Dr. Duckworth has recommended an *Acetum Ipecacuanhæ* as more stable than the wine.

**Trochisci Ipecacuanhæ.**—Lozenges of Ipecacuanha contain  $\frac{1}{4}$  gr. in each lozenge. The **Trochisci Ipecacuanhæ et Morphisæ** contain  $\frac{1}{4}$  gr. Ipecac. and  $\frac{1}{8}$  Hydrochlorate of Morphia in each.

**Catechu Pallidum.**—Pale Catechu occurs in pale brick-red cubes, quite soluble in boiling water and free from starch. It is an extract from the leaves and twigs of the *Uncaria Gambir* of Singapore.

Catechu contains mucilage and 48 per cent. of tannin in the form of *Mimotannic acid* and *Catechin*. Catechin differs from ordinary tannin in not being precipitated by gelatine, and the mimotannic acid turns green, not black, with persalts of iron. Catechin can be crystallized, and has the formula  $C_{20}H_{18}O_8$ . The *Acacia Catechu* (*Leguminosæ*), *Terra Japonica*, or *Black Catechu* of Pegu, is not in the B. P. It contains more astringent matter than the pale catechu, and occurs in black masses covered with leaves.

Catechu acts as an astringent. It is used locally in the form of lozenges, **Trochisci Catechu**, 1 grain in each lozenge, for the cure of relaxed throat; and it is given internally to check diarrhoea and atonic waterbrash or pyrosis. The dose of the **Infusum Catechu** is one to two ounces; alkalies, metallic salts, and gelatine are all incompatible with the infusion. **Tinctura Catechu** contains cinnamon and proof spirit, and is given in dose of half to one drachm.

**Pulvis Catechu Compositus**, a reddish-brown astringent powder of catechu, with kino, rhatany, and nutmeg, is a very useful aromatic astringent in dose of ten to twenty grains.

The **Pulvis Kino Compositus**, it will be remem-

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\* See Paper by Mr. G. Johnson, *Pharmaceutical Journal*, vol. vii. p. 179.

bered, is also a reddish-brown astringent powder, but it contains Pulvis Opii 1 in 20.

The Coffee plant, *Coffea Arabica*, belongs to the Cinchonaceæ. Coffee and Tea yield a similar crystalline principle, called *Caffein*, or *Thein*. It contains nitrogen, and acts on the system as a nerve-stimulant, producing excitability and sleeplessness. Caffeine,  $C_8H_{10}N_4O_2$ , exists in the raw coffee seed as a tannate; and, in the process of roasting the coffee, this tannate of Caffein is partially transformed into a stimulating alkaloid, *methylamine*. Pure caffeine occurs in silky needles, sublimable by heat. With citric acid it forms a soluble citrate, a salt that I have found valuable in cases of spasmodic asthma\* and in cases of feeble heart with dropsy. Dose 1 to 2 grains in water or in warm coffee.

Strong infusion of coffee is an excellent restorative in cases of opium poisoning, it arouses the torpid nervous centres. Caffeine alone does not possess this power.

In sick headache citrate of caffeine is often a useful remedy.

The light-brown powder named *Guarana*, after the tribe of the Guaranis, who employ it medicinally, resembles Thein and Caffein in composition and also in properties. The dose of Guarana is five to ten or twenty grains stirred in water. A tincture and extract are also employed. The Guarana acts as a nerve tonic, and is good in cases of sick headache, with severe pain over the eyebrow or in the temples.

Guarana is prepared from the seeds of the *Paullinia sorbilis*; these are bruised, made into paste, and formed into cylinders, in which state Guarana is sent into the market.

*Paullinia sorbilis* belongs to the Natural Order

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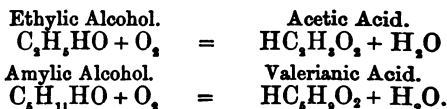
\* See Lettsomian Lectures on Bronchial Asthma, given before the Medical Society of London. 1819. *Lancet*.

*Sapindaceæ.* Tea is derived from the Order *Cameliaceæ.*

#### VALERIANACEÆ.

**Valerianæ Radix.**—The root of the wild Valerian, common in England, is collected in autumn and dried. It is a short yellowish rhizome, with fibrous roots attached, and the fresh root has a strong odour and bitter taste. Distilled with water the root yields volatile oil of valerian and valerianic acid. The volatile oil of valerian contains a camphor-like body, forming white crystals identical with Borneo camphor.

Valerianic acid is an oily, strong-smelling liquid, forming crystalline salts. It is usually prepared by the oxidation of Fousel oil or Amylic alcohol. It bears the same relation to Amylic alcohol, that Acetic acid does to Ethylic alcohol. Thus the two oxidations are compared by Attfield—



On reference to Valerianate of Soda in the B. P. it will be seen how the Amylic alcohol is oxidized by distillation with dilute sulphuric acid and bichromate of potash to form Valerianic acid. From the valerianate of soda, other valerianates, as those of zinc and iron, can be made by double decomposition. Hot solutions of sulphate of zinc and valerianate of soda mixed yield on cooling a crop of crystals of valerianate of zinc.

Valerian acts on the system as a nerve tonic and sedative to reflex excitability. It is used with benefit in epilepsy, chorea, headache, neuralgia, and nervous palpitation of the heart. The **Infusum Valerianæ** may be given in dose of one to two ounces, and the **Tinctura Valerianæ Ammoniata**, made by mace-

rating valerian root in aromatic Spirit of Ammonia, in dose of half to one drachm, may be added to the infusion. The proof spirit *Tinctura Valerianæ* is given in dose of  $\frac{1}{2}$  to 1 drachm, and like the Ammoniated tincture, is of a reddish-brown colour.

The valerianates of zinc, quinia, and ammonia are thought by some to act on the nervous system in a similar way to valerian; but in my experience are far inferior in efficacy to the preparations of valerian root. Valerianate of zinc has a strong repulsive odour, which is a great objection to its use. Probably the active part of valerian is the camphorated essential oil, and valerianic acid has very little power by itself when artificially made.

#### COMPOSITÆ.

**Pyrethri Radix.**—Root of *Anacyclus Pyrethrum*, Spanish chamomile, or Pellitory of Spain, imported from the Levant. The root contains an acrid resinous matter, *Pyrethrin*, with some tannin. The root has a thick brown bark and is studded with shining black points.

Pellitory is an example of a *sialogogue*, from the Greek *σάλων*, *saliva*, and *ἀγωγός*, *evoking*—that is, a medicine promoting the flow of buccal mucus and saliva. If a piece of pellitory root be chewed, it would then be said to act as a *masticatory*. Pellitory is not given internally; a small piece chewed relieves toothache, and a gargle made with the *Tinctura Pyrethri*, two or three drachms to one pint of water, is used for the same purpose.

The tincture mixed with glycerine, or mel rosæ, makes a very excellent application to be rubbed over the gums of infants when in dentition difficulties.

*Artemisia Absinthium*, or Wormwood. The infusion of the flowering herb is given as an aromatic bitter tonic and anthelmintic, but is not officinal. From an undetermined species of *Artemisia* is obtained *Santonica*, or Russian Worm Seed.



Though called *Semen contra* and *Worm Seed*, *Santonica* is not a seed, but the unexpanded flower-heads of a species of *Artemisia*. The flower-heads are pale greenish-brown, fusiform, and smooth. Those of the *Artemisia Judaica*, or *Barbary Worm Seed*, are round and hairy. *Santonica* may be given in dose of ten to sixty grains against worms, but it is chiefly used to prepare *Santonin*.

**Santoninum**, or *Santonin*, is a crystalline neutral principle, having the composition  $C_{15}H_{18}O_2$ , prepared from *Santonica* by the process given in the B. P. *Santonin* occurs in colourless crystals, yellow if they have been exposed to sunlight, sublimable and hardly soluble in cold or hot water, insoluble in dilute mineral acids, but quite soluble in chloroform and hot alcohol. *Santonin* may be adulterated with mineral or earthy matter, in which case it will leave a residue when incinerated, and will not dissolve in hot alcohol.

*Santonin* is used as a direct anthelmintic, or vermicide, and against the round worm, *ascaris lumbricoides*, *santonin* is most efficacious. The remedy may be given as powder in dose of two to five grains, according to age; or three or four grains may be dissolved in one ounce of castor oil, and this given in doses of one or two drachms at intervals. *Santonin* sometimes causes nervous disturbance and tetanic spasm; it may cause patients to see all objects of a yellow or green colour. It passes into the blood, combining there with soda, and part is excreted by the urine. *Sodic santonate*, in dose of two to four grains, is an effective vermicide; and, being more rapidly eliminated by the urine than pure *santonin*, is by many considered a safer drug for children to take than the uncombined *santonin*. *Santonate* of lime being a soluble salt is also sometimes given. The names of these two salts show that *santonin* is an acid, forming *santonates*, with alkaline bases such as soda and lime. The solubility of *santonin* in

solution of lime, and its insolubility in dilute mineral acid (HCl) are facts made available in the B. P. process for preparing santonin.

**Anthemidis Flores.**—Chamomile Flowers, the double and single flower-heads of *Anthemis nobilis*.

Chamomile flowers contain bitter extractive matter and volatile oil. One hundredweight of flower-heads yields about one and a half ounces of this oil, which varies from a bluish to greenish colour when fresh. The **Ol. Anthemidis**, in dose of two to four minims, acts as a stimulant and stomachic. It will be observed that the oil is added to the **Extractum Anthemidis** after the dark extract has been evaporated; this secures the presence of both bitter matter and aromatic oil in the extract, and makes it a very valuable preparation for use as a tonic and stomachic in dose of two to eight grains. The oil of chamomile reduces reflex excitability in frogs in a remarkable degree, so as even to antagonize the action of strychnia (Binz).

**Infusum Anthemidis.**—Chamomile tea is made by infusing the flowers for fifteen minutes in boiling water. Taken in dose of one or two ounces, cold, it acts as a strengthener of the stomach and promoter of appetite and digestion. If taken warm it acts as an emetic. Scalded chamomile flowers are employed sometimes as an anodyne application to painful parts.

**Taraxaci Radix.**—Roots of the Dandelion, or *Leontodon Taraxacum*, gathered between September and February. Indigenous like chamomile.

The root yields a milk-like juice, which gradually turns brown. This juice contains bitter matter, a crystalline body, *Taraxacine*, and sometimes traces of *Mannite*.

*Taraxacum* is often used in chronic affections of the liver, and the plants are much cultivated in India, the roots being collected between September and February. The roots are sometimes taken in the

form of a paste; at other times they are roasted, ground up, and mixed with coffee, in the proportion of one of *Taraxacum* to nine of coffee.

Lieutenant Pegson states that he knows persons with liver disease in India who are kept alive by the daily use of *taraxacum* coffee.

Animals in India, when affected with liver complaint, are sometimes dosed with *taraxacum*.

Nitro-hydrochloric acid will go well with *taraxacum*, and such a combination is often prescribed in cases of hepatic congestion and torpor. Of the preparations of *taraxacum* the juice, or *Succus Taraxaci*, is one of the best; dose one to two drachms.

The *Decoctum Taraxaci* is also used in dose of one to four ounces, and often acts on the kidneys as a diuretic.

*Extractum Taraxaci* is given in dose of five to twenty grains. The Extract, like the Succus, is made from the fresh root.

During the summer dandelion root yields a thin, bitter juice, not so valuable as the thicker juice obtained from the root in the winter.

Mr. Squire finds that 100 of root yield 30 of juice = 8 of extract.

*Lactuca*, the *Lactuca Virosa*, or Wild Lettuce,—Indigenous.

*Extractum Lactucæ* is the only preparation made from the lettuce; it is usually of a brown colour, and is given in dose of five to twenty grains, as a very mild sedative.

Lettuce contains a body known as *Lactucarium*, which is the juice collected and dried. A crystalline body, *Lactucone*, soluble in alcohol and ether, but not in water, has been obtained from *Lactucarium*.

*Lactucarium* is best given as a pill in the same dose as the lettuce extract, as a mild sedative to relieve irritating cough. Combined with ether in a mixture I have known it very useful in bronchitic asthma.

Lettuce lozenges are used to allay cough.

**Arnica Radix.**—The twisted rough rhizome and rootlets of the *Arnica Montana*, or Leopard's Bane, from Southern Europe. A volatile oil and a bitter principle, *Arnicine*, soluble in water, have been found in both the root and yellow flowers of the *Arnica* plant. From recent researches it appears, however, that the value of *Arnica* depends on a clear, colourless, alkaline fluid, *Trimethylamine*,  $C_3H_7N$ , which is readily soluble in water. This body is found in herring brine, and has been employed as a remedy in acute rheumatism. Applied in concentrated state to the skin, *Trimethylamine* acts as a rubefacient. The officinal preparation of the root is **Tinctura Arnicae**, a lemon-yellow or sherry-coloured tincture. I have long been in the habit of using a tincture made with equal parts of the flowers and root of the *Arnica*, and this seems to me a stronger and better preparation than that made with the root alone.

Internally, in dose of twenty to forty minims, Tincture of *Arnica* acts on the nervous system as an excitant and stimulant. Externally, in the form of a lotion, with two or three parts of water to one of tincture, this remedy is used against bruises and recent injuries, and certainly has a remarkable power in promoting resolution of ecchymoses resulting from injuries. In prolapsed bowel of young children, rubbing the spine with *arnica* tincture is a method of treatment I have employed with success.

Dr. Phillips recommends infusion of *arnica*, 2 drms. of flowers to 8 oz. of hot water, as superior to the diluted tincture, inasmuch as the infusion never causes erysipelas of the skin, an effect that does in some constitutions follow the application of the diluted tincture, though I have never observed it myself.

#### LOBELIACEÆ.

**Lobelia.**—The dried flowering herb of *Lobelia Inflata*, or Indian Tobacco, usually met with in

oblong compressed cakes, as prepared by the Shakers in North America. All parts of the plant contain volatile oil, *Lobelic acid*, and an alkaline principle, first obtained by Proctor, called *Lobelina*, which appears as an acrid yellow liquid, forming crystalline compounds with acids. It is precipitated by tannic acid. One grain of lobelina, diluted with water and given to a cat, caused excessive prostration, with dilated pupils, and recovery after fifteen hours.

Lobelia seeds are very rich in *Lobelina*. The seeds are almond-shaped, puce-coloured, marked with longitudinal and cross ridges, so that their surface looks like basket-work.

On the human subject Lobelia acts somewhat in a similar way to tobacco, causing great prostration, and sometimes vomiting and purging. Lobelia causes death by paralysing the respiratory centres of the medulla oblongata, and in animals poisoned by it the respiration ceases before the heart stops.

Dr. Cutler, of Massachusetts, first drew attention to lobelia as a remedy for spasmodic asthma, in consequence of the benefit he himself derived from its use. In paroxysmal dyspnoea the tincture may be given in dose of thirty to sixty minims every hour till signs of depression appear; or a dose of ten or twenty minims may be given every ten minutes till some effect is observed.

Over the spasmodic element of whooping-cough and chronic bronchitis, lobelia has some power, but it is of no use if there be an inflammatory state of the air-passages; for, owing to its acrid nature, it may tend to increase this condition.

**Tinct. Lobeliæ** and **Tr. Lobeliæ Ætherea** may be given in dose of from ten to sixty minims, according to the effect produced. The first of these tinctures I believe to be preferable as a remedy.

**ERICACEÆ.**

**Uvæ Ursi Folia.**—Bearberry leaves, from *Arctostaphylos Uva Ursi* of Northern Europe and America. The description of the leaves should be studied with a specimen at hand; and it should be observed that the Ph. says, "leaves not dotted beneath, nor toothed on the margin." This is to distinguish them from the leaves of Red Whortleberry, which are dotted and not reticulated on the under surface.

Bearberry leaves contain much tannin, with bitter matter. A crystalline glucoside, *Ursin*, has been obtained by Mr. Hughes. The preparation is the **Infusum Uvæ Ursi**; and this is given in dose of one to two ounces as an astringent and diuretic in catarrhal affections of the bladder and kidneys. Alkalies or acids, can be given with *Uva Ursi*.

*Chimaphila Umbellata* or Winter Green—Order *Pyrolaceae* is not in the B. P. A decoction of the leaves is used sometimes in dose of one to two ounces, as a tonic diuretic in dropsical complaints. A pint of the decoction may be taken in twenty-four hours. *Chimaphila* leaves are lanceolate, smooth, shining, and with serrate edges. When bruised, they smell like tea, and if applied to the skin cause much irritation.

**SAPOTACEÆ.**

To this Order belongs the *Isonandra gutta* or Taban tree of Borneo, the concrete juice of which forms **Gutta Percha**.

**Liquor Gutta-Percha** is made by dissolving 1 oz. of Gutta-Percha in 8 oz. of Chloroform, agitating with carbonate of lead to separate impurities, and then decanting off the clear liquor.

Two ounces of this solution mixed with an ounce of black mustard meal, and then spread over paper, forms the **Charta Sinapis** or mustard paper of the B. P.

## STYRACACEÆ.

**Styrax Præparatus.**—Prepared Storax is a balsam obtained from the bark of *Liquidambar Orientale*, the oriental sweet gum-tree of Asia Minor. Several kinds of storax are known—as storax in grains (very rare), and storax in the reed, or *Styrax calamita*. A third variety, which is common, consists of reddish-brown lumps, mixed with sawdust and other impurity. Liquid storax, very like balsam of Peru, is the officinal variety. Prepared Storax is made by digesting storax in spirit, straining, and then distilling off the spirit, when prepared storax remains as a brownish-yellow honey-like resin, of agreeable fragrance, and aromatic taste.

Storax contains *Resin*, *Cinnamic acid*, and an oily body, *Styrol* ( $C_8H_8$ ), which, when oxidized by warming it with bichromate of potash and sulphuric acid, yields Benzoic acid from the oxidation of the colourless oil *Styrol* contained in storax. Storax acts on the system as a balsamic stimulant. There was, in the Ph. Lond., a storax pill, containing one grain of opium with saffron and storax in a five-grain pill; but now the only preparation into which storax enters is the Compound Tincture of Benzoin. Lately storax has been placed in the Natural Order *Liquidambaraceæ*.

**Benzoinum.**—Benzoin is a balsamic resin from the incised bark of the *Styrax Benzoin* of Sumatra and Siam. The brownish mottled tears in which it occurs are soluble in rectified spirit, and in solution of potash. Benzoin consists of resin and **Benzoic Acid** ( $HC_7H_5O_2$ ), which last may be obtained in white crystals as a sublimate by heating the gum benzoin. Benzoic acid is sparingly soluble in water, but quite soluble in spirit. It combines to form salts, and one of these, the Benzoate of Ammonia, occurs in the B. P.

The dose of benzoic acid is ten to fifteen grains; it passes into the urine as hippuric acid, increasing

the acidity of that fluid. To become hippuric acid benzoic acid takes the elements of glycocine (gelatin sugar), so that hippuric acid is a benzoic glycocine, and may be thus written:  $C_9H_9(C_2H_3O)(NH_2)O_2$ , (Attfield).

Benzoic acid is not often given internally. Like benzoate of ammonia it acts on the mucous membrane of the bladder. Lozenges of benzoic acid are used for chronic sore throat with some advantage. Benzoin is employed internally in the form of inhalation in chronic throat and laryngeal affections, with loss of voice. One drachm of the compound tincture of benzoin, mixed with twenty ounces of water at  $150^\circ$  makes a good inhalation. (Morell Mackenzie).

**Tinctura Benzoini Composita**, known as Friar's Balsam, is an old medicine, containing Benzoin, Storax, Tolu, Socotrine Aloes, and rectified spirit, and much used as an application to wounds and sores. Internally, in dose of half to one drachm, it may be given with mucilage, for hoarseness and chronic cough.

**Adeps Benzoatus** is lard which has been melted for two hours with gum benzoin; it has an agreeable odour, and keeps well. It will be observed that four suppositories of the B. P. and four of ointments are made with benzoated lard.

Benzoic acid is used in making **Tinct. Camph. Co.** and **Tinct. Opii Ammoniata**.

#### OLEACEÆ.

**Oleum Olivæ**.—Olive Oil or Salad Oil is expressed from the ripe fruit or drupe of *Olea Europæa*, a tree growing in the South of Europe.

Olive Oil, the B. P. says, congeals partially at about  $36^\circ$ . This is a sign of its purity; for, if adulterated with poppy oil and other cheap fixed oils, it will not congeal till the temperature is reduced below  $36^\circ$ . The fluid part left after the congelation is nearly pure



*Oleine*, the rest of the oil being *Palmitine*. *Oleine* is oleic acid combined with a radical, *Glyceryl* ( $C_3H_5$ ), of which glycerine is the hydrate. *Palmitine* is *glyceryl* with palmitic acid.

In preparing Lead Plaster olive oil is decomposed, by long boiling with oxide of lead, an oleate being formed while glycerine is set free. Attfield and Martindale have observed that oleic acid readily combines with metallic oxides, forming oleates which are soluble in fats. Such combinations make excellent ointments, and an ointment of the oleate of mercury has been introduced by Mr. Marshall and Mr. Berkeley Hill into very successful use at University College Hospital. See page 127.

Olive oil, it will be seen, enters into three of the Liniments and four of the Unguents of the B. P., as well as into several plasters. The purgative Enema *Magnesiae Sulphatis*, contains 1 oz. of olive oil, 1 oz. of sulphate of magnesia, and 15 oz. of starch mucilage.

Internally, in dose of one to four drachms oil acts as a demulcent and mild laxative; it possesses also nutrient properties.

**Sapo Durus**, or Hard Soap, is made with olive oil and soda, and is an oleate and palmitate of soda. Heated with rectified spirit it entirely dissolves, and it does not impart an oily stain to paper. These tests show the genuine Castile soap as distinguished from Curd soap, which is made with mutton fat and lard. The mottled appearance often seen in Castile soap is due to oxide of iron; when the soap is freshly cut this oxide is black, but after exposure to the air it absorbs oxygen and turns red.

Hard Soap is used in preparing the **Emplastrum Cerati Saponis**, **Emplastrum Saponis**, **Linimentum Saponis**, and **Pilula Saponis Composita**.

Internally, in dose of five to ten grains, soap acts as a laxative, and it is often given in pill with rhubarb. Soap liniment, or *Opodeldoc*, is of a straw colour, and contains hard soap, camphor, oil of rosemary, rectified

spirit, and water. It is used as a stimulant embrocation in rheumatism and chronic affections of joints and muscles. The Compound Soap Pill contains about one grain of opium in five, and is given as an opiate, and sometimes used as a suppository for the rectum.

**Sapo Mollis.**—Soft soap is made with olive oil and potash, and is an oleate and palmitate of potash. It differs from hard soap in yielding on incineration an ash which is very deliquescent.

The only preparation containing soft soap, with camphor, is the **Linimentum Terebinthinæ**, a fawn-coloured emulsion, very useful as an application to the chest in chronic bronchial affections.

**Sapo Animalis**, or Curd Soap, is a soda soap, made with purified animal fat, and consisting mainly of stearin. It is a hard white soap, easily pulverized when dry, and easily moulded when heated. It is of use in preparing various suppositories, and may take the place of hard soap in preparing Iodide of Potassium Liniment. Good curd soap is soluble in rectified spirit, and imparts no greasy stain to paper.

**Glycerine** ( $C_3H_5O_2$ ) is a sweet syrupy liquid, obtained when fats and oils are saponified into soaps or plasters, or distilled with superheated steam. Glycerin is the hydrate of a body, glyceryl, the basylous radical of oils and fats. In constitution glycerin is an alcohol, and may be called glyceric alcohol. Three atoms of hydrogen in the alcohol being replaced by the radicals of the fatty acids.

Glycerine when distilled yields an acrid vapour of *Acrolein*. Glycerine dissolves in water and in alcohol, but not in chloroform, ether, or oils. A solution of one of glycerine in ten of water is antiseptic, and will preserve animal substances as well as spirit does. A variety of substances dissolve freely in glycerine.

Glycerine is applied externally as a soothing and moistening agent in a variety of skin affections. Added to a poultice it insures its remaining moist &

long time. Internally, glycerine is demulcent and very slightly nutritive. As a sweetening agent it may be employed in place of syrup.

Five glycerine solutions occur in the B. P.

1. **Glycerinum Acidi Carbolici.**—Solution of Carbolic Acid in Glycerine. 1 acid in  $4\frac{1}{2}$ . Dose five to ten minims in water. As an antiseptic gargle, two drachms in eight ounces of aqua rosæ.

2. **Glycerinum Acidi Gallici.**—1 in  $4\frac{1}{2}$ . Solution of Gallic Acid in Glycerine. Dose as a remote astringent, ten to sixty minims.

3. **Glycerinum Acidi Tannici.**—1 in  $4\frac{1}{2}$ . Solution of Tannic acid in Glycerine. A direct astringent, of a dark-greenish colour; may be given internally in dose of ten to forty minims. Applied locally to enlarged and relaxed tonsils; when thus used, it is best to dilute it somewhat with water.

4. **Glycerinum Amyli**, or *Plasma*.—1 starch in  $8\frac{1}{2}$ . An opaque jelly made by heating starch with Glycerine. It may be used as the basis of ointments and applications.

5. **Glycerinum Boracis.**—1 in  $4\frac{1}{2}$ . Biborate of Soda, or Borax, dissolved in Glycerine. This may be used as a mouth-wash or gargle, mixed with honey of borax (*Mel Boracis*) and water. Internally, the dose is half to one and a half drachms.

**Manna** is a concrete exudation obtained by incision from the stem of *Fraxinus Ornus* and *F. rotundifolia*. From Calabria and Sicily.

Manna occurs in stalactiform, porous, yellowish-white pieces, and contains 60 to 80 per cent. of a crystallizable sugar, *Mannite*, which does not ferment with yeast. Manna is nutritious, and acts as a mild laxative, often causing flatus. Mixed with acid tartrate of potash it may be given as a laxative to young children. Dose from one drachm upwards.

## LOGANIACEÆ.

**Nux Vomica.**—Seeds of *Strychnos Nux Vomica*, the Koochla Tree of the East Indies. The characters of the seeds should be studied from the B. P. with a specimen at hand. The five seeds are found in the pulp, which fills the round orange-like fruit of the tree. The ashy-grey circular satiny flat seeds contain a powerful alkaloid, *Strychnia*, and two other crystalline bodies, *Brucia* and *Igasuria*; all being combined with a crystallizable acid, *Igasuric* or *Strychnic* acid. *Brucia*, if pure, possesses no powerful action on the system; it gives a bright-red colour with nitric acid, and this red colour is distinguished from that produced by nitric acid and morphia in being changed to violet and green by reducing agents, such as the hyposulphite of soda and chloride of tin. These decolorize the morphia red entirely.

The bark of the nux vomica tree contains strychnine; and hence the serious accidents which happened when this bark was confounded with *Cusparia* or *Angustura* bark. (See *Rutaceæ*.)

*St. Ignatius' Bean*, from the Philippine Islands, is a dark-brown irregularly triangular bean, and yields as much as 1·2 per cent. of strychnia; this is more than is yielded by nux vomica seeds.

*Nux vomica* and strychnia act specially on the spinal cord, increasing its irritability, and causing muscular twitchings, spasms and tetanic convulsions; with, finally, death by asphyxia.

Medicinally, *nux vomica* is of great value as a nerve tonic in cases of paralysis where all inflammatory action has subsided. The effect of the drug is seen soonest to be manifested on the paralysed limbs. The paralysed limb has been seen to sweat and to become covered with an eruption before any sign appeared in the sound part of the body. *Nux vomica* does not cause narcotism of the brain, nor does it much affect the pulse; but in poisonous dose it exhausts

the nervous irritability, and produces death by stoppage of respiration; and, according to Dr. J. Harley, by destroying the powers of the tissues to absorb oxygen.

In dyspepsia, with much flatus in the stomach and bowels, and tendency to cardiac palpitation, the extract and tincture of *nux vomica* are excellent remedies.

In old bronchial asthma with very prolonged expiration I have found *nux vomica* highly beneficial.

Dose of **Tinctura Nucis Vomiceæ**, five to fifteen minims—eleven minims equal one grain of *nux vomica*; of **Ext. Nucis Vomiceæ**, the dose is one quarter to one and a half grains. This Extract is a very good addition to a pill of aloes and iron. It tends to give tone to the muscular coat of the intestine. When first given to a patient, *nux vomica* should always be tried in the smallest of the above indicated doses. A dose of ten minims of the tincture given to an adult has been known to cause alarming symptoms; and large doses, if persisted in, seem to me to check the secretions of the body, and to fail in effecting much permanent relief.

**Strychnia** ( $C_{21}H_{23}N_2O_2$ ).—This crystalline alkaloid of *nux vomica* is soluble in hot alcohol and chloroform, not in ether. Cold water dissolves only one-two thousandth part, and forms a very bitter solution. Strong sulphuric acid added to a crystal of strychnia, and a little solution of bichromate of potash, forms a purple colour, soon fading to yellowish-red.

When given medicinally, it is best to give strychnia in solution, as in the **Liquor Strychniæ** of the B. P., of which two drachms contain one grain of strychnia dissolved with the aid of hydrochloric acid. The usual dose of strychnia is from one-thirtieth to one-twelfth of a grain. The Liquor is administered in dose of five to ten minims, and it is an excellent preparation in functional paralysis with a low, exhausted state of system. When taken for some weeks it is proper to suspend its action from time to time, for strychnia seems to collect in the system.

and it may happen that suddenly symptoms of poisoning, indicated by spasm with tetanic convulsions and rigidity, may come on and alarm the patient much. Two minims of Liquor Strychniæ have been used hypodermically, and Mr. Barwell has met with good success in treating the paralysis of young children by means of hypodermic injections of strychnia.  $\frac{1}{120}$ th of a grain is the proper dose to commence with hypodermically. The antidotes to strychnia poisoning appear to be Chloral Hydrate, Calabar Bean; and, with caution, the Enema Tabaci of the Pharmacopœia. The attacks of spasm are best overcome by the inhalation of Nitrite of Amyl drops.

Extract of St. Ignatius' Bean may be given in the same dose as Nux Vomica Extract.

**Gelsemii Radix** (non-off).—The root of the yellow Jasmine of America is used for preparing a tincture, 1 oz. of root digested for one week in 8 oz. of proof spirit. This tincture of gelseminum is given in dose of ten to thirty minims in various forms of neuralgia and is useful in cases of spasmodic cough.

#### ASCLEPIADACEÆ.

**Hemidesmi Radix.**—The dried root of *Hemidesmus Indicus* of India. Indian Sarsaparilla. The pieces are yellowish-brown, twisted, furrowed, and with annular cracks. Odour fragrant and taste agreeable. A crystalline acid, called by Pereira *Hemidesmic Acid*, has been obtained from this root.

*Hemidesmus* is used in India as a diuretic in affections of the kidneys, and it is also given for the sore mouth of young children. It is believed to be, like sarsaparilla, a corrector of vitiated states of blood, and is used in syphilis and other complaints where sarsa is indicated.

Preparation, **Syrupus Hemidesmi**, a dark-brown syrup, of which the dose is one to four drachms. To Order *Asclepiadaceæ* belongs *Solenostemma Argel*, the leaves of which occur, as an adulteration, in *Alexandrian senna*.

## GENTIANACEÆ.

**Gentianæ Radix.**—The dried root of the *Gentiana lutea*, or Yellow Gentian of the Alps and Pyrenees. The root occurs in brown, twisted, wrinkled pieces, with close transverse rings. The inner part is yellow.

The bitter of gentian can be extracted by water or spirit; the bitter principle is called *Gentianin* and cannot be crystallized. Another body found in the root is a yellow crystallizable acid, *Gentianic Acid*,  $C_{14}H_{10}O_6$ ; it is not bitter, and turns dark-brown with alkalis.

Gentian acts on the system as a bitter tonic. Like all bitters, if taken before food it increases the flow of gastric juice, and is a valuable remedy in weakness of stomach. Gentian is reputed to have power in preventing the effects of miasmatic poison. Alkalis or acids may be combined with gentian, but not salts of iron, lead, or silver.

**Extractum Gentianæ.**—A brown consistent extract that makes a good pill basis in dose of ten to ten grains.

**Infusum Gentianæ Compositum.**—Gentian, bitter Orange and Lemon-peel, infused in boiling water. Dose one to two ounces. An excellent tonic, that may be given with ammonia and soda or potash.

**Mistura Gentianæ.**—Gentian mixture contains bitter orange peel and coriander fruit. The ingredients are steeped in proof spirit for two hours, then cold water added. Dose half to one ounce. The compound gentian mixture of the old Pharmacopœia contained senna as well as gentian.

**Tinctura Gentianæ Composita.**—A useful tonic. Dose one to two drachms. Contains orange-peel, cardamoms and proof spirit.

*China Gentian.*—I am indebted to Mr. Gale for information that the small brown rootlets of this gentian come from the *Justicia paniculata* (*Acanthaceae*).

of Bengal and China. There is a parcel of this China gentian, with the original China label, in the Pharmaceutical Society's Museum.

The common Centaury (*Erythræa Centaurium*) and the Buck Bean (*Menyanthes Trifoliata*), contain a bitter principle, and have been used in medicine in a similar way to gentian.

**Chirata.**—Chiretta, the entire plant of *Ophelia Chirata*, is met with in long bundles containing the round, smooth, pale-brown stems and flowers. The roots are often attached also. The plant is a native of Northern India and Nepal; it yields a very bitter extract to water and alcohol. The B. P. contains **Infusum Chiratæ**, made with water at 120°, a pure and intense bitter, good in weakness of stomach and defective action of liver. **Tinctura Chiratæ** is a dark-brown proof spirit tincture. Dose of infusion, one to two ounces; of tincture, half to two drachms.

#### CONVOLVULACEÆ.

**Scammoniae Radix.**—Scammony Root, from the *Convolvulus Scammonia*, is a large tapering root, three or four feet long, growing in the hedges of Syria and Asia Minor. To obtain scammony itself the earth is cleared from the root as it grows, and then the top of the root is shaved off, and in twelve hours the whole of the milky juice, which is but a few drachms, will have drained into the shell placed to receive it. This exudation forms pure virgin Scammony.

**Scammonium**, or Scammony, is a gum resin of an ash-grey colour, with resinous fracture and a cheese-like odour, owing usually to some fermentation having taken place in the juice. It is covered with a light powder, and mixed with water readily forms an emulsion by virtue of the gum which it contains. This gum is not soluble in ether. Scammony is imported from Smyrna. Before leaving Smyrna scammony is much adulterated by the so-called scammony makers. Chalk, starch, and dextrine, or British gum, are the



chief ingredients used in "making" scammony; hence we hear of calcareous or cretaceous scammony, and of calcareo-amylaceous scammony. When thus adulterated the drug effervesces with hydrochloric acid, and its cold emulsion turns blue with iodine, showing the presence of starch. An excellent series of adulterated scammonies are to be seen in the Materia Medica Museum of the Middlesex Hospital. Specimens of impure scammony, faced, or coated, with layers of good scammony, are sometimes met with. Aleppo scammony is usually reckoned as the best.

**Scammonia Resina.** — Resin of Scammony. About 60 or 80 per cent. of good scammony consists of resin, the remainder being gum. The brown transparent resin is soluble in alcohol and ether. It is a glucoside resembling the convolvuline found in jalap, and boiled with dilute sulphuric acid, separates into glucose and a resinous acid.

Scammony resin is said to be adulterated often with common resin, and the resin of guaiacum and jalap. When thus adulterated, it is not entirely soluble in ether. If guaiacum be present then the tincture of the resin will turn the fresh-cut surface of a potato blue (*see* Guaiacum). The resin being separated from the gum in the B. P. process of manufacture, will not form an emulsion with water unless gum be again added. Resin of scammony is employed in preparing scammony mixture and compound extract of colocynth. Scammony is used as a drastic purgative; if the intestine be pretty free from mucus it may act with violence and much griping. As a purgative scammony ranks between jalap and gamboge; it is more active and less nauseous than jalap, but not so powerful as gamboge.

Good scammony may be given in dose of five to ten grains, and the resin in dose of three to eight grains. The smaller dose would be a proper one for a child; and the drug is often given to children as a vermifuge to clear the intestine of worms.

Scammony enters into the Pil. Colocynth. Co. and the B. P. contains a **Confectio Scammonii** of a light-brown colour, in which scammony is made up with honey, ginger, and oils of caraway and cloves. Ten to thirty grains is the dose of this confection, and it contains one of scammony in three.

**Pulvis Scammonii Compositus.**—A compound powder of scammony with jalap and ginger, one scammony in two; a useful purgative in dose of ten to twenty grains. Calomel, or grey powder, may be combined with this powder.

**Mistura Scammonii** is made with resin of scammony triturated with milk. Dose half to two ounces.

**Pilula Scammonii Composita.**—Compound scammony pill made with resins of scammony and jalap, curd soap, tincture of ginger, and rectified spirit. Dose, as an aperient, five to ten grains.

**Jalapa.**—Jalap, named from the Mexican city Xalapa, consists of the dried tubercles of the *Exogonium Purga* of Mexico. True Jalap is known as Vera Cruz Jalap, as distinct from Tampico Jalap.

The larger tubercles of jalap are incised, and sometimes sliced, to facilitate the process of drying. Many tubercles are worm-eaten, but this is no detriment, as the worm consumes only the ligneous and amylaceous matter, and leaves the resin. The tubercles are covered with a wrinkled cuticle.

Powder of Jalap is of a yellowish-grey colour; if inhaled it irritates the nostrils and fauces.

Jalap contains about 15 per cent. of resin. This resin consists of two portions; one is hard and insoluble in ether, the other soft and soluble. The hard resin is called *Rhodeoretin*, or *Convolvuline*; it is a colourless, tasteless resin, soluble in alcohol, and possesses active purgative properties; its composition is  $C_{21}H_{20}O_{16}$ . *Jalapin*,  $C_{24}H_{26}O_{16}$ , exists largely in the spurious, or fusiform, jalap, and it is soluble in alcohol and in ether. This fusiform, or male jalap, is a spindle-shaped root from the *Convolvulus Oriza-*

benis. It is much inferior in activity to the true jalap. Jalap resins are soluble in sulphuric acid, being deposited again in a soft state after some hours. Jalap resin differs from common resin in being insoluble in oil of turpentine. Pure jalap resin turns crimson with sulphuric acid.

**Jalapæ Resina** of the B. P. is obtained by digesting the jalap tuber with rectified spirit, precipitating the resin by water, and then washing and drying it. Jalap resin is a dark-brown, brittle, resinous substance, soluble in spirit. The white powder prescribed as *Jalapin* is the resin decolorized by means of animal charcoal. Like the resin, it may be given as a purgative in dose of two to five grains. Powder of jalap is of a pale grey colour, with sweetish sub-acrid taste, and is given in dose of ten to thirty grains, as an active cathartic, producing watery stools, and acting chiefly on the small intestines. It is an excellent vermifuge, and may be combined with grey powder or calomel.

**Pulvis Jalapæ Compositus**.—Here jalap is combined with acid tartrate of potash and ginger. The dose of this powder is twenty to sixty grains, as a hydragogue cathartic in cardiac and renal dropsy.

**Extractum Jalapæ**.—100 pounds of jalap yield fifty pounds extract. A soft brown extract; dose five to ten grains as a purgative. It is a mixed water and spirit extract.

**Tinctura Jalapæ**.—A reddish-brown proof spirit tincture. Dose half to one drachm as an adjunct to purgative mixtures.

Lately, the tubers of Tampico jalap, *Ipomœa simulans* (?), have been imported to Europe. This jalap has a peat-like odour, and contains from 5 to 14 per cent. of purgative resin, wholly soluble in ether.

#### SOLANACEÆ.

**Dulcamara**.—The dried young branches of the *Solanum Dulcamara*, Bitter-Sweet or Woody Night-

shade, common in hedges, bearing purple flowers, with two round green spots at the base of each segment. Berries scarlet and juicy. An alkaloid, *Solanina*, has been obtained from *Dulcamara* as well as from the *Solanum Nigrum* (black or garden nightshade), and from *S. Tuberosum* (potato). The shoots thrown out by potatoes, when stored in the dark, contain much *solanina*. *Dulcamara* has been used in the form of the *Infusum Dulcamaræ* as a remedy for lepra, and some other chronic skin diseases, in dose of one to four ounces. I have tried an *Extractum Dulcamaræ* in lepra, but found no effect whatever from its use. Dr. Garrod has given the infusion in dose of sixty ounces daily; and the fruit in quantities of half a pound daily, with the effect of curing an obstinate case of lepra.

*Dulcamara* does not cause dryness of the throat nor dilatation of the pupil, like belladonna, hyoscyamus, and stramonium.

**Capsici Fructus.**—The fruit of the *Capsicum fastigiatum*, the Guinea Pepper or Pod Pepper of Zanzibar. The pod contains red colouring matter and an intensely hot resinoid principle, soluble in alcohol, and, when pure, crystallizable; it is known as *Capsicin*. Powdered capsicum forms Cayenne pepper, which has been found adulterated occasionally with red lead. Capsicum is a powerful stimulant to the mucous surfaces; half, to one grain, added to a digestive pill helps to promote secretion of gastric juice in atonic dyspepsia, and to allay nausea.

**Tinctura Capsici**, 1 of capsicum, 27 sp. rect., in dose of ten to twenty minims, is useful at times in the treatment of neuralgia and delirium tremens, as an adjunct to other remedies. In common relaxed and ulcerated sore throat, a gargle of Tincture of Capsicum, half, to one drachm, in eight ounces of Infusion of Roses, is very useful.

## ATROPACEÆ.

**Belladonnæ Folia et Radix.**—The fresh leaves and the dried root of the *Atropa Belladonna*, or Deadly Nightshade, are used in medicine. The activity of both leaves and root is due to the presence of a crystalline alkaloid, *Atropia* ( $C_{17}H_{23}NO_3$ ), and this body is also found in the sweet juice of the black cherry-like fruit of the belladonna; hence the poisonous character of these berries, for *Atropia* is a very powerful poison.

*Belladonna* acts as an acro-narcotic poison to animals, but it affects the herbivora less powerfully than it does the carnivora. A horse has been known to eat eight pounds of the leaves without effect, and blackbirds feed freely on the berries. When given in poisonous dose to man, belladonna produces great dryness of the throat, with dilatation of the pupil of the eye, and if the dose be large, pains and noises in the head, with nausea and delirium, become prominent symptoms. At times a rash, like that of scarlet fever, covers the surface of the body. In fatal cases putrefaction rapidly follows after death. The pulse is quickened by belladonna, and the active principle *Atropia*, is, as Dr. J. Harley has shown, rapidly eliminated by the kidneys. Children bear large doses of belladonna well; the reverse is the case with opium. The caustic alkalies have been shown by Dr. Garrod completely to neutralize the effect of belladonna as well as of *hyoscyamus* and *stramonium*. Opium is believed by some to be antagonistic in action to belladonna, and cases are recorded where the hypodermic injection of the one drug has neutralized the poisonous action of the other. *Physostigma* Calabar bean, is also reputed an antidote to belladonna.

*Belladonna* is used externally as an anodyne to relieve pain. For this purpose we have in the Pharmacopœia an *Emplastrum Belladonnæ* o

considerable strength; and also an **Unguentum Belladonnæ**, both being made with the green extract of the belladonna leaves. The ointment is of great service as an anodyne application to tender inflamed glandular swellings, &c.

**Linimentum Belladonnæ** is a preparation of the root, made by percolating with spirit, and adding one of camphor to twenty of root. Mixed with an equal part of soap or compound camphor liniment it forms an excellent anodyne liniment. **Lin. Bella.** seven parts, chloroform one part, applied on spongipiline, is strongly recommended by Mr. Squire as a cure for lumbago.

**Tinctura Belladonnæ** is made by macerating the bruised leaves in proof spirit. Dose five to thirty minims.

**Succus Belladonnæ.**—Juice of the leaves of belladonna is given in dose of five to fifteen minims.

Internally, belladonna is given in the form of powdered root, of extract, and of tincture. It acts specially on the peripheral ends of the sensory nerves, allaying neuralgic pain and spasm, and not checking the secretions, or causing constipation, as opium does. In neuralgia affecting the stomach and bowels, as well as in facial neuralgia and sciatica, belladonna is a drug often of great value.

Small doses of the extract are at times an efficient remedy for obstinate constipation of the bowels. Belladonna has been long used as a means of causing dilatation of the pupil of the eye. If a weak solution of atropia be dropped into the eye, or some of the extract or ointment of belladonna be rubbed on the skin near the eye, the pupil will be seen soon to dilate. Drs. Harley and Wood ascribe this effect of belladonna to a paralysing action on the peripheral ends of the oculo-motor nerve. Others believe it to be due to contraction of the radiating fibres of the iris, or to the action of the belladonna on the fifth nerve in diminishing the sensibility of the retina.

Belladonna is used to check the secretion of milk; it probably does this by causing contraction of the blood-vessels going to the breast. In the same way belladonna and atropia at times act in a very marked way, to check excessive sweating. For either of the above purposes belladonna may be applied locally, as well as given internally. In checking profuse salivation, belladonna acts by paralysing the terminals of the chorda tympani nerve.

In nocturnal incontinence of urine belladonna is a very certain remedy, and the tincture or extract may be given in gradually increasing doses to persons of all ages troubled with nocturnal incontinence.

In typhoid fever belladonna has been used with advantage to allay delirium. The drug is also employed in the treatment of scarlet fever, and it has been recommended as a prophylactic against the contagion of this disease. In epilepsy, whooping cough, and other nervous convulsive affections belladonna is often employed. In spasmodic asthma repeated doses of belladonna are often very useful, but the drug must be stopped as soon as dilated pupils are observed, and dryness of throat complained of by the patient. The extract may be given in dose of one quarter to one grain. Tincture in dose of five to twenty minims.

**Atropia** ( $C_{17}H_{21}NO$ ).—The process for preparing this alkaloid from belladonna root is given in the B. P. Pure atropia is soluble in alcohol and ether, and sparingly so in water; with terchloride of gold it forms a yellow precipitate. It exists in belladonna combined with malic acid. Solubility in water, one in five hundred; in spirit, one in eight. **Liquor Atropiæ** is a solution of atropia in water, with the aid of spirit in the proportion of one in one hundred and twenty.

**Unguentum Atropiæ** contains eight grains atropia to one ounce of lard, spirit being used to dissolve the atropia. Thirty grains of this ointment, contain-

ing half a grain of atropia, will form a safe, cleanly, and efficient anodyne application.

**Atropiæ Sulphas** is used to prepare the **Liquor Atropiæ Sulphatis**, a solution of the sulphate in distilled water. This solution, being free from spirit, is of service to dilate the pupil of the eye; also for purposes of hypodermic injection. 1 m. =  $\frac{1}{120}$  of sulphate of atropia.

**Stramonii Folia.**—The dried leaves of *Datura Stramonium*, or Thornapple, of Britain. *Stramonium* leaves are ovate, sinuous, and deeply cut, while *bella-donna* leaves are ovate, entire, and smooth, and those of *hyoscyamus* are sinuate, hairy, and clammy, with a strong odour. The leaves and seeds of *stramonium* contain a crystalline alkaloid ( $C_{11}H_{23}NO_3$ ), *Daturia*, identical with atropia.

There are not any preparations made from *stramonium* leaves, but these leaves are smoked in the form of cigarettes, or mixed with tobacco in a pipe, for the relief of asthma. This practice of smoking *stramonium* to cure asthma was introduced by General Gent in 1802. In a severe fit of asthma, Mr. Lawford's plan of inhaling *stramonium* is a good one. The leaves are smoked, and the smoke collected under a glass, which, when full of smoke, is applied over the mouth; a momentary sense of suffocation is felt, followed by expectoration and speedy relief to the asthma.\*

Some years ago the *Datura Tatula* leaf was introduced by Savory and Moore as superior to the *stramonium* as an inhalation for the relief of asthma; and there is abundant testimony to the value of various preparations of *D. Tatula*, as remedial agents in asthma.

With some patients the inhalation of *stramonium*

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\* See "Notes on Asthma," third edition, page 59, by the Author.



smoke produces so much depression as to make the practice a dangerous one.

**Stramonii Semina.**—The characters of these dark reniform seeds, as well as of the leaves, should be studied from the Pharmacopœia with specimens at hand. A tincture and an extract are made from the seeds. **Tinctura Stramonii**, in dose of ten to twenty minims, relieves spasmodic dyspnoea; it should not be combined with mineral acids or caustic alkalies. **Extractum Stramonii** may be given in dose of a quarter of a grain, gradually increased, for the same purposes as the tincture. In intestinal pain and spasm this extract has been highly commended by Dr. Elliotson. Made into an ointment with lard it forms a valuable anodyne in cases of painful cancer. The ointment used at the Middlesex Hospital is made by heating half a pound of stramonium leaves in two pounds of lard, and straining.

**Hyoscyami Folia.**—From the leaves and small branches of the *Hyoscyamus Niger*, or Henbane, an extract and tincture are made. The plant contains a crystalline alkaloid, *Hyoscyamin*, which has been successfully prescribed in cases of mania, with sleeplessness. The German amorphous *Hyoscyamin* is more powerful than the crystalline form. Of this first  $\frac{1}{4}$ th of a grain is a fair dose, and has been found useful by Dr. Savage, of Bethlem Hospital.

**Extractum Hyoscyami** is a green extract, prepared from the fresh juice of the leaves and small stalks. **Tinctura Hyoscyami** is made from the dried leaves by maceration and percolation with proof spirit.

Henbane, like Belladonna and Stramonium, is a mydriatic; it produces mydriasis, or dilatation of the pupil of the eye. Internally henbane is employed as a sedative in cases where opium does not agree; it calms nervous excitement; allays palpitation of the heart, and indirectly promotes sleep. In convulsive affections of children, henbane is often useful. Added to purgatives, as in *Pil. Colocynthis et Hyoscyami*,

it prevents griping. Dose of the Extract, five to ten grains; of the Tincture, twenty to sixty minims, or more.

**Succus Hyoscyami** is the juice pressed from the bruised leaves and mixed with rectified spirit. Dose thirty to sixty minims.

**Tabaci Folia.**—The dried leaves of the *Nicotiana Tabacum*, or Virginian Tobacco, from America. These leaves are large, mottled-brown, ovate, or lanceolate-acuminate, bearing short glandular hairs. Virginian Tobacco contains about 6 per cent. of an oily alkaloid called *Nicotina* ( $C_{10}H_{14}N_2$ ), which is extremely poisonous. This alkaloid is given off when tobacco is distilled with potash. Tobacco also contains a volatile oil. Locally, tobacco is an irritant; and, in the form of snuff, is used as an *errhine* to stimulate and excite the mucous membrane of the nose. Taken internally, or inhaled in the form of smoke, tobacco acts as a sedative and depressant to the heart; often causing, in those not used to it, nausea and extreme collapse. Used moderately, tobacco smoke aids expectoration, promotes regular action of the bowels, and calms nervous irritation.

**Enema Tabaci** contains twenty grains of tobacco to eight ounces of water. This is as much as it is safe to use by injection in cases of obstinate intestinal obstruction; larger quantities given by enema have caused fatal collapse.

**Duboisine** is an alkaloid yellow powder obtained from an Australian solanaceous plant called *Duboisia myoporoides*. Like belladonna, *duboisia* dilates the pupil of the eye and checks sweating.

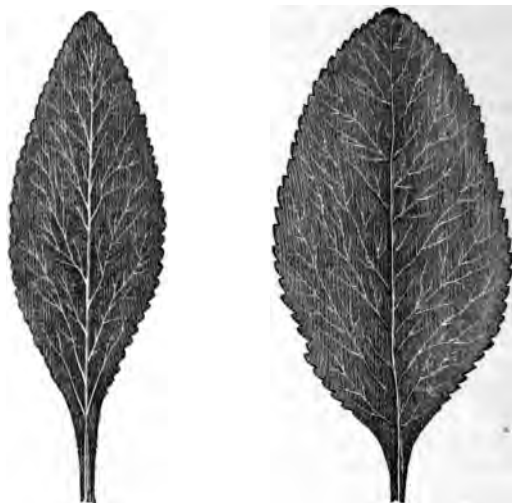
#### SCROPHULARIACEÆ.

**Digitalis Folia.**—The dried leaves of *Digitalis purpurea* or Purple Foxglove. The name *Digitalis* was given to the plant in 1542, by Fuchsius, from the resemblance of the flower to a finger-stall. The leaves should be dried and kept in the dark, as day-

light impairs their medicinal virtue. Leaves of the Mullein, or *Verbascum thapsus*, are sometimes mixed with *digitalis* leaves. In powdering the leaves the stalks, or petioles, should be rejected, and the dry powder kept in a dark place.

Seeds of Foxglove are small, roundish, grey-brown in colour; they are not now used in medicine.

FIG. 9.



FOXGLOVE LEAVES.

First year's leaf.

Second year's leaf (from Pereira).

Fig. 9 represents the leaf of the first and second year. The latter are preferred as most active. The leaves should be collected at the period of inflorescence—*i.e.*, in June and July. The leaves are ovate-lanceolate, rugose, downy, paler on the under surface, with crenate borders.

**Digitalinum**, the assumed active principle of *Foxglove*, is found in the B.P., and a process for its

preparation is detailed. Digitalin does not contain nitrogen, it does not form salts with acids, is not crystallizable, and probably is not a pure principle. It is soluble in alcohol, but not in water, and possesses very poisonous properties. It has been given internally in dose of one-sixtieth to one-thirtieth of a grain. Tannin, and a body called Digitalose, exist in digitalis.

The parts of the nervous system believed to be specially influenced by digitalis are the cardiac ganglia. To these the drug acts as a stimulant, according to Dybkowski, Pellikan, and Handfield Jones. Traube thinks it may act by paralyzing the pneumogastric nerve; but the first theory accords best with recent observations and clinical experience.

Digitalis acts specially on the heart and arterioles. Observations and experiments made by Fothergill, Lauder Brunton, Handfield Jones, and others, show that in animals killed by digitalis the ventricle of the heart is found firmly contracted—the very opposite to the condition of heart observed after poisoning by aconite; and the way in which digitalis may counteract the poisonous effect of aconite has been already alluded to, and reference made to a very well marked case.\* Fothergill observed that *digitalin* possessed less power in inducing cardiac contraction than a preparation containing the other principles of the leaf. The effect of digitalis in causing contraction of the arterioles has been demonstrated by Dr. Lauder Brunton and by Dr. Nunneley. By its primary action on the heart it diminishes the blood volume in the arterioles. When given medicinally, digitalis may at first quicken the beat of the heart; but speedily the pulse-rate falls, and if the drug be continued for a long time a condition of great cardiac weakness results with tendency to syncope on

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\* Hastings' "Prize Essay on Action and Use of Digitalis," by J. M. Fothergill, M.D., 1871, page 7.

assuming the erect position. Large doses of digitalis appear capable of bringing about a tetanic condition of heart that is highly dangerous, while small doses appear to stimulate and tonify a weak heart. Dr. Withering, in 1775, first introduced digitalis into use as a remedy for dropsy; and he observed that it always succeeded best when the pulse was feeble and intermitting, the face pale, lips livid, and when the anasarcaous limbs pitted freely on pressure. With persons of ruddy countenance and firm muscle it rarely agreed as a remedy. Digitalis proves diuretic in cases of dropsy with deficient action of the kidneys; it probably restores the normal amount of arterial pressure on the glomeruli of the Malpighian bodies, and so promotes diuresis. Ergot of rye, which, as Dr. Silver has proved, can be a good diuretic, may act in the same way: by contracting the arterioles it restores the normal amount of blood pressure in the kidney. Fomentations of digitalis leaves, applied externally, are powerfully diuretic in cases of dropsy with suppression of urine. In the dropsy after scarlet-fever I have found the infusion of digitalis an invaluable medicine. In cases of cardiac dropsy with dilated heart and diseased mitral valve, digitalis is very efficacious, it relieves the dyspnoea, due to congestion of the lungs, promotes secretion, and acts in a way that is often quite marvellous. In these cases of cardiac dropsy a pill of powdered digitalis leaf\* one grain, powdered squill one grain, and pil. hydr. one grain, is a time-honoured specific. If there be albumen in the urine then the mercury should be omitted. In Bright's disease, with disorganization of kidney and imperfect urinary elimination, digitalis must be cautiously given, as it may collect in the blood and act in a poisonous way on the system.

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\* In prescribing this pill of the powder of digitalis leaf it is essential that the powder has not been kept in stock over twelve months.

*Digitalis* is of value in cases of hæmorrhage. In hæmoptysis and in menorrhagia it is given with much success. In delirium tremens it has been given in the form of tincture in large (four-drachm) doses. In some cases it has succeeded well, in others it seems to have rather unexpectedly brought about the death of the patient. *Digitalis* is said to be a cumulative medicine, liable to collect in the system, and suddenly to produce death by syncope. I have used *digitalis* frequently and successfully, but have never had any evidence of its cumulative action. *Digitalis* tincture in large doses (half to one ounce) has been praised in acute inflammation, and Wunderlich and others have found it, especially in conjunction with quinia, to lessen a febrile temperature of body; aconite is, however, a safer and more efficient remedy than *digitalis* in these cases. Powdered *digitalis* leaf may be given in dose of half to two grains; **Infusum Digitalis** (3 grains in 1 ounce), two to four drachms; **Tinct. Digitalis**, ten to thirty minims. Closely allied in action to *digitalis* is the Casca, or Sassy, bark of Angola. Lauder Brunton and Walter Pye have proved that casca tincture slows the circulation by stimulating the vagi nerves. In dilated heart, with mitral valve disease, I have used 3-minim doses of tincture of casca with decidedly good effect.

#### LABIATÆ

**Rosmarini Oleum.**—A pale straw-coloured oil, distilled from the flowering tops of *Rosmarinus Officinalis*, or Rosemary. The British oil is superior to that imported. Oil of rosemary is a hydrocarbon, holding in solution a species of camphor.

**Spiritus Rosmarini** is the oil dissolved in rectified spirit. Oil of rosemary acts as a rubefacient and stimulant. Internally the oil may be given in dose of one to five minims, or the spirit in dose of ten to sixty minims. Externally oil of rosemary is used in

the **Linimentum Saponis**. It enters into the composition also of the **Tinct. Lavandulæ Co.**

**Lavandulæ Oleum.**—Oil distilled in Britain from the flowers of *Lavandula Vera*. A yellow oil, with hot taste. The oil is a hydrocarbon, holding a camphor in solution; it is sometimes adulterated with oil of turpentine and with the greenish oil of spike, from *Lavandula Spica*.

Oil of Lavender acts as a stimulant; it is not given alone, but is much used as a perfume, and is used externally in the **Linimentum Camphoræ Co.**

**Spiritus Lavandulæ** may be given internally in dose of thirty to sixty minims.

**Tinct. Lavandulæ Co.**—Tincture of Red Lavender is a compound tincture of oil of lavender with rosemary, cinnamon, nutmeg, and red sandalwood. In dose of thirty to sixty minims it is given as a carminative and nerve tonic in hysteria.

**Menthæ Piperitæ Oleum.**—Oil distilled in Britain from fresh flowering Peppermint. Two lbs. of fresh peppermint will yield about two drachms of oil. The oil is chiefly made at Mitcham. Oil of Peppermint consists of a hydrocarbon, *Menthone* ( $C_{10}H_{18}$ ), and hydrous menthene, a crystalline stearopten, or *peppermint-camphor*. Canton oil of peppermint consists almost entirely of this solid camphor. Peppermint contains some tannic acid.

Peppermint is an agreeable and powerful stomachic and carminative. The fresh herb bruised and applied to the epigastrium allays sickness and cholæric symptoms.

**Aqua Menthæ Piperitæ.**—Water distilled from an admixture of the oil with water. Used in making the **Mistura Ferri Aromatica**, and given as a warm stomachic in dose of one or two ounces. Peppermint water is a good vehicle for sulphate of magnesia and various other medicines.

**Essentia Menthæ Piperitæ.**—One of oil in five of spirit. Dose ten to twenty minims.

**Spiritus Menthæ Piperitæ.**—One of oil in fifty of spirit. Dose thirty to sixty minims, or for very young children two to three minims.

**Menthæ Viridis Oleum** (Oil of Spearmint).—Its properties are similar to those of peppermint, and the B. P. has an **Aqua Menthæ Viridis** prepared by distilling the oil with water; used in dose of one to two ounces.

**Oleum Pulegii** (Oil of Pennyroyal) is not now official. Pennyroyal water has some repute as an emmenagogue in dose of one to two ounces. *Horehound* (*Marrubium Vulgare*), *Balm* (*Melissa Officinalis*), and *Marjoram* (*Origanum Vulgare*), are plants of some medicinal value, belonging to Labiatae, but they are not found in the Pharmacopœia. From the oil of Thyme is prepared the crystalline body *Thymol*, used as an antiseptic when made into a solution of 1 in 100 of water.

#### Sub-Class Apetalae.

##### POLYGONACEÆ.

**Rhei Radix.**—The species of *Rheum* the root of which furnishes the B. P. rhubarb is not known, owing to the great secrecy of the Chinese Government. Pereira found the root of *Rheum Palmatum* most closely to resemble that of the Asiatic rhubarb. Quite recently a rhubarb plant has been introduced at Kew called *Rheum officinale*, as the genuine plant. The best rhubarb was formerly known as Russian Crown rhubarb, and as Turkey rhubarb in England. This rhubarb was brought into Russia from Chinese Tartary and Thibet, and, after passing a rigid scrutiny at Kiächtâ, was brought overland by way of Moscow. The external cortex of best rhubarb has been removed by slicing; externally it is smooth, and covered with a delicate yellow dust, which is not turned red by boracic acid and alcohol, as turmeric powder is. The pieces generally have a hole bored in them, though not penetrating the piece; that is done to ascertain



that the rhubarb is sound in the centre. If rapidly dried by heat the root is apt to be soft in the centre.

East Indian, or half-trimmed rhubarb, occurs in hard roundish pieces, with bits of cortex adhering; externally red and veined, and not covered with yellow dust. This rhubarb is known as *Rheum Sinense*, Canton, and Chinese rhubarb. Very fine samples of this rhubarb, known as best East Indian, are now met with. The root-branches probably constitute what is called the Canton stick-rhubarb. Holes are seen in this rhubarb; they usually penetrate the piece, and sometimes a portion of the woollen cord used in drying the rhubarb remains in the hole.

Dutch trimmed or Batavian rhubarb occurs in round or flat pieces, drilled with a hole.

English rhubarb occurs in long sticks; it is derived from *Rheum Ponticum*, and grows at Banbury, in Oxfordshire.

Himalayan rhubarb was a good deal imported in 1840, when China rhubarb was scarce.

Rhubarb when chewed feels gritty; this is due to the presence of crystals of oxalate of lime, *Raphides*, in the root. These are most numerous in Russian rhubarb, amounting sometimes to 35 per cent. Rhubarb contains a cathartic and also an astringent principle with resinous matters. A yellow crystalline acid, *Chrysophanic Acid*, has been obtained from rhubarb, but the true purgative principle has not been isolated. The above-named acid turns red with alkalis. Rhubarb is used in pill, infusion, and tincture, as a stomachic and tonic aperient, with an after-astringent effect; hence it is a good medicine for diarrhoea due to the presence of acrid matters in the intestine. Bicarbonate of soda acts well in unison with rhubarb; and oil of nutmeg, or cinnamon, disguises very completely the unpleasant taste of the drug. Powdered rhubarb may be given in dose of three to six grains in pill with soap, as a tonic, or in dose of twenty or thirty

grains as a purgative. The colouring matter of rhubarb is excreted by the kidneys.

**Extractum Rhei.**—Rhubarb is digested with rectified spirit and water, and, if good, gives thirty-five per cent. of extract. Dose three to ten grains as a stomachic and aperient.

**Infusum Rhei**, made with sliced rhubarb and boiling water, is given in dose of one to two ounces as a tonic aperient. Gentian and alkalies are often combined with this infusion.

**Pilula Rhei Co.** (Compound Rhubarb Pill), much used as an aperient, contains Rhubarb, Socotrine Aloes, Myrrh, Hard Soap, Oil of Peppermint, and Treacle. Dose five to ten grains.

**Pulvis Rhei Co.**, known as Gregory's Powder, contains Rhubarb, Ginger, and Light Magnesia. Dose as an aperient and antacid, thirty to sixty grains. Five to ten grains for children.

**Syrupus Rhei**, in dose of one or two drachms, is a good aperient for children. This syrup contains Coriander.

**Tinctura Rhei** contains, besides Rhubarb (one in ten), Coriander, Cardamoms, and Saffron. Dose as a stomachic one to two drachms; in larger doses it is purgative.

**Vinum Rhei.**—Sherry Wine, Rhubarb, and Canella Alba Bark compose this preparation; it does not keep well. The dose is one to two drachms.

**Chrysophanic Acid** is the active principle of *Goa Powder*, much used in the treatment of skin diseases. One of this acid in five of Ozokerine forms an ointment recommended by Mr. Balmanno Squire in eczema and psoriasis.

#### MYRISTICACEÆ.

**Myristica**, or Nutmeg, is the kernel or endocarp of the fruit or drupe of *Myristica officinalis*, from the Banda islands of the Malayan Archipelago. Nutmegs

are dried in their shells, which are then cracked open, and the worm-eaten nuts being rejected, the good ones are packed in casks dusted with lime, and so sent to England. The true round nutmeg consists chiefly of oleaginous albumen, the reddish veins of which abound in volatile oil. The mace surrounding it is at first red, but becomes yellow after keeping. The long wild nutmeg has a red mace, distinguished as wild or false mace. The envelope, or *aril*, of the nutmeg, known as mace, is an expansion of the exostome, and therefore an *arillode* or false aril (Planchon). Nutmegs contain a concrete oil or fat, obtained by expression and heat, and known as oil of mace; and also a volatile oil obtained by distillation. The fixed fat yields crystalline, *myristic*, acid. Nutmeg, it will be seen, enters into four preparations, two of which are powders. **Oleum Myristicæ**, British volatile oil of nutmeg, is used in preparing **Spiritus Myristicæ**. The expressed concrete oil of nutmeg, **Oleum Myristicæ Expressum**, is used in making **Emplastrum Calefaciens** and **Emplastrum Picis**.

Oil of nutmeg is given internally in dose of one to five minims. The oil enters into the pill of Socotrine Aloes, and the Aromatic Spirit of Ammonia. The spirit may be given in dose of thirty to sixty minims. Nutmeg acts as a warm stimulant, tending sometimes to induce headache and somnolence.

#### LAURACEÆ.

**Cinnamomi Cortex**.—Rolled quills of Cinnamon bark from Ceylon. The inner bark of shoots from the truncated stock. Cinnamon bark yields a dark volatile oil, which is a hydride of cinnamyl. It is converted by alkalies into cinnamic acid, and by nitric acid into benzoic acid. A certain amount of tannin and resinous matter is also present in cinnamon bark.

Cinnamon is stimulant, aromatic, and astringent, and is used against diarrhoea with flatulence. The

oil, in dose of one to two minims, very effectually covers the taste of rhubarb in a draught. Cinnamon enters into a large number of preparations. **Aqua Cinnamomi**, made by distilling bruised cinnamon with water, is given as a pleasant astringent in dose of one or two ounces. It forms the bulk of guaiacum and chalk mixtures. **Tinctura Cinnamomi**, a dark brown tincture, made by digesting bruised cinnamon in proof spirit, is given in dose of one or two drachms. **Pulvis Cinnamomi Co.** is a dark fawn-coloured aromatic powder, containing Ginger and Cardamoms. Dose five to ten grains. **Oleum Cinnamomi**, when good, sinks in water. Dose one to five minims.

Cassia Bark, or Chinese cinnamon, yields a volatile oil. The bark is thicker and rougher than that of Ceylon cinnamon. **Aqua** and **Tinctura Cassiæ** formerly existed in the Ph. Edin.

**Camphora.**—Camphor is a white, semi-transparent, concrete, volatile oil obtained by sublimation from the wood of *Camphora officinarum* of Japan. Dutch Tub camphor is made by boiling the roots and wood of the camphor tree and allowing the camphor to volatilize and condense on straw placed in a head fitted over the vessel. The common kind of camphor is the China or Formosa camphor, obtained by boiling the wood in water and collecting the camphor on the stick used in stirring. Crude brownish camphor is purified by mixing with lime and then subliming it in glass *bomboloes*.

By the action of nitric acid camphor is oxidized into camphoric acid. Oil of camphor is obtained by distilling branches of the camphor tree with water. It appears as a brownish oil with strong camphoraceous odour, from holding camphor in solution. Camphor acts externally as a rubefacient, and occurs in pharmacy, dissolved in olive oil, 1 in 5, as **Lini-mentum Camphoræ**, or Camphorated Oil. **Lini-mentum Camphoræ Co.**, or Compound Camphor

Liniment, is a cleanly and useful rubefacient, consisting of camphor with ammonia, oil of lavender, and rectified spirit.

Internally, in excessive dose of forty grains, camphor has caused failure of pulse, vertigo, convulsions, and delirium. In ordinary dose of one to ten grains, camphor stimulates the brain and nervous and vascular systems.

It acts also as an anaphrodisiac, and will allay painful excitement of the genital organs. Camphor prevents the strangury that is sometimes caused by cantharides.

**Aqua Camphoræ**, formerly **Mistura Camphoræ**, is a solution of camphor, made by confining camphor in a muslin bag under water. One ounce contains about half a grain of camphor. Camphor water is much used as a vehicle for carbonate of ammonia and saline febrifuge medicines.

**Spiritus Camphoræ** contains one in ten. Dose ten to thirty minims in milk or emulsion. This preparation is very useful in diarrhoea of choleraic type. Externally, it is applied to harden the skin, and prevent bedsores. Taken in repeated small doses it is good for cutting short a cold; and taken in the same way, gives much relief in hay-fever or summer catarrh.

**Tinctura Camphoræ Co.**, known as **Paregoric Elixir**, contains camphor with Oil of Anise, Benzoic Acid, Opium, and proof spirit, one drachm containing a quarter of a grain of opium. The dose is thirty to sixty minims in chronic cough and bronchitis.

**Murray's Fluid Camphor** is camphor dissolved in fluid magnesia. Sumatra or Borneo camphor occurs in small, hard, opaque crystals, and comes from a tree of the Dipterocarpus tribe; it is rarely met with in this country.

Artificial camphor is made by passing hydrochloric acid gas through oil of turpentine.

**Sassafras Radix.**—Dried root of *Sassafras officinale*.

from North America. Occurs in branched, and also in chips. The bark is greyish-brown, agreeable odour and aromatic taste. It contains essential oil, *Oleum Sassafras*, Resin, and a principle called *Sassafrasin*. Sassafras root in chips is employed in the *Decoct. Sarsæ* Co.; it acts as a stimulating cathartic.

**Nectandra Cortex.**—Bark of the *Nectandra* tree, or Greenheart tree, of British Guiana. The bark occurs in large flat pieces a foot or two long, reddish-brown externally, dark brown internally, with astringent taste. From this Bebeeru bark is obtained **Beberia**, a non-crystalline alkaloid, soluble in alcohol, and for the preparation of the sulphate process is given in the B. P.

**Beberia Sulphas** ( $C_{22}H_{40}N_2O_4H_2SO_4$ ) occurs in brown translucent scales, which are yellow when dried, and soluble in water and alcohol. *Beberia* is given in dose of one to ten grains as a cathartic and antiperiodic. Some consider it of use in neuralgic headaches, and also in menorrhagia. Alkaloids and astringents should not be combined with it. Another alkaloid, *Nectandria*, has been found in the bark.

*Bibirine*, or *Bibirine*, must not be confounded with *Beberia*, or *Berberine*, the yellow alkaloid found in the root, Podophyllum root, Hydrastis Canada, and many yellow woods.

*Laurus Nobilis*, or Sweet Bay, is not official. The small, cherry-like berries (Bayberries) contain essential oil, called Oil of Bays. It is not used now.

#### ARISTOLOCHIE.

**Serpentaria Radix.**—Dried rhizome of *Aristolochia* *Serpentaria*, or Virginian Snakeroot. Occurs in small rhizome with pale greyish radicles growing from it. The root contains a volatile oil with resinous matter. It has a warm camphoraceous

taste, and acts as a stimulating diaphoretic. Serpentry is of service in chronic bronchitis in rheumatic constitutions.

**Infusum Serpentariæ** is given in dose of one to two ounces; ammonia goes well with this infusion.

**Tinctura Serpentariæ**, in dose of half to two drachms, may be added to the infusion. Often tincture of serpentry is combined with senega and ammonia in treating chronic bronchitis in old persons with weak or diseased heart.

#### THYMELACEÆ.

**Mezerei Cortex.**—The dried bark of *Daphne Mezereum*, or Wood Laurel, collected in Kent and Hampshire. The root bark is more active, and commands a better price than the stem bark. The Ph. describes the bark as olive-brown on surface, white and fibrous within. Mezereon contains acrid volatile oil and resin, with a crystalline principle, *Daphnin*. The bark has been used as a masticatory in toothache and paralysis of tongue. Locally mezereon is a very strong irritant; it is said to be of service in chronic rheumatism. It enters into the Decoctum Sarsæ Co. **Extractum Mezerei Æthereum** is a soft green extract used in preparing **Linimentum Sinapis Co.**; eight grains are contained in one ounce.

#### EUPHORBIACEÆ.

**Cascarillæ Cortex.**—Cascarilla Bark, from the *Croton Eluteria* of the Bahama Islands. In short quills, coated with white lichens, warm and bitter to the taste; diffuses a fragrant odour when burned. Chips of wood cut off by a knife are mixed sometimes with the quills of bark. Cascarilla bark is seen on section to contain cells filled with oleo-resin; and a crystalline principle, *Cascarilline*, has been obtained from the bark. Cascarilla is an aromatic bitter tonic, useful in convalescence, and in cases of irritable bowels, with tendency to diarrhoea. The bark yields

virtue to water and spirit, and we have the **sum Cascariellæ**, of which the dose is one to two ℥s; when fresh, this is an excellent vehicle for mineral acids, or for ammonia. **Tinctura Cascariellæ**, in dose of one to two drachms, may be added to the infusion. The resin held in solution by the ether is precipitated by dilute acids, and a turbidity thus caused in the mixture. Cascarilla contains iron, and will not go well with iron.

**oleum Crotonis**.—Croton Oil, expressed from the seed of the Croton Tiglium of the East Indies. The seed of the seed is dark-brown or blackish. The pericarp is thin, brittle, and light in colour. The seeds are oval oblong in form. Croton oil contains crotonic oil, and a volatile oily acid, *crotonic acid*. The oil is soluble in ether. Agitated with alcohol, and cooled, it forms a clear solution, from which about one-fourths of the oil separate on cooling.

Internally, croton oil acts as an irritant, producing a papular and later a pustular eruption on the skin.

**Lintimentum Crotonis**, a greenish-yellow ointment, containing Croton and Cajeput Oil, with refined Spirit, forms a very powerful counter-irritant.

Externally, croton oil is a powerful and rapid cathartic.

From one-third to one minim may be given in pill bread crumb, or a drop of the oil may be placed on the patient's tongue; and given thus it is a most powerful purgative in apoplexy with loss of consciousness.

In neuralgic affections croton oil has been recommended as a purgative.

Garrod finds a combination of one-twelfth of a grain of croton oil with castor oil efficient as a cathartic. The acidity of the croton oil is mitigated in this combination.

**oleum Ricini**.—Castor Oil is expressed from the seed of the Ricinus Communis of East India and America. The seeds are oval, of a pale grey colour.



marbled with brown spots and stripes. The best castor oil is "*cold drawn*"—*i.e.*, expressed from the seeds, and not extracted by the aid of heat; for heat tends to cause acidity in the oil (Soubeiran). Castor oil is entirely soluble in one volume of alcohol. It is a fixed oil, containing glycerine united with ricinic, ricin-oleic, and ricin-stearic acids. Ether dissolves castor oil. Many fixed oils, if mixed with castor oil, are rendered soluble in alcohol. Lately a tasteless castor oil has been prepared by Allen and Hanbury; it does not rise on the stomach, and is an effective purgative.

Castor oil is used externally in *Collodium Flexile* and in *Linimentum Sinapis Co.* A drop put in the eye is good to relieve irritation of the cornea from injury and abrasion of the epithelium. Mixed with an equal quantity of *Balsam of Peru* castor oil forms an excellent dressing for bed-sores.

Internally, castor oil is a safe, speedily acting purgative. In cases of colic and painful irritation of the bowels it is a good purgative, as well as in cases where the bowel is obstructed by a collection of feces. From one to three drachms of pale cold-drawn oil is enough for a child; half to one ounce for an adult. The oil may be given floating on some aromatic water.

In dysentery and dysenteric diarrhoea castor oil is a most valuable medicine. It may be given in dose of one to two drachms in emulsion with *Tr. Rhei* one drachm, and *Tr. Opii* five minims, three times daily.

Rubbed over the abdomen castor oil produces purgation.

The leaves of the plant, *Folia Ricini*, made into a decoction are applied to the breasts to promote the secretion of milk: applied, therefore, for the opposite purpose to that for which we use belladonna.

*Kamala*, *Kameela*, or *Wurrus*, is a red powder, long used as a dye, composed of minute glands adhering to the capsules of *Rottlera Tinctoria*, of East India, so

named after Dr. Rottler. The fruit ripens in the spring, when it is gathered and the red powder brushed off. Kamala contains resinous matter, and is soluble in alcohol and ether. The insoluble residue consists of tufted hairs, and very often of sand. Its action is that of a purgative and anthelmintic, and it is used for the cure of tænia or tapeworm. The dose, of 30 to 120 grains, may be given stirred up in gruel; large doses are apt to produce severe purgation. Dr. Anderson found that after a dose of three drachms of kamala, the worm was usually expelled in the third or fourth stool, entire and dead.

#### PIPERACEÆ,

**Piper Nigrum.**—Black Pepper, the dried, unripe berries of *Piper Nigrum* from Sumatra, Penang, and Malabar. The heaviest and best is the Malabar pepper. White pepper is the fruit deprived of the external pericarp, or decorticated.

Pepper contains a crystalline body, *Piperine* ( $C_{15}H_{19}NO_3$ ). This body is tasteless and odourless; it exists in the long pepper, and also in cubebs.

A light volatile oil gives the odour and taste to pepper.

Pepper is an acrid stimulant, acting specially on the mucous membranes; its use in excess may cause eruption of nettle-rash on the skin. Taken as a condiment with food it aids the flow of gastric juice. Pepper steeped in brandy is a popular remedy against the cold fit of ague. Piperine dissolved in spirit has been given with success as an antiperiodic in ague.

**Confectio Piperis.**—Black Pepper mixed with Caraways and Honey. A dark, olive-brown paste, being an imitation of the so-called *Ward's Paste*, invented by one of that name, and employed by him very successfully in curing piles. The dose of *Confectio Piperis* is one to two drachms two or three times a day, for the relief and cure of fistula and piles. *It acts as a local stimulant to the rectum.*

Pepper is contained in **Confectio Opii** and in **Pulvis Opii Co.** Formerly an ointment of black pepper was used to cure *Tinea capitis*.

*Piper Longum*.—The unripe fruit of *Piper Longum*, or *Chavica Roxburghii*, is not now official. It occurs in spikes or spadices, greyish-brown in colour, about an inch long, with aromatic odour and pungent taste. Its properties and uses are similar to those of *Piper Nigrum*.

**Cubeba**.—The dried unripe fruit of *Cubeba officinalis*; grows wild at Bantam, in Java, from which island it is imported. Cubebs resemble black pepper, but each fruit has a small stalk attached (*Piper candidum*), and the odour is characteristic.

Cubebs contain essential oil, **Oleum Cubebæ**, a non-crystalline principle, *Cubebine*, somewhat like Piperine, and resinous matter.

Cubebs and the oil act as special stimulants to the genito-urinary mucous membrane. In cystitis, gonorrhœa, and gleet, when inflammation has subsided, cubeb pepper is a good remedy. Of the powder twenty to sixty grains, or more, may be given as a bolus in wafer-paper, three times daily.

**Tinctura Cubebæ**, a straw-coloured tincture containing 1 of cubebs in 8 of rectified spirit, in dose of one to two drachms, goes well with tincture and syrup of orange. The **Oleum Cubebæ**, in dose of five to twenty minims, may be given with syrup and mucilage; and copaiba is sometimes added. Cubebs, in the form of lozenge, is an excellent remedy for chronic sore throat and tonsillitis. Brown's Bronchial Troches are said to contain cubebs. When given for any urinary affection, cubebs should be commenced in small dose, for a large dose may add to existing irritation.

**Maticæ Folia**.—Matico leaves, from *Artanthe elongata*, or *Piper angustifolium* of Peru. These leaves are from two to eight inches long, veined and **resellated** on the upper surface, downy beneath.

Matico leaves contain a little tannin, with a crystalline acid and Terebinthinate oil. The leaves applied locally act as powerful styptics to stop bleeding, and it is believed that their action, when thus used, is a mechanical one, due to the structure of the leaf. **Infusum Maticæ**, in dose of one to two ounces, is given internally as an astringent in gonorrhœa, leucorrhœa, and similar affections. Lately Professor Bentley has described a species of matico from *Arctanthe adunca*. The leaves of this matico are not reticulate on the upper, and downy on the under surface, like true matico. It contains a Terebinthinate oil, and is useful as a styptic.

#### SALICACEÆ

**Salicis Cortex.**—Willow Bark is not officinal. The bark, which occurs in tough fibrous quills, yields a white crystalline body, *Salicine* ( $C_{12}H_{10}O_7$ ), which turns blood-red with strong sulphuric acid. Salicine occurs also in poplar bark and in castoreum. By oxidation it yields *Salicylous Acid*, or hydride of salicyl, which is identical with Oil of Spiræa Ulmaria, or Meadow Sweet. Salicine, in dose of ten grains or more, has been given as a febrifuge and anti-pyretic; it appears in the urine as hydride of salicyle, or salicylous acid, and so causes the urine to turn purple with persalts of iron. Salicin boiled with sulphuric acid yields *Saligenin* and glucose.

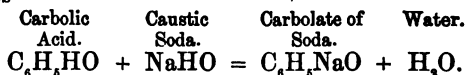
Salicine in dose of 10 to 20 grains has recently been employed with great success by Dr. Maclagan and others in the treatment of rheumatic fever; it soon allays local pain, and then reduces temperature.\* I can, from trials of willow-bark salicine in rheumatic fever, thoroughly confirm all that has been said in its favour.

Salicine is soluble in water in proportion of 1 in 28, but it is best given stirred up in milk. As a remedy for

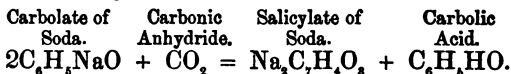
\* See *Lancet*, January, 14, 1882; *British Medical Journal*, May 20, 1876, and January, 1882.

the pyrexia of phthisis and tuberculosis salicine has not proved of any value in my hands.

**Salicylic Acid and Salicylate of Soda.**—When salicine is oxidized by heating it with red chromate of potash and sulphuric acid there is perceived the odour of salicylic aldehyde, hydride of salicyl, or salicylous acid ( $C_6H_5O_2H$ ), identical with the essential oil existing in the meadow sweet (*Spiræa ulmaria*). Salicylate of methyl exists as the essential oil of winter green (*Gaultheria procumbens*). From these natural sources pure salicylic acid ( $C_6H_5O_2$ ) can, by oxidation, be obtained in white acicular crystals. Salicylic acid is now made on a large scale by passing carbonic acid (carbonic anhydride) into a mixture of carbolic acid and caustic soda in a retort at a temperature of  $212^\circ$ , gradually raised to  $500^\circ$ , and decomposing the salicylate of soda with an acid. During this process a little carbolic acid distils over, while sodium salicylate remains in the retort. In the first part of the process—

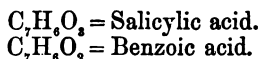


In the second part—



When the solution of salicylate of soda is decomposed by hydrochloric acid the salicylic acid precipitates in prismatic crystals. (Muter.)

Salicylic acid is called also *Oxybenzoic acid*, and its close relation to benzoic acid is evident on comparing the formulæ, thus—



Just as hydride of benzoyl, benzoic aldehyd, or essential oil of bitter almonds, yields by oxidation benzoic acid, so salicylic aldehyd, hydride of salicyl,

or essential oil of spiræa by oxidation yields salicylic acid.

Pure crystalline salicylic acid is dissolved by cold water in the proportion of 1 in 1800, but is freely soluble in hot water and alcohol; from its solution in this last it deposits in pure white acicular crystals. In olive oil and in glycerine the acid is fairly soluble. With persalts of iron salicylic acid forms a deep violet colour. When heated salicylic acid is decomposed and gives off carbolic acid.

**Uses.**—Salicylic acid is a most powerful antiseptic, and is used to preserve milk and beer from turning sour. In the form of lotion it may be employed as a saturated solution in cold water. Stronger solutions are very irritating to any raw surface, and may well be replaced by solutions of boracic acid. Internally, the acid has been given in dose of 10 to 20 grains; it rapidly passes out in the urine, and is apt seriously to disturb the stomach, so that now the soda salt, *Sodæ Salicylas*, is employed in place of the free acid. Well made salicylate of soda, as prepared by Kolbe's process, should be free from all odour of carbolic acid; and when quite pure should crystallize in pearly plates, though commonly we meet with it as a white powder soluble in water as 1 in 1. This salicylate of soda may be given in dose of 10 to 20 grains every two hours in cases of acute rheumatism, with the effect of speedily relieving the joint pains and reducing the temperature. After a time it depresses the action of the heart very notably, and then the dose must be diminished or the drug suspended. Sometimes the salicylate of soda does not agree, and may cause violent delirium. Solution of salicylate of soda may be applied as a lotion to rheumatic joints with a view to relieving the pain. Citrate of potash may be combined with salicylate of soda and the solution flavoured with syrup of orange-peel or chloroform water.

## ULMACEÆ.

**Ulmæ Cortex.**—The dried inner bark of the broad-leaved elm, *Ulmus Campestris*. The bark contains a little tannin, with much mucilage. **Decoctum Ulmi** has been given in dose of one to two ounces or more as an alterative in chronic skin affections.

The *Ulmus Fulva*, called in America the *Red* or *Slippery* elm, is largely gathered in Michigan, and yields abundance of agreeable mucilage that is nutritious and possessed of some amount of antiseptic property.

## CUPULIFERÆ.

**Quercus Cortex.**—Bark of small branches of the Oak, or *Quercus pedunculata*, collected in spring. Oak bark contains as its active astringent principle both *Tannic* and *Gallic* acids. The bark, covered by a grey shining epidermis, is brittle, fibrous and astringent.

**Decoctum Quercus** may be given as an astringent, in dose of one to two ounces; and may also be used locally as an astringent lotion, injection, or gargle.

**Galla.**—Galls are excrescences caused by the punctures and deposited ova of an insect called *Diplolepis galleæ tinctoriæ* in the bark of the *Quercus infectoria*, a bushy shrub of Asia Minor, with shining prickly leaves. Galls are hard globular bodies, bluish-green outside, yellowish-white within, with a small central cavity, which has been the residence of the gall insect. English galls contain from 14 to 28 per cent. of tannic acid. Aleppo galls contain 25 to 65 per cent. of tannic, and 5 per cent. of gallic acid.

Nut galls come chiefly from Asia and the Levant.

The medicinal value of galls depends on their astringency.

**Tinctura Gallæ**, made by macerating bruised galls in proof spirit, is chiefly used as a test for the

persalts of iron, with which it forms black ink, and for gelatine, with which it forms a brown precipitate. Tincture of galls throws down vegetable alkaloids as insoluble tannates. Internal dose one to two drachms.

**Unguentum Gallæ**, eighty grains powdered galls in one ounce of benzoated lard, and **Ung. Gallæ cum Opio**, are used as astringent and anodyne ointments. The last is much used as an application to painful piles. Fourteen grains equal one grain of opium.

**Acidum Tannicum** ( $C_{37}H_{22}O_{17}$ ), called also *Tannin*, is extracted from damp gall-nut powder by means of common ether, according to the process detailed in the Pharmacopœia. Tannic acid forms a yellowish glistening mass; it is a glucoside, and when boiled with dilute sulphuric acid it yields glucose and gallic acid. Tannic acid readily dissolves in water and in glycerine. It may be given internally as an astringent to check hæmorrhage or diarrhœa, in dose of two to ten grains; when thus taken it is excreted by the urine in the form of gallic acid, and it acts therefore as both a *direct* and *remote* astringent. The tannic acid found in catechu and in kino differs slightly in chemical properties from the Querci-tannic acid of the oak and gall nut.

**Glycerinum Acidi Tannici**, one ounce of tannic acid in four ounces of glycerine, is a useful astringent application to mucous surfaces. Given internally in dose of ten to forty minims.

**Trochisci Acidi Tannici** (Tannin Lozenges).—Good for bleeding from the gums, and for relaxed throat. Each lozenge contains  $\frac{1}{2}$  grain of tannic acid.

**Suppositoria Acidi Tannici**.—Each contains three grains of acid.

The **Suppositoria Acidi Tannici cum Sapone**, made with Curd Soap, Glycerine, and Starch, will supersede the ones first named, as being more efficacious and cleanly.

**Acidum Gallicum**.—Gallic Acid ( $H_3C_6H_2O_5H_2O$ )



occurs in needle-like crystals. It is procured from tannic acid after this has undergone during six weeks a process of fermentation in contact with moisture. Ferric salts in solution turn blue-black with gallic acid, a gallate of iron being formed. Gallic acid forms no precipitate with solution of gelatine, and thus is distinguished from tannic acid. Gallic acid, in dose of two to twenty grains, is a most valuable remote astringent to check hæmorrhage from lungs or kidney. One ounce of water will hold four grains in solution, and this dose may be repeated every half-hour till some effect is produced. In albuminuria gallic acid is a common remedy.

**Glycerinum Acidi Gallici.**—One ounce of gallic acid in four ounces of glycerine. Dose ten to sixty minims. Thirty grains of the acid and four minims of glycerine can be moulded into six pills, if it be desired to give the remedy in pilular form. *Ellagic Acid* ( $C_{14}H_6O_8$ ) is a white crystalline insoluble acid, found in small quantity in gall nuts.

#### URTICACEÆ.

The Fig and the Mulberry belong to this Order. The fig, **Ficus Carica**, from Smyrna, is nutritious and laxative, and enters into the *Confectio Sennæ*. Roasted figs are used as cataplasms to boils.

**Mori Succus.**—The juice of *Morus Nigra* with sugar makes the dark red acidulous **Syrupus Mori**, given in dose of one to two drachms, and used as a pleasant adjunct to gargles for the throat.

**Cannabis Indica** (Indian Hemp).—The dried flowering tops of *Cannabis Sativa*, known in India as *Gunjah* and *Bang*, and first introduced into English medicine by Sir W. O'Shaugnessy and Mr. P. Squire.

Indian hemp contains some volatile oil and a resin called *Cannabin*. The effect of the resin is to produce exhilaration and intoxication of a pleasant kind, followed by sleep and stupor. Many spasmodic and convulsive diseases are decidedly relieved by Indian

hemp; and in conjunction with bromide of ammonium it has been used with benefit in maniacal excitement (Dr. Clouston). Small doses of three or four minims of the tincture are recommended by Ringer in severe headache, with tenderness of the surface; and the late Dr. John Murray, used to prescribe the tincture with great benefit in cases of sick headache. This medicine has been employed in asthma, chorea, and a variety of nervous complaints, with varying success. Some persons are powerfully affected by a very small dose of cannabis.

**Tinctura Cannabis Indicæ.**—Made by dissolving the extract in rectified spirit: is intensely green in colour, giving a whitish precipitate of resin if mixed with water; hence mucilage should always be added to suspend the resin. Dose five to twenty minims.

**Extractum Cannabis Indicæ.**—Intensely green extract, made with rectified spirit. Dose a quarter to one grain. The extract probably does not readily dissolve in the stomach.

**Lupulus**, or Hop.—Dried strobiles, or catkins of female plant of *Humulus Lupulus*. The catkin is composed of membranous scales secreting a golden-yellow powder, called *Lupuline*, in which the active principle chiefly lies. *Lupuline* contains volatile oil, resin, and about eleven per cent. of bitter principle.

Hops act as bitter tonics and stomachics, with something of a sleep-producing tendency; so that pillows filled with hops are used to induce sleep. The narcotic principle lies in the volatile oil of the hop.

**Infusum Lupuli** is given in dose of one to two ounces. **Tinctura Lupuli**, made by macerating two and a half ounces of hops in a pint of proof spirit, is given in dose of one to two drachms. **Extractum Lupuli**, dose five to fifteen grains. *Lupuline* is given in dose of five to ten grains. It has a specially sedative action over the genital organs. Hops are not much used now in medicine save as adjuncts.

Mineral acids and metallic salts are incompatible with hops.

**CONIFERÆ, OR, PINACEÆ**:—Gymnosperms — i.e., with ovules naked and fertilized by direct application of pollen.

**Terebinthinæ Oleum**.—Oil of turpentine is distilled from the oleo-resin, or turpentine, obtained from *Pinus palustris*, P. Tæda, and sometimes P. Pinaster. The residue of the distillation forms *Colophony*, or *Resin*. Turpentine comes chiefly in casks from North Carolina and Virginia. It is of yellowish-white colour, with consistence varying according to temperature. When melted and strained from impurities it forms refined turpentine. Old and concrete American turpentine is sold sometimes as *Frankincense*.

Bordeaux turpentine (P. Pinaster and P. Maritima) soon concretes, and is distinguished by solidifying with magnesia, just as balsam of copaiba does. Turpentine consists of resins dissolved in oil; and when the oil is distilled off the resins remain.

Oil of turpentine ( $C_{16}H_{16}$ ) will mix with other oils, and remains transparent when mixed with chloroform. It dissolves many fats, as well as wax, iodine, sulphur, and phosphorus. With hydrochloric acid it forms an artificial camphor. The oil is inflammable, soluble in ether, slightly so in hydrous alcohol.

Resin consists of three isomeric acids, having the formula ( $C_{20}H_{30}O_2$ ), and the names—1, Pinic; 2, Sylvic; and 3, Pimaric Acid. They are separated by means of alcohol, which, when cold, will dissolve No. 1; when warm, No. 2; when boiling, No. 3.

Oil of turpentine applied externally is a useful rubefacient; sprinkled on hot flannels it is applied as a counter-irritant in tympanitis and peritonitis. In gangrene and in burns it has been used locally.

In the form of **Linimentum Terebinthinæ** (camphor, soft soap and oil of turpentine) and **Linimentum Terebinthinæ Aceticum**, it is much

used as an embrocation in chronic chest affections, and in rheumatism. The acetic liniment contains equal parts of turpentine, acetic acid and liniment of camphor, and was used nearly fifty years ago as a secret cure for consumption by John St. John Long. The secret was purchased for a large sum of money; whether the investment proved a remunerative one, I cannot say; but that the acetic acid and turpentine liniment is valuable in cases of chronic phthisis, is pretty generally admitted.

Internally, oil of turpentine acts as a stimulant and diuretic; excreted by the kidney it communicates an odour of violets to the urine.

Turpentine is eliminated from the body by the skin and lungs, as well as by the urine. It seems to constrict the capillary vessels, and so checks secretion, and hæmorrhage. If taken for too long a time, in dose of one drachm or so, turpentine may cause suppressed and bloody urine, with fever and vomiting. Turpentine in large dose, one to three ounces, has been given to cure tapeworm. In dose of one ounce it kills and expels the worm, and to insure purgation and carry off the oil, some castor oil should be combined with the turpentine. The turpentine enema is a very certain cure for small threadworms. As a styptic in hæmorrhage from the lungs and bowels, oil of turpentine has seemed to me most valuable. In the diarrhæa and hæmorrhage from the bowels in fever, I have given it with great benefit. In sciatica, turpentine has been much praised; in epilepsy, dropsy, and eye inflammation the oil has been given with asserted benefit.

The ordinary dose of *Ol. Terebinth.* is from ten to thirty minims. As an anthelmintic, much larger doses, four to twelve drachms, may be given. It should be given in mucilage—one drachm of mucilage to half a drachm of oil.

**Confectio Terebinthinæ.**—Turpentine, Liquorice, and Honey. May be given in dose of 60 to 120 grains.

**Enema Terebinthinæ.**—One ounce of turpentine in fifteen ounces of starch mucilage, is used as an antispasmodic and purgative in colic and tympanitis.

**Unguentum Terebinthinæ**, a very stimulating ointment for dressing indolent sores, consists of Turpentine, Resin, and Wax.

**Resina** is used in preparing **Emplastrum Resinæ**, and **Unguentum Resinæ**, or **Basilicon** ointment—a yellow ointment, used to indolent sores.

**Thus Americanum** (Common Frankincense).—A soft concrete yellow turpentine, from *Pinus palustris* and *P. Tæda*. Combined with true Burgundy pitch, which is a resinous exudation from the Spruce fir, and comes from Switzerland and Hamburg, it forms with resin, yellow wax, and oil of nutmeg, **Emplastrum Picis**, or Pitch plaster, often used as a mild stimulating plaster to the chest in bronchial affections.

**Pix Burgundica**, as described in the B. P., should be studied, as an imitation is made with common resin, yellow ochre, and oil. True Burgundy pitch is hard and brittle, of reddish-brown colour, and soluble in its own weight of acetic acid.

**Pix Liquida**, or Tar, is a treacle-like liquid, obtained from pine-wood by distillation. Tar is, to some extent, soluble in water, forming Tar-water, once reputed a cure for phthisis. A sherry-coloured acrid oil can be separated from tar by distillation, and this has been used as an application to cure ring-worm.

**Unguentum Picis Liquidæ**, is a black ointment made of tar and yellow wax. It is used chiefly for *Tinea capitis*.

Inhalation of air impregnated with vapour of tar is often useful in chronic lung affections. The acetic acid in the tar should be neutralized with an alkali, if the inhalation be tried in a concentrated form. Oil of Scotch Pine (Fir-wool oil), two drachms; Magnesia, sixty grains; Water to three ounces, make a mix-

of which one teaspoonful may be inhaled from a glass of water at 150°, in chronic laryngitis (Morell kenzie).

Internally I have tried tar in various forms, but have nothing positive to say of its curative properties. The products already described come from the *Abietifera* or true Conifers; to the section *Cupressinæ* belonging Juniper and Savine.

**Juniperi Oleum.**—The oil distilled in Britain is from unripe Juniper berries. The berries are as big as currants, of a purple colour, and full of yellow seeds. Oil of Juniper is composed of  $C_{10}H_{16}$ . When oxidized it forms a resin. Dissolved in rectified spirit forms **Spiritus Juniperi**. Juniper oil acts as a stimulating diuretic, and is of use in dropsical complaints. The oil may be given in dose of one to three minims, or the spirit in dose of thirty to sixty minims, as an adjunct to diuretic infusions. The oil may also be given by inhalation in dropsy.

**Juniper Tar** (non. off.), or Oil of Cade, from *Juniperus Oxycedrus*, is a tarry liquid, which, when mixed with lard into an ointment (one to eight of lard), is a valuable application in lepra and other chronic skin diseases.

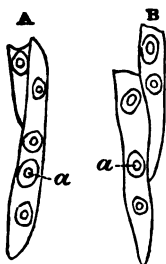
**Sabinæ Cacumina.**—Tops of the Savin, or *Sabina*, yielding on distillation a straw-colored oil, **Oleum Sabinæ** ( $C_{10}H_{16}$ ), isomeric with turpentine. This oil is the active principle of the resin. Applied externally it is an irritant; given internally it is an efficient emmenagogue, acting powerfully on the uterus. In passive hæmorrhage and leucorrhœa it acts curatively by arresting such discharges. Dose, one to five minims; may be given in solution, or made into pill with bread mass.

**Tinctura Sabinæ.**—A green tincture, made with dried Savin tops and proof spirit. Dose, fifteen to thirty minims, may be given in similar cases to those in which the oil is used.

**Unguentum Sabinæ** should always be freshly

made, and should be of a pea-green colour. This ointment is used to keep a blistered surface open and discharging. Savin in powder is applied with success to cure warts and vegetations on the skin. Sometimes savin is given with criminal intent to cause abortion. If the powder be found in the stomach, in the event of a fatal dose being taken, it may be known by yielding volatile oil when distilled, by forming a

FIG. 10.



A, B, Woody Fibres of *Juniperus Sabina*, showing the pores *a a* (Pereira).

green tincture with alcohol; and, if the powder be coarse, a microscopic examination of the woody fibres will detect their circular pores, characteristic of the Gymnosperms. (See Fig. 10.)

**Terebinthina Canadensis.**—Canada Balsam is a turpentine from *Abies Balsamea* or Balm of Gilead Fir. It dries slowly into a varnish, and is used for mounting microscopic objects. It is also used in making flexible collodion and blistering paper. Dose five grains in pill.

Venice Turpentine is obtained from *Abies Larix*; it is a greenish-yellow liquid, and does not congeal by keeping. An artificial substitute is made with oil of turpentine and black resin, and sold as true Venice Turpentine. **Laricis Cortex** is the inner bark of *Larix Europæa*, or common larch. Macerated with rectified spirit it forms **Tinctura Laricis**, a tincture which has been found, by Dr. Greenhow and others, very useful in chronic bronchitis with excess of secretion, and also in hæmoptysis. Larch bark contains a crystalline acid, *Larixinic Acid*. An Extract of Larch Bark is also employed by Dr. Greenhow.

Chian, or Cyprus Turpentine, it will be remembered is the product of *Pistacia Terebinthus* (*Terebinthaceæ*); in composition and properties it resembles the turpentines of the Conifers.

## CLASS II.—ENDOGENS.

Endogens, as distinct from Exogens, are Monocotyledons; they have leaves usually sheathing at the base, mostly alternate, parallel-veined, rarely netted. The trunk consists of cellular tissue, among which vascular tissue is mixed in bundles with no distinction of bark, wood, and pith. The class includes among its Natural Orders the following:—

## ZINGIBERACEÆ.

**Zingiber.**—Ginger, the scraped dried rhizome of *Zingiber officinale*, from the East and West Indies. Some kinds of ginger are dark, coated, and unscraped. Jamaica ginger, and certain kinds from Malabar and Bengal, are deprived of the epidermis, and therefore said to be uncoated or scraped. Bardoos, African, and coated Malabar and Bengal gingers, are blacker and bigger than the white gingers. Ginger is sometimes washed and bleached. The best ginger is whitish in colour, free from any waxy coating, and soft in its centre; it contains volatile oil, resinous matter, and starch like that of Indian arrow-root.

Ginger acts as a warm stimulant to the stomach; is a sialagogue, and induces free flow of saliva, and stimulates the stomach to secrete gastric juice. Ginger is frequently added to purgative and tonic draughts. It enters into fourteen preparations of the P.

In the form of infusion (*Ginger-tea*) it is used as a domestic remedy against flatulence. In the B.P. are *Infusura Zingiberis*, given as a warm stomachic in dose of ten to thirty minims—contains one in eight; and *Tinctura Zingiberis Fortior*, or Essence of ginger, of which the dose is five to twenty minims—contains one in two.

**Syrupus Zingiberis** is made with the strong tincture and syrup. Dose one to four drachms, as an adjunct to bitter infusions.



Powdered ginger, in dose of five to ten grains, is a stimulant to the gastric and respiratory organs. Mixed with warm water and spread on cloth or paper, it forms a useful counter-irritant plaster.

**Cardamomum.**—Cardamoms are the seeds of *Elettaria Cardamomum*, contained in capsules or pericarps. There are many varieties of Cardamom; as the Java round Cardamom, the black Cardamom, the Ceylon Cardamom, and the hairy China round Cardamom. The official one is the Malabar Cardamom, and of this three kinds are recognised—1, *Shorts*; 2, *Short-longs*; 3, *Long-longs*—each varying in length. The seeds of the cardamom are the part used in medicine, and these are of a reddish-brown colour, triangular shape, with white interior. The pericarps are triangular with rounded angles. The seeds contain aromatic volatile oil, with fixed oil and colouring matter. They should remain in their pericarps till required for use. Cardamoms are warm, aromatic, and carminative, and are used commonly as adjuvants to purgatives to prevent griping. They enter into seven B. P. preparations.

**Tinctura Cardamomi Co.**, is of a deep lake colour, and contains Cochineal and Cinnamon; it exists in the *Mist. Ferri Aromat.*, and in dose of one-half to one drachm is added as a warm, agreeable, flavouring adjunct to various mixtures.

**Curcuma Longa.**—The rhizome of the Turmeric plant comes from China, Bengal, and Ceylon. Some of the tubers are long, some round. The yellow resinous colouring matter of turmeric, *Curcumin*, is soluble in alcohol; and this solution forms the *Tinctura Curcumæ* of the B. P. test solutions. Unsized paper steeped in the tincture forms the yellow turmeric paper. Turmeric is used as a test for alkalies, with which it turns red brown. It should be known that borates and sulphides, as well as boracic and hydrochloric acids turn turmeric brown (Berzelius). Turmeric is used internally as an ingredient in curry-powder.

## IRIDACEÆ.

**Crocus.**—Dried stigma, and part of the thread-like style of *Crocus sativus*, from Spain, France, and Italy, constituting what is known as Hay Saffron. Saffron contains volatile oil and an orange-yellow colouring principle, *Polychroite*, which turns blue with sulphuric acid. Sometimes, to give a freshness to saffron and increase its weight, it is damped and oiled; in which case a piece pressed between folds of white filtering paper will give a wet or oily stain. Strong sulphuric acid turns Saffron blue. True Cake Saffron is not now met with; what is called by this name being commonly the florets of safflower (*Carthamus tinctorius*) compressed into flat cakes.

Saffron is an ingredient in many preparations. The chief use of the tincture is as a colouring agent. As a domestic remedy it is used to promote the development of the rash in measles.

**Tinctura Croci**, light-brown, proof-spirit tincture of Saffron. Dose is half to two drachms. Contains one in twenty.

## SMILACEÆ.

**Sarsæ Radix.**—Jamaica Sarsaparilla root is the variety of Sarsa that is officinal in the B. P. It is, like the Lima and *true* or *lean* Vera Cruz sarsa, of the *non-mealy* variety, and has a deeply coloured cortex, containing very little starch. Jamaica sarsa yields much extractive matter to water. Red Jamaica sarsa comes originally from Central America, and is imported to Europe by way of Jamaica.

Bundles of Lima sarsaparilla are folded with the *chump*, or root-stock, in the interior.

Vera Cruz sarsa comes in large bales bound round with thongs, containing the roots folded on themselves, and separately packed.

The Honduras, Brazilian, or Lisbon sarsa, and the Caraccas sarsa from La Guayra (Gouty Vera Cruz sarsa) are examples of mealy sarsaparilla. The

Brazilian sarsa comes over in compact rolls, bound round closely with some flexible stem. It possesses much acidity, and is believed to be a valuable kind of sarsaparilla. Dr. Berthold Seeman believes that Brazilian, Jamaica, and Guatemala sarsaparilla all are produced from *Smilax Officinalis*.

Sarsaparilla in decoction has a mucilaginous and bitter taste and peculiar odour. The acrid principle of the root, on which its efficacy depends, is very soluble in alcohol. On analysis the root has been found to contain volatile oil, starch, and a principle, *Smilacin*, which is met with as powder, but has been crystallized by M. Thubeuf. Pereira thinks *Smilacin* to be identical with *Saponin*, the glucoside found in Soapwort. The test of good sarsaparilla is the taste, which should be decidedly acrid when the root is chewed in the mouth.

As a remedy sarsaparilla dates as far back as 1530, when it was introduced as a cure for *Lues Venerea*. It is now considered to act on the blood as an alterative and tonic, with some amount of diaphoretic and diuretic effect.

*Decoctum Sarsæ* may be taken in quantities of one pint in twenty-four hours as a diet drink.

*Decoctum Sarsæ Compositum* contains Guaiacum, Sassafras, Liquorice root, and Mezereon, and may be given in rheumatism and chronic skin affections. Dose two to ten ounces.

*Extractum Sarsæ Liquidum*.—Dark liquid extract, given in dose of one to four drachms. Alkalies decompose the preparations of sarsa very readily.

#### LILIACEÆ.

**Scilla**.—The Squill, *Urginea Scilla*, or *S. Maritima*, grows on the sea-coast of Spain, France, Italy, and Greece.

The bulb is pear-shaped, usually as big as a fist, sometimes as big as a child's head. Two varieties are known, *red* and *white* squill. The bulb contains a

viscid, very acrid juice. By drying, the acidity is much diminished and the bulb loses about four-fifths of its weight. The bulb is cut into slices, and when these are quite dry they are easily reduced to powder, *Pulvis Scillæ*. The virtues of squill are extracted by water, alcohol, and vinegar. The acrid principle is not volatile, and appears to be a resinous matter; a bitter principle, *Scillitin*, is also found, with mucilage and small crystals of citrate of lime.

Squill is expectorant, diuretic, and in large doses emetic and purgative; it is of very ancient repute as a medicine. Squill agrees best in cases where no inflammation is present. In old chronic bronchitis squill goes well with Ammoniacum and Senega as an expectorant. In dropsy with dilated heart it is very useful in combination with digitalis, and sometimes with mercury, when it acts as an efficient diuretic. The dose of *Pulv. Scillæ* is one to three grains.

*Acetum Scillæ*, or Vinegar of Squills, made by macerating dried squill in dilute acetic acid and then adding proof spirit, is of a straw colour, and given in dose of fifteen to forty minims. *Tinctura Scillæ*, made by macerating squill in proof spirit, is given in dose of ten to thirty minims.

*Oxymel Scillæ*, and *Syrupus Scillæ*; of each the dose is half to one drachm.

*Pilula Scillæ Co.*—A pill composed of squill with Ginger and Ammoniacum. Given as an expectorant, in dose of five to ten grains.

#### ALOES.

*Aloe Barbadosis* and *Aloe Socotrina*.—Barbadoes Aloes is the inspissated juice of the cut leaf of *Aloe vulgaris*, or common Aloe, of Barbadoes. Barbadoes aloes has yellow flowers borne in long racemes. The leaves are cut transversely, and the juice allowed to exude from the cut orifices of the intercellular passages. The juice is collected in gourds, and when dry is usually of a dark liver colour, with a disagree-

able odour, and nauseous bitter taste. This aloes breaks with a conchoidal fracture, and yields a dull olive-green powder; when this is dissolved in spirit crystals of *aloine* are observed by the microscope. Barbadoes aloes contains more soluble extract, which is its active part, and less resin than the Socotrine aloes; for while the solubility of Barbadoes aloes in water is 75 per cent., that of the Socotrine is but 50 per cent.

**Aloe Socotrina**, or Socotrine aloes, is the inspissated juice of the leaf of an undetermined species of aloes. Made in Socotra, it is imported in skins and casks from Bombay. Socotrine aloes occurs in reddish-brown translucent masses, with fruity odour. The fracture is resinous, and the powder is of orange-yellow colour. It is believed that often in preparing Socotrine aloes the leaves are boiled; if it be so, that accounts for the excess of resin in this aloes, for boiling converts the soluble extract into resin (Squire). Dr. Garrod has failed to detect aloine in some kinds of Socotrine aloes, the reason being that heat has been applied and has dissolved the crystalline matter. *Hepatic aloes* is a species of aloes from East Indies. *Cape aloes* is a common variety of aloes, from *Aloe spicata*; greenish-brown in colour, and exhibiting no crystals. In an interesting article on aloes in the *Medical Times and Gazette* for January 4, 1868, we find some curious facts. It seems that in 1866, 910,507 pounds of aloes were imported into this country. Of this, 114,282 pounds were of the orthodox kind, worth as imported 1s. 6d. per pound; while the remaining seven-eighths consisted of Cape aloes, worth 3½d. per pound.

In France, Cape aloes is officinal, and some of this quantity may go there; the question is, what becomes of the rest? Caballine, or horse aloes, is an inferior sort of Cape aloes.

A crystalline body, *Aluin* or *Barbaloin* ( $C_{24}H_{36}O_{14}H_2O$ )

has been found by T. and H. Smith in Barbadoes and Socotrine aloes. This substance turns red with nitric acid, and yields by oxidation a yellow acid, *Chrysammic Acid*, which forms red salts.

*Nataloin*,  $C_{24}H_{38}O_{11}$ , was discovered by Flückiger in Natal aloes. It crystallizes, gives a red colour with nitric acid, but yields no chrysammic acid. The resinous matter of aloes is remarkable as being soluble in boiling water. Aloine, in dose of half to one or two grains, acts as a purgative. Aloes is a medicine of great antiquity, being employed by Celsus and Dioscorides. Its use is that of a purgative, slow in action, and tending specially to influence the large intestine, expelling matter therein collected, and therefore called an *eccoprotic*, as opposed to a *hydragogue* purgative. From its stimulating influence on the rectum aloes is avoided as a purgative by those who have piles, fissure, or fistula of the rectum. On the stomach aloes acts as a bitter tonic, and appears to promote the secretion of bile. Aloes increases slightly the secretion from the bowels, and sometimes if the bowels be much loaded may cause griping. The solubility of the active principle of aloes is increased by alkalies and soap. In the **Enema Aloes** either Barbadoes or Socotrine aloes may be used; forty grains of aloes are mixed in ten ounces of starch mucilage and fifteen grains of carbonate of potash added to insure solution. A useful purgative injection, very good against ascarides in the rectum. When used for this purpose four to six oz. will be sufficient.

*Preparations of Barbadoes Aloes* :—

**Extractum Aloes Barbadosis.**—A black, water extract, given as a purgative in dose of two to six grains.

**Pilula Aloes Barbadosis.**—A purgative pill containing powdered Aloes, Hard Soap, Oil of Caraway and Confection of Roses. Dose four to eight grains.

**Pilula Aloes et Ferri.**—A tonic aperient, useful

also in suppressed menses; contains Aloes Sulphate of Iron Cinnamon, and Confection of Roses. Dose five to ten grains.

*Preparations of Socotrine Aloes:—*

**Decoctum Aloes Compositum.**—The Compound Decoction of Aloes contains Socotrine Aloes, Myrrh, Saffron, Tincture of Cardamom, Carbonate of Potash, and Liquorice; the object of this last being to mask the bitter taste of the aloes. This medicine has long been known as *Baume de Vie*, and in dose of one or two ounces is an antacid mild cathartic. In smaller doses it is an excellent purgative for children, not being unpleasant, and rarely griping. By keeping, its bitterness is much diminished. It contains four grains of aloes in one ounce, and should not be boiled longer than five minutes as prolonged boiling tends to resinify the aloine of the aloes.

**Extractum Aloes Socotrinæ.**—Dose two to six grains; not so powerful as the Barbadoes aloes extract.

**Pilula Aloes et Assafœtidæ.**—An antispasmodic cathartic pill; dose five to ten grains.

**Pilula Aloes et Myrrhæ.**—Aloes, Myrrh, Confection of Roses and Saffron, known as *Pil. Rufi*, or Rufus's Pill, for the last two hundred years. A very good tonic laxative and emmenagogue.

**Pilula Aloes Socotrinæ** contains Aloes, hard Soap, Oil of Nutmeg and Confection of Roses. This mass keeps well. Dose five to ten grains.

**Tinctura Aloes.**—Dose one to two drachms; contains Aloes and Liquorice extract in proof spirit.

**Vinum Aloes.**—A red wine made of Aloes with Ginger and Cardamoms, in sherry. Dose one to two drachms.

Extract of Aloes can be combined with Extract of Gentian, Rhubarb, or Nux Vomica, to form a tonic laxative pill, good in chronic constipation.

## MELANTHACEÆ.

**Veratrum.**—The rhizome of the *Veratrum Album*, or White Hellebore of the Pyrenees, is not official in the B. P. The rhizome is about three inches long, with brown, wrinkled exterior, and has an acrid taste. It contains the alkaloid *Veratria*. White hellebore acts as an irritant and as a drastic purgative and emetic. *Vinum Veratri*, or Wine of White Hellebore, has been given in dose of ten to twenty minims in gout; but the experience of Dr. Garrod is decidedly against it as a remedy in this disease.

**Veratri Viridis Radix.**—Green Hellebore Root is in the B. P. It is a thick rhizome, with pale yellow radicles, has an acrid taste, and causes much tingling of the fauces. The rhizome comes from the United States and Canada.

*Veratrum viride* acts on the system in a similar way to *V. album*. It is a powerful vascular sedative and allied in action to aconite, though more apt to disturb the stomach. As an antiphlogistic in pneumonia it is highly commended, and it has been employed also in enteric fever in conjunction with chlorate of potash, with good effect. In rheumatic fever it is said to be of service. My own experience would lead me, in this last-named disease, to prefer aconite to *veratrum*. *Tinctura Veratri Viridis* may be given in dose of five to twenty minims with care and watchfulness. The powdered rhizome is sometimes given in dose of one to three grains.

**Veratria** ( $C_8H_{12}N_2O_{10}$ ) is an alkaloid existing in both white and green hellebore. In this last C. Bullock, however, has found two alkaloids—one soluble, the other insoluble in ether, and neither exactly corresponds to *veratria*. To these two alkaloids the names *Viridia* and *Veratroidia* have been given. *Viridia* is a very depressing agent.

The source whence *veratria* is obtained is **Saba-**



**dilla**, Cevadilla, the dried fruit of *Asagraea officinalis* of Mexico.

Cevadilla fruit consists of three brown papyraceous follicles, each of which contains one to three elongated, black, shining seeds. Viewed from above, each fruit looks like a single capsule with three cells. The alkaloid veratria was discovered in Cevadilla seed by Pelletier and Caventou; it exists combined with gallic acid, and volatile fatty *Cevadic Acid*. Cevadilla is a drastic emeto-cathartic, and it has been given for the cure of tapeworm. Its chief use is as a source of veratria, and the process for obtaining this alkaloid is given in the B. P. Veratria is a grey amorphous powder, very irritating to the nostrils if inhaled. It is insoluble in water, but soluble in ether, and can be crystallized from its solution in alcohol; it turns red with sulphuric acid. Veratria is not often given internally. The dose is from one-twelfth to one-sixth of a grain.

**Unguentum Veratriæ**, containing one in sixty, is used as an anodyne ointment for the cure of neuralgia where the skin is unbroken. Applied to the nape of the neck it has proved serviceable in spasmodic asthma.

**Colchici Cormus—Colchici Semina.**—The fresh corm of the *Colchicum Autumnale*, or Meadow Saffron, stripped of its coats, sliced transversely, and dried. The slices of corm have a yellowish rim, and within are white and amylaceous.

The seeds of *Colchicum* are hard, reddish-brown in colour, white within, and of the size of black mustard seeds.

*Colchicum* contains a crystallizable active principle, *Colchicine*; differing from veratrine in not exciting sneezing when inhaled, and being fairly soluble in water. *Cevadic Acid* exists in *colchicum*, as well as gum and starch.

*Colchicum* in large doses causes vomiting and purging, with great depression of the pulse. In me-

dicinal doses colchicum produces increased secretion generally; it causes free diuresis, but it is not proved to cause increased elimination of urea and uric acid. On the heart it acts as a depressant. In gout, and gouty inflammations, colchicum is an active remedy. With some gouty persons it acts best if given in repeated small doses, and seems to cut short the impending paroxysm by some specific action not yet explained. Other persons have very decidedly told me that colchicum never relieves them of an attack of gout until it is given in such doses as to cause free purgation. Rheumatism and bronchitis, when connected with gout, are often notably relieved by colchicum. In dropsy colchicum has been found useful.

Powdered colchicum corm may be given in dose of two to eight grains. The dark-brown **Extractum Colchici**, and the **Extractum Aceticum**, in dose of half to two grains. **Vinum Colchici** and **Tinctura Colchici Seminum** may be given in dose of ten to thirty minims.

Some consider the preparations of the seeds to be milder and yet remedially more efficacious than those of the corm. Alkalies, such as magnesia, may be combined with colchicum; but astringents and tinctures of iodine or guaiacum are incompatible with colchicum. In the event of excessive depression from a dose of colchicum, brandy or ammonia should be administered. A tincture of the Flowers of Colchicum is recommended strongly by some physicians.

The two Natural Orders, **MARANTACEÆ** and **PALMACEÆ**, may be here mentioned. From the first comes *Maranta arundinacea*, the arrowroot of the West Indies; the tubers of which yield a fine, pure, nutritious starch. From the second comes sago—the fecula of the stem of *Sagus levis* of the East Indies. The finest and best sago is known as pearl sago.

Like arrowroot sago is a pure, digestible, and nutritious starch.

**Tapioca** is granulated starch from the Bitter Cassava.

To the Order Palmaceæ belongs **Areca**, or **Areca Nut**.—The seed of **Areca Catechu**, a Tannin-bearing Palm of the East Indies. **Areca nuts** contain tannic and gallic acids, with gum and red insoluble matter. The fruit is as big as a small egg, of an orange-yellow colour, and contains the nut, imbedded in a fibrous envelope. The kernel, or **Betel-nut**, is of conical form, and deep-brown colour, mixed with a fawn tint. Internally the nut is brownish-red, with white veins. The powder of the nut was introduced by Dr. Edwin Morris, as a remedy for tapeworm. Dose four to six drachms. At Mysore extract of Betel nut is made and formed into cakes covered with *paddy*, or rice husks. This extract is called **Areca Catechu**. Mixed with leaves of the **Chavica** vine and quicklime, **Areca nut** forms the **Betel** which is chewed by the natives of India.

#### GRAMINACEÆ.

**Farina Triticæ**, or **Wheat Flour**, consists of 11 per cent. *gluten* and about 70 per cent. *starch*, with some amount of sugar and mucilage. When flour tied up in a cloth is exposed to a current of water, the starch is washed out, and the nitrogenized matter or *gluten* remains as a sticky mass in the cloth.

**Amylum**, or **Starch**, consists of round and flattened grains, each being formed by an albuminous coat enclosing gelatinous starch, or *amidin*. When starch is boiled, the envelopes swell and adhere, and thus starch jelly, or mucilage, is formed, which, when cold, strikes a blue colour, with free iodine, *iodide of amidin*. Prolonged boiling dissolves the envelope, and then no jelly forms. **Amidin** is the basis of every kind of starch, but different starches vary in microscopical appearance, according to the character of the envelope. These differences are best learned by examining specimens of wheat, potato, and rice starch

under the microscope, and studying also such plates of the starches as may be found in Pereira's "Materia Medica."

Taken into the mouth, starch is converted by the action of the saliva into glucose. Nitric acid converts starch into oxalic acid.

Wheat flour is well known as an article of food. In the B. P. it is used in making the yeast poultice, or *Cataplasma Fermenti*. **Mica Panis**, Bread crumb, or Bread mass, is used as a basis for pills, and is also employed in making the charcoal poultice, or *Cataplasma Carbonis*. Starch is used in the form of **Glycerinum Amyli**, or **Plasma**, as an ingredient in various applications. This preparation is an opaque jelly, and is employed in making the **Morphia and Soap**, and **Tannic Acid and Soap Suppositories**.

**Mucilago Amyli**.—Starch mucilage is used in preparing four of the six official enemata. What is called violet powder is starch perfumed. Pure wheat flour is quite soluble in a 12 per cent. solution of potash; mineral adulterations remain undissolved. When lightly baked, flour acquires a buff colour, and becomes a good article of diet for children with diarrhoea; being first prepared by boiling with milk.

The *Bran* of wheat flour contains much phosphatic matter; and bran-tea is used as a drink, being demulcent, slightly laxative, and nutritious. Bran bread is used by patients with saccharine diabetes, who cannot take starch.

*Semolina* and *Manna Croup* are dietary preparations of wheat flour.

**Hordeum Decorticatum**.—Pearl Barley is the seed of barley deprived of the husk. It contains much vegetable fibrine with starch, gum, and gluten, and is used in preparing **Decoctum Hordei**, or Barley-water, good as a demulcent drink for invalids. **Malt** is barley that has germinated, and in which about 40

per cent. of the starch has become *dextrine*, or British gum, and grape sugar, or glucose. Extract of malt is now used as a nutritious and demulcent preparation in chest affections. The decorticated seeds of the oat, *Avena sativa*, form groats, and are used to prepare gruel. The ground meal is oatmeal, and contains all the essential elements of nutrition in good proportions.

**Ergot.**—Spurred Rye, or Ergot, is now believed to be caused by the sclerotium (compact mycelium, or spawn) of a minute fungus called *Claviceps purpurea*, produced within the paleæ of the common rye, *Secale cereale*. In place of the grain of seed there is produced a dark horn-like body, whence the name *cornutum* applied to the rye-grain thus affected. Ergot occurs in long purplish-brown grains, brittle, and with a pinkish-white interior consisting of spores and flocci. Chemical analysis shows ergot to contain 35 per cent. of fixed oil, and about 15 per cent. of a reddish-brown resinoid matter, *Ergotine*, on which the active property of the ergot depends. This ergotine is said by Winckler to have the properties of an acid, and to exist in ergot combined with a volatile base called *Secalia*. Distilled with potash, ergot yields a body called *Propylamine*, or *Trimethylamine*, identical with propylamine that is made from herring-brine, and given as a remedy for rheumatism.

Persons who have for some time eaten bread made with ergotized rye become affected with dry gangrene of the extremities; apparently due to the action of ergot in causing contraction of the small vessels. This power possessed by ergot to cause contraction of the vessels renders it useful in various forms of hæmorrhage; and in those forms of paralysis which are due to increased fulness of the vessels of the spinal cord, ergot has been shown by Dr. Brown-Séquard to be a very efficacious medicine. Ergot may prove diuretic; appearing to act in a similar way to digitalis. The great use of ergot is as an agent to act on the

womb, and induce uterine contraction. It is very serviceable to stimulate uterine action in lingering labour, when the passages are clear for the child to pass. To prevent hæmorrhage after the birth ergot is often used. The best way to give ergot in these cases is to make a fresh infusion of two drachms of coarsely-powdered ergot in half a pint of boiling water; let it stand for one hour, and give it in doses of one tablespoonful every ten minutes. Given thus, ergot will soon cause the expulsion of the ovum, when this event is necessary, in miscarriage. **Infusum Ergotæ** may be given in dose of one to two ounces. **Tinctura Ergotæ**; dose fifteen to sixty minims. The old ethereal tincture is very properly discarded; it contained all the fixed oil of ergot, which acts as a great disturber of the nervous system.

**Extractum Ergotæ Liquidum.**—In making this preparation the oil is removed by means of ether, and then a liquid extract of the active ergotine is made, and proves an excellent preparation given in dose of fifteen to thirty minims. I have given this extract in five-minim doses to children, for incontinence of urine, with great success. In amenorrhœa it is a good medicine in combination with iron. Iron may be given for three weeks, and then the extract of ergot, ten minims three times daily, for a week before the monthly period is expected. Ergotin has been injected hypodermically with much success in arresting pulmonary and uterine hæmorrhage. Tumours of the womb have been observed to waste and disappear under hypodermic injections of ergotine. In diarrhœa and dysentery powdered ergot has been employed with curative effect. The dose of powdered ergot is ten to thirty grains.

**Saccharum Purificatum** ( $C_{12}H_{22}O_{11}$ ).—Refined sugar. Cane sugar, crystallized and refined, is used in several dry and moist preparations, and enters into all the Syrups and Lozenges of the B. P.

**Theriaca**, or Treacle, is the uncrystallized residue

of the refining of sugar, and is used in the preparation of various pills.

### CLASS III.—ACOTYLEDONES.

#### Sub-Class I.—Acrogens, or Cryptogams.

##### FILICES.

**Filix Mas.**—The dried rhizome of the *Aspidium Filix Mas*, or Male Shield Fern, gathered in summer. The rhizome contains volatile oil, resin, and fixed oil; all of which active ingredients are soluble in ether. **Extractum Filicis Liquidum** is made by percolating the powdered rhizome with ether, and evaporating. This extract, sometimes called oil of male fern, in dose of thirty to sixty minims, is a most valuable medicine against tapeworms. *Tænia solium* and *Bothriocephalus latus* are both killed by the drug; this last worm more readily than the first. The bowels should be cleared out by a purgative, and the extract, made into an emulsion with mucilage, given fasting; then, a few hours later, a dose of castor-oil will bring away the dead worm. The powdered rhizome of male fern has for some time had a great repute as a specific against tapeworms. Dose sixty to a hundred and eighty grains.

#### Sub-Class II.—Thallogens.

##### LICHENES.

**Cetraria.**—Iceland Moss is a lichen, the *Cetraria Islandica*, or Liverwort. This lichen consists of a foliaceous thallus of cartilaginous character, with a bitter and mucilaginous taste. The bitter principle can be crystallized, and is known as *Cetrario Acid*.

**Decoctum Cetrariæ** is given in dose of one to two ounces as a demulcent and nutrient, in affections of the mucous membrane of the lungs and bowels.

One part of moss in twelve of water, boiled down to six, forms a complete jelly when cold.

**Lacmus**, or **Litmus**, is a blue colouring matter made from the lichens, *Rocella tinctoria* and *Lecanora tartarea*. Blue tincture of litmus and litmus test paper are at once turned red by acids. Red litmus paper forms a test for alkalies, which restore its blue colour.

## ANIMAL KINGDOM.

Class—**Mammalia**.

### RODENTIA.

**Castoreum**.—Preputial follicles of the Beaver (Castor Fiber), dried with their contained secretion. The oil sacs should be separated and rejected. The follicles occur in pairs, three inches long, fig-shaped, and brownish-black in colour. Castoreum comes from the Hudson's Bay Territory. That known as Canadian castoreum is reckoned an inferior variety. Russian castoreum is very rare now. The resinous highly odorous secretion found in the follicles is almost entirely soluble in rectified spirit and ether. An active principle, *Castorin*, exists in the secretion, with traces of salicine, benzoic, and carbolic acids. The presence of salicine is due probably to the beavers feeding on willow bark.

Castoreum acts as a stimulant and antispasmodic, and is used in low nervous states and in hysteria. Dose of the substance five to ten grains.

**Tinctura Castorei**, a deep-red tincture, contains 22 grs. to one ounce of rectified spirit and is given in half to one drachm doses.

### RUMINANTIA.

**Moschus**, or **Musk**, is the dried secretion from the preputial follicles of *Moschus moschiferus*. The musk deer of Thibet and Asia is the size of a roebuck, but has no horns. A good specimen of the animal may be seen in the Museum of the Pharmaceutical



Society. The musk sac is placed midway between the umbilicus and the prepuce. Each sac contains 100 to 200 grains of musk, in unctuous reddish-black grains, of a strong odour, due to volatile oil. Chinese musk sacs are smaller and darker than the Russian ones. The odour of Russian musk is rather empyreumatic, and it is inferior to really genuine Chinese musk. True musk sacs, or pods, are hairy on one side, with the hairs placed concentrically round the opening.

Musk being a costly drug, it has become a common practice to make artificial musk pods from pieces of the skin of the musk animal, and then fill these with a mixture of dried blood. The arrangement and appearance of the hairs on the true musk pod are characteristic, according to the description in the B. P. The microscope shows cells on the hairs of the true musk sac. Musk is an antispasmodic and stimulant. It is administered in spasmodic affections of the respiratory organs in young children, but I cannot regard it as so valuable a remedy as some consider it in these cases. Musk is soluble in alcohol and ether. I have given it as *Mistura Moschi*—*i.e.*, musk made into an emulsion with gum acacia and rose-water. The dose of musk is five to ten grains.

*Hartshorn.*—The horn, *cornu*, of the stag, *Cervus Elaphus*, was formerly in the Pharmacopœia, in the form of shavings. These shavings of stags' horn, when distilled, furnished a strong solution of carbonate of ammonia, called Spirit of Hartshorn, or Spiritus Volatilis Cornu Cervi. The ash of the horn contains about 57 per cent. of phosphate of lime, and was formerly contained in the Pulvis Antimonialis of the Ph. Lond. Shavings of hartshorn contain gelatine; and this, when extracted by boiling water and flavoured with lemon-peel and sugar, has been given as a nutrient to invalids.

**Sevum Præparatum.**—Suet prepared from the internal fat of the abdomen of the sheep. White,

smooth, and nearly scentless. Soluble in boiling alcohol. Suet, like other hard fats, consists chiefly of stearine—that is, of tri-stearate of glyceryl ( $C_3H_5\{3C_{18}H_{35}O_2\}_3$ ). Stearine can be crystallized from its solution in ether. Oleine is the liquid constituent of fat and oils, and is a compound of oleic acid with glyceryl. Suet is emollient, and is used in preparing *Emplastrum Cantharidis* and *Unguentum Hydrargyri*.

**Sapo Animalis**, or Curd Soap, consists almost entirely of stearine. It is made with soda and purified animal fat.

**Lac.**—The fresh milk of the cow is used in preparing *Mistura Scammonii*. Milk contains 3 per cent. of *Casein*, held in solution by alkali, with about 12 per cent. cream, and 3 to 3½ per cent. butter. The corpuscles of milk consist of fatty matter within an albuminoid envelope. When the milk stands these fatty corpuscles rise to the surface, forming cream. Fresh milk is faintly alkaline, but after a time it turns sour from the formation of lactic acid. The water of milk is from about 86 to 87 per cent., and the solids 12 to 13 per cent.

**Saccharum Lactis** ( $C_{12}H_{22}O_{12}$ ), or Milk Sugar (*Lactine*), is obtained as a crystalline matter from milk whey, after the separation of the curds. It is crystallized on cords or pieces of wood, and is hard, greyish-white, and gritty. Milk sugar is soluble in six parts of cold and three of boiling water. In feeding infants milk sugar may be preferred to cane sugar, as being less likely to turn acid, and so cause mucous irritation. Cows' milk with water and milk sugar makes a good artificial food for infants. Milk sugar is an excellent medium for the preparation of certain powders; thus the **Pulvis Elaterii Compositus** is made by triturating ten grains of elaterium with ninety of milk sugar. Sugar of milk when sour turns into *Lactic Acid* ( $H_3C_3H_5O_4$ ). *This acid in dose of one drachm or more has been*

given in diabetes. With syrup, phosphoric acid, and lime it forms lacto-phosphate of lime, a remedy of value in weakness of the bones.

**Fel Bovinum Purificatum.**—Purified Oxbile is made by shaking Oxgall with rectified spirit, decanting, and evaporating to the consistence of a pill extract.

The object of the agitation with the spirit is to separate in the sediment all the mucus of the gall bladder; when free from mucus, the extract keeps well, consisting only of biliary substance—*glycocholic* and *taurocholic* acids, combined with soda, and colouring and fatty matters.

Bile, when mixed with water and a drop of syrup, on the addition of sulphuric acid shows a play of colours from red to violet.

Purified bile is given in dose of five to ten grains, as a laxative in cases where there is deficiency of bile in the intestines. In chronic diarrhoea it is of service also. As it is desirable the bile should pass through the stomach into the small intestine, oxgall is best given either in a capsule, or in a pill coated over with ethereal solution of Tolu.

**Pepsin.**—Pepsin is a dried digestive principle prepared from the fresh stomachs of pigs, sheep, or calves.

The mucous membrane is gently scraped, and the pulp thus obtained is dried at a temperature not exceeding 100°.

Pepsin is a yellowish-brown powder, slightly soluble in water and spirit. Mixed with water and hydrochloric acid, it slowly dissolves boiled white of egg, and the solution will remain free from putrescence much longer than if the egg be added to the acid and water without any pepsin. At a temperature of 120° the activity of pepsin is destroyed. Dose two to five grains, as an aid to weak digestion, at meal times. Pig's pepsin is said to be five times stronger than the pepsin from the calf's stomach, and is soluble in water (Allen and Hanbury).

Boudault's pepsin was introduced in 1855, by Mr. Peter Squire. It is a greyish white powder prepared in such a way as to be free from gastric epithelium.

*Pancreatine*, the active principle of pancreatic juice, has been introduced into medicine by Dr. Dobell.

In cases of imperfect digestion of fat, pancreatine powder has been given with remarkably good effect.

#### PACHYDERMATA.

**Adeps Præparatus.**—Prepared lard is the internal fat of the abdomen of the hog—*Sus scrofa*. Lard should be free from salt, and also from starch; hence the B. P. directs that the water in which it has been boiled be tested with nitrate of silver for chloride of sodium and for starch with solution of iodine. Lard contains about 60 per cent. of oleine, with palmitine, and stearine. Its great use is as a basis for ointments.

**Adeps Benzoatus.**—Benzoated lard is made by heating benzoin with lard; it keeps well, and does not turn mouldy or rancid. Benzoated lard is used in preparing suppositories and a few ointments.

**Unguentum Simplex** consists of white wax two, almond oil and lard of each three parts.

#### GETACEÆ.

**Cetaceum.**—Spermaceti is obtained from the head of the Sperm Whale, *Physeter macrocephalus*, of the Pacific and Indian Oceans. It exists chiefly in an excavation in the upper jaw. Spermaceti consists of a body, *Cetine*, with a certain amount of oily matter.

Cetine represents the purest crystalline spermaceti; it is combustible, soluble in hot alcohol and ether, and in the fixed oils, and does not melt under 100°. Cetine may be regarded as a compound of palmitic acid with a radical cetyl.

Spermaceti is not now often given for the cure of internal injuries, and for coughs, but is used with white wax and almond oil to form the emollient ex-

plication known as **Unguentum Cetacei**. It is employed also in making *Charta Epispastica*, or Blistering Paper.

#### Class Aves.

**Albumen Ovi.**—Egg albumen is the liquid white of the egg. Solution of albumen in water is given as an antidote in cases of poisoning by irritant bodies; such as corrosive sublimate, sulphate of copper, acetate of lead, &c. It forms an insoluble compound with the poison, and so protects the coats of the stomach. Albumen in solution is coagulated by heat, by nitric acid, by creasote, and by the monobasic glacial variety of phosphoric acid.

Yolk of egg is very nutritious, containing about fourteen parts of casein, with thirty of yellow fatty matter, and a little albumen. Yolk of egg is used to form emulsions, and it enters into the brandy and egg mixture—the **Mistura Spiritus Vini Gallici** of the B. P.

#### Class Pisces.

**Isinglass** (*Ichthyocolla*, or Fish Glue) is made from the dried swimming bladder of the sturgeon, cut into shreds. The sturgeon is one of the cartilaginous fishes of genus *Acipenser*, all of which furnish a similar gelatine. The best isinglass comes from Russia and Siberia, and contains about 70 per cent. of gelatine. Isinglass solution is introduced as solution of gelatine among the tests of the B. P. to distinguish tannic from gallic acid. With tannic acid isinglass combines to form an insoluble compound—*tanno-gelatine*, or leather. Cleanly and efficient vaginal suppositories can be made by incorporating various extracts with strong solution of isinglass and glycerine, and casting in moulds.

Isinglass is used in making *Court Plaster*. Good isinglass forms with boiling water a clear jelly, quite

free from smell. This jelly possesses some amount of nutrient property.

**Oleum Morrhuae.**—Cod-liver Oil, extracted from the fresh liver of *Gadus Morrhua*, with the aid of heat not exceeding 180°. Various fish, such as the Ling, Pollack, and others, also furnish this oil. The best oil is that prepared by the B. P. process. Inferior oils are made by boiling the livers with water, and skimming the oil from the surface; also by exposing the livers to the sun, and letting the oil gradually drain away. Twenty-eight pounds of livers yield twelve pounds of oil and one pound of water. The brown oils usually come from Newfoundland and Norway. The pale oil is largely made in England.

Cod-liver oil contains *Oleine* and *Margarine*, with certain biliary principles, minute traces of iodine and phosphorus, a peculiar body, *Gadum*, which turns red with sulphuric acid, and *Propylamine*—a substance found also in ergot of rye, and in herring brine. Cod-liver oil forms a beautiful, but evanescent, play of purple colour when a drop of sulphuric acid is allowed to run into it. This is due to the action of the acid on the biliary matter in the oil, for I have observed the same colour produced by the action of sulphuric acid on oil extracted from a fatty human liver.

Cod-liver oil had been in use as a medicine in Germany some time before Dr. Hughes Bennett introduced it to notice in England in 1844. It acts as a digestible and nutritious fat that easily enters into the blood. In skin diseases, chronic rheumatism, scrofulous disease of the glands, and pulmonary consumption, it is now a remedy of approved value. Before giving the oil it is often well to prepare the stomach for its reception by a short course of alkali with a bitter tonic, and then the oil may be given in dose of from a teaspoonful to a tablespoonful, two or three times a day. Usually

it agrees best if taken after food, on a little orange wine. A dose at bedtime I have found useful in checking cough, and night-sweating in phthisical patients. In some cases, where the liver is diseased or disordered, the oil is not digested, but passes away by the bowels; here the conjunction of *pancreatine* with the oil may be resorted to with some chance of overcoming the difficulty, or the dose of oil may be reduced. Cod liver oil may be given with syrup of iodide of iron, or with phosphoric or nitric acid in infusion of orange-peel, and will usually stay well on the stomach if given in this last-named vehicle. Children often benefit greatly on a course of cod-liver oil, provided the oil be always suspended as soon as any sign of gastric disturbance be detected. An emulsion of pancreatic juice with pure fat has been recommended by Dr. Dobell as a substitute for cod-liver oil; and this emulsion will at times agree well where cod-liver oil is apt to disturb the stomach. Cod-liver oil is very rapidly converted into fat, and the fatness it induces soon passes away, as Lauder Brunton observes, when the oil is omitted. Cod-liver oil fat is a "fleeting," not a "fast," fat.

### Class Insecta.

#### HYMENOPTERA.

**Mel.**—Honey is a saccharine secretion deposited in the honeycomb by *Apis Mellifica*, the hive-bee. Honey consists chiefly of grape-sugar ( $C_6H_{12}O_6$ ). As honey is often adulterated with flour it should be noted whether, after boiling with water, it gives when cold, a blue colour with solution of iodine, indicating the presence of wheat starch.

**Mel Depuratum.**—Honey clarified by melting and straining through flannel. Clarified honey enters into several preparations. With acetic acid honey forms **Oxymel**, used as an adjunct to gargles, and given as

an expectorant in dose of one to two drachms. Honey is nutritious and slightly laxative.

**Cera Alba.**—White wax is *C. Flava*, or yellow wax, bleached by exposure to light and air.

**Cera Flava** is the honeycomb melted down. Good yellow wax is not unctuous to the touch, is insoluble in cold rectified spirit, but, when boiled, a body, *Cerotic Acid*, dissolves, and an insoluble matter, *Myricine*, remains; and this myricine, acted on by potash, yields palmitic acid. Cerotic acid deposits as the alcohol cools, while a third constituent of wax, *Ceroleine*, remains still a solution.

White and yellow wax enter into various ointments and plasters to give consistence. White wax is used in making suppositories, but it tends to make these hard; and probably the curd soap and starch, or gelatine basis, will be found to answer better.

#### HEMIPTERA.

**Coccus.**—Cochineal, *Coccus Cacti*, the dried female insect which lives on the *Opuntia Cochinillifera* of Mexico. Three harvests are made in the year, when the insects are brushed from the plant, and killed by means of boiling water. The best silver cochineals are the females gathered at the first harvest, when full of eggs. The black cochineals are the insects after the eggs have escaped.

Cochineal contains fatty matter, and a red colouring principle of acid character, soluble in water and spirit, called *Carmin*, or *Carminic Acid*. The chief use of cochineal is as a colouring ingredient, though the drug has long been reputed a remedy for pertussis or whooping-cough. *Tinctura Cocci* may be given in dose of thirty to ninety minims as a colouring agent. If given in pertussis it is often combined with carbonate of potash and syrup.

Cochineal occurs in *Tinctura Cinchonæ Co.* and *Tinctura Cardamomi Co.*



## COLEOPTERA.

**Cantharis.**—*Cantharis vesicatoria*, *Lytta vesicatoria*, Blistering Beetle, or Spanish Fly ; collected in Hungary, Spain, and France. These beetles have bright green shining wing-covers ; when pulverized the powder should be free from mites, and the green fragments of the wing-covers should be readily seen in it. Powdered euphorbium is sometimes used as an adulteration. If damp, the powder acquires a putrid odour. The flies are brushed off the tree in the month of May, and killed in hot vinegar.

Powdered cantharides yield some oily matter, and a very active blistering principle, *Cantharidine* ( $C_8H_{12}O_2$ ), which is crystalline and can be sublimed ; it is soluble in acetic acid, chloroform, and ether.

Cantharides possess strong rubefacient and vesicating powers, and applied to the skin cause a serous effusion between the corium and epidermis. If the epidermis be removed, the subjacent corium is seen red and inflamed, and if irritating applications, such as savine ointment, be applied, the blister can be kept open and discharging. The primary action of cantharides is that of a rubefacient, the secondary effect that of an epispastic or vesicant.

Large blisters sometimes cause strangury and bloody urine in consequence of absorption of cantharidine into the circulation. Finely-powdered camphor dusted over the blister will prevent this unpleasant effect. Blisters are used for counter-irritant rather than evacuant purposes, though in cases of serous effusions into joints or cavities some think it best for a blister to fill well with fluid, as this tends to promote absorption of the fluid contained in the joint or cavity. Blisters appear to induce a bloodless condition of the deep structures ; for when cantharides collodion was painted over a rabbit's back for fourteen days, great hyperæmia of the surface was induced.

while the deeper structures were found anæmic and bloodless.

In acute inflammation blisters are likely to do more harm than good, and they should also be used with much caution in the case of young children and in persons of low vitality, lest they cause ulceration and sloughing. In acute rheumatism of joints, I have found the application of a blister near the joint, to relieve pain very speedily.

For external use the B. P. has **Acetum Cantharidis**, a dark-brown liquid, of use as a rubefacient. **Liquor Epispasticus** is a greenish liquid containing ether with acetic acid and cantharides. Applied with a brush it speedily causes a blister to rise.

**Unguentum Cantharidis**, an olive brown ointment containing olive oil and yellow wax, is employed to promote discharge from a blistered surface.

**Emplastrum Cantharidis**, or **Emplastrum Lyttæ**, made with cantharides, yellow wax, suet, resin, and lard, is the ordinary blistering plaster. Thin tissue-paper is sometimes placed between the blister and the skin, to prevent absorption of the cantharides. If, after a blister begins to rise, a poultice be applied, a large vesicle or bleb of fluid is usually formed.

**Emplastrum Calefaciens**.—A warm stimulating plaster, made with soap and resin plaster, yellow wax, and expressed oil of nutmeg.

**Charta Epispastica**, a useful counter-irritant plaster.

**Tinctura Cantharidis**, a straw-coloured tincture containing 1 of cantharidis in 80 of proof spirit, is given internally in dose of five to twenty minims; it acts as a stimulating diuretic. In incontinence of urine it is usually a successful remedy, and I have seen it of service in paraplegia. In pyelitis of the kidney, and some forms of chronic cystitis I have seen excellent results follow on the employment of ℞ij-ij of tincture of cantharides three times daily. In *chronic skin diseases* it is at times of service. The

urine of those who are under the influence of cantharides usually contains slight traces of albumen. Camphor is a trustworthy antidote for an overdose of Spanish fly.

Cantharides and Cantharidine are used as ingredients in various pomades and lotions for promoting the growth of the hair. Cantharidine is found in certain other insects which have vesicating properties, such as in the *Lytta Vittata* and *Mylabris Cichorii*.

The proportion of Cantharides in the various preparations described is as follows:—

Acetum Cantharidis . . . . .	1 in 10.
Liquor Epispasticus . . . . .	1 ,, 2½.
Unguentum Cantharidis . . . . .	1 ,, 7.
Emplastrum Cantharidis . . . . .	1 ,, 3.
Emplastrum Calefaciens . . . . .	1 ,, 25.
Tinctura Cantharidis . . . . .	1 ,, 80.

#### Class Annelida.

**Hirudo.**—The Leech, of which two kinds are officinal:—1. *Sanguisuga\** *medicinalis*, the Speckled English Leech; 2, *S. officinalis*, the Green Leech. Collected in Spain, France, Italy, and Hungary. The characters of the leech are given in the B. P. The creatures are androgynous—*i.e.*, each possesses male and female organs, and they propagate by eggs, which they deposit from May to September. The consumption of leeches now is probably less than formerly, when it was immense. Pereira says 7,200,000 used to be imported annually.

The use of the leech is to draw blood locally from the vicinity of inflamed organs. The leech fixes by his oval disk to the skin; and then, by a sawing movement of its three cartilaginous jaws, it works its teeth, of which it has two rows in each jaw, through

\* From *sanguis*, blood; and *sugo*, I suck.

the skin. A leech will draw on an average about one and a half drachms of blood. Before applying leeches the part of the skin selected for their application should be cleaned, and then the leech dried in a cloth before it is placed on the spot chosen. Leeches should not be applied where there is much loose cellular tissue, but over as firm and smooth a surface as possible. Care should be taken that the leech does not find its way into the mouth or other openings of the body. If, by inadvertence, a leech be swallowed, the use of salt and water as a remedy must be at once resorted to. Salt and water may produce vomiting with the expulsion of the leech; and under all circumstances solution of salt is very deadly to leeches. Alcohol also is a poison to the leech. In case of difficulty in arresting bleeding, after the leech has fallen off, a little powdered alum, powdered matico leaf, or a point of nitrate of silver may be employed as hæmostatic agents to stop the bleeding.

A warm poultice is at times applied over leech-bites to promote the flow of blood; if this be done, the patient and the poultice should be carefully watched lest too profuse bleeding take place. Cutting the tail of the leech is a common way of causing it to quit its hold on the skin when this is desirable. Leeching and cupping are examples of what is called local bleeding. To treat of the effects of general blood-letting by venæsection, or arteriotomy, hardly falls within the scope of this small book, designed chiefly as a guide and companion to the British Pharmacopœia.

General bleeding is usually performed by opening the median cephalic vein at the bend of the elbow. The operation is one capable of affording great relief in certain oppressed states of the circulation. When the right side of the heart is much gorged with blood, the lung deeply congested, with perhaps persistent hæmoptysis also present, a bleeding from the arm will give an amount of relief that cannot be obtained.

in any other way. In puerperal convulsions, with great pressure on the blood-vessels of the brain, blood-letting speedily relieves the dangerous strain. The idea of a free bleeding tending to cut short an acute disease is, I believe, a fallacious one; urgent symptoms may be temporarily relieved by the operation, but most commonly a long convalescence is entailed on the patient. The practice of bleeding in every kind of apoplectic seizure cannot be too strongly deprecated. The practice lowers the vital powers, and seems to me to tend to make permanent any paralytic lesion that may be connected with the apoplexy.

#### Class Porifera.

To this class belongs the *Sponge* (*Spongia Officinalis*). The best sponges come from the Grecian Archipelago. The sponge is cleansed from the gelatinous matter with which it is impregnated, and its dry skeleton forms the substance so familiar to all.

Compressed sponge, impregnated with wax, is employed as a tent to dilate and open up contracted canals. The cervix uteri can be thus dilated by means of a sponge-tent, the tent gradually swelling as it becomes moist.

*Spongia Usta*.—Calcined or burnt sponge contains, among other salts, Iodide of Sodium and Bromide of Magnesium, and the powder of burnt sponge was formerly often given for the cure of bronchocele and various glandular swellings. The dose given may range from 30 to 100 grains. Good burnt sponge, heated in a flask with sulphuric acid, should evolve violet vapours of iodine.

TEST SOLUTIONS  
OF  
THE PHARMACOPŒIA.

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*Solution of Acetate of Copper* is used to detect the presence of Butyric acid in valerianate of zinc. Page 135.

*Solution of Acetate of Potash* is used to distinguish Citric from Tartaric acid. Tartaric acid precipitates as acid tartrate of potash.

*Solution of Acetate of Soda* is added in excess to the solution of Phosphate of Lime in nitric acid preparatory to testing for lime with oxalate of ammonia, and for phosphoric acid with perchloride of iron solution. The soda neutralizes the nitric acid and in its place we have free acetic acid which does not dissolve the precipitate. Pages 85 and 112. Ferri Phosphas.

*Solution of Albumen* gives a white precipitate with the monobasic, or glacial, phosphoric acid; and with creasote and carbolic acid.

*Solution of Ammonio-Nitrate of Silver* gives a yellow precipitate with arsenious and phosphoric acid, soluble in ammonia and in nitric acid.

*Solution of Ammonio-Sulphate of Copper* gives a green precipitate (Scheele's green) with arsenious acid.

*Solution of Ammonio-Sulphate of Magnesia*, used in testing the Phosphate of Ammonia, with which it forms the Ammonio-Magnesian, or triple, phosphate ( $MgNH_4 \cdot PO_4 \cdot 6H_2O$ ), a salt that is insoluble in solution of chloride of ammonium. When dried and

## 322 TEST SOLUTIONS OF THE PHARMACOPŒIA.

heated this salt loses ammonia, and a phosphate of magnesia remains. Page 78. This solution is used also to prove the presence of phosphoric acid in phosphate of iron.

*Solution of Boracic Acid* is used to detect the adulteration of Rhubarb with Turmeric. See page 267.

*Solution of Bromine*, or of *Chlorine*, is employed in testing bromide of potassium for iodide. Bromine, or chlorine, will set iodine free, and then its presence is detected by its turning blue with starch mucilage. Page 67.

*Solution of Carbonate of Ammonia* serves to distinguish zinc from alumina and the alkaline earths. Page 133.

*Solution of Chloride of Ammonium*, used in testing the purity of carbonate of magnesia. Page 87.

*Solution of Chloride of Barium* forms a white precipitate of sulphate of baryta, when added to sulphuric acid or any sulphate. The precipitate is insoluble in boiling nitric acid.

*Solution of Chloride of Calcium* serves to prove the presence of citric acid in citrate of potash by forming the insoluble citrate of lime when the solutions are boiled. Page 63.

*Solution of Gelatine* or Isinglass is used as a test for tannic acid, with which it gives a yellowish white precipitate, thus distinguishing it from gallic acid.

*Solution of Terchloride of Gold* forms a double chloride with the alkaloid atropine.

*Solution of Protochloride of Tin* is a powerful de-oxidizing agent, absorbing oxygen, and also chlorine, very readily. It reduces salts of silver, gold, and mercury (see Hydrargyrum Ammoniatum).

*Solution of Iodate of Potash* is used to detect the presence of sulphurous acid in acetic acid. Sulphurous acid would decompose the iodate and liberate iodine.

*Solution of Iodide of Potassium* forms a yellow pre-

cipitate of iodide with solutions of lead; with solutions of perchloride of mercury it forms a red precipitate soluble in excess of either solution.

*Solution of Oxalate of Ammonia* detects lime in solution by forming a white insoluble oxalate of lime.

*Solution of Perchloride of Platinum* forms an insoluble double chloride with salts of potash. Page 49.

*Solution of Phosphate of Soda*, employed in proving the presence of magnesia and lithia. Page 75.

*Solution of Red Prussiate of Potash, or Ferridcyanide of Potassium*, gives a dark blue precipitate (Turnbull's blue) with Proto salts of iron or Ferrous salts.

*Solution of Sulphate of Indigo* loses its blue colour in presence of free chlorine, or of nitrate of lead. Pages 16, 130.

*Solution of Sulphate of Iron*, a test for nitric acid, with which it forms a dark purple colour. Page 11.

*Solution of Sulphate of Lime*, a test for the presence of oxalic acid in tartaric acid.

*Solution of Sulphide of Ammonium* is used to precipitate certain metals as sulphides.

*Sulphuretted Hydrogen Gas* is employed to precipitate certain metals as sulphides from acid solutions.

*Solution of Tartaric Acid* is a test for potash in solution. It is also a solvent of the oxide of antimony. Page 93.

*Solution of Yellow Prussiate of Potash, or Ferrocyanide of Potassium*, gives a blue precipitate of Prussian Blue with Persalts of Iron or Ferric Salts. With salts of copper it forms a brownish-red precipitate.

**Volumetric Solutions of the Pharmacopœia.**—The student must remember that the proportions in which chemical substances unite to form compounds are definite and unvarying. If he thoroughly understands the law of combining equivalents or proportions he will readily comprehend the processes of *Gravimetric* and *Volumetric* analysis.

In Gravimetric Quantitative analysis we estimate quantity by weight. A body may be separated and



weighed by itself, or it may be separated and weighed in combination with another body, whose combining proportion is known.

An example of Gravimetric quantitative analysis is furnished under Argenti Nitras, B. P. page 96. 8.44 grains of chloride of silver are precipitated; in this precipitate the chlorine will be to the silver as 35.5, combining equivalent of chlorine, to 108, combining equivalent of silver. 143.5, the molecular weight of chloride of silver, consisting of 35.5 chlorine, and 108 silver.

The processes of Volumetric analysis depend also on the law of combination in definite fixed equivalents or proportions.

The strength of the alkalies is ascertained by means of the volumetric solution of Oxalic Acid. The molecular weight, or combining equivalent of this acid, is 126, being the sum of the combining equivalents of its constituents,  $\text{H}_2\text{C}_2\text{O}_4, 2\text{H}_2\text{O}$  (oxalic acid cryst.) = 126. Owing to the bivalent character of the oxalic radical, and the univalent character of most of the metals, it is convenient to take half the molecular weight of the acid (63) for experiments. Thus 63 of oxalic acid will neutralize and combine with 56 of caustic potash ( $\text{KHO} = 56$ ), or 40 of caustic soda ( $\text{NaHO} = 40$ ).

In the volumetric solution of soda,  $\text{NaHO} = 40$ . This 40 is the molecular weight of soda, and it will therefore neutralize and combine with acids in equivalent proportions. Thus 60 parts by weight of true acetic acid,  $\text{HC}_2\text{H}_3\text{O}_2$ , is a combining proportion, and will exactly neutralize 40 parts by weight of soda, forming Acetate of Soda.

Volumetric solution of Bichromate of Potash is used to peroxidize the protosalts of iron. See page 106.

Volumetric solution of Hyposulphite of Soda is used for the estimation of Chlorine and Iodine. See page 16.

Volumetric solution of Iodine is used to ascertain the strength of solution of arsenious acid. *See* page 98. It is also used for the same purpose in the instance of Sulphurous Acid. *See* page 37.

Volumetric solution of Nitrate of Silver is employed to test the strength of solution of Hydrocyanic or Prussic Acid. Page 59.

For complete details as to the reactions and methods of Volumetric analysis I refer the reader to Atfield's Chemistry. In studying the processes given in the Pharmacopœia of 1867, it will be well to refer to the list of corrections given in the new issue of 1874, as they are of considerable importance, and, if neglected, confusion may result in the mind of one who may be working out some of the volumetric processes.

# GLOSSARY

OF

## THERAPEUTICAL TERMS.

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**ALTERATIVES** are medicines which gradually, without exciting any crisis or evacuation, in a way not thoroughly understood, correct deranged action, and so bring about the cure of disease.

**ANÆSTHETICS** are agents which destroy the sense of feeling and so prevent pain. *Local anæsthesia* is illustrated when the skin is frozen by ether spray; *General anæsthesia*, when the nervous centres are rendered insensible by means of chloroform inhalation.

**ANTHELMINTICS**, from ἀντί, *against*, and ἔλμινς, *a worm*, are medicines given for the destruction and expulsion of intestinal worms.

A *vermifuge* is a remedy that expels the worm; a *Vermicide*, a remedy that kills the same.

**ANTIDOTES** are remedies employed to counteract the effects of certain poisons. Vinegar and acids are antidotes to poisonous doses of caustic alkali. Alkalies neutralize the poisonous action of corrosive acids.

**ANTIPHLOGISTIC.** A term applied to treatment, by various agents, remedial and dietetic, with a view to reducing fever and moderating inflammatory action.

**ANTIPEIODICS** are medicines which tend to prevent the periodic recurrence of certain morbid symptoms. Arsenic and quinine, when acting in such a way as to prevent the periodic return of an ague fit, may be taken as examples.

**ANTISEPTICS** are bodies that arrest putrefactive

change and decomposition. Carbolic Acid, Creasote  
*e.g.*

**ANTISPASMODICS** are remedies that give relief to painful spasm. Example, Gum Assafoetida.

**ASTRINGENTS** constrict muscular fibre, and contract capillary vessels. By contracting the blood-vessels they arrest hæmorrhage, and are then called *Styptics* and *Hæmostatics*.

**APHRODISIACS**, from ἀφροδίσιας, *venery*; medicines which excite the sexual feelings. Example, Cantharis.

**ANAPHRODISIACS**, from ἀναφροδίσια; medicines that quiet sexual excitement. Example, Camphor.

**APYRETICS**, ἀ, *not*; πῦρ, *fire*. Remedies that reduce abnormally high temperatures. Example, Cold Baths, Quinia, Aconite.

**BLISTERS** or **VESICANTS** irritate the skin and cause the epidermis to rise in a *Bleb* or *Vesicle* full of serous fluid.

**CARMINATIVES**, derived from the Latin *carmen*, a charm, are medicines that expel flatus from the stomach, and relieve pain and uneasiness.

**CATHARTICS**, from καθαίρω, *I purge* or *cleanse*, or

**PURGATIVES**, from the Latin *purgo*, are medicines which produce alvine evacuations. A purgative which, like aloes, merely acts by emptying the lower bowel of solid matters, is said to be an *ecoprotic*, from ἐκκόπρωσις, a cleansing out of excrement. A drug which, like Gamboge, causes much water to pass away by the bowel is said to be a *hydragogue*, from ὕδωρ and ἀγωγός, *eliciting* or *evoking*. Strong purgatives are said to be *drastic*, from δράω *I am active*. Gentle purgatives are called *laxatives* or *lenitives*.

**CHOLAGOGUES**, from χολή, *bile*, are medicines tending to promote the flow of bile. Example, Calomel.

**COLLYRIA** are fluid washes for the eyes.

**DERIVATIVES** are medicines given to determine action in one part of the body with a view to relieving excess of action, or excess of blood, hyperæmia, &c.

another part. Strong purgatives are sometimes given in affections of the brain with a view to this kind of therapeutic action.

**DIAPHORETICS**, from *διαφορέω*, *I perspire*, and **SUDORIFICS**, are medicines that promote perspiration.

**DIURETICS**, from *διά*, *through*, and *οὐρέω*, *I make water*; medicines promoting the flow of urine.

**EMETICS**, from *έμέω*, *I vomit*; medicines that provoke vomiting.

**EMMENAGOGUES**, from *έμήνια*, *the menstrual discharge*, and *άγωγός*, *evoking*, are medicines that promote the catamenia or menses in women.

**ERRHINES**, from *έν*, *in*, and *ρίν*, *the nose*; medicines introduced as snuff into the nostril to induce increase of mucous secretion. When employed to excite sneezing, these remedies are called *sternutatories*.

**EXPECTORANTS**, from *εξ*, *out of*, and *pectus*, *the breast*. Medicines which promote the expulsion of secretion from the air passages.

**HYPNOTICS**, inducing sleep; from *ύπνώω*, *I lull to sleep*.

**NARCOTICS** induce sleep as *Hypnotics* or *Soporifics*, and also allay pain as *Anodynes*.

**PESSARIES** and **SUPPOSITORIES** are solid medicaments that are introduced into the vagina or rectum to ease pain.

**SEDATIVES** tranquillize excited action and irritation, and are the reverse of stimulants. The action of sedatives may be local or general. A general sedative often acts as a soporific or hypnotic and induces sleep.

**SIALOGOGUES**, from *σίαλον*, *saliva*, and *άγωγός* *evoking*. Example, Pellitory Root.

**STIMULANTS**. General or Diffusible stimulants, such as Alcohol and Ether, call forth the force of the system, and quicken the circulation. Alcohol increases the action of the heart, but it does not give enduring strength to this organ; it rather tends to induce ultimate exhaustion of the cardiac power. Special stimulants act on special organs to call them into action.

Thus Ergot stimulates the womb to contract, Cantharis stimulates the kidney, and Strychnia the spinal cord.

TONICS, *τεινω*, *I stretch*, are supposed to call forth force, while at the same time they impart it to feeble organs. Bitters call forth a flow of gastric juice from the stomach, while at the same time they increase the power of the organ to furnish a supply of gastric juice.

Tonics occupy a place between alteratives and stimulants.



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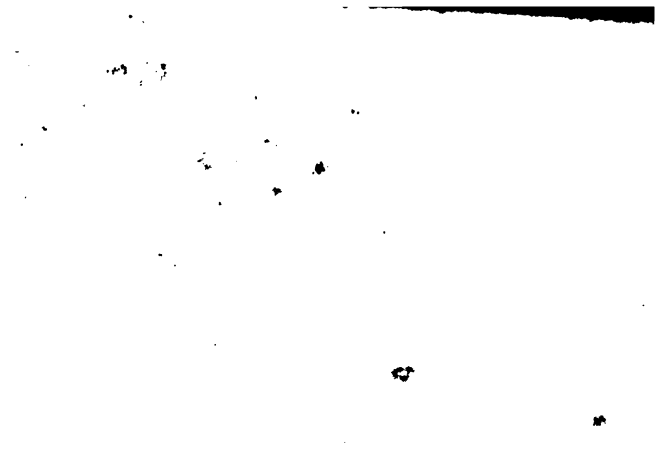
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