a gastro-enterostomy when obstruction is present.

For the favourable case an extensive gastrectomy, with special attention to the lymph glands in the subpyloric region, and those along the lesser curvature to the coronary artery, is the operation of choice. The omentum should also be removed.

SOME POINTS IN CONNECTION WITH THE TOXIC EFFECTS OF LEAD, ARSENIC, MORPHINE, COCAINE, ETC.¹

By SIR WILLIAM WILLCOX,

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LADIES AND GENTLEMEN,—I was asked to give a lecture in this course, which I understand to be a post-graduate course especially arranged for the M.R.C.P. examination. The subject I have chosen for it is "Some points in connection with the toxic effects of lead, arsenic, morphine, cocaine, &c."

I do not propose to go over the ordinary toxicological features which you see detailed in the textbooks relating to these subjects; what I propose to do is to deal with some more recent researches and developments in the toxicological aspects of the subjects. And I shall not speak of anything which is not of very great importance at the present time; I shall not deal with anything in the way of abstruse scientific investigation; everything I shall tell you will be of real importance.

First of all with regard to lead. A great deal of knowledge has been gained during the last twenty years with regard to lead poisoning. You are all familiar with the

symptoms and the modes by which it is acquired. There is acute lead poisoning and chronic lead poisoning. Acute lead poisoning is caused by the swallowing of a large quantity of some salt of lead. Lead is an irritant poison, and the symptoms, when a large quantity of lead has been taken by the mouth are: acute gastro-enteritis, vomiting, diarrhoea, pain in the abdomen, a metallic taste in the mouth. In the case of lead this condition is followed by constipation. Many of the mineral poisons cause gastro-enteritis and a lasting diarrhoea. Lead causes constipation as an after-effect. Whenever any large quantity of poison is taken, whether it be arsenic or lead, you get the acute effects of the lead, and afterwards there may be such symptoms as occur in the chronic poisoning. Therefore sometimes after taking one dose of lead the patient gets the acute symptoms of gastro-enteritis, and then these symptoms may be followed by those of chronic lead poisoning which I will deal with directly.

Chronic lead poisoning is a very common disease; it is one of the notifiable industrial diseases. It has to be notified to the Home Office, that is, every case of it which occurs in industry. And the causes of industrial lead poisoning have been very thoroughly worked out in this country. Sir Thomas Legge, who was formerly a Medical Inspector for the Home Office, devoted a great deal of time and research to the subject, and as a consequence, the occurrence of industrial lead poisoning has become very much less than it was formerly. Chronic lead poisoning may occur from accidental causes due to contamination of water, as has occurred in the North of England, such as in the Sheffield district, where a soft plumbosolvent water has been used as the water supply, and outbreaks of chronic lead poisoning have occurred in that way. And sometimes food becomes contaminated with lead, in consequence of it being wrapped in lead wrappers, or being stored in lead vessels, or through contact with lead in any

¹ A lecture delivered in connection with the Fellowship of Medicine and Post-Graduate Medical Association (M.R.C.P. special course) at the rooms of the Medical Society of London, on Tuesday, June 3, 1930.

other way ; for example, beer-drawn through lead pipes from the barrels to the bars.

Lead has not been very much used criminally. The commonest use of it in that way is for purposes of procuring abortion. Diachylon is a lead plaster, i.e., oleate of lead, and formerly in certain districts it was used largely, being rolled into pills and swallowed, in that way taking perhaps 10 to 20 grains a day. Lead oleate is a lipoid-soluble substance, and a lipoid-soluble substance can travel to the central nervous system. Diachylon caused a large number of deaths when it was used for criminal abortion ; it caused the condition known as lead encephalopathy. It caused symptoms of mental disturbance, irritability, then delirium, stupor, convulsions, and coma and commonly this train of symptoms would terminate in death. And the lead would not only act on the brain and central nervous system, but on the kidneys causing nephritis, and the symptoms of lead encephalopathy would be partly accompanied by uræmic conditions.

Lead is an extraordinary poison as regards its selective action. It acts on the nervous system, it may act on the central nervous system, as I have told you, when it acts in the more acute type of case, causing acute cerebral symptoms ; but it also acts on the peripheral nervous system. This you see, often, in chronic lead poisoning, the lead causing peripheral neuritis. And the distribution of this peripheral neuritis is very remarkable. It affects the arms rather than the lower extremities, and the extensor muscles of the forearm are affected, though, curiously enough, the supinator longus is generally spared. Lead will also affect the muscles of the shoulder, and may cause deltoid and biceps paralysis. One sees persons suffering from lead poisoning able to walk about, as they have little weakness in the legs, and yet who have the characteristic wrist-drop. Alcohol, diphtheria and arsenic, when they cause neuritis, affect the legs equally with the upper extremities, and

there may be foot-drop as well as wrist-drop, and a symmetrical distribution. But in lead, as I say, you have only the hands and shoulders affected. And I have seen cases in which only one side has been affected.

In chronic lead poisoning there is a blue line on the gums, or there may be. But it is curious that you do not often see that blue line when lead is given intravenously. One does not often see the blue line nowadays. If the teeth are absent a blue line does not occur ; it is due to the formation of lead sulphide in the tissues from decomposition of the material between the gum and the teeth. If people keep the teeth clean they will not develop the blue line. Lead causes a sallow complexion. It has a curious action on the blood. People suffering from lead poisoning have anæmia, as lead destroys the red blood-cells, and it causes such changes in those cells as poikilocytosis, and there may be some nucleated red cells. And with lead, too, you get punctate basophilia in the red cells ; there is a stippling of those cells. But that stippling is not absolutely diagnostic, for it can occur in other conditions ; but it shows well the effect of lead on the blood. And the red blood-cell stains a slaty colour, a so-called polychromasia.

As to the white cells, lead causes a mild leucocytosis, and the eosinophiles are increased, often being present to the extent of 5 per cent. or 6 per cent. The leucocytes are not altered appreciably in the differential count, but there is some granulation of the leucocytes. So much for the action of lead on the blood.

With regard to the joints, lead may cause gout, "poor man's gout," as it is often called ; it occurs in plumbers ; they also get pain in the joints, arthralgia. It affects the kidneys, causing chronic nephritis, and these patients develop high blood-pressure and all the symptoms of chronic interstitial nephritis. Lead also acts on the blood-vessels, causing arteriosclerosis. It is a deadly poison ; it gets fixed in the tissues, and if a person gets

lead in his tissues he is never the same again. In the case of a person who has had his tissues saturated with lead a year will elapse, at least, before it disappears from his urine.

Lead, as you know, has been used for the treatment of cancer. Professor Blair Bell, of Liverpool, is a great advocate of the use of lead in cancer. But I am not here to-day to talk about cancer, and most of you, no doubt, have your views as to the value of lead in the treatment of cancer. Suffice it to say now that it has not come into general use by the medical profession. I know Professor Blair Bell very well; I know he is a very earnest worker, and I have been to Liverpool and seen his cases and all his work. For the treatment of cancer lead is given intravenously in the form of a colloidal solution, of 0.5 per cent. strength, it is suspended in a solution of gelatine. I show you a solution which Professor Blair Bell made himself. Lately they have been using lead selenide. That is rather more toxic, and so 0.2 per cent. is used. Whether lead has done any good for cancer I am not going to say, but its use has been of some value in toxicology. We have learned something about the toxic effects of lead from the use of lead in the treatment of cancer. Blair Bell gives, as a fatal dose of lead, given intravenously, 0.2 of a grain, and that would be 40 c.c. of colloidal lead solution. As Professor Blair Bell gives and advocates a dose of 20 c.c. of this, you will agree we should be sailing near to danger by giving to patients in one week half the fatal dose; weekly doses are given for cancer. The effect of lead is measured by the blood-tests; the hæmoglobin is estimated, and films of the blood are made, and when the punctate basophilia appears, the bio-chemist holds his hand until the blood is clear of its stippled cells before giving another dose.

When lead is given intravenously there may be gastro-intestinal symptoms, with colic, just as when lead is swallowed by the mouth: there are very marked blood

changes, and there may be an action on the nervous system. It may cause encephalopathy. It may act on the eye, causing amaurosis, that is to say, temporary blindness. Or it may cause optic atrophy, though this latter is a very uncommon occurrence. Lead may cause nephritis, that is to say, there is albumin in the urine, casts, possibly blood. It may also act on the liver, if given intravenously, and cause toxic jaundice. I have seen all these symptoms occur from the use of lead intravenously in the treatment of cases of cancer. You will, therefore, agree, that lead must be used with great caution.

There is another compound of lead which is of great interest to everyone, and that is lead tetra-ethyl; it was discovered about sixty years ago. It is $\text{Pb}(\text{C}_2\text{H}_5)_4$. It was discovered in the chemical laboratory of Oxford University, and some original work was done on it there. It is a colourless liquid of a specific gravity of 1.62; it is lipoid-soluble, and boils at 200°C . When people were first working on this lead tetra-ethyl, the assistants who were doing the "spade-work," it was noticed, were affected mentally; they had attacks of mania, and two of them died. It was thought to be nothing more than a coincidence. But when a third developed similar symptoms it was thought that this tetra-ethyl might be responsible for the condition, and that was found to be so. It is one of the most dangerous cerebral poisons there is. It is lipoid soluble, it may be inhaled and absorbed and it can be absorbed by the skin. It attacks the brain, and you get profound mental symptoms; it causes insomnia, delusions, mania, restlessness, tremors, and may cause coma, convulsions and death in a few days.

You may ask, "What has this to do with the M.R.C.P. or with present-day affairs?" It has much to do with them, because the motor is the chief means of transport to-day; nearly everyone has a motor-car or rides in one. It has been found that if you

add to ordinary petrol certain substances you can make the explosion more even, you can prevent what is known as "knocking" in a motor car by these additions to the petrol. Many substances have been tried, and it was found that lead tetra-ethyl added to ordinary petrol, or even to inferior petrol, made it better for use, because of the greater evenness of the explosion. An ethyl-petrol—petrol to which 1 part in 1,300 has been added of lead tetra-ethyl, has been introduced into America and is being largely used there. It has also been introduced into England. Perhaps the American cars are more in need of something to smooth their explosion than the English cars, so I doubt if this substance will come into general use in England; one objection is that it is 2d. a gallon more. Another reason why it has not come into use, perhaps, is that one of the leading newspapers made a great attack on ethyl-petrol and alarmed people. As a result, a Government Committee was appointed—of which I was a member, and our Report was issued a few weeks ago. We collected all the evidence we could. Though lead tetra-ethyl is such a deadly poison, yet when it is diluted down 1,300 times with petrol, there does not seem to be any danger if care is exercised. In fact we were unable to find a single case of lead tetra-ethyl poisoning from the use of ethyl-petrol. But the side issues from these scares, or from the use of these uncommon substances, are often of great importance, and they were of great importance here, because a remarkable discovery was made. When ethyl-petrol was introduced a great many investigations were made to see if it was dangerous, and control tests were made; that is to say, persons exposed to the use of this had their urine and fæces examined, and control tests were done on people who were not so exposed; and the remarkable discovery was made that lead occurs in the urine of everybody at the present day. It used to be thought that if it was present it meant the

person was being poisoned by lead. In London the normal amount of lead in the urine is about 0.05 parts per million; and in the case of people living in the country, 0.025, or half that in town dwellers. If people are exposed to the action of lead, the amount of lead in the urine is very much greater, ten or more times greater.

A new method has been discovered for detecting these minute quantities of lead, or several methods. I think the best is that published by Sir Robert Robertson, the Senior Government Chemist, who was a member of this Ethyl-petrol Committee.

So those are very interesting points with regard to lead, its use in cancer, the occurrence of lead normally in the urine of people to-day—probably it occurred in former days, but to-day we have got lead all round us, paint, lead pipes and lead everywhere, lead in soldered food tins, so it is not surprising that there are small amounts of lead in the urine.

Now I come to some new points relating to arsenic. You know the various types of arsenical poisoning. There is the acute arsenical poisoning which occurs when white arsenic or some such compound of it is taken by the mouth. It causes an acute typical gastro-enteritis. A fatal dose is 2 gr. of arsenic. As I have said, if you take a big dose of any poison you get acute symptoms, and there may be some of the poison left in the body, leaving chronic symptoms; that is to say, one big dose of arsenic may nearly kill the person from acute gastro-enteritis, and he may recover, and have after a few days peripheral neuritis from the one dose. I have seen that. The books talk of arsenic being an irritant poison. It is more than that, it is a deadly poison. It acts on the kidney and heart muscle and on the liver, and it does not really cause death by producing vomiting and diarrhoea—people do not vomit to death, they are not purged to death—when arsenic kills it kills because it poisons the heart, kidneys and liver; it is a tissue poison.

Chronic arsenical poisoning you are familiar with, when small doses are taken. It particularly acts on the nervous system, and there occur peripheral neuritis, foot-drop, wrist-drop, &c. I shall not go into that.

Arsenuretted hydrogen is another type, and that is different from the other two. It is a most deadly poison, and acts on the blood, destroying the blood cells, causing extreme anæmia. It is a liver poison, so that you get toxic jaundice, hæmorrhages, hæmaturia and purpura. It is a very rapidly-acting deadly poison.

Another type of arsenical poisoning is provided by the arsenical compounds used in the treatment of syphilis, &c., arsenobenzol. I wonder there are not more cases of poisoning from them, from the way they are used. I have seen many fatal cases from their use, and the danger must always be borne in mind. This preparation is generally given intravenously, and some people have an idiosyncrasy; some can tolerate it, but in others even a small dose may be fatal or deadly. A careful man will first find if the patient is sensitive to it before using the regulation dose. A few months ago I had the case of a person who had syphilitic infection and was given 0.3 of a grm. of N.A.B., and he got jaundice after it. He was given another dose, 0.1 grm., and he had severe toxic jaundice after it. If we had continued with the drug it would have killed him; he was sensitive to arsenobenzol. It used to be thought that the poison attacked the brain, as they had symptoms like uræmia, mental irritability, vomiting, drowsiness, then became delirious and comatose. That was thought to be due to the action on the brain. I think I was the first to show that such was not the case; that was in 1910, just after arsenobenzol was introduced. I saw several fatal cases, and I analysed the brains of several of them, and found no arsenic in the brain. Arsenobenzol causes death by its action on the liver, causing acute degeneration of the liver cells, and there is an

auto-intoxication due to defective liver function. In other words, the death from this cause is like that from acute yellow atrophy. There may be jaundice, but in arsenobenzol poisoning the persons are, often, dead before jaundice has had time to show itself. Sir Bernard Spilsbury and I have investigated many cases, and we found very marked fatty degeneration of the liver cells in all these cases. Therefore arsenobenzol must be used with care, because it is a liver poison and may cause death by auto-intoxication and paralysis of the liver function.

How can you prevent these tragic deaths? For when a person in normal health dies in two or three days it is tragic. You must first give only a small dose, and if jaundice results, do not use the drug. Another way is this: it is always a good plan, before a person is exposed to a toxic substance, to protect the liver by giving glucose. If you give an ounce of glucose two or three hours before giving arsenobenzol, the drug is tolerated much better. It is good also before an anæsthetic. Chloroform is a liver poison, and if you give an ounce of glucose a few hours before, it is tolerated very well. When I was trying this lead for cancer I always gave glucose three or four hours before giving the lead injection.

When arsenic has been taken, either for criminal purposes or in any way, you can find it in the urine for three or four weeks afterwards. It is absorbed by the hair and the nails, where you may be able to find it months or years afterwards. It is excreted in the fæces, too, for three or four weeks. Arsenic poisoning may be thought to be food poisoning, because of the gastro-enteritis, as in the Armstrong case. When Major Armstrong tried to poison a rival solicitor, the doctor thought there was food poisoning, but he sent some urine up for examination a few days afterwards, and it was loaded with arsenic. I remember seeing the case of a person who had been in India and who was suffering from neuritis. This patient told me it was really no good his seeing me,

as he had seen many doctors in India, and none of them could find out what was the matter with him; some said he had beri-beri. I said to him, "Will you let me cut your hair?" He probably thought I had gone mad. I cut some of his hair off and had the Marsh test applied, and it was found to be loaded with arsenic. I said to him, "You have arsenic poisoning. What happened before you were ill?" He said, "That was the day I had a row with my cook." The cook had given him a dose of arsenic a few months before I saw him and he was suffering from the late effects of arsenic poisoning. So you can detect arsenic months, even years, after the taking of the arsenic, in the nails and hair.

Some interesting work on arsenic has been done recently. About forty years ago some American discovered arsenic normally in the urine in a certain district. The statement was looked upon with suspicion and no notice taken of it. A short time ago a Commission was appointed in Sweden to inquire into arsenical poisoning, and they made the startling discovery that arsenic was present in the urine of normal persons in Sweden. Naturally, then, other countries began to investigate this question, and in 1925 a paper was published in England by Dr. Cox, who analysed the urine of a number of persons who were not having arsenic in any form, and he found arsenic in the urine of nearly all of them in quantity up to 0.1 per million.

Quite recently it has been found that arsenic is a normal constituent in certain fish and crustaceæ: plaice, sole, shrimps, cod, turbot, and many of the common fish we eat, have small quantities of arsenic in them; while oysters, mussels, lobsters and crabs have quite large amounts. Plaice, cod and sole may have 0.1 to 0.8 parts of arsenic per million; lobsters and shrimps may have as much as 20 to 40 parts per million; mussels 100 parts per million; oysters 10 parts per million. These animals are disobeying the Royal Commission, because

that Commission which sat on the subject of arsenic, in 1900, enacted that the limit for arsenic in solids should be 1.4 per million, and in liquid 0.14 per million. So lobsters have about thirty times as much arsenic in them as the Royal Commission permit. You may say, again, "What has this to do with medicine?" It has this to do with it: that if persons die from these symptoms and arsenic is found in their bodies, you have to ask, "Is it possible this arsenic may have got in through the natural diet? Or has it been criminally administered?" That problem presented itself to me last year. A lady in Wales had rheumatoid arthritis and chronic kidney disease, ascites, a dilated heart, and so on, and it was not to be wondered at that before she died she had vomiting and diarrhoea. Some urine and a stool were sent to the analyst and a small amount of arsenic was found in them. An inquest was held, and it was alleged that this lady had been poisoned by arsenic. When the matter was gone into carefully, it was found that the amounts of arsenic found in the organs were very minute, and though this lady was in such a terrible condition of health, she had retained a very good appetite to the end; she had been in the habit of sending out for fried fish for lunch, and of this she ate heartily, and so it was clear, taking all the evidence into account, that the arsenic had got into her body in a natural way, that it was not a case of criminal arsenical poisoning.

Apples may contain arsenic in their skins, that is those apples which have been sprayed with sprays made for killing insects, many of them containing arsenate of lead. English apples have not been found to contain arsenic.

I advise you to read up about drugs of addiction; time will not permit me to talk about them: morphine, cocaine, heroin, &c. You should know the important enactments of the Dangerous Drugs Acts and Regulations. Remember that morphine, if in amounts of over 0.2 per cent., morphia and

all its preparations, come under the Dangerous Drugs Acts; also cocaine and its preparations in amounts over 0.1 per cent.; and recently heroin, in all amounts, has been added. Any preparation of heroin, however minute its quantity, must be prescribed in a manner which fulfils all the requirements of the Dangerous Drugs Acts.

I want now to say a word or two about alcohol. When you talk about alcohol you mean, of course, ethyl alcohol. There has been a good deal of medico-legal trouble recently on the question of drunkenness, especially drunkenness when in charge of a motor car. The legal definition of drunkenness is "the condition in which a man is drunk," and you will agree that does not take us "much forrader." Lawyers refuse to define the term "drunk." We make elaborate definitions, but I will not go into that. Suffice it to say that, though Committees have sat and pondered over the tests for drunkenness (I was a member of the British Medical Association Committee), yet we are not carried much further. Because there is no legal definition of "drunk," there has been an attempt to put the matter on a scientific basis. There has been a good deal of work done recently, and Dr. Southgate is one who has published several papers in this country during the last few years on the excretion of alcohol. When ethyl alcohol is taken by the mouth, it is quickly absorbed, and it is slowly and steadily excreted. So if a large quantity of alcohol is taken, within an hour it finds its way into the blood to its maximum amount, and then steadily falls. If a big dose of alcohol is taken probably it will take twelve hours for it to be excreted; if a very big dose, it might take twenty-four hours. But it is quickly absorbed. That, in the normal person, differs entirely from sugar. There will be 0.2 per cent. alcohol in the blood in an hour's time, and then it will gradually come down, and the blood will be normal again in twelve to eighteen hours. If a smaller quantity is taken it will probably all be excreted in about twelve

hours. If glucose is taken by the mouth, it is absorbed very quickly, and within two hours it will all have disappeared from the blood. It will not have been excreted in that time, but will be stored in the liver. Southgate has shown that when alcohol is taken by the mouth it is quickly absorbed, and quickly appears in the blood, and that it takes twelve to twenty-four hours for it to be eliminated from the blood, and that in the urine you can find alcohol in very similar amounts to that in the blood. So on testing the urine of a person, if he has had alcohol within six hours you will find it being excreted in the urine. So this would be a valuable test for drunkenness. No one has yet dared to give specific amounts, but you may take it from me that if there is over 0.2 per cent. alcohol in the blood or urine, that that person, though he may not be "drunk," is not fit to drive a motor car; if he is not drunk it takes him all his time to hide the symptoms of drunkenness. He is under the effects of alcohol, and with over 0.2 per cent. of alcohol there might be more or less deep intoxication. But you cannot ask a person to give evidence which may be against himself; you cannot ask a wife to give evidence against her husband, nor a husband against his wife; so, according to English law, it is not quite fair, if a person is suspected of being drunk, to say that you want a little of his blood, or to ask him to pass water for analysis, so that you may say whether he is drunk. That test has not come into general use here; but it would be of great value, if a person under suspicion had locomotor ataxy and were arrested, and the test showed absence of alcohol in blood or urine, to be able to say such person could not have been drunk. If a person takes a dose of 75 c.c. of ethyl alcohol it would be a pretty stiff dose, equalling 5 or 6 oz. of whisky. A good deal of it is got rid of in six hours, but it takes twelve hours for the majority of it to be eliminated; it might even take a little longer. And that corresponds to the clinical effects in a person who gets drunk; some

may get a little better of their symptoms in a few hours, but it takes twelve hours to get rid of their symptoms. I shall not go into the clinical effects of alcohol, because you will find them described in the books.

Now a word or two about other alcohols. In appearance and smell and taste, methyl alcohol is exactly like ethyl alcohol; but methyl alcohol is a much more deadly poison; 10 c.c. of it has caused death. And it is a poison which does not produce the pleasurable effects of alcohol. The onset of the symptoms of methyl alcohol may be delayed, but its action is very prolonged; a person may be in coma from it for three or four days.

Methyl alcohol has a selective affinity for the optic nerve, and many persons who have been poisoned by methyl alcohol have developed blindness and optic atrophy in a large number of cases. You may say, again, What has that to do with us? It has this. Sometimes the makers of spirits—fortunately not in England but in other countries—and of brandies and liqueurs and scents and essences have used methyl alcohol instead of ethyl alcohol. In Germany there have been several very bad epidemics of blindness from the use of adulterated brandy; and, in America, from adulterated whisky and essences. I have seen some cases. Fortunately, however, they are very rare in this country.

Remember what methylated spirit is. Before the War it was an ordinary crude alcohol, but since the War, in order to prevent people from drinking methylated spirit, it has had additions. Before the War it contained 10 per cent of wood naphtha, a very impure methyl alcohol. Since the War it has been made nauseous stuff; it is coloured blue with aniline dye, and it has in it pyridine and paraffin, as well as wood naphtha, and anyone who drank this would have violent vomiting. It contains $\frac{1}{2}$ per cent. of pyridine, and 0.375 per cent. of paraffin. But for industrial purposes methylated spirit can be bought which is purer than that sold

before the war. It is methyl alcohol with 5 per cent. commercial wood naphtha. It is difficult to buy industrial methylated spirit; all sorts of forms have to be filled up, because of the danger of people drinking it. "Surgical spirit" is industrial spirit to which some castor oil has been added; why that should be added I do not know; whether it is to prevent surgeons drinking it I cannot say! They do, however, put in 3 per cent. of castor oil.

There is another alcohol, isopropyl alcohol. It is an alcohol which is very similar to ethyl alcohol in appearance, and it has many of the facilities and properties of that which render it useful for the arts; it is a solvent for varnishes and can be used for perfumes, and it may replace ethyl alcohol. It is twice as poisonous as ethyl alcohol, though it is not likely to replace it as a drug of addiction, as it does not produce pleasurable effects; it only makes the person drowsy and sleepy. If people know about it, there is a danger of it being used in this country as a beverage.

Lastly, I remind you that amyl alcohol is a toxic, nasty, irritant liquid, has a pear-like odour, is five times as poisonous as ethyl alcohol, causes headache, stupor and coma, and persons taking it suffer from glycosuria. It is one of the chief constituents of fusel oil, that is to say the spirit which is produced in ethylic fermentation. And it is one of the impurities occurring in bad whisky.

Those points which I have mentioned will, I hope, be useful to you in supplementing your reading on toxicological subjects.

POST-GRADUATE NEWS.

FROM September onwards the Fellowship of Medicine has arranged a varied choice of Special Courses. Particulars of these can be obtained from the Secretary of the Fellowship, 1, Wimpole Street, London, W. 1, who will be pleased to supply copies of syllabuses