

to fail for want of blood, fill it by raising the legs and compressing the abdomen." No operation, especially on parts supplied by the fifth nerve, should be undertaken during partial chloroform anesthesia, for the reasons given on page 89. For the Schleich method with a mixed anesthetic see under *ÆTHER*, page 91.

The purest Chloroform in prolonged contact with damp air has a tendency to decompose, forming the dangerous gas *Phosgene*, COCl_2 ; hence chloroform in partially filled bottles, or in bottles filled in the drug-store by drawing from larger vessels, should not be used for anesthesia. Témoin states that chloroform may be preserved indefinitely without decomposition by the addition to it of Sulphur in the proportion of about 4 grammes (5j) to each kilogramme (lbij).

At a certain stage of chloroform anesthesia women often exhibit marked signs of sexual excitement, and on recovery it is not uncommon for them to bring charges of improper conduct against some one present, with no false intention but in the belief that impropriety actually occurred. It is never safe to administer an anesthetic to a woman without the presence of a third party (Murrell).

Dr. Sayre, the celebrated New York surgeon, used only ten or twenty drops of chloroform at a time, but he excluded all air not impregnated with the anesthetic on the principle that oxygen is the antidote to its action. He stated that with this small quantity he produced immediate and profound anesthesia in several thousand cases, without the least sign of danger, and without the struggling usually seen when the anesthetic is given in the ordinary manner.

Ethyl Chloride is increasing in popularity as a general anesthetic for minor operations, dental surgery, reduction of fractures and luxations, curettement, parturition, and examinations of sensitive subjects, especially children; also as a preliminary inhalation to prevent the early excitant effects of ether or chloroform. It acts rapidly, anesthesia being usually complete within a minute or two, and its risks are considered slight, even in patients with unsound heart or lungs. It does not relax the muscles, and in operations requiring complete relaxation its use should be followed by that of ether or chloroform. Its mortality is stated at 1 in 15,000 cases. It may give rise to erotic sensations resulting in false accusations, and should not be used for women except in the presence of a witness.

CHLORUM, Chlorine, Cl,—is a greenish-yellow gas having a suffocating odor, belonging to the *Halogen* group of elements; and though not official itself is represented in medicine by several of its compounds, also by several preparations which furnish it.

Chlorine Compounds, described under the titles of their respective metallic bases, are: the *Chlorates* of Potassium and Sodium; the *Chlorides* of Ammonium, Calcium, Potassium, Sodium, Mercury, Gold, Iron, Zinc, etc.; also *Hydrochloric Acid*, classed with the mineral acids, and Chloroform, Ethyl Chloride, Chloral and Butyl-chloral.

Preparations.

Liquor Chlorig Compositus, Compound Solution of Chlorine, Chlorine Water,—is an aqueous solution containing about 0.4 per cent. of Chlorine, with some oxides of chlorine and potassium chloride. It is prepared by adding Potassium Chlorate 5, Hydrochloric Acid 18, and Distilled Water 20, heating the mixture on a water-bath for two or three minutes, adding Distilled Water to 1000 and agitating. It should be freshly made when wanted. Dose $\text{℥xx}-\text{ʒij}$ [av. ʒj] in water; as a lotion or spray ʒj-ʒiv. well diluted.

Chlorine Water may be extemporaneously prepared by mixing in a mortar Chlorate of Potassium 40 grains and Hydrochloric Acid ʒijss, adding a pint of distilled water by agitation during the evolution of the vapors. If done in a closed vessel danger may arise from the explosive gas, Cl_2O_4 , which is liberated at the same time. It should be quickly bottled.

Calx Chlorinata, Chlorinated Lime, Chlorinated Calcium Oxide, (often improperly called Chloride of Lime),—is a compound resulting from the action of chlorine upon calcium hydroxide, containing not less than 30 per cent. of available Chlorine. It occurs as a white or grayish-white, granular powder, of repulsive taste, partially soluble in water or alcohol, but when dissolved in diluted Acetic Acid gives off an abundance of chlorine gas. Dose, gr. iij-vj [av. gr. iv] in water; for external use a 1 to 3 per cent. solution. The *Liquor Calcis Chlorinata* of the B. P. is a solution of 1 pound in 1 gallon of water.

Liquor Sodæ Chlorinatæ, Solution of Chlorinated Soda (Labarraque's Solution),—is an aqueous solution of several chlorine compounds of sodium, containing at least 2.4 per cent. by weight, of available Chlorine; prepared by adding together aqueous solutions of Monohydrated Sodium Carbonate 65, and Chlorinated Lime 90, then adding water to 1000. Dose, $\text{℥x}-\text{xxx}$ [av. ℥xv] in 20 parts of water.

Incompatibles.

Incompatible with *Chlorine-water* are: Alkalies, Ammonium salts, Arsenous salts, Bromides, Ferrous salts, Hypophosphites, Iodides, Lead salts, Lime-water, Mercurous salts, Oxalic Acid, Silver salts; with *Chlorinated Lime* are Fats, Glycerin, Iodides, Oils; with *Chlorides* are Hydrogen Peroxide, Lead, Mercurous, and Silver salts, Nitric Acid, Sulphuric Acid.

Incompatible with *Chlorates* are Ammonium Picrate, Arsenites or Bromides in acid solution, Charcoal, Cyanides, Ferrous salts in acid solution, Gallic Acid, Glycerin, Honey, Hydrochloric Acid, Hypophosphites, Hyposulphites, Iodides in acid solution, Iodine, Iron (reduced), Lycopodium, Mercurous salts in acid solution, Oxalic Acid, Phenol, Phosphorous (amorphous) Salicylic Acid, Shellac, Starch, Sugar, Sulphides, Sulphites, Sulphuric Acid.

PHYSIOLOGICAL ACTION.

In the presence of moisture Chlorine is one of the most powerful of disinfectants and deodorants, also an antiseptic and antifermentive agent of the highest activity; its power in these respects being due to its affinity for hydrogen, decomposing all bodies which contain hydrogen as a molecular constituent, forming hydrochloric acid and setting oxygen free in its nascent form (ozone). Administered internally, it is converted, on reaching the stomach, into hydrochloric acid and chlorides, losing all action on the organism in its own character. Locally applied, it is irritant to the skin and mucous membranes, producing a sense of heat, with a burning sensation and even vesication. Inhaled in any quantity, it causes cough, sneezing and spasm of the glottis, also inflammation of the mucous lining of the air-passages and of the lungs.

THERAPEUTICS.

The Chlorinated preparations are used as disinfectants and deodorizers of rooms, drains, and discharges from the body. They are rarely used about the person or clothing of patients by reason of the irritation produced by them when inhaled, and their power to destroy the color of fabrics. In dilute solu-

tion they are well employed as local applications in aphthæ, gangrene, scarlet fever and diphtheria, in which their principal action is to destroy fetor. The same may be said of their use in sloughing ulcers, gangrenous wounds and foul discharges, as they are rarely employed about the person in sufficient strength to have any destructive effect on disease germs. A strong solution of Chlorinated Soda is a good application to bites of serpents and insects, to wash the hands after contact with infectious material, and to prevent infection by the syphilitic poison.

The well-known solution of Potassium Chlorate and tincture of Ferric Chloride in glycerin and water (see formula under the title DIPHTHERIA in Part III), which was devised by Dr. Jacobi many years ago, has in diphtheria a high reputation which rests on a sound scientific basis. If properly prepared, by dissolving the potassium chlorate in water before adding the other ingredients, it contains some undecomposed Chloric Acid, HClO_3 . This at a higher temperature and in contact with organic matter is split up into perchloric acid and chlorine peroxide, which are fatal to bacteria, and especially to the bacillus diphtheriæ. It is said that the glycerin in this mixture has occasionally caused a violent explosion, but the preparation has been used for many years with great satisfaction.

Chlorine gas is a powerful local stimulant, and has been used with great benefit to promote healing in old ulcers. Absorbent cotton may be exposed to the gas extemporaneously prepared as directed on page 225, and bandaged on the surface of the ulcer. Chlorine inhalations were used forty years ago, by Sir James Simpson and others, in phthisis pulmonalis, with apparent benefit.

Chlorinated Lime, freshly prepared, in solutions of varying strength, from 1 in 60 to 1 in 12, is used by hypodermic injection in Australia as an antidote to serpent venom. The solution is injected into several points above the wound, 20 to 100 minims being inserted at each place. In some cases this procedure causes great pain, but it does not seem to induce any local inflammation, and it is highly efficient for the purpose for which it is used. A common method of disinfecting a sick-room is to place a pound of Chlorinated Lime into a canvas bag and immerse it in a mixture of common hydrochloric acid, $1\frac{1}{2}$ pint, and water $4\frac{1}{2}$ pints, allowing it to remain for 24 hours. A still better method is to mix common salt, manganese dioxide and sulphuric acid in a saucer. The chlorine generated is heavier than atmospheric air, so that the vessel should be placed on a high shelf and not on the floor, in order that it may be diffused throughout the room.

CHROMII TRIOXIDUM, Chromic Trioxide, (Chromic Acid) CrO_3 ,—is obtained by the action of sulphuric acid on potassium dichromate. It occurs in small, crimson, needle-shaped crystals, deliquescent in moist air, very soluble in water. True Chromic Acid, H_2CrO_4 , does not occur in the free state. Chromic Trioxide should be kept in glass-stoppered bottles, and great caution

should be observed to avoid bringing it in contact with organic substances, such as cork, tannic acid, sugar, alcohol, glycerin, etc., as dangerous accidents are liable to result. It is not used internally.

Potassii Dichromas, Potassium Dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$,—large, orange-red prisms of disagreeable, metallic taste and acid reaction, soluble in 10 of water at 59°F ., and in $1\frac{1}{2}$ of boiling water, insoluble in alcohol. It is used locally in aqueous solution (gr. v- $\bar{3}$ j to the $\bar{5}$), and internally in doses of gr. $\frac{1}{10}$ -gr. ss [av. gr. $\frac{1}{2}$] in trituration.

Incompatible with Chromic Trioxide are: Alcohol, Bromides, Chlorides, Ether, Glycerin, Hypophosphites, Iodides, Oxalates, Sulphides, Tartrates; with *Chromates* are the salts of Barium, Bismuth, Lead, Manganese, Mercury, Silver, and Strontium; with *Dichromates* are many alkaloids, also Tannic Acid, Sugar, and other oxidizable substances.

PHYSIOLOGICAL ACTION AND THERAPEUTICS.

Chromic Trioxide is a powerful escharotic and penetrates deeply, but it is slow of action and is not very painful. It coagulates albumin and parts readily with its oxygen, oxidizing organic matter and decomposing ammonia and sulphuretted hydrogen; and is therefore an energetic disinfectant and deodorizer. When used as a caustic it is mixed with sufficient water to make a paste, which may be employed for the destruction of warts, hemorrhoids and other superficial growths; the neighboring parts being protected by cotton soaked in a strong alkaline solution. For syphilitic warts and condylomata, lupus, tinea tonsurans, etc., a solution of 100 grains to the $\bar{3}$ of distilled water is generally used. A solution of 1 in 40 is an excellent and inexpensive antiseptic lotion for putrid sores and wounds, syphilitic affections of the tongue, mouth and throat, ozena, leucorrhœa and gonorrhœa. In uterine catarrh and hemorrhages a solution of 120 grains to the $\bar{3}$ has been injected into the uterine cavity with good results.

Potassium Dichromate is a good antiseptic and escharotic of milder action than the trioxide. In doses of $\bar{3}$ j-iv it has proved fatal to life in adults, with symptoms of gastro-enteritis, suppression of urine, and cardiac paralysis. It is chiefly employed as a local application in saturated solution to warts and venereal condylomata; and in dilute solution (gr. j-x to the $\bar{3}$) for catarrhal conditions of the nasal, buccal or vaginal mucous membrane. Internally it has been employed with benefit in locomotor ataxia and in dyspepsia simulating gastric cancer; also in chronic gastric catarrh, the tongue having a thick yellow coat, in chronic diarrhea from intestinal ulceration, and in chronic ulcers of the pharynx and mouth. It is a good remedy in syphilitic sore throat, local rheumatism of the fibrous tissues, periosteal and syphilitic rheumatism, and acute catarrh and influenza, chronic nasal catarrh, chronic laryngitis, and chronic catarrhal affections of the bronchial mucous membrane, especially when the expectoration is tough and stringy. It has also been used with some success in diphtheria. In pharmacy it is employed in preparing chromic trioxide and valerianic acid, and as a test solution. Most of the medical galvanic and faradic batteries are run by a mixture of this salt with sulphuric acid. *Poisoning* by it should be treated as directed for mineral acids in Part III.

CHRYSAROBINUM, Chrysarobin, $C_{30}H_{26}O_7$,—is a neutral principle extracted from *Goa Powder*, a substance found deposited in the wood of *Vouacapoua Araroba*, a Brazilian tree of the nat. ord. Leguminosæ. It is commonly misnamed *Chrysophanic Acid* (one of the constituents of Rheum)—though easily converted into that substance. Occurs as an orange-yellow powder, odorless and tasteless, nearly insoluble in water and in alcohol, but readily soluble in ether, solutions of alkalies, and sulphuric acid. Dose, gr. $\frac{1}{4}$ – $\frac{1}{2}$ [av. gr. ss].

Unguentum Chrysarobini, Chrysarobin Ointment,—Chrysarobin 5, Benzoinated Lard 95 parts. Should be diluted for average use from 1 to 3 times.

In 20-grain doses Chrysarobin is a gastro-intestinal irritant, producing large, watery bilious stools, with repeated vomiting, but not much nausea. Locally it produces diffuse dermatitis, often followed by follicular and furuncular inflammation. It stains the skin a dark yellowish-brown color, which may be removed by a weak solution of chlorinated lime. The use of this remedy is confined to superficial parasitic skin diseases of vegetable origin, and for psoriasis, in the latter affection being the best remedy known.

CIMICIFUGA, Cimicifuga, (*Black Cohosh*)—is the dried rhizome and roots of *Cimicifuga racemosa*, a plant of the nat. ord. Ranunculaceæ, native in the United States. It contains a *Volatile Oil* when fresh, resin, tannic and gallic acids, also an acrid, crystallizable, neutral principle. *Cimicifugin* or *Macrotin* is an impure resin obtained by precipitation from a concentrated tincture by the addition of water. The active principle has not been isolated. Dose, gr. x–xx [av. gr. xv.]

Preparations.

Extractum Cimicifugæ, Extract of Cimicifuga.—Dose, gr. j–vj [av. gr. iv]

Fluidextractum Cimicifugæ, Fluidextract of Cimicifuga.—Dose, ℥v–xx [av. ℥xv.]

Tinctura Cimicifugæ, Tincture of Cimicifuga.—20 per cent.—Dose, ℥x–ʒij [av. ʒj.]

Macrotinum, Macrotin, (Unofficial).—Dose, gr. ss–ij.

PHYSIOLOGICAL ACTION AND THERAPEUTICS.

Cimicifuga is stomachic, antispasmodic, aphrodisiac, diaphoretic, diuretic and expectorant. Its taste is bitter and nauseous, resembling that of Opium. It acts on the heart and circulation similarly to Digitalis, and on unstripped muscular fibre like Ergot, but is much feebler in activity than either of these agents. Small doses stimulate digestion and secretion, the generative function and the menstrual flow, and especially the secretions of the bronchial mucous membrane and the kidneys. Full doses slow the heart while increasing its force, raise arterial tension and stimulate uterine contraction. Large doses dilate the pupils and produce dimness of vision, vertigo, intense headache, nausea, vomiting, and in some persons soporific and anodyne effects.

Cimicifuga closely resembles Digitalis in action, but is safer, and should be more frequently used when the latter drug is indicated. In cardiac diseases it is very efficient, especially in weak or fatty heart where Digitalis would be dangerous. It is a good stomachic tonic, particularly in the irritable dyspepsia of alcoholism. As an expectorant it is used in acute and chronic bronchitis. It is a good nerve tonic in delirium tremens, and in functional impotence it is often efficient. In rheumatoid arthritis and rheumatism of the localized muscular variety, as lumbago, torticollis, and intercostal rheumatism, it is one of the most efficacious remedies, having a strong affinity for the muscular sys-

tem. Neuralgias of various kinds are benefited by it, particularly ovarian neuralgia. Chorea about the age of puberty is one of the affections in which it is most useful, and the same may be said of the hysterical form of this disease.

Many uterine disorders are benefited by Cimicifuga, such as amenorrhea, neuralgic and congestive dysmenorrhea, passive menorrhagia, subinvolution, spinal irritation due to some obscure sympathetic or neuralgic affection of the womb, sympathetic pains and neuralgiæ arising from the so-called irritable womb. In obstetrics it gives excellent results when used to initiate uterine contractions, to check hemorrhage, and to allay afterpains and nervousness after delivery. In puerperal mania and peritonitis its good effects are frequently remarkable, and in puerperal hypochondriasis it is strongly recommended by high authority.

CINCHONA, Peruvian Bark.—The Cinchona tree belongs to the nat. ord. Rubiaceæ and is a native of the eastern slope of the Andes, but has been largely planted in India, Ceylon, Java and Burmah, with the result of improving the quinine-yielding value of many species by cultivation. In late years the test of appearance has given way to that of assay in judging of the various barks of commerce, and only those are official which yield 5 per cent. of total alkaloids. The official species are:—

Cinchona, Cinchona,—the dried bark of *Cinchona Ledgeriana*, *Cinchona Calisaya*, *Cinchona officinalis*, and of hybrids of these and of other species of Cinchona, yielding, when assayed by a prescribed process, not less than 5 per cent. of total alkaloids.

Cinchona Rubra, Red Cinchona,—is the bark of *Cinchona Succirubra* or of its hybrids, containing not less than 5 per cent. of cinchona alkaloids. From it is prepared the Compound Tincture of Cinchona.

Bark may be administered in doses of gr. x–xxx [av. gr. xv.], but it is never used now in substance, being bulky and very disagreeable to the taste.

The principal varieties of the sub-order Cinchoneæ, the barks of which are found in commerce and are used by manufacturers of the alkaloids, are—*Cinchona Calisaya*, *Cinchona Flava*, Yellow Bark, from Peru, Bolivia and India; *C. Succirubra*, Red Bark, from Ecuador, Java and Ceylon; *C. Condaminea*, Pale Bark, from Ecuador and Peru; *C. Pitayensis*, Pitaya Bark, from New Granada; *C. Micrantha*, Gray Bark, from Peru and Bolivia. Altogether there are some 31 species acknowledged by botanists, and the list is constantly increasing, from the tendency of the different trees to hybridize. Several trees formerly acknowledged as Cinchonas are now placed in the genus *Cascarilla*, but their barks are to be found on the market. Cuprea bark is from trees of the genus *Remijia*, growing in Columbia; it contains Quinine and a peculiar alkaloid, *Cinchonamine*, but no Cinchonidine.

Composition of Cinchona.

Cinchona bark contains 21 natural alkaloids, 3 of which are official, 8 artificial alkaloids, 2 simple acids, 2 tannic acids, a resinoid and a coloring matter, as follows:—

Quinine, $C_{20}H_{24}N_2O_2$,—a strong base, fluorescent, the most valuable of all the alkaloids; heated with glycerin to $374^\circ F.$, it is converted into the isomeric base, *Quinicine*.

Quinidine, $C_{20}H_{24}N_2O_2$,—isomeric with Quinine, fluorescent, probably the most powerful as an antiperiodic, but existing in very small quantity.

Cinchonine, $C_{19}H_{22}N_2O$,—the least active of the official three, having about half the therapeutic power of quinine. Not fluorescent.

Cinchonidine, $C_{19}H_{22}N_2O$,—isomeric with Cinchonine, not fluorescent, one of the most powerful of the alkaloids.

The other alkaloids are of no interest medicinally.

Kinic and Kinovic Acids,—are combined in the bark with the alkaloids. The former is used to make a Kinate of Quinine, and the latter occurs in non-official pharmacy as Kinovate of Lime, an ingredient in Deloude's Extract, which is used in Europe and India for dysentery.

Kino-tannic and Kinovo-tannic Acids,—give to bark its peculiar and powerful astringent qualities. They have not been fully studied.

Kinovin,—is a bitter, amorphous resinoid, which is resolvable into Kinovic Acid and sugar. It is soluble in alcohol, but not in water.

Cinchona Red,—a reddish-brown, insipid, inodorous substance.

Preparations of the Bark.

Fluidextractum Cinchonæ, *Fluidextract of Cinchona*.—Dose, ℥x-xxx [av. ℥xv .]

Tinctura Cinchonæ, *Tincture of Cinchona*,—has of Cinchona 20, in Alcohol $67\frac{1}{2}$, Water 25 and Glycerin $7\frac{1}{2}$. Dose, ʒss-ij , [av. ʒj .]

Tinctura Cinchonæ Composita, *Compound Tincture of Cinchona*,—has of Red Cinchona 10, Bitter Orange Peel 8, Serpentaria 2, in Alcohol 85, Water $7\frac{1}{2}$ and Glycerin $7\frac{1}{2}$; and is intended to replace Huxham's Tincture of Bark (see below). Dose, ʒss-ij [av. ʒj .]

Huxham's Tincture of Bark, 1788 (Unofficial), is still used. Red Cinchona ʒiv , Orange-peel ʒij , Serpentaria gr. lxxx, Spanish Saffron gr. clx, Cochineal gr. lxxx, Brandy ʒxl , digested for 4 days, expressed and filtered. Dose, ʒss-ij .

Quinine and its Salts.

Quinina, *Quinine*, $C_{20}H_{24}N_2O_2 + 3H_2O$,—a white, amorphous or minutely crystalline powder, of alkaline reaction and very bitter taste, soluble in 1670 of water and in 0.6 of alcohol at $59^\circ F.$ and readily in dilute acids. Dose, gr. j-xx [av. gr. iv], or gr. xl in special cases. Is insoluble in saliva.

Quininæ Sulphas, *Quinine Sulphate*, $(C_{20}H_{24}N_2O_2)_2 \cdot H_2SO_4 + 7H_2O$,—very light, snow-white, fragile crystals, of bitter, persistent taste, soluble in 740 of water and in 65 of alcohol at $59^\circ F.$, more soluble in acidulated water. Dose, gr. j-xx, or even gr. xl in special cases, [av. gr. iv.]

Quininæ Bisulphas, *Quinine Bisulphate*, $C_{20}H_{24}N_2O_2 \cdot H_2SO_4 + 7H_2O$,—clear, colorless efflorescent crystals or small needles, of very bitter taste and strongly acid reaction, soluble in 10 of water with blue efflorescence, and in 32 of alcohol, at $59^\circ F.$ Dose, gr. j-xx, or even gr. lx in special cases, [av. gr. iv.]

Quininæ Hydrobromidum, *Quinine Hydrobromide*, $C_{20}H_{24}N_2O_2 \cdot HBr + H_2O$,—colorless needles, of very bitter taste, soluble in 54 of water and in 0.6 of alcohol at $59^\circ F.$, very soluble in boiling water and in boiling alcohol. Dose, gr. j-xx, [av. gr. iv.]

Quininæ Hydrochloridum, *Quinine Hydrochloride*, $C_{20}H_{24}N_2O_2 \cdot HCl + 2H_2O$,—white needles in tufts, of very bitter taste, soluble in 34 of water and in 3 of alcohol at $59^\circ F.$, in 1 of boiling water or alcohol. Dose, gr. j-xx [av. gr. iv.] An excellent salt which should be more generally used; 5 to 10 grain doses are antipyretic.

Quininæ Hydrochloridum Acidum, *Acid Quinine Hydrochloride*, $C_{20}H_{24}N_2O_2(HCl)_2 + 3H_2O$ (B.P.),—is soluble in less than its own weight of water, and may be used hypodermically. Dose, gr. j-x.

Quininæ Hydrochloridum Carbamidatum, *Quinine Carbamide Hydrochloride*, (Unofficial),—is a compound salt of Quinine and Urea, soluble in equal parts of water and there-

fore admirably adapted for hypodermic administration in a 50 per cent. solution. It is almost unirritating to the tissues, and is given subcutaneously in doses of gr. j-ij.

Quininæ Salicylas, *Quinine Salicylate*,—is soluble in 77 of water, in 11 of alcohol, in 37 of chloroform, and in 110 of ether, at $77^\circ F.$ It contains 70 per cent. of quinine. Dose, gr. j-xx [av. gr. iv.], in pill or capsule.

Tinctura Pyrexialis, *Tinctura Antiperiodica*, *Warburg's Tincture* (Unofficial),—is a celebrated and formerly secret preparation. The formula, published in 1875 by the originator, includes 16 ingredients, one of which (Confectio Damocratis) contained many drugs which are not now obtainable. The tincture contained Quinine Bisulphate, 2 per cent., with Aloes, Rhubarb, Camphor and several aromatic herbs. Dose, ʒj (about $9\frac{1}{2}$ grains of Quinine Bisulphate) in 2 doses given 3 hours apart. Hager's modification of the original formula is—Quinine Sulphate 1, Spt. Camphoræ 2, Tinct. Aloes et Myrrha 22, Alcohol 16. Dose, as above. Some of the preparations now sold under this name contain few, if any, of the original ingredients. The so-called *Warburg's Pill* is a most irrational form in which to administer this complex medicine, even if it contains the proper constituents.

Quinine is a constituent of the Glycerite and the Syrup of the Phosphates of Iron, Quinine and Strychnine (see under FERRUM).

Unofficial Derivatives of Quinine.

Aristochin, *Diquinine Carbonic Acid Ester*,—occurs as a white, tasteless powder, insoluble in water, soluble in alcohol and in chloroform, and contains 96 per cent. of quinine. It is said to be free from the unpleasant effects of quinine, though twice as powerful against protozoa and twice as efficient in malarial fever. Dose, gr. viij-xv, thrice daily; gr. j-v for children, according to age.

Euchinin, *Euquinine*, *Quinine Carbonic Ether*,—occurs in light, fleecy, white needles, soluble in alcohol, ether, and chloroform, very slightly soluble in water. Is tasteless in substance, though decidedly bitter in solution; and is claimed to have no unpleasant gastric effects, to cause cinchonism less frequently and less intensely than quinine sulphate, though equally efficient as an antimalarial, antispasmodic and antineuralgic. Dose, gr. v-xx.

Saloquinin,—is a salicylic acid ester of quinine, and occurs as a tasteless, crystalline powder, insoluble in water. It is said to be free from the cerebral effects of ordinary quinine salts, and to have been used with satisfaction in malarial fevers, sciatica, rheumatism, dysmenorrhœa, and nervous headaches. Dose, gr. v-xx or more.

Salts of Other Cinchona Alkaloids.

Cinchoninæ Sulphas, *Cinchonine Sulphate* $(C_{19}H_{22}N_2O)_2 \cdot H_2SO_4 + 2H_2O$,—white, shining prisms, of very bitter taste, soluble in 66 of water and in 10 of alcohol at $59^\circ F.$, and readily soluble in dilute acids. Dose, gr. v-xx or more [av. gr. iv.]

Cinchonidinæ Sulphas, *Cinchonidine Sulphate* $(C_{19}H_{22}N_2O)_2 \cdot H_2SO_4 + 3H_2O$,—white, silky crystals, of bitter taste, soluble in 70 of water and in 66 of alcohol at $59^\circ F.$, freely soluble in acidulated water. Dose, gr. j-xx or more [av. gr. iv.]

Cinchonidinæ Salicylas, *Cinchonidine Salicylate* (Unofficial),—has antimalarial properties which are but slightly inferior to those of the quinine salts. Dose, gr. v-xx or more.

Unofficial Preparations.

Chinoidinum, *Chinoidin*, *Quinoidin*,—a mixture of alkaloids, mostly amorphous, obtained as a by-product in the manufacture of the crystallizable alkaloids from Cinchona. A black solid when cold, plastic when warmed, of bitter taste, almost insoluble in water, freely soluble in alcohol and in dilute acids. It contains the 4 alkaloids in amorphous condition, and has about $\frac{1}{2}$ the therapeutic power of Quinine. Dose, gr. v-xxx or more.

Quinquina, *Quinetum*,—is an Indian preparation containing the total alkaloids extracted from bark by acidulated water, then precipitated by soda and dried. In India it is called "febrifuge."

Incompatibles.

Incompatible with *Cinchona* are Acids (mineral), Alkalies, Carbonates, Alkaloidal precipitants (see page 5), Ferric and Ferrous salts, Lead Acetate, Lime-water, Magnesia, Mercuric Chloride, Rhubarb infusion, Silver Nitrite, Tartar Emetic, Zinc Sulphate; with *Quinine* as for other alkaloids (see page 6).

SUBSTITUTES FOR QUININE.

The synthetical production of Quinine has been the philosopher's stone of the modern chemists, who have prosecuted with untiring energy the search for an artificial product possessing all its properties. Though in this they have as yet been unsuccessful, they have discovered several organic bodies, which closely resemble each other and also quinine, both in chemical constitution and physiological action. These substances belong to the aromatic series of carbon compounds, all of which are derivatives of *Benzene*, C_6H_6 , the hydride of the organic radicle *Phenyl*, C_6H_5 . The distinctive action of the lower members of this series is their antiseptic and antipyretic powers,—as that of the fatty series of carbon compounds is stimulant and anesthetic (Brunton). Many of these agents are obtained from coal-tar oil (petroleum) by fractional distillation, and they are all derivatives of benzene, either directly or from some one of the products formed therefrom by substitution, various radicles replacing the different constituent atoms of H and C.

Thus by the atomic ring-arrangements peculiar to this series, there are formed from Benzene, C_6H_6 , the following substances, viz.:

Phenol, (*Carbolic Acid*), C_6H_5OH —by replacing H by OH (hydroxyl).
Pyrocatechin, or *Ortho-Resorcinol*, ... or *Meta-Hydroquinone*, or *Para-* } $C_6H_4(OH)_2$.
dioxybenzene,—by replacing 2H by 2OH.
Pyrogallol, *Pyrogallol Acid*, *Tri-hydroxybenzene*, $C_6H_3(OH)_3$.—3H by 3OH.
Amido-benzene, or *Anilin*, $C_6H_5NH_2$ —by replacing H by NH_2 (amidogen).
Nitro-benzene, $C_6H_5NO_2$ —by replacing H by NO_2 (nitroxyl).
Benzoic Acid, $C_6H_5CO.OH$ —by replacing H by $CO.OH$ (carboxyl).
Salicylic Acid, $HC_7H_5O_3$ —by replacing 2H by OH and $CO.OH$.
Naphthalene, $C_{10}H_8$ —by uniting two Benzenes in an over-lapping ring.
Pyridine, C_5H_5N —by replacing tetrad C by triad N.
Chinolin, C_9H_7N —by uniting Benzene, C_6H_6 , and Pyridine, C_5H_5N

Derived from Chinolin is the hypothetical base—

Chinicin or *Quinicin*, $C_9H_7N_2$ —represented in Antipyrine.
Kairin, *Thallin*, and other compounds; also probably the Cinchona alkaloids.

The most important of these are Antipyrine, Acetanilide, Resorcinol, Chinolin and Naphthalene, which are respectively described in separate articles.

PHYSIOLOGICAL ACTION.

Cinchona is an astringent bitter and a stomachic tonic. At first it promotes appetite, digestion, the flow of saliva and of gastric juice; long continued it sets up a gastric catarrh, impeding digestion and causing constipation. The action of Cinchona in sufficient dose is generally that of its alkaloid Quinine, except that the bark is decidedly astringent, more of a gastric irritant, and its active principles are more slowly absorbed by reason of its bulk. In large doses (5ij) the powdered bark has produced flatulence and eructation, and in many well-authenticated instances has apparently caused a well-marked febrile paroxysm, beginning with chill, then fever and headache, which gradually subsided with slight perspiration. So also, Quinine, while incapable of producing intermittent fever in a healthy person, if taken in large doses unneces-

sarily, may throw the nervous system into high commotion, and if untimely used by a malarial subject may reproduce the paroxysm with greater or less severity.

Quinine is a bitter tonic, an antiseptic, antiperiodic and antipyretic, a diminisher of reflex action, a protoplasmic poison and a cardiac depressant. It is rapidly diffused and slowly excreted, being found in the urine in 15 minutes after its administration and for two or three days afterwards. Its action on the stomach is similar to that of cinchona, small doses having tonic effects, while large doses are irritant. The heart and arterial tension are somewhat stimulated by small doses, but depressed by large ones (gr. xl-lxxx), which slow and enfeeble the pulse by direct action on the cardiac ganglia. The brain is rendered hyperemic and exhilaration is caused by small or moderate doses, but large ones produce a train of congestive cerebral symptoms, collectively termed *cinchonism*, and including a sense of fulness and constriction in the head, tinnitus aurium, vertigo, staggering gait, amblyopia and deafness, great headache, dilated pupils, delirium, coma, and in the lower animals convulsions. The eyes and ears, though suffering severely, are rarely injured permanently. In very large doses it abolishes the cerebral functions.

Quinine reduces the size of the spleen when enlarged, and lowers the temperature of pyrexia by lessening oxidation, though it does not depress the body-temperature in health. Large doses lower the reflex function of the spinal cord. It depresses the retrograde metamorphosis of the tissues, and lessens the formation of the nitrogenous excretory products, the elimination of uric acid and urea being decidedly decreased during its administration. It arrests the movements of the white blood-corpuscles though increasing their number, and prevents acetification and decay of the blood outside of the body. It is actively destructive to lowly organized life, a solution of 1 in 800 killing the larger infusoria immediately, 1 in 1,000 after some minutes, and 1 in 20,000 after some hours. Upon the higher infusoria and mould penicillium much stronger solutions are required for its fatal action, while vibrios and bacteria resist solutions weaker than 1 in 100. The ameboid movements of human white blood cells are arrested by a solution of 1 in 4,000.

Individual idiosyncrasies are frequently observed with regard to the action of Quinine. In some persons even small doses produce a severe erythema or urticaria, with subcutaneous edema, often followed by desquamation of the cuticle, and accompanied by pronounced disturbance of the nervous system and the circulation. In one case the symptoms simulated those of strychnine poisoning. Occasionally it produces renal and vesical irritation, and in some persons it causes sexual excitement. It acts as a uterine stimulant in labor, and is used as an oxytocic, but its power to initiate uterine contractions is strenuously denied by many investigators.

The fatal dose of Quinine is undetermined. In one case five ounces taken in the course of ten days caused death; in another 7.7 grains (gramme 0.5) given hypodermically caused profound toxic symptoms which terminated in

death after seven days. On the other hand an ounce of the sulphate has been taken without causing more than a mild stupor, and in another case half an ounce produced neither vomiting nor other ill effects. Surgeon Roberts of the Indian army has recorded a case in which a woman aged 35 years took 6 drachms of the sulphate at one dose, and survived, after profound coma for several hours, also slow and shallow respiration, slow pulse, abolished reflexes, deafness and blindness. The hearing was restored within a week, but the blindness was absolute for two weeks, when light began to be distinguished. Objects were not perceived until after three or four weeks, and then indistinctly for several months, the vision remaining greatly impaired for a long time.

Cinchonine and the other alkaloids closely resemble quinine in their physiological and therapeutical properties, in doses about one-third larger. In large doses Cinchonine has some and Cinchonidine has a very strong tendency to produce epileptiform convulsions, while small quantities of the latter given to epileptics will increase the number of their attacks. Cinchonine produces greater headache than quinine, also much precordial pain and muscular weakness, but is asserted to have little effect on the sight or hearing. By some authorities it is said to be the least active of the four alkaloids; by others Cinchonidine is considered to be the most poisonous, Quinine coming next in rank, then Cinchonine, and lastly Quinidine.

THERAPEUTICS.

Cinchona is used as a tonic, and has many applications. The infusion or compound tincture with a mineral acid is serviceable in atonic dyspepsia, gastric catarrh of alcoholics, adynamia, and convalescence; also in asthma, chronic bronchitis, and generally in weak subjects of flabby flesh and freely perspiring skin. Quinine in small doses is much employed as a tonic, usually in conjunction with iron. Its tonic power is believed by some to be due to its lessening tissue-change, by others to its increasing the number of the red blood corpuscles.

Quinine finds its principal field of action in the malarial diseases, over which its influence is specific, by reason of its power to prevent the development of the plasmodium to which malaria is due. In intermittents, a ten-grain dose of the sulphate should be given in the sweating stage and again 5 hours before the expected time of the next paroxysm. In the intervals Arsenic is a better remedy, as quinine may cause a daily exacerbation of temperature if long continued. In remittents from 20 to 30 grains are administered once or twice daily until the temperature becomes normal, and in pernicious remittents doses of 30 to 60 grains are necessary to the safety of the patient. In chronic malarial toxemia Chinoidin is considered more effective than quinine. As a prophylactic against malarial fevers the use of small doses of quinine, 3 to 5 grains daily, has been universally approved until recently, especially in tropical countries. Professor Koch considers this to be dangerous practice and to be respon-

sible for the increased death-rate in certain parts of West Africa during late years. He holds that the indiscriminate use of quinine as a prophylactic in malarial countries is in many cases the indirect cause of the pernicious "black-water" fever, one of the most virulent forms of malarial disease; also that this drug seriously weakens the action of the heart when taken regularly in excessive doses, and will so inure the system to its influence that it becomes useless as a remedy when required for this purpose. Warburg's Tincture obtained a very high reputation in the hands of Indian army-surgeons in the treatment of remittent and other malarial fevers of the most malignant types, in malarial neuralgiæ, acute nervous exhaustion and sudden collapse without organic disease. Dr. Maclean affirmed that the influence of this combination to arrest an exacerbation of remittent fever is far more powerful than that of quinine alone. The remedy has become much less of a favorite since its originator was induced to make public the secret of its composition.

As a general antipyretic large doses of Quinine were in common use before the introduction of the modern synthetical antipyretics, to which it is inferior for this purpose. Its power of lowering temperature in non-malarious fevers is decided, and is especially manifested at the beginning of a natural remission of the fever. In the exanthemata and typhoid fever, after the use of the cold bath, a 20-grain dose of quinine will usually delay the return of high temperature, but the large dose necessary causes much discomfort by its action on the brain and the hearing. Quinine has been employed as an antipyretic and antiseptic in typhus and typhoid fevers, variola, pneumonia, acute rheumatism, surgical fever, septicemia, pyemia, hectic fever, scarlet fever, measles and erysipelas, in many of which it has enthusiastic advocates, who recommend its administration throughout the course of the disease. In exhausting suppurations it is generally employed, and in some skin diseases, particularly erythema nodosum, it is said to be very efficient. It is used in conjunction with morphine, a full dose of each, at the commencement of acute inflammations, with the object of aborting them; also in acute tonsillitis and acute coryza for the same purpose. Quinine is a routine remedy with many persons to break up a cold, but there is no evidence, clinical or experimental, that it has any such power, and its only effect in these cases probably depends upon its anodyne and antipyretic action. Neuralgia of malarial origin, and that of the ophthalmic division of the fifth nerve, are decidedly amenable to it. In whooping-cough the internal administration of Quinine, also its inhalation in the form of a sprayed solution, have been employed with asserted benefit. In hay-fever, the application of a weak tepid solution of the hydrochloride, gr. iij to the ℥, was recommended by Helmholtz, who was benefited thereby, but it has not proved generally efficacious in this affection. The Salicylate is an efficient antirheumatic and intestinal disinfectant, and has been used with benefit in acute and subacute rheumatism, influenza, pneumonia, diphtheria, typhoid fever, erysipelas and other exanthemata, also in chlorosis. The Sulphate, in