

ADMINISTRATION.—The usual mode of exhibiting it is mixed with treacle: the dose usually stated in pharmacological works is one or two drachms, but Alston gave much larger quantities; his mode of employing it as a vermifuge was the following:—The patient was well purged with senna, and on the following morning *one ounce* of tin powder was given in four ounces of treacle; on each of the two following days half this quantity was taken, and then the patient again purged. However, tin powder is certainly much inferior to oil of turpentine as a remedy for tape-worm.

#### ORDER 24.—LEAD AND ITS COMPOUNDS.

##### *Plum'bum.*—Lead.

HISTORY.—This metal was known in the most remote ages of antiquity. It is mentioned by Moses (*Job*, xix. 23, 24.) The Greeks called it *μολυβδος*; the alchymists, *Saturn*.

NATURAL HISTORY.—It is found in the metallic state (*native lead*), combined with sulphur (*galena*), with selenium, with chlorine (*horn lead*), with oxygen (*native minium*), and with oxygen and an acid, forming an oxy-salt (*carbonate, phosphate, sulphate, tungstate, molybdate, chromate, arseniate, and aluminate.*)

PREPARATION.—It is usually extracted from galena, which is roasted in reverberatory furnaces, by which it is converted into a mixture of sulphate and oxide of lead, and afterwards smelted with coal and lime, the first to abstract oxygen, the second to remove the sulphur.

PROPERTIES.—It has a bluish-gray colour and considerable brilliancy. It may be crystallized by cooling in four-sided pyramids. It is malleable, but not ductile. Its sp. gr. 11.35. It has a peculiar odour when handled. It fuses at 612° F. and at a red heat boils and evaporates. Its equivalent is 104. By exposure to the air it attracts, first oxygen, and then carbonic acid, so as to form carbonate of lead.

Pure distilled water has no action on lead, if the gases (as air and carbonic acid) be excluded; but if these be admitted, a thin crust of carbonate is soon formed. It is remarkable that the presence of most neutral salts—sulphate of soda and chloride of sodium, for example—impairs the corrosive action of air and water. Hence, therefore, we can easily comprehend the reason why leaden cisterns and pipes do not more frequently give a metallic impregnation to water; and why rain-water is more apt than spring-water to become impregnated with lead. The latter, however, by long keeping in leaden vessels, may also become contaminated with lead.

CHARACTERISTICS.—If lead be dissolved in nitric acid, we may easily recognise its presence in the solution by the following tests:—Alkalies, their carbonates, sulphuric acid and the sulphates, and ferrocyanide of potassium, produce white precipitates; chromate of potash and iodide of potassium occasion yellow precipitates; hydrosulphuric acid and the hydrosulphates form black precipitates of the sulphuret of lead; lastly, a piece of zinc throws down metallic lead in an arborescent form.

The delicacy of these tests is, according to Devergie (*Méd. Lég.* ii. 779), as follows:—



	<i>Degree of Dilution.</i>
Sulphate of Soda . . . . .	stops at 5,000
Iodide of Potassium . . . . .	10,000
Ferrocyanide of Potassium . . . . .	18,000
Potash . . . . .	20,000
Carbonate of Soda or of Potash . . . . .	60,000
Chromate of Potash . . . . .	100,000
Hydrosulphuric Acid . . . . .	500,000

PHYSIOLOGICAL EFFECTS.—1. *Metallic lead*.—I believe that so long as lead retains its metallic form it is inert. In a French journal (*Journ. de Méd. de Leroux*, xxiii. 318) we are told that three ounces and six drachms of this metal have been given to a dog without any obvious effects. As, however, it is a metal which is readily oxidated, it occasionally proves active when swallowed, in consequence of its being acted on and oxidized by the contents of the alimentary canal. An instance of this kind is mentioned by Paulini (*Miscell. Nat. Cur. Dec. ii. Ann. vi. App. p. 7.* quoted by Voigtel, *Arzneimitellehre*), in which colic was produced by swallowing a leaden bullet. Proust (*Ann. de Chim. lvii. 84*) says, that the alloy of lead and tin may be swallowed with impunity, in consequence of its being much less easily oxidated than the pure metal.

2. *Of the preparations of lead.* (a.) *On vegetables*.—Marcet found the solution of acetate of lead injurious to plants; but Wiegmann declares it to be inert, and ascribes its inertness to the formation of an insoluble salt (carbonate) of lead by the carbonic acid of the roots of plants.

(b.) *On animals*.—The preparations of lead are, for the most part, energetic poisons. The *sulphuret*, however, appears to be inactive, or nearly so; for Orfila (*Toxicol. Gén.*) gave an ounce of it to dogs without observing any ill effects; four ounces have even been given to horses without any unpleasant results. The *sulphate*, also, according to Orfila, is inactive. Our knowledge of the effects of the salts of lead on animals is derived from experiments made with the acetates, nitrate, and carbonate. The first two act as corrosives: all affect the nervous system, manifested by convulsions, palsy, and colica pictonum. (Christison, *Treat. on Poisons*, 506 et seq. 3d ed.)

(c.) *On man*.—Mr. Braid (*Christison, op. cit. 518*) states that workmen who dig and pulverize the ore (sulphuret of lead), at the lead-mills in Lancashire, never have the lead colic until they work at the smelting furnaces.

Most, if not all, the other preparations are more or less active; the effects and symptoms, however, vary with the dose.

In *small doses* these preparations act on the alimentary canal as astringents; checking secretion and causing constipation. These may be regarded as the local effects. When absorbed, the constitutional effects of lead are observed: the arteries become reduced in size and activity, for the pulse becomes slower and smaller; the temperature of the body is diminished; and sanguineous discharges, whether natural or artificial, are frequently checked, or even completely stopped. This constringing and sedative effect seems extended to the secreting and exhaling vessels; the discharges from the mucous membranes, the exhalation from the skin, and the urine, being diminished in quantity. Thus we observe dryness of the mouth and throat, thirst, greater solidity of the alvine evacuations, diminution of the bronchial secretion, and of



cutaneous exhalation. From all these circumstances it would appear that these preparations give rise to a contracted state of the coats of the blood-vessels (at least of the arteries.) It is not at all improbable that the coats of the absorbents are similarly affected, as has been asserted. If this be the case, some obstruction would probably be offered to the passage of lymph; the functions of absorption would be carried on with less energy, and the lymphatic glands would perhaps become in consequence affected: the wasting of the body produced by lead in these small doses has been denominated *tabes saturnina*, or *tabes sicca*.

The long-continued use of the preparations of lead rarely fails to give evidence of its effect on the muscular and nervous systems, and which is manifested by a curious train of symptoms, commencing with colic, and terminating in palsy or apoplexy. *Lead or painter's colic (colica pictorum)* is variable in its mode of attack; at one time commencing suddenly, and without any very marked premonitory symptoms, at another being preceded by dyspeptic symptoms—such as diminished appetite, with a painful and constipated state of the bowels, the fæces being very hard. During an attack, there is usually obstinate constipation, with acute pain, much increased at intervals; but sometimes a relaxed condition of the bowels has been met with. Merat (*Traité de la Colique Métallique*) refers the continued pain to the small intestines, while the more violent and intermitting kind resides principally in the transverse portion of the colon. Pressure rarely increases, and very commonly relieves, the pain. Cases, however, do occur (and I have seen several) in which there is great tenderness of the bowels. The abdomen is strongly retracted, sinks in about the navel, and feels very hard. To these symptoms may be added vomiting, cramps of the lower extremities, hard and generally slow pulse, though sometimes it has been found frequent.

De Haen and Merat, on examining the bodies of patients who have died affected with lead colic, found a contracted condition of the colon, and this was considered by the last-mentioned writer to indicate the seat of the disease. But Sir G. Baker, Andral (*Path. Anat.* by Townsend and West, ii. 140), Louis, and Copland (*Dict. Pract. Med.* i. 366), have not, in some cases, found any alteration. Moreover, it would appear probable from Dr. Abercrombie's observations on ileus (*On Diseases of the Abdom. Viscera*) that the empty and collapsed portion of the intestine was not the seat of the colic, but another part found in a state of distension,—for the collapsed or contracted state is the natural condition of healthy intestine when empty; while the distended portion is, in ordinary cases of ileus, the primary seat of the disease, the distension arising from a paralytic condition of the muscular fibres, whereby it is unable to contract and propel its contents onward. Now this view of the case is the more probable, since the action of lead on the muscular fibres of the intestine is regarded as of the same kind as that on the fibres of the voluntary muscles. Some have found intus-susception, others have noticed marks of inflammation.

Another effect of poisoning by lead is an affection of the cerebro-spinal system, generally manifested by *paralysis*, but occasionally by giddiness, convulsions, and coma, and now and then by apoplexy. The palsy may occur without colic, or it may come on while the patient is suffering with it, but in general it succeeds colic. It may happen in both upper and lower extremities, though more frequently in the former; and it affects



the extensor more than the flexor muscles, so that the hands are generally bent on the arms, which hang dangling by the side. Frequently pain is experienced in the paralyzed part, and sometimes in the region of the spine also. On examining the bodies of persons who have died with this disease, no lesion has hitherto been discovered in the spinal marrow. The muscles of the affected limb are observed to be wasted and very pale, and have sometimes the appearance of a white fibrous tissue.

In *very large doses*, some of the plumbeous preparations (the acetate, for example) act as irritant and caustic poisons; giving rise to the usual symptoms indicative of gastro-enteritis. However, none of them equal, in the intensity of their local action, the mercurial or even the cupreous compounds.

MODUS OPERANDI.—Tiedemann and Gmelin (*Vers. über d. Wege, wie Subst. aus d. Mag. ins Blut. gelang.*) found lead in the blood of the splenic, mesenteric, and hepatic veins of dogs killed by the acetate; they also found it in the contents of the stomach and intestines, but neither in the chyle nor the urine. Wibmer (Christison's *Treatise on Poisons*, 3d edit. p. 509) detected it in the liver, muscles, and spinal cord.

The local or corrosive action of the soluble salts of lead depends on the affinity of these bodies for the organic constituents of the tissues (*vide PLUMBI ACETAS*).

The nervous system is specifically affected by lead. The paralysis of the voluntary muscles, the pain in the course of the spine, the occasional giddiness, coma, or apoplexy, seem to establish this. The colic as well as the astringent influence of lead over the coats of vessels are probably secondary effects of the action of lead over the nervous system.

The constitutional effects of lead may be produced in various ways: as, when taken with articles of food and drink into the stomach; when inhaled in the form of dust or vapour with the air; when applied to mucous membranes, ulcers, &c. Hence the persons most liable to these effects are those whose occupations bring them in contact with this metal; for example, painters, plumbers, roasters and smelters of lead, the manufacturers of the plumbeous preparations, glass-blowers, potters, lapidaries, &c.

Dr. Anthony Todd Thomson (*Lond. Med. Gaz.* v. 538, and x. 689) is of opinion, that carbonate of lead is the only preparation of this metal that can produce colic: and though he has, I think clearly, shewn that lead colic more frequently arises from the carbonate than from any other salt of lead, he has, in my opinion, failed in proving that no other preparation of lead *can* produce it. Indeed, if his opinion were true, it would constitute an exception to the general effects of the metallic preparations; for we do not find that the specific effects of arsenic, or of mercury, or of copper, or of antimony, are produced by one preparation only; so that, *à priori*, analogy is against the opinion. Furthermore, it is well known that the vapour of the oxide of lead taken into the lungs may produce colic, and that the ingestion of the acetate, citrate, or tartrate of lead, is capable of exciting the same effect. Now Dr. Thomson explains these facts by assuming that the oxide of lead unites with carbonic acid in the lungs, and is thus converted into carbonate: and that the acetate, citrate, and tartrate, are decomposed in the alimentary canal, and converted into carbonates. But it appears to me to be much more



simple and consistent with analogy, to admit that these preparations are of themselves capable of producing colic, than to assume that they undergo the changes here supposed. Moreover, in some instances in which colic was produced, it is unlikely that these changes could have occurred, owing to the excess of acid taken with the salt of lead.

USES.—The uses of the preparations of lead may be in part inferred from the foregoing account of their effects. These agents are employed when we wish to constrict the capillary vessels and to diminish their vital activity. Thus we administer them internally to check excessive secretion and exhalation, as in catarrhal affections of the mucous membranes of a chronic nature; in profuse secretion of pus; in sanguineous exhalations from the mucous membranes; and in colliquative sweating. They have also been applied, in some instances with success, in certain chronic affections of the nervous system, as epilepsy; but the practice is altogether empirical, as we have no rational principles to guide us in using them. As topical remedies, we employ the preparations of lead to diminish vascular excitement, to allay preternatural heat, and to check excessive secretion. Thus we apply them to inflamed parts to promote resolution, and to ulcers and other secreting surfaces as astringents or desiccants. During the internal employment of lead, attention must be paid to the condition of the stomach and bowels, as we find the traces of their injurious effects in these organs. Constipation is a very frequent result of their medicinal employment. Loss of appetite, indigestion, and griping pains, are also often noticed. The tendency to colic is diminished, according to Dr. A. T. Thomson, by conjoining acetic acid.

ANTIDOTES.—Poisoning by lead usually puts on one of three forms—*irritant poisoning*, *lead colic*, and *paralysis*.

1. *Irritant poisoning*.—Administer diluents holding in solution some sulphate (as sulphate of soda, of magnesia, or of potash or alum), so that a sulphate of lead may be formed. If vomiting have not already come on, tickle the throat, and administer emetics of the sulphate of zinc or of copper, or the stomach-pump may be employed.

2. *Lead colic*.—Here the best remedy is alum (*vide pp. 372, 373*). But in this country lead colic is frequently treated by the combined use of purgatives and anodynes, the purgatives being either castor oil or salts and senna, the anodyne being opium. When the vomiting is very troublesome, and liquid medicines do not remain on the stomach, we may give the compound extract of colocynth, with opium, in the form of pill. In several cases in which the pulse was full and strong, the face flushed, and the tongue furred and dry, I have used blood-letting with evident advantage. The sulphates have been recommended, as also mercury.

3. *Lead paralysis*.—Nux vomica, and its active principles—strychnia and brucia, are perhaps of all internal remedies most deserving of trial, because of their specific effect on the spinal marrow; and the chance of their success is, of course, much increased by the circumstance of there being no discoverable lesion of this portion of the nervous system. Mercury has been recommended by Dr. Clutterbuck. Various local measures have been tried, but without much benefit; for example, electricity and irritants (such as ammonia and cantharides).



*Plum'bi Ox'ydum.—Ox'ide of Lead.*

**HISTORY.**—The ancients were acquainted with oxide (or *protoxide*) of lead. Hippocrates (*De Morb. Mul.* ii.) employed the semi-vitrified oxide (*litharge*, λιθάργυρον). Dioscorides (lib. v. cap. cii.) and Pliny (*Hist. Nat.* xxxiv. 53) both mention litharge: the latter calls it *molybdæna*.

**PREPARATION.**—Litharge is usually obtained as a secondary product in the cupellation of argentiferous lead. The alloy is melted on a porous vessel, called a *test* or *cupel*, and exposed to the blast of a bellows, by which the lead is oxidized, half vitrified, and driven off into hard masses of a scaly texture, and is called, in that state, *litharge* or *silver stone* (Watson's *Chem. Essays*, iii. 325, 6th ed.)

The compound called in the London Pharmacopœia *hydrated oxide of lead* (*plumbi oxydum hydratum*) is prepared by mixing six pints (or as much as may be sufficient) of solution of potash with six pints of solution of diacetate of lead and three gallons of distilled water. The precipitate is to be washed until nothing alkaline remains. In this process the potash combines with acetic acid, and forms acetate of potash, which remains in solution; while a white compound, called by Mr. Phillips hydrated oxide of lead, is precipitated. But it is stated, that "oxide of lead does not form a hydrate with water, the white powder which caustic alkalis throw down in solution of lead being a basic (sub) salt" (Geiger's *Handb. d. Pharm.* von J. Liebig).

**PROPERTIES.**—Oxide of lead presents itself in several forms. One of these is yellow, and is termed *Massicot* (*cerussa citrina*). When semi-vitrified (*plumbi oxydum semivitreum*), it is called *litharge* (*lithargyrum*), which occurs in the form of small yellow or reddish scales or flakes, and, according to its colour, is called *gold* or *silver litharge* (*lithargyrum aureum* [*chrysitis*] seu *argenteum* [*argyritis*]). The *plumbi oxydum hydratum*, Ph. Lond., is a perfectly white powder.

Oxide of lead is fusible, and at a very high temperature volatile. When heated in contact with charcoal or carbonaceous bodies, it is readily reduced to the metallic state. It is insoluble in water.

**CHARACTERISTICS.**—Heated on charcoal by the blowpipe, it is readily reduced to the metallic state. It is blackened by hydrosulphuric acid, and completely dissolves in nitric acid. The characteristics of this solution have been already described (*vide* p. 505). The varieties of the oxide are distinguished by their physical peculiarities.

**COMPOSITION.**—Oxide of lead is thus composed:—

	Eq.	Eq. Wt.	Per Cent.	Berzelius.	Berthier.
Lead . . . . .	1	104	92·85	92·85	93·3
Oxygen . . . . .	1	8	7·14	7·15	6·7
Oxide of Lead . . . . .	1	112	99·99	100·00	100·0

**PHYSIOLOGICAL EFFECTS.**—Inhaled in the form of vapour, or fine dust, it produces the before-mentioned constitutional effects of lead (*vide* p. 506).

The effects of this substance, when swallowed, are but little known. It possesses very slightly irritant properties. "The experimentalists of



Lyons found litharge to be irritant in large doses of half an ounce," (Christison, *op. cit.* p. 509).

From its external use ill consequences have sometimes resulted.

USES.—The oxides of lead are never employed internally. Litharge is sometimes sprinkled over ulcers, as an astringent and desiccating substance.

In pharmacy, litharge is used in the preparation of EMPLASTRUM PLUMBI, CERATUM SAPONIS, ACETAS PLUMBI, and LIQUOR PLUMBI DIACETATIS.

The *plumbi oxydum hydratum*, Ph. Lond., is directed to be used in preparing QUINÆ SULPHAS. But the Pharmacopœial process for making the latter substance has not been found by manufacturers to answer, and, therefore, the hydrated oxide of lead is, in fact, not employed in pharmacy.

**HAIR DYE.**—Various powders, pastes, and liquids, have been prepared for dyeing the hair brown or black (*Journ. de Chém. Méd.* ii. 250, 2<sup>nd</sup> Ser.) In general a mixture, or rather compound, of litharge and lime is employed. The preparation sold as *Orfila's hair dye* is of this kind. The proportions are one part of each, or three parts of litharge and two of lime. Sometimes carbonate of lead is partially or wholly substituted for litharge. The mixture is made into a paste with hot water or milk, and applied to the hair for four or five hours, the part being enveloped in oil-skin or a cabbage leaf. The water causes the oxide of lead to combine with the lime, and thereby form a saline compound, called *plumbite of lime*. The lime is useful by removing the fatty matter of the hair, while the oxide of lead forms, with the sulphur contained in the oil of the hair, a black sulphuret of lead. Dyed hair is dry and crisp. The mode of detecting stained hair has been described by the late Dr. Cummin (*Lond. Med. Gaz.* xix. 215), and by Devergie (*Méd. Lég.* ii. 931).

*Plum'bi Chlo'ridum.*—*Chlo'ride of Lead.*

NATURAL HISTORY.—Chloride of lead occurs in the mineral kingdom.

PREPARATION.—In the London Pharmacopœia this compound is directed to be prepared as follows:—Dissolve 19 ounces of acetate of lead in three pints of boiling distilled water, and 6 ounces of chloride of sodium in one pint of boiling distilled water: mix. Wash the precipitate when cold with distilled water, and dry it.

In this process one equivalent or 163 parts of dry acetate of lead are decomposed by one equivalent or 60 parts of chloride of sodium; by which one equivalent or 140 parts of chloride of lead are precipitated, and one equivalent or 83 parts of acetate of soda remain in solution.

REAGENTS.	RESULTS.	
1 eq. Acetate of { 1 eq. Acetic Acid..... 51	} 1 eq. Soda 32	} 1 eq. Acetate Soda 83
Lead.... 163 { 1 eq. Ox. Lead 112 } 1 eq. Oxyg. 8		
1 eq. Chloride of { 1 eq. Sodium ..... 24	} 1 eq. Chloride Lead 140	
Sodium.. 60 { 1 eq. Chlorine ..... 36		

Hydrochloric acid occasions the precipitation of more chloride of lead after the action of the chloride of sodium is over; so that there must be some compound of lead in solution (Phillips, *Transl. of Pharm.* 3rd ed.)



PROPERTIES.—It is a white crystalline powder (*magisterium saturni Crollii*), soluble in thirty parts of cold or twenty-two parts of boiling water. When heated it fuses; and by cooling forms a semitransparent horny-like mass, called *horn lead* (*plumbum corneum*).

CHARACTERISTICS.—Its aqueous solution causes a white precipitate with nitrate of silver, soluble in ammonia but insoluble in nitric acid: hence it is shown to be a chloride. The solution is known to contain lead by the before-mentioned tests for this metal (*vide p. 505*).

COMPOSITION.—The following is its composition:—

	Eq.	Eq.Wt.	Per Cent.	J. Davy.
Lead . . . . .	1 . . . . .	104 . . . . .	74·3 . . . . .	74·22
Chlorine . . . . .	1 . . . . .	36 . . . . .	25·7 . . . . .	25·78
Chloride of Lead . 1 . . . . .	140 . . . . .	100·0 . . . . .	100·0 . . . . .	100·00

USE.—It is employed in the preparation of hydrochlorate of morphia.

### *Plum'bi Io'didum.—Iodide of Lead.*

HISTORY.—This compound was introduced into medicine by Cottereau and Verdé-Delisle.

PREPARATION.—It is prepared by adding a solution of iodide of potassium to a solution of acetate of lead. The reacting proportions are 166 parts of iodide and 190 of crystallized acetate. In the London Pharmacopœia, the proportions directed to be employed are seven ounces of iodide of potassium and nine ounces of acetate of lead: the quantity of iodide of potassium is, therefore, larger than theory would dictate, supposing the acetate to be neutral. This excess is disadvantageous, since it retains a portion of the iodide of lead in solution. To prevent the formation of an oxyiodide of lead, a little acetic acid should be added to the acetate of lead, before adding the iodide of potassium. The precipitate should be washed and dried.

By the mutual reaction of one equivalent or 163 parts of dry acetate of lead, and one equivalent or 166 parts of iodide of potassium, we obtain one equivalent or 230 parts of iodide of lead, and one equivalent or 99 parts of dry acetate of potash.

REAGENTS.			RESULTS.
1 eq. Acetate	{ 1 eq. Acetic Acid . . . . . 51	1 eq. Potash, 48	1 eq. Acet. Potash, 99
Lead, 163 . . . . .	{ 1 eq. Ox. Lead } 1 eq. Oxyg. 8		
	{ 112 . . . . . } 1 eq. Lead 104		
1 eq. Iodide	{ 1 eq. Potassium . . . . . 40		
Potassm. 166	{ 1 eq. Iodine . . . . . 126		1 eq. Iodide Lead, 230

PROPERTIES.—It is a fine yellow powder, very sparingly soluble in cold water, but readily soluble in boiling water; from which it for the most part separates, as the solution cools, in the form of golden yellow, brilliant, small scales. It is fusible. It combines with the alkaline iodides, forming a class of double salts, called the *plumbo-iodides* (*iodo-plumbates*, Thomson). Caustic potash dissolves it, and forms a plumbio-iodide of potassium and plumbate of potash (Dumas, *Traité de Chim.* iii. 379). It is soluble in acetic acid and in alcohol.

CHARACTERISTICS.—When heated, it first forms a yellow vapour (iodide of lead), and afterwards a violet vapour (iodine), leaving a residue (lead), which, when dissolved in nitric acid, gives all the characters of a



solution of lead (*vide* p. 505). Boiled with carbonate of potash, it forms carbonate of lead and iodide of potassium.

COMPOSITION.—Its composition is as follows:—

	Eq.	Eq. Wt.	Per Cent.	Henry.
Lead . . . . .	1 . . . . .	104 . . . . .	45·21 . . . . .	45·1
Iodine . . . . .	1 . . . . .	126 . . . . .	54·78 . . . . .	54·9
Iodide of Lead . 1 . . . . .	230 . . . . .	99·99 . . . . .	100·0	

PURITY.—It should be completely soluble in boiling water.

PHYSIOLOGICAL EFFECTS. (a.) *On animals*.—Twenty-four grains of iodide of lead were given to a cat at two doses, with an interval of four hours: the animal suffered violent colic, and died in three days; but no signs of irritation were observed after death (Paton, *Journ. de Chim.* iii. 41, 2<sup>nd</sup> Ser.) Iodide of lead was given in doses of from gr. v. to ʒss. to a bull-dog: no effect was observed until the fifteenth day, when the animal refused food, and kept in the recumbent posture. He died on the eighteenth day, having swallowed altogether ten drachms and fifty grains of iodide. During the whole period, he had only three or four intestinal evacuations (Cogswell, *Essay on Iodine*, 143).

(b.) *On man*.—Its effects on man have been imperfectly determined. It does not appear to act as an irritant when applied to the skin or ulcerated surfaces. Under the continued external and internal use of it, enlargements of the lymphatic glands have disappeared, from which we infer a specific influence over the glandular and lymphatic system. In some cases it appeared to occasion irritation of the stomach. I have seen constipation induced by it.

USES.—It has been principally employed to reduce the volume of indolent tumors, especially enlargements of the cervical, axillary, and mesenteric glands. In these cases it should be simultaneously administered internally and externally. I have used it in two cases of enlarged cervical glands, but without benefit. Velpeau (*Lugol's Essays*, by Dr. O'Shaughnessy, p. 206) and others, however, have been more successful.

ADMINISTRATION.—The dose is half a grain gradually increased. Dr. O'Shaughnessy (*Lugol's Essays*, p. 207) says, ten-grain doses are easily borne, without the slightest annoyance.

UNGUENTUM PLUMBI IODIDI, Ph. Lond. (iodide of lead, ʒj. ; lard, ʒviiij. M.)—This is applied, by way of friction, to scrofulous and other indolent swellings.

#### *Plum'bi Car'bonas.—Car'bonate of Lead.*

HISTORY.—This substance was employed by Hippocrates (*De Morbis*, lib. ii.), under the name of ψιμίθειον. Theophrastus (*De Lapidibus*) described the method of making it. Dioscorides (lib. v. cap. ciii.) and Pliny (*Hist. Nat.* lib. xxxiv.) also mention it.

It has been known by several names, as *psimmythium*, *ceruse* (*cerussa*), *magistry of lead* (*magisterium plumbi*), *white lead*, and *subcarbonate of lead*.

NATURAL HISTORY.—This salt is found native, crystallized, or massive, in Scotland, England, &c. It is called *white-lead ore*.

PREPARATION.—The old method of obtaining it is by exposing coils of lead-plate, placed perpendicularly in earthen pots, to the vapour of

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acetic acid. The pots, in the bottom of which is contained the acid, are buried in stable litter or tanners' bark. The plates become corroded and covered with carbonate of lead. In this process, the lead, when in contact with acetic vapour, rapidly abstracts oxygen from the air, and the oxide which is formed, combining with some acetic acid, forms a sub-acetate, which is decomposed by the carbonic acid of the air, forming carbonate and the neutral acetate of lead. The latter is reconverted into a subsalt, and is then decomposed by carbonic acid. At the end of the process, a small quantity of acetate of lead remains mixed with the carbonate, and is removed by washing.

Pure carbonate of lead may be procured by adding a solution of an alkaline carbonate to a solution of acetate of lead.

Carbonate of lead may be also procured by passing carbonic acid (obtained by the combustion of charcoal or coal) through a solution of subacetate or subnitrate of lead.

PROPERTIES.—The primary form of the crystals of the native carbonate of lead is a right rhombic prism. Artificial carbonate is a heavy, snow-white, tasteless powder, or in white chalk-like masses. It is insoluble in water, but dissolves in caustic potash. When heated it gives out carbonic acid, and forms the yellow oxide.

CHARACTERISTICS.—Heated before the blow-pipe, on charcoal, it yields metallic lead. It is blackened by hydrosulphuric acid. It dissolves in nitric acid with effervescence. The solution possesses the general characters of the plumbeous solutions already described (*vide* p. 505).

COMPOSITION.—Its composition is as follows:—

	Eq.	Eq.Wt.	Per Cent.	Berzelius.
Oxide of Lead . . . . .	1 . . . . .	112 . . . . .	83.58 . . . . .	83.5
Carbonic Acid . . . . .	1 . . . . .	22 . . . . .	16.42 . . . . .	16.5
Carbonate of Lead . . . . .	1 . . . . .	134 . . . . .	100.00 . . . . .	100.0

PURITY.—Carbonate of lead of commerce is rarely pure. It is usually adulterated with earthy or metallic sulphates (as of lime, baryta, or lead.) These are detected by their insolubility in diluted nitric acid. Chalk (which is by some used to adulterate it) may be detected as follows:—Dissolve the suspected substance in nitric acid, and precipitate the lead by hydrosulphuric acid. Boil and filter the solution, in which will be contained nitrate of lime (if chalk had been present), recognizable by oxalic acid or oxalate of ammonia (*vide* p. 343.)

PHYSIOLOGICAL EFFECTS.—Its *local* effects are not very powerful: applied to ulcerated surfaces, it acts as a desiccative and astringent substance: swallowed in large quantities, it does not act as a local irritant, like the acetate. Its *constitutional* effects are similar to those of the other preparations of lead, already described. It appears probable (*vide* p. 508) that carbonate of lead more frequently produces colic than the acetate of lead—a circumstance which Dr. Christison thinks may be owing to the great obstinacy with which its impalpable powder adheres to moist membranous surfaces, and the consequent greater certainty of its ultimate absorption.

USES.—It is never administered internally.

Externally it is employed as a dusting powder in excoriations of children and lusty persons; but the practice is objectionable, on account of the



danger of absorption. In one case, related by Kopp (Richter, *Ausführ. Arzneim.* iv. 613) a child was destroyed by it.

*UNGUENTUM PLUMBI CARBONATIS*, Ph. Dubl. and Ed. (Carbonate of lead, reduced to very fine powder, ʒij.; ointment of white wax, lbj. M. The Edinburgh formula is one part of carbonate of lead, and five parts of simple ointment.)—This ointment is valuable as a cooling and desiccative application to excoriated surfaces or burns.

An ointment or plaster of carbonate of lead has been known to give relief in some cases of neuralgia (*Journ. de Pharm.* xx. 603).

*Plum'bi Ac'e'tas.—Ac'etate of Lead.*

**HISTORY.**—Raymond Lully and Isaac Hollandus were acquainted with this salt in the 13th century. It has been known by several appellations, as *sugar of lead* (*saccharum saturni*), *acetated ceruse* (*cerussa acetata*), and *superacetate of lead* (*plumbi superacetas*).

**PREPARATION.**—Though directions are given in the Pharmacopœia for its preparation, it is never made by the apothecary, but is procured from persons who manufacture it on a large scale.

It is sometimes made by immersing lead in acetic acid. The metal attracts oxygen from the air and combines with the acid. It may also be procured by dissolving carbonate of lead in acetic acid, filtering the solution, and evaporating so that it may crystallize. But it is almost exclusively obtained now by dissolving oxide of lead (litharge or massicot) in acetic (pyroligneous) acid. This process is the one followed in the London Pharmacopœia; where four pounds and two ounces of powdered litharge are directed to be dissolved, by the aid of a gentle heat, in a mixture of four pints of acetic acid and four pints of distilled water. The solution is to be strained, and evaporated so that it may yield crystals. In this process, the oxide, in virtue of its affinity for acetic acid, combines with the latter, and forms a definite compound.

**PROPERTIES.**—The primary form of the crystals of this salt is the right oblique-angled prism. Their taste is sweetish and astringent. In a dry and warm atmosphere they slightly effloresce. When heated they fuse, give out their water of crystallization, and, at a higher temperature, are decomposed; yielding acetic acid, *pyroacetic spirit* (or *acetone*), carbonic acid, inflammable gas, and water: the residuum is a mixture of lead and charcoal. Acetate of lead is soluble in both water and alcohol. The aqueous solution feebly reddens litmus, though it communicates a green colour to the juice of violets. A solution of the neutral acetate is partially decomposed by carbonic acid: a small quantity of carbonate of lead is precipitated, and a portion of acetic acid is set free, which protects the remaining solution from further change.

**CHARACTERS.**—When heated with sulphuric acid, the vapour of acetic acid is disengaged. Its solution is known to contain lead by the tests for this metal already mentioned (*vide* p. 505). If a small quantity of acetic acid be added to the solution, a current of carbonic acid occasions no precipitate. The ordinary acetate of the shops usually throws down a scanty white precipitate (carbonate of lead) with carbonic acid. When charred, it readily yields globules of metallic lead on the application of the blowpipe flame.



COMPOSITION.—This salt, when properly prepared, has the following composition:—

	Eq.	Eq. Wt.	Per Cent.	Berzelius.
Oxide of Lead . . . .	1 . . . . .	112 . . . . .	58.9 . . . . .	58.71
Acetic Acid . . . . .	1 . . . . .	51 . . . . .	26.8 . . . . .	26.97
Water . . . . .	3 . . . . .	27 . . . . .	14.3 . . . . .	14.32
Crystall <sup>d</sup> Acetate of Lead 1 . . . . .		190 . . . . .	100.0 . . . . .	100.00

PURITY.—It should be readily and completely soluble in water. Sulphuric acid, or sulphuretted hydrogen in excess, being added to the solution, to throw down the lead, the supernatant liquor should be completely volatilized by heat: any fixed residue is impurity.

PHYSIOLOGICAL EFFECTS. (a.) *On vegetables.*—(Vide p. 506.)

(b.) *On animals.*—Orfila (*Toxicol. Gén.*) found that in large doses the acetate of lead acted on dogs as an irritant, and caused vomiting, pain, and death. When the action was slower, and absorption took place, an affection of the nervous system was observed, marked by difficult progression, and in some cases convulsive movements. The mucous membrane lining the alimentary canal was found whitened (owing to the chemical influence of the poison), and, where the action was more prolonged, reddened. Injected into the veins, or applied to wounds, it affects the nervous system. Schloepfer (quoted by Dr. Christison, p. 507) produced colica pictonum, paralysis, and convulsions, in dogs, by the repeated use of small doses. Dr. A. T. Thomson (*Lond. Med. Gaz.* x. 691) gave successively, one, two, three, and six drachms to a dog without any ill effect.

(c.) *On man.*—Applied to ulcers, mucous membranes, or other secreting surfaces, it acts as a desiccative and astringent. It reacts chemically on the albumen of the secretions and of the living tissues, and forms therewith compounds, which are for the most part insoluble in water and acids (Dr. C. G. Mitscherlich, *Brit. Ann. of Med.* i. 204). Hence the difficulty with which this salt becomes absorbed. Some of its compounds with organic substances are, however, rendered soluble in water by acids (as the acetic, hydrochloric, and lactic). In large quantities, acetate of lead taken into the stomach acts as an irritant, and causes symptoms of inflammation of the stomach, viz. vomiting, burning in the gullet and stomach, and tenderness at the pit of the stomach; but these are usually accompanied with colica pictonum, and are not unfrequently followed by convulsions, coma, or local palsy (Christison, *Treat. on Poisons*, 3d edit. p. 512). Ten grains taken daily for seven days caused tightness of the breast, metallic taste, constriction of the throat, debility, sallow countenance, slow respiration and circulation, gums turgid and tender, ptyalism, tightness and numbness in the fingers and toes, no nausea, pains of the stomach and abdomen, bowels confined (Laidlaw, *Lond. Med. Repos.* N. S. vi. 292). The observations of Dr. A. T. Thomson and others (Van Swieten, Reynolds, Latham, Laidlaw, Daniell, Christison, &c.) have, however, shewn that injurious effects from the use of large doses are very rare. Dr. Christison has given eighteen grains daily for eight or ten days without any unpleasant symptoms whatever, except once or twice slight colic. Whenever this salt gives rise to any obvious effects, they are those of the plumbeous preparations in general, and which have been already described (p. 506.) Its medicinal action, therefore, is sedative and astringent.



USES.—Acetate of lead is administered *internally* to diminish the diameter of the capillary vessels, and lessen circulation, secretion, and exhalation. Thus we employ it in profuse discharges from the mucous membranes; as from the lungs, alimentary canal, and even the urogenital membrane. In the mild cholera, so common in this country towards the end of summer, I have found acetate of lead in combination with opium most efficacious where the chalk mixture failed. I have used this combination in a few cases of malignant cholera, and in one or two with apparent benefit. In colliquative diarrhœa and chronic dysentery it occasionally proves serviceable. In phthisis it has been found beneficial, but only as a palliative, namely, to lessen the expectoration, check the night sweats, or stop the harassing diarrhœa. Dr. Latham (*Med. Trans. Coll. Phys.* v. 341) speaks most favourably of the use of sugar of lead and opium in checking purulent or semipurulent expectoration. Though I have repeatedly seen it diminish expectoration, I have generally found it fail in relieving the night sweats, though Fouquier supposed it to possess a specific power of checking them: they are more frequently benefited by diluted sulphuric acid. In sanguineous exhalations from the mucous membranes, as epistaxis, hæmoptysis, and hæmatemesis, and in uterine hæmorrhage, it is employed with the view of diminishing the calibre of the bleeding vessels, and thereby of stopping the discharge; and experience has fully established its utility (Reynolds, *Trans. Coll. of Phys. London*, iii. 217; Davies, *Med. and Phys. Journ.* Jan. 1808, p. 8; also, Mitchell, *ibid.* p. 69; Latham, *op. cit.*). It may be employed in both the active and passive states of hæmorrhage. It is usually given in combination with opium. It has been employed also as a remedy for mercurial salivation (Daniell, *Lond. Med. Repos.* N. S. vi. 308). It had already been applied for this affection in the form of gargle by Sommé (*Archiv. Gén. de Méd.* i. 483). Unless care be taken to wash the mouth carefully after its use, it is apt to blacken the teeth. On the same principles that we administer it to check excessive mucous discharges, it has been employed to lessen the secretion of pus in extensive abscesses attended with hectic fever.

There are some other cases in which experience has shewn acetate of lead is occasionally serviceable, but in which we see no necessary connexion between its obvious effects on the body and its remedial powers; as in epilepsy, chorea, intermittents, &c.

As a *topical* remedy, we use acetate of lead as a sedative, astringent, and desiccative. An aqueous solution of it is applied to inflamed parts, or to secreting surfaces, to diminish profuse discharges. Thus we use it in phlegmonous inflammation, in ophthalmia, in ulcers with profuse discharges, in gonorrhœa, and gleet. In the sloughing and ulceration of the cornea which attend purulent and pustular ophthalmia, its use should be prohibited, as it forms a white compound which is deposited on the ulcer, to which it adheres tenaciously, and in the healing becomes permanently and indelibly imbedded in the structure of the cornea. The appearance produced by this cause cannot be mistaken: its chalky impervious opacity distinguishes it from the pearly semi-transparent structure of even the densest opacity produced by common ulceration (Dr. Jacob, *Dubl. Hosp. Rep.* v. 369). The white compound consists of oxide (acetate?) of lead, animal matter, much carbonate of lead, traces of phosphate, and chloride of the same metal (Dr. Apjohn, *op. cit.* p. 402).



ADMINISTRATION.—Acetate of lead is administered internally in doses of from one grain gradually increased to three, four, or more, even to eight or ten grains, repeated twice or thrice daily. Dr. A. T. Thomson advises its exhibition in diluted distilled vinegar, to prevent its change into carbonate, which renders it more apt to occasion colic. It is usually exhibited in the form of pill, frequently in combination with opium. Acetate of lead and opium react chemically on each other, and produce acetate of morphia and meconate, with a little sulphate of lead. Experience, however, has fully established the therapeutic value of the combination. Sulphuric acid (as in infusion of roses), sulphates (as of magnesia, and soda, and alum), phosphates, and carbonates, should be prohibited. Sulphuric acid, the sulphates, and phosphates, render it inert: the carbonates facilitate the production of colica pictonum. Common (especially spring) water, which contains sulphates, carbonates, and chlorides, is incompatible with this salt. The liquor ammoniæ acetatis is incompatible with it, on account of the carbonic acid usually diffused through this solution.

*CERATUM PLUMBI ACETATIS*, Ph. Lond.; *Unguentum Plumbi Acetatis*, Ph. Dubl. and Edinb. (Acetate of lead, powdered, ʒij.; white wax, ʒij.; olive oil, fʒviiij. M. Ph. Lond. The *Dublin College* mixes an ounce of the acetate of lead with a pound and a half of ointment of white wax. The *Edinburgh College* uses twenty parts of simple ointment and one part of acetate of lead in very fine powder.)—It is an excellent soothing application to irritable ulcers, painful excoriations, and blistered surfaces.

ANTIDOTE.—*Vide PLUMBUM.*

*Liquor Plum'bi Diacetatis.*—*Solution of Diacetate of Lead.*

HISTORY.—This compound was known to Basil Valentine in the fifteenth century. It owes its reputation, as a medicine, principally to the praises bestowed on it by M. Goulard, in the latter end of the last century. He called it *extract of Saturn* (*extractum Saturni*). It is frequently termed *Goulard's extract*, or *liquor plumbi subacetatis*.

PREPARATION.—In the London Pharmacopœia it is directed to be prepared by boiling together two pounds and three ounces of acetate of lead, one pound and four ounces of oxide of lead (litharge) rubbed to powder, and six pints of water; frequently stirring: when the liquor is cold, add as much distilled water as may be sufficient to measure with it six pints. The acetate of lead combines with an additional equivalent of oxide of lead, to form the diacetate. This process yields a uniform preparation.

In the Dublin Pharmacopœia it is ordered to be prepared by boiling one part of semivitrified oxide of lead with twelve parts of distilled vinegar, until eleven parts of the fluid remain; and when the impurities have subsided, the liquid is to be filtered. The acetic acid of the distilled vinegar combines with the oxide of lead to form a subacetate of lead. This process is objectionable, since the strength of the solution depends on the strength of the vinegar, which is subject to variation.

PROPERTIES.—It is a transparent and colourless liquid. Prepared according to the London Pharmacopœia, its specific gravity is 1.260:



according to the Dublin Pharmacopœia, it is 1·118. Its taste is sweet and astringent. By evaporation it yields crystals of the diacetate of lead, which, according to Dr. Barker, are flat rhomboidal prisms, with dihedral summits.

**CHARACTERISTICS.**—The presence of lead and of acetic acid in this solution may be known by the tests before mentioned (p. 515) for acetate of lead.

From the neutral acetate it is distinguished by the more abundant precipitate which it produces with carbonic acid, and by the copious precipitate which it affords with mucilage—an effect not produced with the neutral acetate. Solution of the diacetate of lead forms a precipitate with most vegetable colouring matters.

**COMPOSITION.**—This liquid is an aqueous solution of the diacetate of lead. The hydrated diacetate has, according to Dr. Thomson, the following composition:—

	Eq.	Eq. Wt.	Per Cent.
Oxide of Lead . . . . .	2 . . . . .	224 . . . . .	61·37
Acetic Acid . . . . .	1 . . . . .	51 . . . . .	13·97
Water . . . . .	10 . . . . .	90 . . . . .	24·66
<hr/>			
Hydrated Diacetate of Lead .	1 . . . . .	365 . . . . .	100·00

**PURITY.**—When this compound has been prepared with common vinegar it has a brown colour.

**PHYSIOLOGICAL EFFECTS.**—Its effects are analogous to the acetate. Dr. A. T. Thomson (*Lond. Med. Gaz.* v. 538 ; x. 693) asserts, from his experiments on animals, that it has more tendency to cause colic than the neutral acetate, because it is more readily converted into carbonate of lead. It is employed in medicine as a local astringent and sedative. Paralysis is said to have resulted from its external use.

**USES.**—It is used, when diluted, to promote the resolution of external inflammation, to check profuse discharges from suppurating, ulcerated, and mucous surfaces, and to alleviate local pains. Thus it is applied to parts affected with either phlegmonous or erysipelatous inflammation, to whitloes, to inflamed tendons, aponeuroses, or absorbent glands; in ophthalmia, to contusions, sprains, burns, wounds, whether incised or lacerated, to blistered surfaces, ulcers, abscesses, &c.

It is said to have been successful, internally, in hydrophobia.

**ADMINISTRATION.**—It is employed diluted with water, added to poultices, or mixed with fatty matters, and applied as an ointment.

**LIQUOR PLUMBI DIACETATIS DILUTUS**, Ph. Lond. *Plumbi subacetatis liquor compositus*, Ph. Dub. (Solution of diacetate of lead, fʒiiss.; distilled water, Oj.; proof spirit, ʒij. M.)—This preparation is an imitation of the *water of Saturn*, or *vegeto-mineral water* of Goulard. It is commonly termed, in the shops, *Goulard water*. It should be transparent and colourless; but when prepared with common water it is more or less milky, owing to the formation of carbonate, sulphate, and chloride of lead. The small quantity of spirit employed can be of no service. The quantity of the solution of diacetate of lead employed in making Goulard water is much too small; it should be, at least, three times, and in some cases I have used six times, as much. I have never seen any ill effects from its use, though it is said to have become absorbed in some cases. The same objection applies to the use of this compound as to that of the neutral acetate in ulceration of the cornea (*vide* p. 517.)



Goulard water is used as a cooling, sedative, and astringent wash in the cases already enumerated for the Goulard's extract. A poultice, composed of crumb of bread, boiled in Goulard water, is sometimes a very useful application to phlegmons, painful wounds, irritable ulcers, &c. &c.

*CERATUM PLUMBI COMPOSITUM*, Ph. Lond. (Solution of diacetate of lead, ℥iij.; wax, ʒiv.; olive oil, Oss.; camphor, ʒss. M.).—This is the *cerate of Saturn* of M. Goulard, and is commonly called *Goulard's cerate*. It is employed as a dressing to wounds and ulcers, for the purpose of allaying irritation and appeasing pain. With the same views it is also applied to excoriated surfaces, burns, scalds, blistered surfaces, and irritable cutaneous affections. Opium is sometimes advantageously combined with it.

*CERATUM SAPONIS*, Ph. Lond.—This contains a subacetate of lead. It has been before described (p. 337).

*Emplas'trum Plum'bi.—Plas'ter of Lead.*

**HISTORY.**—This compound was known to the ancients: both Pliny (*Hist. Nat.* xxxiv. 53) and Celsus (*De Medicina*, lib. v. cap. xix.) give a formula for a plaster used by the Roman surgeons, which is almost identical with that for the officinal plaster of lead.

It is termed *emplastrum lythargyri* in the Dublin Pharmacopœia, and is commonly sold in the shops as *diachylon* or *diachylum*.

**PREPARATION.**—In the London Pharmacopœia it is directed to be prepared by mixing six pounds of oxide of lead (litharge), rubbed to a very fine powder; a gallon of olive oil; and two pints (ʒxl.) of water. These are to be boiled together over a slow fire, constantly stirring, to a proper consistence.

In this process the oil becomes saponified, and converted, by the aid of the elements of water, into *glycerine*, *oleic acid*, and *margaric acid*. The glycerine remains in solution in the water, while the two fatty acids combine with the oxide of lead to form the oleo-margarate of lead or plaster of lead.—(For further particulars respecting the theory of saponification, *vide* p. 334).

The water used in this process serves two purposes; it moderates the heat, and facilitates the union of the acids with the oxide of lead.

**PROPERTIES.**—It is met with in the shops in cylindrical rolls, of a greyish or yellowish-white colour, brittle when cold, but softening and ultimately fusing by heat. It is insoluble in water, and nearly so in alcohol. It has no taste, but a slight though peculiar odour.

**CHARACTERISTICS.**—When heated it fuses, then decomposes, gives out inflammable gas, and leaves a carbonaceous residue, which, when heated in a close vessel, yields globules of lead. Ether dissolves the oleate but not the margarate of lead.

**COMPOSITION.**—Berzelius (*Traité de Chim.* v. 373) says this compound is to be regarded as a tribasic salt: that is, as consisting of one equivalent of the fatty acids (oleic and margaric) and three of the oxide of lead.

**EFFECTS AND USES.**—This plaster is employed in surgery, on account of its adhesiveness and the mildness of its local action; for it rarely excites irritation. It is used to keep the edges of wounds together in persons with delicate skins. Spread on calico it forms a good *strap-*



ping for giving support and causing pressure in ulcers of the leg,—a most successful mode of treating them, and for which we are indebted to Mr. Baynton.

In pharmacy it serves as a basis for various other plasters.

*EMPLASTRUM RESINÆ*, Ph. Lond. *Emplastrum Lithargyri cum Resina*, Ph. Dubl. *Emplastrum Resinosum*, Ph. Ed. (Resin, Oss.; plaster of lead, Oij. M. Ph. Lond. The proportions used in the Dublin and Edinburgh Pharmacopœias are slightly different).—This is the common *adhesive plaster* (*emplastrum adhæsivum*), and is kept in the shops ready spread. It is employed to retain the lips of wounds in contact, as in cuts, surgical operations, &c. It is more adhesive than lead plaster, but at the same time somewhat more irritant, and occasionally causes excoriation. It is sometimes employed as a *strapping* for dressing ulcers, on Baynton's principles.

*EMPLASTRUM SAPONIS*, Ph. Lond. and Dub.—The lead plaster is a constituent of the soap plaster already described (p. 338).

*UNGUENTUM PLUMBI COMPOSITUM*, Ph. Lond. (Prepared chalk, ʒviii.; distilled vinegar, fʒvj.; plaster of lead, lb. iij.; olive oil, Oj. Mix the chalk with the vinegar, and when the effervescence has ceased, add gradually the solution to the plaster and oil melted with a slow fire, and stir constantly until they are cooled).—By the action of the acetic acid on the chalk, an acetate of lime is procured, and carbonic acid evolved, and the acetate of lime is then mixed with lead plaster and oil. This compound is an imitation of *Kirkland's neutral cerate*, used as a dressing to indolent ulcers. It is employed by Mr. Higginbottom (*Essay on the Use of Nitrate of Silver*, 2d ed. p. 119), under the name of *neutral ointment*, as a defence for ulcers after the application of nitrate of silver.

#### ORDER 25.—ZINC AND ITS COMPOUNDS.

##### *Zin'cum*.—Zinc.

**HISTORY.**—Although the ancients were acquainted with the method of converting copper into brass by means of an ore of zinc, yet they were unacquainted with metallic zinc, one of the constituents of this alloy. Albertus Magnus, who died in 1280, is the first who expressly mentions this metal.

It has various appellations, such as *contrefeyn*, *golden marcasite*, *Indian tin* (*stannum indicum*), *spialtler*, *speltre* or *spelter* (*speltrum*).

**NATURAL HISTORY.**—It occurs only in the mineral kingdom. It is found in the form of oxide (*red zinc*), of sulphuret (*blende* or *black jack*), of carbonate (*calamine*), of sulphate (*white vitriol*), of silicate (*electric calamine*), and aluminate (*automalite* or *gahnite*).

**PREPARATION.**—It is obtained from the sulphuret, carbonate, and silicate. The sulphuret is roasted, by which part of the sulphur is expelled, and the metal oxidized: it is then mixed with some carbonaceous substance, introduced into an earthen crucible, the bottom of which is perforated by an iron tube which passes into a vessel of water situated in an apartment below. The zinc is reduced in the pot, sub-