THE FATAL ACCIDENT IN THE FLEET-LANE SEWER.

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It will be remembered that in February last four men were killed by asphyxia while working in the Fleet-lane sewer, at its point of junction with the eastern branch of the Fleet, and that the post-mortem appearances in one case were fully de-

scribed in THE LANCET of February 23rd, (p. 187.) Since then the Commissioners of Sewers of the City of London have made diligent inquiries into the cause of the accident, but have not discovered it. That it arose from the action of sulphuretted hydrogen, there can be no doubt; but the source of the mephitic gas is still a mystery. Let it have come, however, whence it may, it is manifest that its presence was confined to a very small area, and that the immediate focus of its action was along the sewer in Fleet-lane and Seacoal-lane, where the four men were killed, and where the dead bodies of seven rats were found (*vide plan*). Its effects, however, were perceived as far

The dots show the places where the dead rats were found, and the four lines where the four men were killed.

off as Paternoster-row and Newgate-street, for there also a few dead rats were discovered. But the sewers of these two localities belong to distinct systems, and it is difficult to understand how the gas could have pervaded them. The only place which seems to establish a connexion between them is the old College of Physicians (now called Tyler's-market), which stands between the prison of Newgate and Warwick-lane. It was at this point that the Messrs. Tylers, the brass-founders, discharged into the sewer on the morning of the accident, and, as it would seem, about half an hour before the men were killed, from eighty to a hundred gallons of acid liquor, the refuse of their cleansing operations during the preceding day. Therefore it was that a suspicion arose as to the probability of the catastrophe having been caused by the action of the acid from their works on the sulphurets of the sewer mud; but subsequent inquiries have failed to show that any direct communication

exists between their drains and the sewer in Fleet-lane. It is right, however, to state that the course of the drains under Newgate and the old College of Physicians is not well known.

The other probable sources of the poison have also been inquired into; and with regard to the influx of a liquor charged with sulphuretted hydrogen, there is no evidence to prove that such a liquid was let loose into the sewer on this occasion. It is true that bad smells have been frequently noticed in the houses along the whole line of the Fleet. These were most remarkable during the severe frost, and there is good reason for believing that they were caused by the presence of gas refuse. That such matters got into the sewers from the Imperial gas works at King's-cross, there is no doubt, and they were most abundant when the barges were locked up in the canal by frost, and were unable to carry away the lime liquor from the works. But there is no proof that such a discharge of the re-

fuse liquor took place on the morning in question, and therefore this source of the poison has been dismissed.

As to the third source,—the spontaneous emission of the gas from the sewer mud, or the liberation of it by disturbance in the act of moving the mud,—there is not only no proof, but no probability; for at the point where the men were at work the mud is remarkably free from noxious gases, and is thoroughly scoured by the rapid flow of the Fleet:—indeed, the fall of the sewer is so great, and the discharge of the sewage so rapid, that gases cannot accumulate in dangerous quantity in the sewer mud. As much as from eight to ten thousand gallons of sewage are sometimes flowing per minute along the Fleet sewer at the point where the men were working, and the fall of the sewer in Fleet-lane is unusually steep. Besides which, the ventilation of the sewer in that locality is uncommonly good, and the air, which has been frequently examined by me, has never contained more than the merest traces of sulphuretted hydrogen and carbonic acid. Even in the worst of the City sewers, in those which are nearly stagnant, the amount of sulphuretted hydrogen is but small—not enough to be estimated quantitatively, and the carbonic acid is less than one per cent.:—in fact, the mean composition of the air of the City sewers is 79·96 per cent. of nitrogen, 19·51 per cent. of oxygen, 0·53 per cent. of carbonic acid, and only traces of ammonia, marsh gas, and sulphuretted hydrogen. It is from this circumstance,—the comparative freedom of the sewers from sulphuretted hydrogen,—that fatal accidents in them are so rare; indeed, there is no record of any such an accident having before occurred in the City sewers. In all London, during the last sixty years, there have been but forty-eight accidents in the sewers; and of these, only five were caused by sulphuretted hydrogen: the rest were due to the presence of coal gas or marsh gas, generally the former, which, by mixing with the air, became explosive. But then, of all these accidents, only those from sulphuretted hydrogen were fatal, and these have caused the death of eighteen men. They happened thus: five men were killed in the Kenilworth sewer, at Pimlico, in October, 1849; two were killed in the Compton-street sewer, at Clerkenwell, in November, 1852; four were killed in the Green-bank sewer, at Wapping, in June, 1857; and three in the month of August of the same year, in a trench communicating with a sewer in Whitechapel. In all these cases, however, the sewers were but imperfectly ventilated, and were little else than cesspools. Under such circumstances, the proportion of sulphuretted hydrogen may reach to one or two per cent.—quantities which would be immediately fatal. Parent du Chatelet, in his account of the Paris sewers, says that Gaultier de Claubry has found as much as 2·99 per cent. of sulphuretted hydrogen; and the mean of all his examinations is 2·29 per cent. My own observations have not discovered so much as this; but still the proportion of gas is sufficiently large to destroy human life. In almost every case the effects have been instantaneous. They have been exactly like those described by Hallé, in his researches on the “Nature of the Mephitisme of Cesspools,” and which have been so well epitomized by Dr. Christison in his work “On Poisons.” Either the individual has fallen and has expired instantly, without a struggle or a sign of pain, or he has become insensible and has died within a few hours from coma, or with violent convulsions. The quantity of sulphuretted hydrogen which is capable of producing these effects is a matter of doubt. Dupuytren and Thénard found that 1 part of the gas in 1500 of air would kill small birds immediately; and that 1 in 290 of air was quickly fatal to rabbits. They also found that horses were killed by an atmosphere containing 1 part of the gas in 250 of air. Dr. Barker, in his recent experiments on this gas, has noticed that 1 part of it in 1800 of air is immediately fatal to birds; and that dogs are quickly destroyed by an atmosphere containing 1 part of the gas in 210 of air. My own experiments are to the same effect. I have found that 1 part of gas in 2000 of air will kill small birds immediately, and that 1 in 200 of air is quickly fatal to rabbits; and there is no doubt that about 1 per cent. would be destructive of human life.

Looking at all the circumstances of the present case, it would seem that the accident arose from the discharge of acid matters into the sewers. These, by acting on the sulphurets contained in the mud, developed enough sulphuretted hydrogen to produce a fatal effect. The mischief was evidently local, and the gas became diffused into the atmosphere so fast as to give no time for retreat.

The case points, on the one hand, to the danger of discharging acid liquids into the sewers; and, on the other, to the necessity for providing some means of protection for the workmen. I believe that such a means will be found in the use of the charcoal respirator invented by Dr. Stenhouse, for this has the

power of oxydizing sulphuretted hydrogen, and rendering it inert. To make them more secure, they might be constructed with an extra thickness of charcoal. The men need not always wear them, but they should have them on their persons, so that in emergencies like the present they may resort to them as safeguards; in fact, they should be instructed to use them whenever they perceive an unpleasant odour. About four years ago, after the death of the sewer-men at Wapping and Whitechapel, I was consulted by the Board of Works on this subject; and although I recommended several means for guarding the men against such disasters, I do not think they have ever been put into practice.

Finsbury-square, May, 1861.

A SECOND WINTER IN ITALY.

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SOME of my readers may recollect that in July, 1860, I gave, in this journal, an account of a winter passed, on health grounds, at Mentone, near Nice. It is my wish, in the present article, to give a sketch of my experience during a second winter's residence in Italy. The narrative of my own doubts and difficulties in the search of a good winter climate may throw a little light on this *veaxata questio*.

Although much pleased with Mentone, I was anxious, on leaving England last October, to find a still better climate, and, like most invalids, desirous to see a little of the world, and thus to combine pleasure and profit. Like most invalids also, I wavered between many places. Madeira offers a mild, agreeable, uniform climate; but, then, there is the tedious and often stormy sea voyage. Dr. Mitchell has written a most seducing report of Algiers; and at one time I had quite decided on going there. Other reports, however, are not so favourable. The winters appear to differ greatly; and I heard, from reliable friends, of two months' rain, one month of such dust that the sea was all but invisible from the land, and of one month of intense heat, during the six of winter. This account alarmed me, so my thoughts turned towards Spain. But Barcelona is a large town, with a cesspool-filled port in a tideless sea, like Marseilles and Genoa. Valentia has many miles of marshy rice grounds in its immediate vicinity. Malaga is a town of 70,000 inhabitants, and was decimated by the cholera last summer—a fact which does not say much for its sanitary state. Moreover, the hotels are inside the town, and there are no suburban villas. I may also add that, in the opinion of my friend, Dr. Edwin Lee, all the Spanish southern health cities are open to the objection that the heat becomes very great early in spring, so that invalids returning to the north of Europe often suffer from the great change, or have to prolong their stay longer than is prudent. On the other hand, Hyères, Cannes, and Nice, are only modifications of the northern Mediterranean climate which I described in my former paper, and certainly inferior to Mentone. I therefore determined to turn my steps to Italy, and to critically examine the eastern Riviera (Ri. di Levante), Pisa, Rome, Naples, and the more southern coast of Italy. Guided by previous knowledge of the country, and the information acquired during the preceding winter, I felt sanguine as to finding an “El Dorado” combining all the advantages of which I was in search.

In former days, in the days of health and strength, Italy exercised over me, as over many others, an indescribable fascination. Several times I escaped from the busy scene of professional life, and rushed to visit its cities and plains. Its classical, historical, and artistic souvenirs and attractions threw over it a charm that never palled. I then purposely threw aside the physician, in order to see nothing but ruins, battle-fields, paintings, and statues. Sickness and human decay appeared a profanation, and I strove to eliminate them from my