

AN ADDRESS ON ALCOHOL AND ON DRAINAGE.

Delivered at the Annual Meeting of the South Midland Branch.

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GENTLEMEN,—To you, the members of the South Midland Branch, who have conferred on me to-day the honour of electing me your President, I beg to return my warmest thanks; and, together with my friends in Bedford, rejoice in having once more an opportunity of social meeting and profitable discussion.

And, in the name of all the members of our Branch, I give a hearty welcome to those gentlemen of the Cambridge and Huntingdonshire Branch, who have so cordially responded to our invitation to join us, and see, with the greatest pleasure, among us so many of those whose lifelong endeavour has been, by their zealous pursuit of science, by their arduous research, and by their enthusiasm in teaching, to restore to an ancient University its School of Medicine; and who now, by the excellence of their work, are successfully striving to restore Medicine to its legitimate and dignified position by the side of Theology and Law.

It is the custom and privilege of the President, on these occasions, to give an address to the members. I will not detain you to express my sense of unfitness; and if this do not make me entirely forego the privilege, it is because I believe that every one so placed is called upon to show in some way with what seriousness and with what loyalty he looks upon the duties of his professional life, and the interests which are thereby entrusted to him.

It is not my intention to dwell on general topics. I wish to make some observations on two questions which, at the present time, are frequently before us.

The first of these is alcohol. Alcohol, chemically, holds an intermediate position between the carbohydrates and the fats. It resembles them, in that it undergoes combustion in the body, furnishing warmth. It helps to sustain life, when taken together with other food, and is only excreted when given in excess. But, far beyond this, alcohol exerts a power over the mental functions and the moral faculties of men, which convinces us of the futility of resting satisfied when we have merely compared it with other substances as an article of diet, or given it a place in our *Pharmacopœias* as one among many other of our medicinal agents.

In the United Kingdom, nearly £130,000,000 are spent upon it annually, and almost as much more must be added as the indirect cost of drinking. Out of 80,000 persons taken into custody in London in one year, 30,000 were taken in consequence of drink.

In the Report of the Lunacy Commissioners, January 1st, 1881, it is stated that there were 73,113 persons of unsound mind in our asylums, and intemperance was reported to have been the exciting or predisposing cause in 12.6 per cent. of the new admissions. Of the pauperised class, we have between two and three millions, costing the country about twenty-five millions of money annually; and a great proportion of this poverty is hereditary, and due to drunkenness and profligacy.

When to this we add the experience of all present of the misery caused in families of every rank, of the blighted lives and ruined prospects, of the degradation and wretchedness which it causes, we begin to realise how vast a power for evil is alcohol in our own land.

Now, if we compare this country, with its 35,000,000 of inhabitants, and its 180,000 persons pursuing the traffic in drink, with Sweden, a country whose population numbers just one-tenth of our own, we find that there there are only 450 places for the sale of spirits, and that that little country, which, thirty years ago, was the most drunken in Europe, has, under the influence of wise restrictive legislation, emerged from moral and material prostration, and is now showing signs of comfort and independence among all classes. (Hoyle.) Seeing this, we cannot wonder that there should be a great endeavour to check the evil which is so great a curse to our country. But, greatly as we deplore the evil, and warmly as we sympathise with those who are grappling with it, we cannot but regret that many of their arguments are unfair and inconclusive,

and we fear that in denying too much they may injure the cause they wish to serve. Recognising, then, the vastness of the evil on the one hand, and on the other, regarding the attempt to deny that any advantage can be derived from alcohol, I wish briefly to survey the question, to consider some of the conditions under which it is useful, some under which it is injurious, and to urge the necessity of strict and rigid moderation.

Is alcohol food? In many respects, it resembles sugar, which certainly is a food. It was long denied that alcohol underwent combustion in the body; but the latest experiments of Dr. Dupré confirm those of Anstie, and prove that "the amount eliminated in both breath and urine is a minute fraction only of the amount of alcohol taken," that is, unless the quantity be excessive. We may, then, infer that alcohol undergoes oxidation in the body, and that force is liberated. We have no proof that it is stored up; and, according to the experiments of Dr. Frankland, the burning of one gramme of alcohol yields sufficient heat to raise seven litres of water 1° Cent., and the burning of one gramme of cod-liver oil suffices to raise nine litres 1° Cent. That is to say, three tablespoonfuls of oil yield about the same amount of warmth to the body as four tablespoonfuls of alcohol; but the alcohol is more easily assimilated than the oil. But, though there are conditions under which, from its high diffusion-power, alcohol is undoubtedly useful—as, *e. g.*, in fevers—wide and repeated experience proves that in health it is not a necessary, nor even an useful, article of diet. It diminishes the power of the blood-cells to carry oxygen; though easily burnt itself, it prevents the combustion of other substances; it thus depresses functional activity, while it lessens waste. It has been well compared in its action to sulphur, which, when put together with other substances, might burn itself, but would prevent their combustion by the formation of sulphurous acid.

In a concentrated form, alcohol coagulates albumen; it thus hardens the skin, and has an astringent effect on mucous membranes. If a very large quantity be taken at a draught, the effect may be similar to that of a blow upon the large sympathetic ganglia; and an immediately fatal result may ensue from paralysis of the heart. But, short of this, delirium tremens may be produced by a single debauch, or by habitually taking excessive quantities, which may or may not have caused drunkenness.

The mortality of the intemperate is greatly increased, especially from diseases of the head and digestive organs. The relative probabilities of living are as follows (Neison's *Vital Statistics*).

Of a Temperate Man.	Of an Intemperate Man.
At 20 = 44.2 years		At 20 = 15.6 years
„ 30 = 36.6 „		„ 30 = 13.8 „
„ 40 = 28.8 „		„ 40 = 11.6 „
„ 50 = 21.25 „		„ 50 = 10.8 „
„ 60 = 14.28 „		„ 60 = 8.9 „

Not only early death, but premature old age, is brought on by indulgence.

The brain, its membranes, and its blood-vessels, suffer; neuralgia, terrifying hallucinations, and various forms of lunacy are developed.

Alcohol has been truly called the "genius of degeneration;" and its startling effects are seen most frequently in gastritis accompanied with constipation; in enteritis with diarrhoea; in cystic degeneration or atrophy of the peptic glands, and increase of the interglandular connective tissue; in fatty or fibrous degeneration of the liver; in chronic bronchitis and lobar emphysema, or in acute pleurisy or pneumonia; in congestions of the pharynx and larynx, with hoarse whispering voice; in atheroma of arteries, with liability to rupture. The conjunctivæ become red or jaundiced; the skin greasy and coarse, affected with the hypertrophic form of acne rosacea and the other eruptions. These and other diseases are the lot of the intemperate; but such shorten not only their own lives, and disturb their own mental equilibrium; they also transmit dire evils to their children. One of the worst of these is the unnatural craving for drink. In the Fourteenth Annual Report of the Fort Hamilton House for Inebriates, it was stated that 44 per cent. were the children of drunkards. Other inherited evils are arrests of development during foetal life; at later periods, uncertain temper, inaptitude for work, nervous irritability, and epileptic seizures.

So far, we have considered only the effects of great excess. When alcohol is taken, as it frequently is, by people who consider themselves moderate, the first effect is upon the mucous membrane of the mouth; the impression thence conveyed to the salivary glands increases their secretion. At the same time, the effect on the branches of the fifth nerve stimulates the circulation in the brain in the same way as it is increased by the taking of snuff, or by scratching the head

or stroking the beard when puzzled.¹ The fluid then reaches the stomach; and here it is not known what changes alcohol produces, nor at what rate it is absorbed; but it seems to be equally distributed over the body, and to pass out quickly, being eliminated chiefly by the lungs and skin. From the stomach, it exerts a reflex action on the cardiac and vaso-motor centres. The heart beats more quickly; the vessels relax, especially those of the surface.

The mucous membrane of the stomach, which in health is pale and velvety, and covered with a thin transparent viscid secretion, on taking food becomes reddened, by the influx of a larger quantity of blood; gastric juice is freely poured out, and digestion proceeds. When, from want of tone or from fatigue, or other causes, the functions of the stomach are in abeyance, a small quantity of alcohol, well diluted, will often stimulate both its movements and secretions, and restore its digestive powers. But, if there be an excess in the amount taken, then, instead of gastric juice, a ropy mucus is secreted, and digestion is arrested.

Alcohol has the property of precipitating pepsine. Dr. Richardson, in some experiments on artificial digestion, found that one per cent. of alcohol was enough to retard the process. Others have found that a much larger amount had no such effect; but all such experiments out of the body are unsatisfactory; and we know, from the observations on Alexis St. Martin, that, when the quantity of alcohol was too large and too often repeated, the stomach lost its smooth and healthy appearance, and presented large patches of erythematous inflammation, the secretions were vitiated, and the food remained undigested and was often vomited.

The general symptoms produced are: dryness of mouth, furred tongue, thirst, and accelerated pulse; and, gradually, a chronic catarrhal condition is set up.

Again, alcohol may interfere with the necessary reduction in the liver of the products of digestion; and these, passing through unchanged into the general circulation, cause the depression and low spirits from which persons sometimes suffer two or three hours after meals, and which are recognised as symptoms of hepatic indigestion.

The effect on the brain varies greatly. In some, irritability is diminished, excitement is calmed. These take it to enable them to face any severe ordeal: for courage, for presence of mind, for steadiness of hand. Thus, it is told of a late eminent surgeon that he was in the habit of taking a dose of opium before operating. In some, pain is allayed, sensibilities are deadened; they take it to obtain rest from harassing care and feverish anxiety, to soothe their aching nerves and weary spirits. Repose is what they seek; and they find it in the sedative influence of alcohol, in the same way that persons in warm climates, in the East and South, take opium and Indian hemp. In those climates, the other effects of alcohol are less desired; the cheerful sunshine and high temperature keep up a free cutaneous circulation, and are sources of comfort and exhilaration.

In others, the more rapid circulation through the brain and the vessels of the surface produces feelings of warmth and comfort; the bodily functions seem to be carried on more easily; imagination is excited; thought and speech are rendered more free and ready. "Their blood, no longer cold, gives mighty pulses." The sense of strength and vigour thrills them with delight; they feel themselves endowed with higher capacities. This is the stimulating effect of alcohol. But there is danger in both. The calm of the one, the strength of the other, is too often deceptive. It is easy to go too far, and to have a reaction, which more than counterbalances the fancied gain. The musician who steadies his nerves by alcohol, by the same agent blurs his notes; the writer who gains in fluency at night, condemns his own work in the morning.

So with those who take alcohol for its stimulating effect. It was found by Dr. Parkes that, when four ounces of brandy were given three times a day at intervals of four hours to a healthy man for three days, it entirely destroyed the power of work. The effect of the spirit was to bring on palpitation and breathlessness. After the first dose the man said "the brandy seemed to give him a kind of spirit which made him think he could do a great deal of work, but when he came to do it he found he was less capable than he thought." On the third evening, the condition of his circulation obliged him to stop altogether; and, says Dr. Parkes, "the inferences were, that even any amount of alcohol, although it did not produce symptoms of narcosis, would act injuriously by increasing unnecessarily the action of the heart which the labour alone had sufficiently augmented;" and he goes on to say "iron-puddlers,

glass-blowers, navvies on piecework, and prize-fighters in training are found to do their work more easily without alcohol."

In Ashantee, when rum was served out on the march, it temporarily removed the sense of fatigue; but this returned after a short interval, which became shorter each time the ration was repeated, and eventually it was found better to give it when the day's work was over.

The sense of increased strength is from the blunting of the nervous system; the power of co-ordination is diminished, the senses of sight, hearing, taste, and touch, are all said to lose their keenness.

Another reflex action of alcohol is that which is produced on the skin by the dilatation of its blood-vessels. In consequence of this, the impression made by the warm blood upon the peripheries of the nerves gives the sensation of warmth, whatever the temperature of the interior may be; the sensations of heat and cold, as the case may be, being for the most part derived from the condition of the skin. Thus, in ague, the patient feels cold when the interior of the body is much above the normal, and thus a false impression has arisen as to the warming effect of a stiff glass of grog. By this action of alcohol on the skin, the glass of grog may produce sleep in a person turning in after exposure to cold, for the dilatation of the vessels of the extremities draws away the blood from the brain, and this is the condition of slumber; and on the other hand a man who may have been indulging without showing any signs of intoxication may become drunk on going out into the cold, by the contraction produced by the sudden impression of the external air and the concentration of the spirit-charged blood in the internal organs, including the brain and spinal cord.

In climates where the cold is extreme, alcohol is said to be dangerous. Under the influence of the cold, the blood being driven inwards and circulating in the vital organs keeps up the temperature in them, the skin and subcutaneous tissues acting as non-conductors and preventing the body from being chilled. Thus whales are protected in Arctic seas by their blubber; and thus is explained the success of a well-nourished man like Captain Webb in swimming across the Channel, and the failure of others who were thin and spare.

Dr. Lauder Brunton tells us that Canadian lumberers have practical knowledge of these effects; and they are well-illustrated by a story which he relates of a party of Americans who had to camp out at a great elevation when crossing the Sierra Nevada. Some of them took no alcohol, lay down cold and uncomfortable, but awoke in health; others drank moderately, went to sleep comfortably, but arose wretched and miserable. The remainder drank freely; the cutaneous vessels became relaxed, the blood circulating through them came in successive waves into contact with the cold external air, and returned chilled to the interior of the body, and this went on until the temperature was reduced to a fatal degree.

But this does not coincide with the Arctic experience of Norden-sköld in the *Vega*, whose daily allowance to each of his crew was "two cubic inches" of brandy or rum, nor with that of Leigh Smith in the *Esra*, nor with that of Mr. Brudenell Carter when encamped on the swampy banks of the Poti; and a medical friend, who was in the Crimea, tells me that during the first winter, which was a very severe one, and which was passed under canvas, there was nothing to eat excepting salt-junk and ship's biscuit, and these only in very limited quantities; and no cocoa, tea, or coffee, except green coffee-berries, which could be neither roasted nor ground; and he believes that they could not have lived through it but for the excellent rum and tobacco which were served out. The next winter, when the food was better and more abundant, the craving which they had had for the rum disappeared.

In countries where the heat is great, the cutaneous circulation is free, perspiration is profuse and rapid, and evaporation keeps down the temperature of the body, the use of alcohol tends to exhaustion. Soldiers are found to endure more fatigue and to have far better health when no spirit-ration is served out; and some of the most arduous marches have been made, the most protracted sieges sustained, and the greatest hardships endured, when no fermented liquids could be procured.

It is certain that in good health alcohol is unnecessary, and may, under many conditions, be injurious. What are some of the circumstances under which it may be beneficial?

It is said that in disease every medical man thinks it most indispensable in that department in which he has most experience; the physician in fevers, the surgeon after operations, the obstetrician in hæmorrhage. In fever, where the temperature is too high and waste too rapid, alcohol in considerable quantities serves to lower the one and prevent the other. It may also act as an anti-

¹ Dr. Lauder Brunton, "On the Influence of Stimulants and Narcotics on Health" (unpublished proof of article in *The Book of Health*).

septic. Professor Binz injected putrid matter under the skin of two dogs of equal size, and both, in consequence, had a high degree of fever; one to which he gave no alcohol died the next day. When the temperature of the other was at the highest, he gave it ten cubic centimetres of alcohol with water. The temperature immediately fell, and continued to do so for two hours, and then rose again. A second dose of alcohol again reduced it for a time, and then again it rose; a third dose brought it down once more, and then the animal recovered (Branton). Mr. Brudenell Carter quotes the experience of Dr. Braun, who for some time lost forty-five per cent. of the eyes on which he operated, for cataract, among ill-fed Russian peasants. After failing with tonics, he tried brandy and wine for a few days in each case, and after a year's trial the forty-five were reduced to six, of whom three partially recovered.

Again, in wasting diseases it is undoubtedly useful, and in convalescence from acute disorders.

Assuming, then, the great value of alcohol in illness, there are also many persons, under unfavourable conditions, or who are just bordering on good health, to whom it is of great service.

When the quantity of food is limited, alcohol is a valuable adjunct, as shown by Hammond, who gained in weight when he added it to an insufficient allowance of food, upon which he had previously been losing.

It is of value when food is of inferior quality or badly cooked, or when the appetite is enfeebled by depressing influences, such as bad air or over fatigue.

It is useful to brace up the flagging energies to a final effort, towards the close of a hard day's exertion.

It is useful after exposure to wet or cold, to assist in restoring the circulation.

Instances are frequent enough to occur to most of us, in which the addition of a small quantity of well diluted alcohol to a meal aids the digestion; as seen by the relief of headache, of gastralgia, of flatulence, or of diarrhoea, in which it aids the circulation, by relieving vertigo, or by giving tone to the heart and arteries, and making a pulse regular, which without it was intermittent; in aiding the nervous system, by relieving insomnia in one, by enabling another to keep awake and do his work with comfort.

But so far as my experience goes, the amount required is very small; and this is the point to which I beg especially to draw attention, as being one of very great importance. While convinced that for the young and vigorous it is wholly unnecessary, often injurious; for those who, by reason of age, or some of the other conditions I have just mentioned, may not have such perfect health, a daily allowance of one ounce of alcohol, often less, is quite sufficient. It has been so in all the instances to which I have alluded, and in many of them the proof has extended over several years. This means from a half to two-thirds of a wine glass ($1\frac{1}{2}$ to 2 ozs.) of brandy or whisky; or a pint of beer, or half that quantity of claret, in the twenty-four hours. This, if it benefits, does not cause flushing of the face, nor heat of skin, nor disinclination for work.

This is what I would call strict moderation; and if the insurance offices which publish such startling comparisons between abstainers and so-called moderate drinkers, would take care to exclude from the latter class all who exceed this amount, they would, by enforcing a true standard of moderation, do a benefit to society, and at the same time they would find the discrepancies between the two classes far less than as at present they would have us to suppose. But as yet their statistics are of no value for such purposes as they profess. Some figures from the reports of the Manchester Royal Infirmary and Convalescent Homes deserve notice. The number of in-patients being over 6,000 in a year, the average cost of spirits, wine and beer, has been reduced since 1875, from 7s. 2½d. per head to 11½d., and the percentage of deaths has decreased from 11.3 to 7.8.

The experiments of nearly all physiological chemists—Parkes, Richardson, Anstie, Edward Smith—tend to prove the same thing, that an ounce and a half of alcohol is about the maximum which, in the absence of fever, can be entirely burnt off in the body; and the experience of those who, like ourselves, approach the question from the side of daily observation, suggests the advisability of keeping well within this limit.

Another subject, to which I must briefly allude, is that of drainage. We cannot shut our eyes to the numerous evils attendant on faulty systems and faulty construction. Not only are typhoid fever, diphtheria, erysipelas, and other acute diseases, intimately connected with the contamination of water, or the escape of gas from

sewers, but also many evils of lesser degree. Parkes tells us that, when the air of sewers escapes into houses, and especially into bedrooms, health is greatly impaired. Anæmia results from the imperfect aëration of the blood, and disorders of the digestive organs become prevalent. Children lose appetite, strength, and colour; older persons suffer from malaise and feverishness. Coughs, sore-throats, headaches, vomiting, diarrhoea, and colic are frequent, and those unsatisfactory and anomalous conditions to which it is difficult to assign a name.

Now, there are many unsolved problems in sanitary engineering; many questions as to dry earth or water, as to currents of air in shafts, as to methods of ventilation, as to different kinds of traps; but two points are certain. We are all agreed (1) that it is of the highest importance that all drain- and soil-pipes should be outside the house; and (2) that the inside trap, which is in connection with the soil-pipe, should be absolutely sound, and free from defect. Fortunately, there is a very simple plan by which the slightest leakage may be detected. A small quantity of some strong-smelling volatile substance—such as half an ounce of oil of peppermint or some paraffine—introduced into some part of the pipe or drain outside the house, poured down the ventilating shaft, if there be one, followed by a gallon or two of boiling water, will, by making its presence known inside the house, lead to the detection of any flaw which may exist. Though perfectly simple, this test requires to be applied with care. There must be no other way of entrance for it into the house, except through the pipe—*i.e.*, all doors and windows must be carefully closed, and the person applying the test must not himself enter the house; the detection must be left to somebody else within.

Those who would attach less importance to the injurious influence of sewer-gas, who are inclined to cite instances in which it has been escaping and has been inhaled, and yet the evils spoken of have not resulted, may be reminded that, in our search after causes, we must often expect them to be complex; that it may take more than one factor to bring about an epidemic; and that sewer-gas is a very important one among them. Others may be peculiar states of the atmosphere, dampness of soil and low situations.

Under no circumstances can the presence of sewer-gas be safely disregarded; but whenever there are any permanently unfavourable conditions—conditions which depress health, but which cannot be removed—it behoves medical men, and all others concerned, to be especially on the alert to guard against all those causes which are remediable, such as escape of sewer-gas into houses, the want of frequent flushing and thorough ventilation of mains, scanty water-supply, or the use of water liable to contamination.

That we may not conclude that there is no dangerous escape of sewer-gas into a house because we are not aware of any offensive smell arising from it, may be inferred from an experiment by M. Gustave le Bon, who found that the gases arising from decomposing animal matter might be more noxious when less pungent. He mixed some hashed meat with water, and allowed it to putrefy; he then placed a frog in an enclosed vessel with it. When putrefaction began, the smell was most foetid, but the frog was uninjured. At this time, the liquid swarmed with bacteria, and, injected under the skin of an animal, proved to be a most virulent poison. After two months, the liquid was neither so foetid nor so virulent when subcutaneously injected; but it proved rapidly fatal to an animal breathing the gas which emanated from it.

Captain Galton, in a paper read before the Society of Arts (*Times*, April 27th, 1883), says: "Improvements effected in sanitary administration and in the habits of the people have reduced the mortality about 2 per 1,000, taking into account density of population, which, with unchanged hygienic conditions, would have increased the mortality. This represented an annual saving of about 48,000 lives in England and Wales, excluding London.....In thirty years, the mean age at death had been raised from 28.4 to 29.6." He went on to say: "If we could introduce into our towns generally the mortality of the healthy districts, we should diminish our death-rate by nearly one-fifth;" and he pointed out how enormous would be the amount of money directly saved from sickness and funerals, if all known insanitary conditions were removed.

Now, when we find the evils spoken of, which directly affect the physical health of those for whom we make ourselves responsible, and which, from their depressing influences, almost as directly affect their moral condition, and so often their domestic happiness; and when we know, as Dr. Quain so forcibly tells us, that "our end and aim should be, first, to discover the cause or causes on which disease depends, and to counteract them, if practicable; and, secondly, to endeavour by every means to restore to health the functions of

the body, and, with that object, to guide and assist Nature, but never to thwart her operations"—if we believe this—where, I would ask, is our self-respect, if we do not search out the causes, or, suspecting them, do not set ourselves to remove them? How do we stand in relation to our patients, when called in to assist them in their distress and in their dependence on us, if we allow them to continue to suffer in person and in pocket while professing to heal them? While, year by year, our knowledge of medicines is more exact and definite—of their actions, more physiological and scientific—at the same time, our view of Medicine is larger and broader. It is not enough, by the administration of an appropriate remedy, to seek to cure; we must, by foresight and circumspection, seek to prevent. This we shall not thoroughly do until we come to realise, in spite of the slight apparent contradiction, that to study the best interests of the patient and of the public is eventually to secure our own best interests and those of our profession.

When we consider how vast are the interests committed to the medical profession, how intimately the wellbeing of the nation is connected with the faithful discharge of our duty; that the health of the army and navy is entrusted to our care; that we have a part in the selection of all candidates for civil posts; that all hospitals, dispensaries, workhouses, asylums, and prisons are virtually directed by us; and, finally, when we consider the intimate relation in which we stand to our private patients, how often the medical man's advice is sought, not only on questions of health and disease, but in questions of domestic and social difficulty, in questions of education, in legislative questions of national importance; when we feel how often counsel and assistance are called for by all, from the highest to the lowest—then we feel the importance of a great Association such as the British Medical, which endeavours to stimulate in each of us our sense of duty and responsibility, which keeps us together with unity of purpose, and encourages us with mutual help to work for a common object. While thankful to belong to so noble a Profession, and for the advantages of so great an Association, let us each for ourselves remember that it is not by the pursuit of wealth, nor of social distinction, nor of personal power or exaltation, but it is by a self-sacrificing spirit and self-sacrificing labour that our Profession seeks to realise its lofty ideal; and that it must be by largeness of heart and breadth and earnestness of purpose that we must each carry out the work confided to us, and thus, humbly and at infinite distance, shall we be following in the steps of Him who "went about doing good."

REMARKS

ON

DEATH FROM METHYLENE AND ON THE USE OF OTHER ANÆSTHETICS.

By F. JUNKER, M.D., M.R.C.S.

PROFESSOR BREISKY of Prague, in the *Prager Medicinische Wochen schrift*, 1883, No. 22, reports a case of death during the administration of chloride of methylene,¹ which, being the tenth fatal case from this anæsthetic, must considerably shake the confidence of the profession in its perfect safety. The patient, a married woman, aged 27, suffered from a cyst of the right ovarium, for the removal of which ovariectomy was to be performed on May 2nd, 1883. Dr. Breisky points out, in his paper, that particular precautions and care were considered necessary in administering the narcotic, on account of the anæmic and weak condition of the patient. One of the clinical assistants watched the pulse, whilst another, who possessed great experience in the administration of anæsthetics, gave chloride of methylene in my apparatus. After ten minutes, during which four drachms were inhaled without producing complete anæsthesia, the radial pulse suddenly stopped; respiration, however, continued three minutes after the heart had ceased to beat. The patient was pale and slightly livid. The head was immediately lowered, the tongue was drawn forward, Sylvester's artificial respiration induced, with free admission of fresh air from the open window; the lower limbs were rubbed with hot flannel; ammonia was applied to the nose, and subcutaneous injections of solution of musk were resorted to, but they were of no avail. Life had fled. The remainder of the narcotic fluid, which the dispenser of the hos-

¹ Chloride of methylene is the scientific term for the preparation usually called bichloride of methylene.

pital had obtained direct from London, was handed to Professor Dr. Hofmeister for chemical analysis. I literally transcribe his report.

"The fluid, which I received in the original bottle, with the label—'Bichloride of methylene, C₂H₂Cl₂, manufactured by J. Robbins and Co., Manufacturing and Pharmaceutical Chemists, 147, Oxford Street, London'—was found, on examination, to be a mixture of chloroform and alcohol. This result is identical with the examination of a preparation supposed to be obtained from Robinson and Co., 372, Oxford Street, London,² and analysed by M. C. Traub (*Pharmaceutische Centralblatt*, 1882, p. 461). The fluid under examination resembled chloroform in colour and odour; its density, found by the pycnometric method at 17.1° Cent. (68.78° Fahr.), was 1.3495, which comes very near to the density of pure chloride of methylene.

"Its boiling-point, moreover, proved that the fluid contained either no chloride of methylene at all, or merely traces of it. The boiling-point of chloride of methylene being 41° Cent. (105.8° Fahr.),³ the preparation under examination, on the contrary, commenced distilling in the water-bath and Glinzky's boiling-tube, at 47° Cent. (116.6° Fahr.), and continued so between 49° and 53° Cent. (120.2° and 127.4° Fahr.), without leaving a residue. When shaken with water, the components separated. About one-fifth of its volume mixed readily with the water, whilst the volume of the portion insoluble in water underwent no alteration after continued shaking. The clear aqueous solution gave Liebig's iodoform-reaction; treated with chloride of benzoyl and concentrated solution of soda, it manifested, in an unmistakable manner, the smell of benzoic ether (Berthelot's alcohol test), a proof that considerable quantities of alcohol had been taken up from the preparation by the water.

"The residue, which was not dissolved in water, was dehydrated by chloride of calcium, and distilled completely, at a temperature of 59.5° to 60.5° Cent. (139.5° to 140.45° Fahr.), which corresponds to the boiling-point of chloroform (at 737 mm. pressure), which Liebig and Regnaud found at 61° Cent. (141.8° Fahr.). This distilled fluid had the density of chloroform (1.4885 at 17.1°), or 1.5252 at 0° Cent. (Watts), and gave, when treated with anilin and alcoholic solution of potash, the smell of isocyan-phenyl, characteristic of chloroform.

"Therefore there can be no doubt that the so-called chloride of methylene under examination was chloroform diluted with absolute alcohol. The proportions calculated from the density, the diminution of volume when shaken with water, and the quantity of the pure chloroform, were one volume (of alcohol) to four of chloroform. That the boiling-point of this mixture was found lower (51° Cent. = 123.8° Fahr.) than the boiling point of either compound (chloroform boils at 61° Cent. = 141.8° Fahr.; alcohol at 78° Cent. = 141.8° Fahr.), is no contradiction with the result of the examination. It is a well-known fact, that a mixture of two fluids may possess a boiling point below that of the most volatile of its components. It can be easily proved by experiment, that the boiling point of chloroform is considerably lowered by addition of absolute alcohol. No decomposition of the constituent chloroform of the preparation could be discovered. An explanation of the fatal effect from this cause must therefore be refuted."

Such is the evidence of the analytical chemist. The necropsy proved highly interesting as regards the complaint of the deceased, but gave no information as to the cause of death.

The dura mater was normal; the meninges and the substance of the brain were pale, anæmic and œdematous. There was a small quantity of mucus in the trachea, the mucous membrane of which, as well as of the larynx and the pharynx, were pale. Both lungs were free, their anterior portions pale, the posterior regions contained a moderate quantity of blood, both were œdema-

² M. C. Traub, in stating that the preparation he analysed was supplied by Robinson, 372, Oxford Street, mistakes the name of the firm; 372 being the old number of the house in which Mr. Robbins's business is carried on, prior to altering the numbers in 1881. Its present number is 147. Traub reports: "Its specific gravity was 1.326 at 15° Cent. (59° Fahr.), which corresponds to that of pure bichloride of methylene, mixed with a small percentage of alcohol to improve its keeping quality. On shaking 50 c.c. of the bichloride with 50 c.c. of water, the volume of the water increases by 7 c.c., which is abnormal. The aqueous layer was indifferent to litmus and nitrate of silver. After having been washed with water several times, and dried over chloride of calcium, it was distilled from a water-bath, and almost the entire liquid distilled over at a temperature of 60.5° Cent. (140.9° Fahr.), without varying. The specific gravity of the distillate was 1.489 at 15° Cent. (59° Fahr.), corresponding to that of bichloride of methylene containing a trace of alcohol. Traub therefore concludes that the supposed bichloride of methylene was merely chloroform reduced by alcohol to the specific gravity of bichloride of methylene.

³ According to Watts (*Dictionary of Chemistry*), the boiling-point of chloride of methylene is 40° Cent. (104° Fahr.). Mr. Robbins showed me, lately, an apparatus in action, where bichloride of methylene distilled at a temperature of 37° Fahr. (52.4° Cent.)