

effects depend rather upon the bitter and astringent than upon the purgative principle of the medicine. Laxative doses are required when looseness of the bowels is caused by irritating substances, as in the diarrhoea of children when the discharges are green. In such cases magnesia is often associated with rhubarb in order to neutralize the excess of lactic acid, as in the official *compound powder of rhubarb*.

The dose and mode of administration vary in different cases. In habitual constipation one dose of gr. iij.-x. is usually given in the evening. In acute constipation, such a dose may be administered every three or four hours until the bowels move. In diarrhoea with acid stools, small doses are given several times a day.

Rhubarb is rarely administered in the form of powder on account of its disagreeable taste, which may, however, be somewhat disguised by the addition of an aromatic, especially the official aromatic powder. The official pill of rhubarb, containing gr. ij. of rhubarb and one of soap, is usually preferred in habitual constipation, from one to three pills being taken at bedtime. Some costive persons daily chew a small piece of rhubarb, weighing from gr. v. to gr. x., in order to increase the action of the bowels.

Of the liquid preparations, the wine, the simple tincture, and the aromatic tincture, in appropriate doses, are suitable laxatives for convalescent, feeble, and aged patients, and the syrup and aromatic syrup for children.

Aloe.—In doses of gr. ij.-v., aloes usually produces one or two stools in from ten to fifteen hours. Occasionally it acts in six or eight hours, but more frequently its action is delayed beyond sixteen hours. The stools are soft, bulky, and dark. Sometimes they are attended by slight griping and tenesmus. These effects are more marked after larger doses, which also cause the stools to become thinner, but do not act much more speedily than small ones. The persistent use of aloes is sometimes followed by a feeling of weight and fulness in the pelvis, and, it is said, by the development of true hemorrhoids. According to Lewin, delicate young persons and the aged are predisposed to such effects. The slowness of action, and the symptoms of hyperæmia of the rectum, show that aloes influences chiefly the descending colon and rectum. According to the researches of Rutherford, it increases the secretion of bile and renders it more watery.

Aloes does not usually lose its activity when habitually taken, the same dose producing the same laxative effect for many months, and sometimes for years; in some cases the dose may even be gradually diminished. For this reason it is one of the most appropriate laxatives for habitual constipation.

Aloes is held to be preferable to other laxatives when constipation is associated with dyspepsia, hypochondriasis, and biliary derangement, and, in females, with atonic amenorrhœa. The presence of piles, unless they are inflamed, does not contraindicate the use of laxative doses. But aloes should not be employed when active hyperæmia of the large intestine exists, or when there is some disease of the uterus tending to hemorrhage. And though small doses might do no harm in pregnancy, it is better to resort to other laxatives.

On account of its slow action, aloes is usually taken just before or after the last meal, and, as a rule, it acts on the next morning after breakfast. If it act sooner, it should be taken just before retiring.

As aloes is intensely bitter, it is generally ordered in the form of pills, of which five varieties are official. For all ordinary cases of constipation the *pilula aloes*, containing each two grains of aloes and soap, answer well, one pill being given daily. The *pilula aloes et mastiches*, known also as Lady Webster's dinner pills, also contain each gr. ij. of aloes and a little mastic; the latter has no effect. The *pilula aloes et ferri* are adapted to the constipation of anæmic persons. Some authors state that the sulphate of iron in these pills increases the activity of the aloes. The *pilula aloes et myrrha* are held to be suitable to constipation associated with atonic amenorrhœa.

Resina Podophylli.—The resin of podophyllum, or po-

dophyllin, as it is commonly called, in doses of gr. $\frac{1}{4}$ to $\frac{1}{2}$, operates slowly, moving the bowels in about eight to twelve hours. Administered in the evening, it usually produces a feculent evacuation next morning after breakfast. Sometimes it causes griping, especially in delicate females. Like aloes, it retains its laxative action for a long time without necessitating an increase of the dose. According to Rutherford and Vignal, podophyllin increases the secretion of bile without altering its composition.

The laxative operation of podophyllin is somewhat uncertain, a dose which acts gently in some persons acting either severely or not at all in some others.

On account of the smallness of its dose, the convenience of its administration, its persistent action in the same dose, and its cholagogue power, podophyllin is much used in various forms of habitual constipation. It is held to be especially adapted to cases of atony or torpor of the muscular layer of the bowel, and to constipation associated with an insufficient secretion of bile. Harley found it very useful in cases of feeble liver, when the insufficient secretion of bile resulted from want of nervous power.

Podophyllin is generally administered in the form of pill. To prevent griping, a small quantity of extract of belladonna or extract of hyoscyamus is incorporated with it, and, when required, some extract of nuxvomica. Podophyllin is sometimes dissolved in alcohol and taken in sweetened water.

The active principle of podophyllum, called podophyllotoxin, has been given to adults in doses of gr. $\frac{1}{4}$ to $\frac{1}{2}$, usually dissolved in alcohol and taken in syrup or sweetened water. Its action is said to be more certain and regular than that of podophyllin. To children it has been given in doses of gr. $\frac{1}{20}$ to $\frac{1}{15}$, according to their age.

Senna.—Senna is rarely given alone as a laxative, but frequently in combination with less active purgatives, as in the official *Confectio Sennæ* and the *Pulvis Glycyrrhizæ Compositus*. Having little or no unpleasant taste and acting very gently, the confection of senna is often used to unload the bowels in pregnancy, convalescence, and hemorrhoidal affections. The dose is one or two drachms, which may be conveniently taken at bedtime. The compound powder of liquorice is adapted to the same cases, and is sometimes used in habitual constipation. It is given in doses of half a drachm to one drachm in a small quantity of water, preferably at bedtime.

Colocynthis.—The extract and compound extract of colocynth are sometimes employed as laxatives in habitual constipation, the former in doses of gr. ss.-i., the latter in doses of gr. i.-v. Generally they are combined with other laxatives, and with extract of hyoscyamus or extract of belladonna, to prevent griping, as in the following pills: R. Extr. colocynth. comp., gr. iv.; pulv. ipecac., gr. ij.; podophyllin, extr. bellad., aa gr. i. M. ft. pil. No. iv. Sig.: One pill at bedtime.

Cascara Sagrada.—This remedy has come into general use as a laxative in habitual constipation. Its prolonged employment in appropriate doses is frequently followed by a return of the normal activity of the large intestine. Usually the fluid extract is given in doses of ℥ x.-xxx. several times daily. R. Extr. rhamni purshianæ fluidi, Syrupi aurantii, Aquæ destillatæ, aa ℥ ss. M. Sig.: One-half to one teaspoonful three times daily before eating. The dose found to be effective should be gradually lessened. In many cases it may be entirely discontinued after a few weeks or months.

Frangula.—In doses of ℥ xv.-xxx. the fluid extract of frangula is said to be a mild but uncertain laxative. As it does not quickly lose its activity, it has been recommended for habitual constipation. Samuel Nickles.

LEAD.—I. GENERAL MEDICINAL PROPERTIES OF COMPOUNDS OF LEAD.—Absorbed into the system, lead exerts a peculiar influence, developing a unique series of symptoms. The influence is wholly toward deterioration of tissue and perversion of function, and has no application in medicine. Locally, the effects differ among the compounds mainly according to solubility. The insoluble

compounds are soothing and absorbent, like the insoluble salts of bismuth, while the soluble are decidedly astringent, but yet, in proportion to the astringency, are far less irritant than most other astringent metallic salts. The therapeutics of lead salts consist in the application of the insoluble compound (carbonate) as an absorbent and healing dusting powder, and the employment of the soluble salts as metallic astringents in catarrhs, or, in weak solution, as cooling lotions in inflammation or irritation of the skin. In these applications the following points need attention: 1. The carbonate should not be applied too extensively over a raw surface, else, through chemical conversion, enough lead may be absorbed to produce distinct constitutional lead poisoning. 2. No lead compounds should be applied to the eye, for, though excellent for simple irritation or catarrh of the conjunctiva, yet there is the peculiar danger that if a loss of the epithelium of the cornea occur, whether by ulceration or by traumatic abrasion, application of a lead solution will produce an instant, indelible, opaque, white streak over the area of exposed underlying corneal tissue. 3. Lead salts should not be given internally for longer than a very few days, lest constitutional lead poisoning result.

II. THE COMPOUNDS OF LEAD USED IN MEDICINE.—These are the *monoxide*, *carbonate*, *iodide*, *acetate*, *basic acetate*, *nitrate*, and *oleo-palmitate* (lead plaster).

Lead Monoxide: PbO. Lead monoxide is the compound so well known as *litharge*. It is official in the United States Pharmacopœia as *Plumbi Oxidum*, Lead Oxide. It is in the form of a heavy yellowish powder or minute scales, insoluble in water or alcohol and without smell or taste. It is not used medicinally under its own form, but is official as being the source, in pharmacy, of the solution of the lead subacetate and of lead plaster.

Lead Carbonate: $PbCO_3 \cdot Pb(OH)_2$. This salt, the common *white lead* of the paint shops, is official in the United States Pharmacopœia as *Plumbi Carbonas*, Lead Carbonate. It is in the form of a heavy white powder or pulverulent mass, and, like the oxide, is insoluble in water or alcohol and is without odor or taste. As its formula shows, it is a mixture of the normal carbonate and the hydroxide. White lead is used as a dusting powder, as already set forth, or it may be applied mixed to the consistency of paint with linseed oil, or it may be used in ointment, in the shape of the official *Unguentum Plumbi Carbonatis*, Ointment of Lead Carbonate, a mixture of ten per cent. of white lead with benzoated lard. White lead, being so largely used in the arts, is a fruitful source of lead-poisoning.

Lead Iodide: PbI_2 . This compound is official in the United States Pharmacopœia as *Plumbi Iodidum*, Lead Iodide. It is in the form of a heavy yellow powder, slightly soluble in cold water and in alcohol, but more readily soluble in boiling water (1 to 200). The claim of lead iodide to medicinal recognition is based upon the theory that the salt will yield the peculiar effects of an iodide along with those of lead. But in practice the medicine seems to amount to little else than a very slightly soluble lead salt, and is little used. It has been given internally in doses of from 0.03 to 0.20 gm. (gr. ss.-iij.). For external application there is an official *Unguentum Plumbi Iodidi*, Ointment of Lead Iodide, consisting of ten parts of the lead salt to ninety of benzoated lard.

Lead Acetate: $Pb(C_2H_3O_2)_2 \cdot 3H_2O$. Normal lead acetate, the salt well known as *sugar of lead*, is official in the United States Pharmacopœia as *Plumbi Acetas*, Lead Acetate. The salt occurs in colorless, bright prismatic crystals or scales, of a faint vinegar-like odor and a characteristic taste at first sweetish and astringent, and afterward metallic. It dissolves freely in water and fairly in alcohol (1 to 21). It effloresces and absorbs carbon dioxide from the air on exposure. The solutions commonly show a slight turbidity, which, however, is easily removed by the addition of a few drops of acetic acid. Commercial sugar of lead is apt to be contaminated with lead sulphate or carbonate, an impurity which may be suspected if a sample fail to dissolve wholly in water. The salt is decomposed by the alkalis, by acids, by soluble sul-

phates, chlorides, citrates, and tartrates, and by lime water.

Lead acetate is one of the most powerful of the lead salts. In rather weak solution it evinces the combined astringency and soothing influence characteristic of soluble lead compounds, but in strong solution is distinctly irritant, so that the salt is a possible severe irritant poison. Lead acetate may be used externally in solution as an astringent wash, with the caution already given about application to the eye. The strength of lead lotions commonly ranges from the one-half of one to one or two per cent. Internally the salt is a good deal given as an astringent in diarrhoeas, and has also an ancient reputation of being of avail for the arrest of hemorrhage in quarters inaccessible to local measures. This alleged hæmostatic potency is held in high esteem by some, but by others is considered wholly imaginary. By the very conditions of the case this virtue is one impossible to establish or disprove by methods of precision.

Lead acetate is administered in doses of from 0.06 to 0.20 gm. (gr. i.-iij.) every two hours or so, and, when given in diarrhoea, is probably more often than not combined with an opiate.

Basic Lead Acetate: $Pb(C_2H_3O_2)_2 \cdot 2PbO$. When lead monoxide (litharge) is boiled in a solution of lead acetate it dissolves with the formation of certain basic acetates, the composition of the resulting basic salt depending on the proportion of litharge to sugar of lead in the making. The United States Pharmacopœia avails itself of this reaction, and by taking the ingredients in the proportion of ten of litharge to seventeen of acetate, obtains a solution of basic acetates of which the principal one is the triplumbic acetate of the formula given above. This solution is proportioned so as to be about twenty-five per cent. strength of salts, and is officially entitled *Liquor Plumbi Subacetatis*, Solution of Lead Subacetate, called also *Goulard's Extract*. It is a clear, colorless liquid, of a sweetish, astringent taste, and an alkaline reaction. It is easily distinguishable from a solution of the normal acetate (sugar of lead) by the fact that it produces a dense, white precipitate with a solution of acacia. Solution of subacetate of lead is exceedingly easy of decomposition; even the carbon dioxide of the atmosphere will attack it and render it milky by the formation of the insoluble carbonate of lead. It must therefore be kept in well-stoppered bottles. It is decomposed also by so many other substances, organic and inorganic, that the practical rule is a good one, viz., to combine this solution, in extemporaneous prescribing, only with opiates. The following preparations of the United States Pharmacopœia are made from this solution:

Ceratum Plumbi Subacetatis, Cerate of Lead Subacetate; Goulard's Cerate. This cerate consists of twenty per cent. of the above solution mixed with camphor cerate, and is specially directed to be freshly prepared when wanted for use. This is because the preparation rapidly decomposes on keeping, turning yellow and becoming rancid.

Liquor Plumbi Subacetatis Dilutus, Dilute Solution of Lead Subacetate; Lead Water. This solution is simply three parts of the foregoing diluted with ninety-seven of distilled water, previously boiled and cooled to deprive it of free carbonic acid. Lead water is of the average strength wanted for actual application of a subacetate of lead solution, and may therefore be prescribed for use without dilution.

These two preparations, derived from the parent solution of the subacetate, are much used as gently astringent, and at the same time soothing applications to sores, excoriations, or inflamed conditions of skin. Lead water is frequently combined with laudanum for the allaying of superficial pains, such as the pain of erysipelas, of a scald, or of a sprain.

Lead Nitrate: $Pb(NO_3)_2$. The salt is official in the United States Pharmacopœia as *Plumbi Nitrates*, Lead Nitrate. It occurs in octahedral crystals, either colorless and transparent or white and opaque, according to the method of preparation. The crystals are permanent in

the air, without odor but with the usual sweetish, astringent and metallic taste of the soluble lead salts. The salt dissolves in two parts of cold water and more freely in boiling water. It is almost insoluble in alcohol. Lead nitrate acts like the acetates, and is used only for external applications. A peculiar property of the salt is that it decomposes sulphuretted compounds, and thus proves deodorant to parts generating foul secretions, such as nasal surfaces in ozæna. *Ledoyen's disinfecting fluid* is a twelve and a half per cent. aqueous solution of lead nitrate. Lotions of the nitrate average two per cent. in strength.

Lead Plaster (Diachylon Plaster). Under the title *Emplastrum Plumbi*, Lead Plaster (Diachylon Plaster), the United States Pharmacopœia recognizes the product resulting from boiling together in a sufficiency of water thirty-two parts of lead oxide and sixty parts of olive oil. Such product, an oleo-palmitate of lead, is a fairly hard solid, of a yellowish-white color, pliable and tenacious, but not greasy. Upon keeping it turns brown on the surface. Lead plaster exerts but feebly the peculiar effects of lead compounds, though a case of lead colic has been recorded as resulting from long-continued application of the plaster as a dressing to an ulcerated surface. The main use of lead plaster is as a basis, non-specific, for medicated plasters.

Edward Curtis.

LEAD PALSY.—Muscular paralysis resulting from the toxic effect of lead is seen most frequently among those whose occupation requires frequent or continuous contact with lead. Thus, it is commonly found in those employed in lead-works, and among painters, typesetters, file-makers, plumbers, glass grinders, and those who glaze pottery with lead, and also in other industries. The accidental causes are numerous, such as the contamination of drinking-water by leaden pipes, the cooking of food in vessels containing lead, the use of various cosmetics, hair dyes, etc. It has also been traced to snuff which was found to contain lead. As a rule, the lead enters the system by way of the alimentary canal, as a result of uncleanliness, and through the pollution of food by hands that have been in contact with lead. It may also enter the system through inhalation, and by absorption from the skin. As in other forms of toxæmia, individual susceptibility to the effect of lead has much to do with the development of lead palsy. Females suffer oftener than males, and people in general ill-health and those addicted to alcoholics seem more predisposed to its toxic action. Only a certain proportion of individuals whose occupation requires the frequent handling of lead are thus poisoned, while many similarly employed are never affected, although no special precautions are taken. After lead poisoning has existed for some time, and not necessarily manifesting any conspicuous symptoms, a peculiar form of multiple neuritis ensues. This is characterized by paralysis of several of the muscles of the upper extremities, occurring first and most pronounced in the distribution of the musculospiral nerve, affecting the extensors of the hands and fingers, but rarely involving the sensory fibres.

As a rule, other symptoms of lead poisoning—especially lead colic, acute constipation, and at times articular and muscular pains, or some of the manifestations of encephalic saturnism—precede the paralysis. It is rarely acute as a sequel of an attack of colic, but generally develops itself in the course of several weeks.

The paralysis may be the first and only recognizable symptom. These patients are frequently found anæmic, with a blue line on the gums close to the teeth, due to the deposit of lead, and signs of arterio-sclerosis or chronic nephritis may also be present. Almost always the common extensors of the fingers are first affected, especially the extensors of the third and fourth fingers; then the extensors of the wrist and little fingers follow; later, the extensors of the wrist, and ultimately the long thumb muscles. The extensors of the hand and fingers are in most cases exclusively involved. These different muscles are affected in varying degrees. The hands and fingers

are held in the position of flexion, and drop as soon as they are placed in extension. On account of the lack of opposing force, the flexors are weakened in their action, but when support is given to the hand by passive extension they act normally. The paralysis of the extensor muscles of the wrist causes "wrist-drop," which produces the characteristic attitude of the hands commonly seen in these cases. In some instances the paralysis is not confined to the distribution of the musculospiral nerve, but all of the intrinsic muscles of the hand which are supplied by the ulnar and median nerves may also be involved. In the majority of cases, the triceps and supinators remain intact. It is only in the most severe forms that the latter muscles are involved. This condition is usually found associated with paralysis in the distribution of other branches of the brachial plexus and with pronounced symptoms of saturnism. Although lead has a strong predilection for the muscles already mentioned, these may escape. Lead palsy usually affects both upper extremities simultaneously, but it is not at all uncommon for it to attack only one arm. The right upper extremity is generally more paralyzed than the left in right-handed persons, and vice versa. It is quite uncommon, however, for both sides to be equally affected. Atypical cases occur in which the supinators, biceps, brachialis anticus, and deltoid are the principal muscles affected (upper arm type of Remak). To this group is generally superadded paralysis of the supra- and infraspinati. This form of paralysis is usually bilateral, and occurs in the most inveterate types of lead poisoning. When this group of muscles is affected, the patient is unable to lift his arm, and it hangs powerless by his side. Sometimes the deltoid is the only muscle involved.

The paralysis is always of a degenerative form, and is most frequently attended or followed by atrophy and loss of faradic irritability and the reaction of degeneration in the affected muscles, as a result of degeneration of the nerve fibres. Fibrillary tremor is usually present. As a rule, there is no disturbance of sensibility. In the more chronic cases there may be a slight swelling over the extensors of the wrist joint. This is due to the long-continued flexion of the carpus producing displacement backward of the bones and distention of the synovial sheaths. The lower extremities are very rarely affected. When this does take place, the muscles involved are the long extensors of the toes and the peronei muscles. The tibialis anticus usually escapes. In fatal cases, the paralysis invades the muscles of respiration, *i. e.*, the intercostals, the diaphragm, and the muscles of the larynx. In some chronic cases the symptoms may closely resemble those of bulbar paralysis.

Primary atrophy (the atrophy preceding the motor paralysis) may occur in the intrinsic muscles of the hands. It sometimes becomes permanent and progressive, just as in other forms of progressive atrophy of spinal origin. The lesion producing lead palsy usually affects the peripheral motor neurons. In chronic cases the peripheral nerves are the seat of well-marked interstitial neuritis. Changes have also been found in the cells of the anterior horns of gray matter of the spinal cord, and also in the anterior nerve roots.

DIAGNOSIS.—In the majority of cases a correct diagnosis of lead palsy is based on the following conditions: its etiology; the peculiarity of onset and its association with other signs of lead poisoning; the characteristic degenerative type of the paralysis and its limitation to certain groups of muscles in the distribution of the musculospiral nerve, with the escape of other muscles supplied by the same nerve; and its frequent bilateral character.

PROGNOSIS.—If there are no serious complications the prognosis as to life is favorable. When the paralysis is not extensive and is of recent occurrence, recovery usually takes place, under proper conditions. The presence of the reaction of degeneration does not militate against recovery. The voluntary power may return before faradic irritability. Recovery occurs, as a rule, when the source and continuance of the lead absorption is eliminated. On the other hand, the course of primary atro-

phy is extremely chronic, and it has little tendency to recover.

Treatment.—The treatment should consist in removal from the source of contamination by lead and its elimination from the system by the administration of small doses of iodide of potassium three times a day, and an occasional cathartic dose of sulphate of magnesia. The joints and paralyzed muscles should be supported by suitable prosthetic apparatus. The daily application of the galvanic current and gentle massage will hasten the restoration of normal function. General tonic treatment is usually indicated.

William M. Leszynsky.

LEAD POISONING, ACUTE AND CHRONIC.—**ACUTE POISONING.**—Cases of acute lead poisoning are comparatively rare and are ordinarily of accidental origin. The form of lead swallowed is usually the acetate, sometimes the basic acetate in the form of Goulard's extract. It may be the ordinary white lead or other lead salts, and cases have not infrequently been reported of poisoning by the yellow lead chromate used in coloring candy. There is no danger of acute lead poisoning by lead salts prescribed medicinally, since the toxic dose is so much larger than the medicinal dose. From 3 iv. to 3 viij. (15.5 to 31 gm.) is, for example, the poisonous dose of lead acetate.

Symptoms.—It is a curious fact that acute lead poisoning presents, within the period of a few hours, almost the entire series of symptoms caused, in much slower stages, by chronic poisoning. Within a few minutes after swallowing a large portion of any of the soluble lead salts the patient perceives a sweetish, followed by a metallic, taste. This is quickly succeeded by a burning sensation in the throat and stomach and by nausea and vomiting. Severe colicky pains in the bowels follow, with a retracted rather than distended abdomen. There are great thirst and marked general distress and prostration, with slow pulse and cold extremities. The bowels are constipated and the urine is scanty. Sometimes there are cramps in the extremities, and it is said that even paralysis has resulted from acute poisoning. Fatal cases usually terminate in convulsions and coma, within two or three days. Recovery is, however, the rule, even after the ingestion of such a large quantity as one ounce and over of lead acetate.

Post-mortem Appearances.—These are not specially characteristic, being usually those of an acute gastro-enteritis or entero-colitis with particularly contracted small intestines.

Treatment.—If the patient is seen early the stomach should be emptied with the stomach tube or pump. In the absence of such appliances nature's efforts at evacuating the stomach should be aided by the hypodermic use of apomorphine or the internal administration of sulphate of zinc. The latter is supposed also to be of value by contributing to the formation of an insoluble lead sulphate in the stomach. Magnesium sulphate and sodium sulphate are also employed for their combined chemical and cathartic action. After these come emollient drinks and the use of opiates to relieve pain.

CHRONIC POISONING.—The introduction of small quantities of lead into the body, during a considerable period of time, brings about a peculiar disease known as lead poisoning or plumbism, accompanied by a varied train of symptoms, some of which are of brief and others of quite long duration. The methods of exposure to lead poisoning fall under two heads—first, those which may be called accidental, and to which every one may be exposed; and secondly, those which are incident to certain occupations. Under the first head comes the accidental introduction of some of the lead salts into food, as by the use of cooking utensils lined with an enamel containing lead; the use of canned goods, especially acid fruits, long canned, which may absorb lead from the solder; the drinking of beer which has stood for many hours in a lead pipe; the use of flour ground with stones the holes of which have been filled with lead, etc. The employment of lead pipes for the conduction of drinking-water

has undoubtedly often caused lead poisoning. This is particularly true if the water is rain or snow water, containing no mineral ingredients. Lead-lined tanks for the holding of such water are absolutely to be interdicted. Hard waters, which contain lime and magnesium sulphates and carbonates, cause the deposit of a comparatively insoluble lead sulphate or carbonate within the pipe, thus protecting the water from contamination. Even then it is always wise, before drinking water from lead pipes, first to let that which may have stood in the pipes run to waste.

Lead suction pipes in wells are very dangerous. The best metal for this purpose is block tin.

By far the greater number of cases of lead poisoning, however, are those which are due to the inevitable exposure incident to certain occupations. Workers in lead mines and workers in lead alloys, as plumbers, lead-pipe makers, type-founders, and even typesetters, furnish frequent instances of poisoning. The same is true of those engaged in the making or handling of lead pigments.

Still more frequent are the cases occurring among those employed in the manufacture of white lead (lead carbonate), and in the honest old days, when they actually handled white lead extensively, the painters gave their name (*colica pictorum*) to one of the prominent symptoms of lead poisoning. A comparatively recent industry, which contributes a very heavy contingent to the cases of lead poisoning in this country, is the smelting and refining of the silver-bearing lead carbonate ores of this country and of Mexico. These smelters, scattered over the land from the crest of the Rocky Mountains (Leadville) to the Atlantic Ocean (Perth Amboy), employ many thousands of men among whom occur many hundreds of cases of lead poisoning annually. The considerable number of deaths and the much larger number of permanently disabled men for which this industry is responsible, and which, under proper precautions, might be avoided, is a matter that ought to be taken cognizance of by state and local health boards, wherever such smelting works exist.

Method of Introduction of the Poison.—Practically the only method by which lead is introduced into the system, among lead workers, is by means of lead-laden dust, this dust entering the nose and mouth and being conveyed to the stomach. There is no such volatilization of lead as would permit of its introduction in gaseous form, through the respiratory system, although the so-called smoke from blast-furnaces or retorts or the steam from kettles carries lead dust, just as ordinary smoke carries soot. The moustache, the fingers, and the clothing of the workman are loaded with this very fine dust, and this is not only swallowed when he opens his dinner bucket and eats with unwashed hands in the workroom, but it coats his upper mucous membranes all the time, is carried home in and disseminated from his clothing, and is present with him constantly.

Symptoms.—These may be divided as follows: 1. Lead cachexia, which often precedes more violent manifestations and generally persists through the entire history of the disease. 2. Lead colic. 3. Lead encephalopathy. 4. Lead paralysis.

Lead Cachexia.—After a variable period of exposure, sometimes extending over but two or three weeks, but oftener over from three to twelve months or even longer, the patient shows signs of failing health. He complains of a loss of appetite, of a sweetish taste in the mouth, sometimes of vomiting, especially after breakfast, always of constipation, of a general sense of lassitude, often of pains simulating rheumatism, either about the joints or in the muscles, perhaps of frequent cramps in the calves of the legs or in other muscles, very likely of vague abdominal pains. On examination he will be found to be somewhat emaciated, sallow, with a foul, coated tongue and very bad breath, the tongue not seldom betraying a tremor on being protruded. If to these signs and symptoms is added the characteristic blue line on the gum, the diagnosis is fairly assured. This blue