

growths were removed from the scrotal region, castration seemed necessary and was accomplished, and in all these tetanic symptoms were manifested. Another case in point was in the radical cure of hernia by Wood's operation; here the patient died of tetanus, and it was found on post-mortem examination that the spermatic cord was strangulated in the wire suture used in approximating the pillars of the abdominal ring and obliterating the canal.

Our treatment, though aiming principally at removal of the cause and the subsequent tranquillising of the nervous system, seems to border much on the domain of empiricism; for when one analyses the treatment one is compelled to confess ignorance as to the part which any single remedy may have exerted upon a fortunate occurrence, and to say that the cure seemed accidental. However this may be, the success in the treatment of tetanus in the Medical College Hospital during the years from 1869 to 1879 is even more favourable than books on the subject would lead us to surmise; and if any drugs are to be relied on favour is decidedly on the side of chloral, opium in the form of morphia, and opium-smoking. Unfortunately, nerve-stretching has not been attended with the same success in tetanus as in the case published by M. Paul Vogt, nor even with the partial relief reported as occurring in two cases which came under the treatment of Dr. Ebenezer Watson of Glasgow. Amputation has not afforded any satisfactory results, nor has division of nerve-trunks been attempted as a *dernier ressort*.

ON THE INCREASE OF CARBONIC ACID IN THE ATMOSPHERE.

AN ATTEMPT TO DETERMINE THE PERIOD WHEN THE AIR WILL BE IRRESPIRABLE.

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THE question of how long our coal-fields will last has been frequently discussed, and astronomers have endeavoured to determine the life of the sun, but the important question of how long the atmosphere will continue to be respirable has not, I believe, ever been considered. We are taught that plants, by absorbing the carbonic acid formed in breathing and combustion, &c., prevent the atmosphere becoming overcharged with this gas. Doubtless, in bygone ages, when the earth was almost covered with trees, and combustion was confined to the burning of wood, this was correct, but little consideration is required to show that this is now no longer true. We have every evidence that in primeval ages the atmosphere abounded in carbonic acid; this abundance of carbonic acid, together with the high temperature, caused very luxuriant vegetation, which rapidly fixed the carbon of the carbonic acid, giving out the oxygen. As ages rolled on this carbon, abstracted from the atmosphere, was gradually stored up in the bowels of the earth as coal, and thus the excess of carbonic acid in the atmosphere became decreased until the latter became capable of supporting the lower forms of animal life. With the development of the higher forms of life commenced the accumulation again of carbonic acid in the air, but until the birth of man this would have very little effect. With the birth of man a very great influence is brought to bear. Man is the only animal capable of making a fire; but even his influence, so long as he continued to burn only wood, would not be very great in poisoning the air, but when he commenced to give back to the atmosphere the millions of tons of carbonic acid slowly abstracted from the air, and stored up through countless ages, he rapidly tends to bring back the atmosphere to its original condition. It appeared to me that it would be very interesting to endeavour to make some guess as to the influence on the atmosphere of the enormous quantities of carbonic acid which are thus yearly added to it. Not only is this a question very interesting from a speculative point of view, but if the consumption of coal continues to increase as it has done during the last twenty years, it will soon become a question of practical importance.

To make the subject as clear as possible I will first consider the sources of carbonic acid, and balance against them the influences which tend to decrease the amount in the air.

The sources of carbonic acid are—(1) Animal respiration; (2) decay of wood plants, &c.; (3) manufactures, as burning of limestone, fermentation, &c.; (4) craters of volcanoes and caverns; (5) combustion. The first of these—viz, respiration, can have little permanent influence, for the animal only gives back to the atmosphere what has previously been absorbed by the plants on which the animal feeds. Decay also only gives back what has been previously abstracted. In the burning of limestone, also, we only return what the animals, from the shells of which the limestone is built up, have previously absorbed. The amount given out by volcanoes, &c., is too small to require notice. We have therefore only left to consider the carbonic acid evolved by combustion. The influences which tend to decrease the carbonic acid are—(1) Absorption by vegetation; (2) solution in water from which it is absorbed by shell animals in building up their shells, but we have balanced this in the burning of limestone, so we have only the influence of vegetation to consider. All cereals, grass as food, can have no permanent influence, as the carbonic acid is given back to the atmosphere by respiration. All animals also give back in their decay what they have previously stored up. The same applies to shrubs and trees, for more wood is being destroyed by burning and decay than is being formed by growth, so we see that vegetation, instead of storing up carbonic acid, is now actually increasing the amount in the atmosphere, and thus the whole of the carbonic acid given off by the combustion of coal and coal products, as petroleum, &c., is permanently added to the atmosphere.

In answer to a question Sir Henry Bessemer very courteously informs me that the amount of coal annually consumed throughout the world cannot be short of 400 million tons; this gives 336 million tons of carbon, which equals 1232 million tons of carbonic acid annually to the atmosphere, and thus a billion tons will be added in from 700 to 800 years, which will increase the amount of carbonic acid in the air from three billions, which it at present contains (the total weight of the atmosphere being 5210 billion tons) to four billions. But as the amount of coal annually consumed is rapidly increasing, probably in a single century a difference will be made which cannot fail to have a great influence on vegetation, and probably on the health of man; and there can be no doubt the air will be quite irrespirable long before the total known coal contained in the world is consumed. Professor Rogers estimates the amount of coal in America and Europe, in round figures, at ten billion tons; adding to this that of China and the rest of the world we get between twenty billion and thirty billion tons, which is equal to between sixty billion tons and ninety billion tons of carbonic acid. Even the lesser of these figures gives an increase of carbonic acid in the air equal to twenty times the amount it at present contains—i.e., it will increase it from '04, as at present, to '8 per cent. Dr. Angus Smith found that feebleness of the circulation was induced by breathing an atmosphere containing 0.15 per cent. when only breathed for a short time, and a much lesser quantity than this lessens the elimination of the carbonic acid from the blood, and thus produces headache, and from its retarding nutrition induces debility and other diseases. Taking these figures as correct, we see that the air will be incapable of supporting life, even when only one-sixth part of the coal known at present is consumed, and as the amount of coal is probably double this, there can be little doubt that the air will be irrespirable before one-tenth part of the available coal is consumed.

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ON A CASE OF SARCOMA; PETECHIAL ERUPTION; DEATH.

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I AM led to publish the following case in consequence of its peculiar termination, and because I am told by my friend Dr. Goodhart that one or two similar cases have been observed at Guy's, the cause of the rash being, as yet, not very clear.

Ada R—, aged twelve years and nine months, was admitted under my care April 13th of this year. She then complained of pain in her right thigh and back and was believed to be suffering from hip disease. On examination