

and loaded as when working shall be perfectly straight. Another object of giving the rod a little excess camber is to allow for weakening by wear and subsequent turning down and lightening of the rod. Mr. Schönheyder then places the bent piston-rod in a lathe between centres, the arrangement being that here illustrated. In the views there given Fig. 7 is a front elevation of a suitable plummer-block or collar-plate, which may be placed and used on any ordinary slide rest lathe, and wherein that part of the piston rod may be held, which is to take the piston; Fig. 8 is a horizontal section of plummer-block; and Fig. 9 a vertical cross section.

In these figures A is the body of the plummer-block formed with suitable lugs or flange for resting it on and bolting it to the lathe bed. It is formed with a cap or upper part, which is united with the lower part by means of bolts *a'*. It is bored out circularly, and in it fits so as to be able to revolve a circular ring or collar-piece B, which is formed internally as a circle with two flat sides, as shown. The ring B has two lugs *b* on each side, each tapped to receive an adjusting-screw *c*. Inside the collar-piece B there is a block C formed to suit the hole through B, and made in two halves, which are formed with flanges outside, and united by bolts *d* passing through oval holes in the collar-piece B. Suitable parts are cut out in C to give room for the lugs *b*, and at *e* are eight set screws, four on each side of the body A. The two halves of B are also held together by steady pins *f*.

The use of this collar-plate is as follows: The required amount of camber having been given to the piston-rod, the block C is by means of the set screws *c* moved to an equal extent, say to the right, and the bent rod is then passed through the collar-plate and placed in the centres of the lathe and secured. The set screws *e* are so adjusted that the piston-rod and collar-bearing can rotate freely without any strain or springing of any sort, the convex side of the piston-rod having of course also been set towards the right in the first instance, or pointing in the same direction as the block C. This latter is now brought back to its normal position, and to facilitate this a scale is provided on each of the lugs *b*, as shown. This movement is accomplished by turning the set screws *c* in a direction opposite to that imparted to them in the first instance. It will then be found that the piston-rod has been sprung into a straight line, or nearly so. The piston-rod being thus properly adjusted (in the mode described, or in a slightly modified manner, which will readily suggest itself to an experienced workman), the bolts *d* are tightened up, and the turning may then be proceeded with in the usual manner, but by preference with two tools starting simultaneously and travelling in opposite directions.

Instead of the piston-rod revolving, however, a special lathe may be employed in which the piston-rod is held stationary and screwed down in the middle, as aforesaid, and the cutting tools are caused to revolve round it. A lathe of this kind, which has been designed by Mr. Schönheyder, is represented by Figs. 1 to 6, Fig. 1 being a side elevation, Fig. 2 a plan, and Fig. 6 an end elevation; while Figs. 3, 4, and 5 are enlarged views of details.

In these various views A is the lathe bed, having lugs cast on for holding down bolts as shown; B is a fixed poppet-head with long projecting boss and "centre" as shown. It carries one end of the driving-shaft *b* with cone-pulleys *c*, and with bevel wheels driven by it, and transmitting motion to the feed-spindle *h*. C is a movable poppet-head also formed with a long projecting boss and "centre" as shown. It carries the other end of the driving-shaft *b*. D is a centre-bearing bolted to the lathe bed. It is shown enlarged in front elevation at Fig. 5. It serves the purpose of pressing down and holding the middle part of the piston-rod, and is made with top and bottom block E and F, and with cap or plate G, which by means of the bolts *F'* can be screwed down, and the piston-rod thereby sprung down to its straight position.

It will be observed that the centre-bearing D fits on V pieces formed along the top of the lathe bed. H, H, are two movable headstocks, which contain the revolving cutting tools; they are shown in section and elevation to a larger scale at Figs. 3 and 4 respectively. H is the body of the headstock, which fits and can slide along the lathe bed. It is formed with a central opening, wherein fits the hollow revolving block I with tool holders *i*, *i*, wherein the cutting tools are secured in any usual manner; or it might be a saddle or sliding cap. J is a counter block or back, which is formed in one with a spur-wheel that gears with a spur-pinion *j*, which slides along the driving-spindle *b*, turning with it by means of feather and groove or otherwise. The revolving-blocks I and J are united by studs *k*, and adjusted against one another by means of set screws *l*, so as to revolve freely and steadily in and on the body H.

The feed is effected as follows: The body H has a lug below, forming a bearing for a small pinion *m*, which gears into a rack *n* fixed to the lathe bed A. On the spindle *o* of the pinion *m* there is another pinion *p* gearing into a pinion *q* on the spindle *r*, which also carries a worm-wheel *s* that gears with a worm *t*, which slides along and turns with the feed-spindle by means of feather and groove or otherwise. By pulling the pinion *p* out of gear with the pinion *q* the automatic feed may be thrown out of gear, and the feed worked by hand by means of a hand-wheel or handle *u* on the square end of the spindle *o*. Change wheels may be employed for altering the self-acting feed, as is usual with ordinary lathes. The headstocks can thus be moved automatically or by hand along the lathe bed with any required speed. The feed-spindle *h* has its bearings at each end of the lathe bed, and in the headstocks.

In order to turn a single-ended piston-rod Mr. Schönheyder forms it with or attaches to it at the cross-head end a temporary end, whereby it may be formed with the proper camber. The end to be turned can then be finished by means of the apparatus above described. Altogether Mr. Schönheyder's plans have been very carefully worked out, and they are, as we have said, well worthy of attention.

PARIS GREEN.

In the February number of the *Scientific Farmer* I notice an able article on "The Colorado Potato Beetle in Massachusetts," by A. S. Packard, Jr., in which he recommends Paris green, mixed with flour, as an artificial remedy. After using it for three years mixed with flour, with water, and with gypsum (sulphate of lime), I find the latter, mixed 1 lb. to 30 lbs., the most economical form, and to give better satisfaction in the end, it being a valuable fertilizer for that crop; and sprinkled over them frequently, gains two important points. It should be applied early in the morning, while the vines are yet damp with dew, and the operation repeated as often as the rains wash or the winds blow it off.

Plainville, Mich.

B. K. BATCHELOR.

UNHEALTHY TRADES.

A LECTURE BEFORE THE SOCIETY OF ARTS, LONDON, BY DR. B. W. RICHARDSON.

(Continued from page 279.)

Aniline Vapor.

SINCE the manufacture of the new aniline dyes has become such a great commercial pursuit, serious injuries have occurred to the workmen employed in the manufacture. The first decisive injury from this substance which attracted marked attention occurred in a lad sixteen years of age, who was brought into the London Hospital, from some aniline works in which he was engaged, on the 9th of June, 1861. The lad had been found in a state of insensibility, in the interior of a vat used for the manufacture of aniline. He was pale and cold; but that which attracted most attention was the extreme blueness of his lips. The lad recovered, but on the following day he still remained blue, and his breath smelt strongly of aniline.

Three years later, Dr. Kreuser, of Stuttgart, reported a set of new facts respecting the influence of aniline on the industrials employed in its manufacture. He showed that the vapor, when it does not act to the extent of producing insensibility, causes violent dry, spasmodic, cough. He also noticed, for the first time, that the vapors produced ulceration of the skin in the lower extremities, with much pain and swelling. The ulcers rapidly healed when the workmen were removed from the influence of the vapors.

Later, Messrs. Knaggs and Mackenzie in England, and M. Chevalier in France, discovered that a peculiar and extreme neuralgia is induced by the vapor of aniline. The neuralgic attacks begin with an intense nervous pain in the head, and a giddiness increasing almost to faintness.

Two French investigators, Tardieu and Roussi, have made some important researches on the physiological action of the red and yellow dyes, by which they have determined that, when animal bodies are subjected to these substances, a fatty change takes place in the minute structure of the vascular organs. The liver is made specially to undergo fatty degeneration; the tissues are also dyed with the color, and from the dye-stuff extracted from the animal organs the experimentalists dyed a skein of silk.

We have no evidence as yet that these phenomena of fatty change have ever occurred in the human subject, although it is fairly to be inferred that a long exposure to the vapor would lead to this result. The mischiefs actually inflicted are sufficiently important. They include *insensibility, followed by blueness of the skin, cyanosis, ulceration of the skin, and acute neuralgia*, all new maladies to be entered on our catalogue of industrial disease.

Nitro-Benzole.

The employment of nitro-benzole in chemical works gives rise to another source of danger, which more than once has been fatal. In all cases long exposure to the vapor of this substance produces nervousness and stupor, but when the vapor is inhaled in the concentrate form, the drowsiness, after three or four hours, passes into stupor and intoxication, and finally into complete coma, or apoplectic sleep. The mind remains clear until the stupor suddenly comes on, and then the insensibility is complete. The body falls precisely as in apoplexy, and death ensues in about five hours.

Dr. Lethely, who of all observers has most carefully inquired into the action of nitro-benzole, is of opinion that the poison is reduced in the body into aniline by giving up its oxygen, but that on the surface of the body the opposite condition is in progress, by which the salts of aniline are oxidized, and are converted into mauve or niagenta purple. I have learned of another mischief incident to the manufacture of nitro-benzole. In making it, by acting on benzine with nitric acid, vapor of hyponitric acid is freely evolved. This vapor produces great bronchial irritation, nausea or vomiting, and colic. Chevalier has reported on the same facts, and has added others which in England have not been noticed so evidently. He says that the process of washing the nitro-benzine is more painful than the making of it, and that the vapor of benzine itself induces intense headache, a fact I can fully confirm.

Thus *coma* and *apoplexy* are again added to our schedule of the industrial diseases.

EFFECTS OF FUMES.

Resinous Fumes.

Some very simple occupations are attended with bad results from trifling causes. For fixing the hair of brushes, such as shaving-brushes, a compound is made by pouring melted resin into boiled linseed-oil. The workman dips the tuft into this solution, and while leaning over it inhales the fumes of resin. Great distress of breathing and irritation are produced by this process. The cough is suffocative and becomes in time chronic, with persistent irritation. Many workmen have to leave the business from these causes.

Copper Fumes.

The first of the metallic fumes to which I have to direct attention is copper-smoke. The action of this smoke is to produce asthmatic seizures in the older operatives, in addition to the bronchial irritation which it excites. The influence of the smoke is destructive to the surrounding vegetation; its influence on vegetation may, indeed, be summed up in one word—corrosive.

Although the fumes are called "copper"-smoke, the amount of copper is exceedingly minute. One half per cent only exists in the deposit in the interior of furnace-chimneys, and so little is present diffused in the air that none can be detected at the distance of a few yards from the works, except when the smoke is extremely dense.

The late Dr. T. Williams, F.R.S., of Swansea, from whose analyses we receive the above and the best facts, states that the products of the smelting operation are divisible into two parts, (a) the gaseous and non-condensable, (b) the solid and condensable, fumes.

The fumes which condense in the culverts contain oxide of iron, oxide of lime, with traces of antimony and other metals, in the proportion of about 44 per cent pure copper, 5 per cent arsenious acid, 10 to 15 per cent sulphur; and sulphuric and sulphurous acids in combination, 15 to 20 per cent; water, from 14 to 19 per cent.

The smoke which escapes into the air from the chimneys contains coal-smoke in abundance, traces of arsenic, and sulphurous and sulphuric acids. Williams reckoned that 829,790 cubic feet of sulphurous acid were sent into the Swansea district atmosphere every week from the copper-smelting works on the Tawe. The acid can be detected in the atmosphere twenty miles from the works. Sulphuric acid is also diffused with sulphurous. According to Williams, for every fifteen parts of sulphurous acid in the smoke there exists one of sul-

phuric acid in combination. Upon these acids is chargeable the destruction of the vegetation of the district.

The cattle feeding in the locality are affected with a disease termed by the Welsh farmers *effyddod*. This disease is an inflammation of the *periosteum*, or membranous covering of bone. The bone becomes thickened in the neighborhood of joints. There is inflammation of the joints with effusion of fluid into them. The bones are prone to fracture. The teeth sometimes fall out and sometimes decay. Williams, whose description is here again followed, attributes the symptoms solely to the sulphurous and sulphuric acids. These acids, brought down by the rain, render the grass sour, and the eating of the grass causes the malady.

It is admitted that the copper-smelters are subjected to bronchial affections from their occupation, but their families appear to be exceedingly healthy and specially free from epidemic disease. Indeed, the accomplished author to whom I have so many times referred, in treating on this subject of epidemic disease, has advanced a theory which is singularly interesting and curious. This theory is that the copper-smoke entirely destroys all the poisons of the spreading diseases, so that "if it were possible to obtain a permanent diffusion of copper-smoke in the atmosphere of a given locality, the population of such locality would be permanently exempt from those epidemic diseases whose causative germs, whatever they may be in essence, travel and multiply from place to place in the atmosphere."

I do not indorse this theory, because the germ-theory of disease is to me incomprehensible; but the speculation of Dr. Williams is worthy of remembrance.

Fumes of Mercury.

In the older manufactures the sublimation of mercury was conducted in such a manner as to lead to very serious symptoms of disease. The workers at mercurial mines are now most subject to the danger of mercurial fumes, especially when they are engaged in the outside works, preparing and subliming mercury.

The disease excited by the fumes varies according to the mode in which they are inhaled. The most frequent symptoms are salivation and ulceration of the mouth. In some instances the stomach is first affected; there is pain in the stomach, constriction, sleeplessness, and cough. These signs are followed by those of salivation, and in some rare examples, recorded by M. Ferrand, there was a red rash on the body like the rash of scarlet-fever, which lasted for several days, and left rheumatic pains in the limbs.

In yet another class of cases the symptoms are more purely nervous, and are those of neuralgia, accompanied or followed by muscular tremor called significantly mercurial tremor. The whole muscular system is in fact thrown into constant feeble contractions and relaxations, over which the patient can exert no control.

In the extreme forms of disease from mercurial inhalation, the teeth become carious, and even the bones are affected. Some idea of these varied forms of disease may be obtained from the facts that have been collected at Idria, in Austria. Here there are the second best mercurial mines in Europe, and over five hundred men are employed at them. The works for smelting and purifying are about a mile from the mines, but the men change about, so that all are equally engaged at the various parts of the works. In one year, Dr. Hermann found that of 516 men thus employed, 122 were attacked with disease from the mercury, in the following forms: 27 had neuralgia; 14, rheumatism; 6, tremors; 10 salivation; and 2, caries. Hermann states that in the valley of Idria all the people and even the domestic animals are liable to be attacked with mercurial disease in one or other of its phases.

In England it is impossible to collect the facts respecting those who work in mercury with so much precision as is above recorded, but the symptoms, when they appear, are of the same order. They add three new diseases to the schedule—namely, *salivation, mercurial rheumatism, and mercurial tremors*.

Fumes of Zinc.

Men engaged in bronze-founding are subject to serious symptoms from inhaling the fumes of oxide of zinc. The fumes rise to the mouth of the workman and settle on the lips, causing sometimes a whitish efflorescence. After long exposure to these fumes there are induced choleraic attacks with shiverings, and severe cramps in the muscles of the legs. Sickness is also induced which may last many days, and the food that is taken seems to undergo a peculiar fermentative change, so that there is constant pyrosis, or water-brash.

The specific action of zinc on the animal economy, for the description of which we are indebted to Dr. Leo Popoff, is amongst the most singular that the study of industrial pathology affords. It adds to our calendar *choleraic disease, cramps of the limbs, and pyrosis*.

Phosphorus.

The introduction of the manufacture of phosphorus or lucifer matches, which commenced about forty-three years ago, created a new form of disease caused by the inhalation of the fumes given off from the phosphorus. This disease, an extremely painful one, affected the jawbone of the worker, causing necrosis or death of the bone. It was not detected until the year 1845, when it became well defined in the public hospitals at Vienna. To Dr. Lethely we are indebted for the first light that was shed on the subject in this country. Soon after his report the whole matter came fully under investigation. The mischiefs, when they occurred, were all produced by the use of white phosphorus, the common phosphorus of commerce. In the match manufacture the fumes of the phosphorus were inhaled at every step in the process, from the stirring of the mixture, through the dipping, to the boxing of the matches. While the disease was present I made a very careful investigation of it in respect to its development and course, and reported the facts in one of my lectures on the "Medical History of Diseases of the Teeth," delivered in 1858, and afterwards published. The facts, briefly described from that lecture, are that the symptoms first complained of were pain, deep-seated in the tooth, having, as it were, one tooth for a centre. It was not a toothache, nor was it strictly confined to one particular tooth, but it extended steadily and persistently along the jaw, and was much intensified whenever the jaw was gently percussed or struck. In time the disease became concentrated in the jaw, a slow inflammatory process occurred, and a thickening of the bone ending in death of the bony structure, with attempts, in parts, at regeneration. In fact, what is technically called a true necrosis was developed. In the worst cases, where the patient was not relieved by operative measures, hectic supervened, with copious night-sweats, extreme pain, and even death from exhaustion. It was remarkable that no bones except those of the jaw were affected, even in the worst cases, so that the disease was purely local, and, indeed, was disconnected from the other symptoms of phosphorus-poisoning. I inferred that the malady was due

to a volatile acid of phosphorus, which was absorbed by the saliva, and affected the jawbone whenever the teeth became unsound and the alveolus or edge of the jawbone became exposed. This view accounted for many of the anomalies—namely, that the lower jawbone alone was affected, that the enamel of the teeth escaped injury, and that workers whose teeth generally were sound escaped the injury altogether.

When the phosphorus-disease once commenced, it continued in progress over periods of one, two, or even three years. It was sometimes localized in its extent, so that the teeth only came out, sometimes it extended through the whole of the bone. I compared it in 1858 to a chemical destruction of the bone, with inflammation from the irritation produced by the foreign products of decomposition. I see no reason to modify that definition.

You will observe that in speaking of the phosphorus-disease, I have spoken of it in the past tense. I have done so because, fortunately, the affection is now all but extinct. The discovery made by Lundstrum, of Sweden, that red or amorphous phosphorus could be applied for the production of matches, led to a complete revolution in the match-making business, and to the introduction of what is called the safety-match. By this plan the red amorphous and practically innocuous phosphorus was placed on the box, and the combustible substance put on the match was made of materials that were perfectly harmless to health. Two qualities of safety were secured by the improvement. The match was rendered safer for common use, and the operatives were freed from the invasion of one of the most severe of the industrial diseases.

The disease was classified under the title of *phosphorus necrosis* in the records of industrial pathology.

Fumes of Lead.

The fumes arising from the process of lead-smelting are less often sources of injury than they were formerly. Some danger occurs from the inhaling of salts of lead in fine powder, but the greatest danger lies in the manipulation of lead when it is used as white-lead or as a salt. To its action on the body and its importance as a source of disease I proceed, at once, in the next section of our subject.

CLASS II.—INJURIES FROM EXPOSURE OF THE BODY TO CHEMICAL AGENTS, SOLUBLE OR IN SOLUTION.

From the study of the effects of substances inhaled, and productive of injury through their introduction into the body by the lungs and the blood, we pass to the second and succeeding classes printed on our table.

Disease from Absorption of Lead.

Lead is always introduced in the form of an oxide, or of a salt of the metal. It specially affects two of the industrial orders—painters and potters. The painters use lead, as we all know, in admixture with oil and turpentine, to make the common paints that are in daily use for ordinary paint-coloring. The potters use it for what is called glazing the pottery—that is to say, for giving the hard, smooth, shining surface to vessels of earthenware. The painters come in contact with the lead while manipulating with paint; the potters come in contact with it in solution, or rather in suspension, while dipping the earthenware. In these cases, and, as a rule, in all cases where lead is used and becomes injurious from its use, it is first brought into contact with the hand of the workman. It has been usually assumed that in this way the substance is directly absorbed through the skin into the blood, and that the nervous centres are reached by this channel of absorption. I am inclined to question this hypothesis. There is no proof whatever of an experimental kind, that lead is absorbed by the skin. Solutions of lead may be applied, I had almost said to any extent, over the external surface of the body without effect of a deleterious kind, and I have had the most convincing evidence of some men who have worked in lead for years, that they have never shown a sign of lead-poisoning. The evidence on the whole is to my mind conclusive that in all cases of lead-poisoning the poison is swallowed by the mouth. The workman or workwoman, becoming careless after a time, takes up bread or other article of food with hands soiled with lead. Thus a little lead is taken daily, and in time the mischief is done.

It is one of the peculiarities of this agent of disease amongst the industrial classes that it is a cumulative poison. Some injurious agents are so soluble they are readily carried out of the body when once they have been received into it. They accompany the excretions, and at a brief interval make their escape. Other foreign and injurious substances are of organic character; these are decomposed or broken up in the chemical processes that go on within the body, and so are eliminated. But lead, an inorganic and sparingly soluble substance, is thrown off with great difficulty. Its chief mode of exit is by the excretion from the kidney. For a time this mode of elimination is sufficient to prevent the general poisonous effects of the lead from becoming active; but at length the action of the poison upon the kidney is to cause chronic inflammation in it—*nephrosis*, as it is called—with destruction of the delicate mechanism of the organ and important function. Then, the mode of escape cut off, the poison commences to accumulate in the system, and disease is established.

The disease induced by lead is of two kinds, acute and often transient, slow and entirely disabling, or fatal. The first or transient form consists of symptoms of intestinal spasm, *colic*, as it is commonly called; the second of *paralysis*. I have seen, but this is of rare occurrence, an intermediate disease in which the internal spasm, succeeded by fever and by the excretion of an extreme fetor with the breath, has ended in a paralysis from which the sick man has recovered without other symptoms. Occasionally the spasm of the intestines terminates in death; but as a rule there is perfect and often rapid recovery from this symptom.

The paralysis from lead is never determinately serious from the first, and is so distinctive that the term "saturnine paralysis" has been applied to it. It is in some respects like that form of paralysis from alcohol which I described last year in this place, and it has been compared with the general paralysis which affects the insane. It differs from these, and from all other paralytic affections in many respects, notably in the following particulars:

(1) It attacks most frequently the muscles of the upper limbs. This is so commonly the case that Tanquerel affirmed he had only seen the lower limbs involved in one case out of one hundred and two. His experience is exceptional. I should place the occurrence of general paralysis after the commencement of paralysis of the arms and hands at one in eleven. Still it is the broad fact that the muscles of the hands and arms are those in which the failure of power appears first, and that the failure in a large majority of instances is confined to these parts.

(2) In this paralysis the extensor muscles, the muscles by

which we extend the limbs, are first and most deleteriously affected, hence the origin of the condition known as "drop wrist"; the extensor muscles of the hand lose the power to lift the weight of the hand. Later in the course of the disease the same deficiency extends to the muscles that raise the limb altogether.

The loss of power which is induced is due, in the first instance, to failure of nervous stimulus from those nervous centres which direct and excite the muscles of the upper limbs of the body to motion. There is no doubt that all the muscles of the limbs are paralyzed; but, relatively, the group of extensor muscles are less powerful as they are less massive than the flexors. In the extensors, therefore, the enfeeblement is first discovered, and here it continues longest.

Many investigations have been made to determine the mode in which the lead-poison acts in causing the paralytic state; but in this direction little that is definite has been revealed. In what form of chemical combination with the tissues the metal lead is fixed has not been determined; all that is known is that it is distributed largely throughout the body in the cases now under consideration. It has been found in the liver, the blood, the nervous substance, and in the muscles of those who have died from it, but how it is maintained in those parts is not ascertained. The nearest approach towards an explanation is that as a salt of lead it acts on the albuminous parts of the tissues, coagulating them, and becoming itself combined with the solidified structure. In this way the activity of nervous action would readily be cut off; but why particular parts of the nervous system should seem to be involved in preference to other parts is difficult to answer. I have thought, in studying the subject, that possibly the theory of selection of parts for action, which has been most entertained, is a mere fancy; and that all parts of the muscular system are deprived by the lead of nervous stimulus, those sets of muscles which are least powerful feeling the loss of stimulus most rapidly. After a period of inaction from lead paralysis the muscles waste, they become of fawn color and shrunken. From this state they never recover, and when the heart—which, as you know, is a muscle—is involved, the sinking into death is slowly inevitable.

While the artisan is suffering from the influence of this simple but potent poison, other parts of his body, besides the muscles and nervous centres, undergo organic changes. Along his gums extends a deep, dark-blue line which specially indicates the action of the metal. His visceral organs, the liver, the kidneys, the lungs, show a reduced nutrition and shrinking of their tissues.

ACTION OF PEROXIDE OF HYDROGEN UPON FATTY OILS.

By S. COHNE.

By the action of HO_2 upon fatty oils they become separated into the two distinct classes known as drying and non-drying oils. Though HO_2 does not exhibit any action upon the latter description, it acts powerfully upon the first kind. When a few drops of a weak solution of HO_2 (if containing only half a volume) are mixed and shaken with a drying oil—such, for instance, as linseed, nut, cotton-seed, poppy, etc.—linolic or palmatine acid are immediately separated from it, which, if put into a basin to settle, the linolic acid subsides to the bottom in the form of a greasy mass, while the palmatine acid sets in fine sheets upon the top of the oil. The remaining fluid oil loses its property of a drying oil, and becomes a non-drying oil.

Castor-oil, after treatment with HO_2 , does not then so readily dissolve in alcohol, and when dissolved in sufficient quantity of alcohol it will be found, if thrown on paper, that it will not dry up: consequently HO_2 is an easy test. If olive-oil is adulterated with cotton-seed oil, this being a cheaper article, it may easily be detected even if the adulteration is less than a quarter per cent, as the oil immediately becomes thick and dull.

The HO_2 appears to act upon the oil somewhat as sulphuric acid does upon alcohol—that is, the HO_2 is not decomposed—and when the solution of HO_2 is allowed to settle, and is afterwards drawn from the oil, it can be used again and again, and will continue to act upon a fresh quantity of oil with a like result.

The weak solution of HO_2 may remain for months under oil without being decomposed, even though heated up to 100°F ; similarly, as Saussure has found, a layer of nut oil, if inclosed with oxygen gas, absorbs in eight weeks in the shade only three times its bulk of that gas. As drying oils are usually much cheaper than non-drying oils, advantage may be taken of the foregoing facts to convert the drying into non-drying oils for lubricating purposes.—*Chemical News*.

ANALOGY OF CYANOGEN TO OXYGEN.

By WILLIAM SKEY.

OXYGEN, especially when in the allotropic form, combines directly with metals generally, including gold and silver; moreover, it combines with hydrogen to form a neutral compound, and this, when electrolyzed, delivers its oxygen at the positive pole. Besides this, cyanogen resembles oxygen, wherein, as shown, it differs from the chlorine group, its compound with the alkaline metals being caustic, and those with the heavy metals characterized by great insolubility in water, while several of these cyanides are soluble in alkaline cyanides, precisely as several of the metallic oxides are soluble in alkaline oxides; further, cyanogen, like oxygen, is capable of assuming an allotropic condition.

Following up analogies here, I would class cyanogen and sulphur together, and so I would their hydrides. HS , like cyanogen, is not strongly acid, indeed probably not acid at all; for, as in the case of hydrocyanic acid, HS exhibits a great tendency to oxidize when in contact with water and to form oxyacids, so that in testing this gas for acidity we are liable to obtain reactions not due to the gas itself.

Our new nomenclature, by doubling the equivalents of oxygen and sulphur, has disturbed the uniformity which before this existed between their common hydrides and that of cyanogen; thus one point of resemblance has been removed, but I think this has been done somewhat arbitrarily in regard to cyanogen. Certainly, when the equivalent of cyanogen is retained, its hydride then being CyH (hydrocyanic acid), comparing with that of chlorine, the supposed similarity of these substances is maintained; and this, by the way, may have been one of the reasons for which the doubling process described was broken off at cyanogen. However, if I am correct in assuming that this compound is analogous with oxygen rather than with chlorine, its equivalent will also require doubling. If you now agree with me, or at least will contemplate the

possibility, that cyanogen is not analogous to chlorine and its isomorphs, but rather to oxygen, you will be in a position to perceive certain interesting relations which it bears to oxygen, and which could not well have presented themselves had the assumption I have here attempted to disprove remained unassailed.

Thus ferro and ferri-cyanogen become, upon this view, ferri-oxides in which oxygen is replaced by its isomer, cyanogen, and the same being true for the rest of the metallic cyanides, these substances should be, I think, viewed as comparing with the oxides of sulphur and chromium as they exist in the sulphates or chromates; further, sulpho-cyanogen and seleno-cyanogen, the only compounds containing cyanogen (or at least its elements) which do compare with the simple halogens, are not at all analogous with cyanogen. The cyanides thus viewed are not salts at all any more than the oxides are: sulpho-cyanides, on the other hand, are true salts, comparing exactly with the corresponding salts of the halogens.

Further, in regard to the question often raised as to the nature of certain of our elements, whether compound or not, it seems interesting that in this compound (cyanogen) we have a substance very similar to the element oxygen, one which at least only varies from it within the limits we are compelled to allow for variation in the members of certain well-defined natural groups of our elements. We are thus, as far as is allowable from such apparent resemblances, justified in entertaining the supposition that oxygen itself is also a compound body. I need not remind you in this connection that any theory which touches upon the nature of this gas has now an especial interest to us, for, as you will be aware, this and our most common gases or gaseous vapors are, for good reasons, considered to be distributed throughout the earth and suns generally, and even to pervade the spaces between them, and to perform all the functions we have hitherto allotted to a purely hypothetical substance. The nature, therefore, of any gas which is possibly a constituent of that which we now consider to be a universal atmosphere becomes invested with an importance to us far beyond what we could even conceive of a short time since.

Lastly, in regard to the question as to the nature of our elements, it appears a very noteworthy circumstance that, by combining cyanogen with sulphur, which is also an analogue of oxygen, we obtain a compound analogous to the halogens I have referred to. That this ternary compound, sulpho-cyanogen, should be thus a true salt radical is strongly favorable to the idea that one or more of the chlorine group of elements is of a compound nature, and in relation to this it is worthy of record that, as I have already pointed out, the "equivalent number of sulpho-cyanogen is one which is very nearly the mean between that of chlorine and bromine."

However, whether these facts indicate any thing of this kind or not, I think the object of this paper has been fulfilled, for I believe I have shown that, to use a familiar but significant phrase, cyanogen has not the "stuff" in it for making a salt radical single-handed, therefore it is not in any way analogous to one, but in order to make it so we must combine it with another element, so that three elements in place of two are as yet the smallest number required to form a compound salt radical.

DR. LETHEBY.

AT the comparatively early age of sixty died, on the 30th of March, Dr. Henry Letheby, who for many years had been eminent in his profession, who had justly gained an extensive popularity, and whose advice was eagerly sought after and greatly valued by those who required the assistance of a chemical expert.

As a technological chemist Dr. Letheby was second to none; and in whatever capacity he was acting—whether as lecturer on Chemistry, Toxicology, and Technology; as Gas and Water Examiner; as Medical Officer of Health; or as Analytical and Consulting Chemist—he always gave evidence of having industriously mastered the minutest details of his subject. His complete knowledge of Chemistry and Toxicology, and his intimate acquaintance with the Sciences of Comparative Anatomy and Physiology, rendered his opinion on subjects connected with medical jurisprudence of especial value.

His writings and labors are so varied and numerous that we can not refer to them all. To show, however, that we have not unduly magnified his high qualities, and also that in his death Chemical Science has sustained a great loss, we may refer to his admirable lectures on "Food," delivered before the Society of Arts, and afterwards, at our request, revised and published in book form; to his lectures on "Practical Toxicology;" to his papers on the "Mode of Conducting Post-mortem Examinations in Cases of Suspected Murder;" to his reports "On the Sanitary Condition of the City of London;" on the "Practice of Disinfection and the Right Use of Disinfectants;" on the "Utilization of the Waste Products in the Manufacture of Coal Gas;" on "Noxious and Offensive Trades and Manufactures;" on the "Detection of and Tests for Aniline," etc.—*Chemical News*.

MESMERISM IN DENTISTRY.

A LADY came to my office, after having broken two engagements, to take an anæsthetic, and said, "Have you any objections to extracting teeth for me while under the influence of mesmerism?" Prof. W. offers to mesmerize me." I gave my consent. He took a position in front of the patient, and after a few gentle strokes of his hands over her face, motioned to me that all was ready. Six teeth were extracted before she left the chair. She expressed herself as not having felt the least particle of pain.

I do not remember of ever having had so timid and nervous a patient. While making the preliminary examination she would not allow me to use an excavator.—J. C. HENRY, New Albany, Indiana.—*Dental Cosmos*.

PRODUCTION OF METHYLANILINE VIOLET DIRECTLY ON COTTON.

By ALBERT DUPUY.

PRINTING goods with a solution of methylaniline chlorate (containing 3 to 4 per cent of methylaniline) which should be neutral, or, if any thing, should contain an excess of base and ageing at a temperature of 30° to 35° , is the method proposed. The addition of $\frac{1}{2}$ to $\frac{1}{4}$ per cent of red prussiate hastens the development of the color, and renders it more uniform. The chlorate prepared with methylaniline, potassic chlorate, and tartaric acid, is not so good for the purpose as that prepared with pure chloric acid. Boiling water will extract the color from the goods, leaving a gray.