DISCUSSION.

MR. TREVOR JONES remarked that the paper read by Mr. Smail had evidently been prepared, not so much to provoke discussion, as to disseminate and promote the latest views entertained by sanitarians upon the sewerage question, and he (the speaker) was at one with him on every point that had hitherto shown itself. He observed that Mr. Smail had sought to show up the utter valueless character of permissive legislation, and its inadequacy to procure any sanitary improvement. While in the service of the Corporation as City Engineer, he had a large experience of the powerlessness of this form of law. For instance, it was permissible for any citizen to adopt the highest science in the ventilation of his premises; and some did so, acting on advice, but whilst their neighbours did not also adopt the same measures, the sanitary citizen found that flues set up by him discharged sewer gas in too strong doses over his own roof, partly relieving the sewer (and his neighbours', no doubt), but at his own cost, as well as to the concentration of the foul air in his own locality. If, however, the law had been such as to enable the City Council to enforce the erection of shafts against houses in sufficient numbers, then the gases discharged at any one of them would be so diluted as to cause no nuisance, and the sewer would be relieved of foul air as it was evolved. The Council, however, being powerless, and also being about to be deprived of the control of the sewers, had no strong inducement to enter on legislating for the same. Finding the uselessness of permissive laws, he wrote a paper containing the substance of all that he had then (1883) read, and thinking to

obtain the help of some public body to further the cause, he secured a reading of it before the Health Board, but with the result that it had never seen daylight since. He then re-wrote much the same paper with such additions as he could, demonstrating the futility of all systems in vogue for voiding the foul air from sewers, except the vent-flue system, now advocated by, and being carried out by his colleague, Mr. Smail, and read the same before the sanitary section of the Royal Society. The daily journals gave favourable notices of the paper, but that was the sole issue; indeed, little else could be done then, for at that time the germs of the present system were being prepared for Parliament. Among people who had not had any great experience in the treatment of sewer air, the notion of which the column at the end of Bathurst Street was an example, was very popular; indeed, up to very recent years, it was given the credit of answering every purpose. The believers in that system theorise that the gas, being lighter than air, would, by its lesser specific gravity, tend to rise, and would flow upwards along the crown of a sewer towards such a column to the summit, in the same way as water flowed along the invert by gravity toward the lower extremity. Experimenters, however, arrived on the field, and applied the touchstone of test to the theory, and they were disappointed to find that the total effect of such a shaft was restricted to a distance of 300 feet, and that parts of the sewer beyond that distance were not influenced by the shaft in the least degree. If, therefore, such columns were to be of any use in liberating the gas, it would be necessary to have one at every 300 feet of the length of the sewer; the absurdity of such a system required no proof. There were those, who still advocated the placing of gratings over the top of the sewers at frequent intervals along the middle of the street, pointing out that by having a great number, the gas that would arise would be so dilute as to be harmless. Experience had always demonstrated the failure of this system; if, indeed the principle of thorough dilution with air would be effectual, why had covered sewers been introduced? why not let the sewage run in the gutters? Feeling

his powerlessness while in the Council to insist on ventilation generally and universally, he did the next best thing possible, viz., to so design such sewers as were laid under his direction, that they could be easily convertible into ventilated sewers, by insisting upon the introduction of a ventilating disconnector trap at the building line where the sewer was under the house, or elsewhere where circumstances demanded. In conferring the large powers on the Board of Water and Sewerage Board that the Legislative Assembly and Council had done, they had established a power that would before very long render this city such as to be second to none in the world for the salubrity of its air; of course, he also referred to the suburbs about to be treated. The Board was seconding in every practical way the efforts of its officers to bring about the above consummation.

Mr. J. B. Henson said that the first part of Mr. Smail's paper was an historical sketch, from which it would be seen how the art of sanitation, like many other arts, had had its periods of progression and decadence. Happily for us, the art was at present in a progressive stage and had reached a point of efficiency which had, so far as was known, never been equalled. Mr. Smail had given most prominence to that branch of sanitary engineering which had to deal with the sewerage of cities and towns. The supply of pure water was of equal, if not of more importance, and many of the water supply works of the ancients still existed, monuments of their knowledge and skill. Water supply and sewerage works had jointly by their beneficial results transformed many of the old European cities and towns from veritable plague spots to a high degree of healthiness. The death rate in London in the last half of the seventeenth century was eighty in every thousand; now it was about twenty-four in every thousand, although much more densely populated. At Dantzic, in 1865, the death rate from enteric fever per 100,000 was 108; water supply and sewerage works were introduced, and in 1880, the record stood at eighteen. A study of the recorded results that had followed immediately upon the adoption of well-considered sanitary precautions showed sudden drops of from twenty to thirty-three

per cent. in the death rate. An idea of the original condition of some of the localities operated upon could be gathered from the following extract:—

" . . . . Sanitary progress in Great Britain is recent, and the first rude sewers were more mischievous than beneficial. The earliest Norman castles were not sewered, but were sinks of filth both within and without. One of the earliest improvements was the guardrobe turret or tower, constructed in an external wall, the floor being carried over the outer face on corbels. This floor was dished from the sides to a central opening from which excreta could fall outwards to the base of the castle wall. Some of these guardrobe towers were removed from Windsor Castle since 1840. About the beginning of this century water closets were re-invented and were introduced into better class residences, the drainage from them being to the nearest sewer, or from the house to some ditch or watercourse or to a pit, or even over the surface of the ground or into the side-channel of a public road. In London and some other towns the nuisance arising from water-closets was found to be so great that Improvement Acts were obtained, in which clauses prohibiting a use of public sewers for water-closets were inserted. The old sewers were large, rude in construction, irregular in gradient, having flat bottoms and being unventilated, so that every form of refuse passed into them remained to putrify, ferment, and exhale gases of a deadly strength; and on some occasions men on entering to cleanse them fell dead. The comfort and convenience of water-closets having been experienced, parties using them did not like to give them up; and, as they were not to use the sewers, they were ordered to construct absorbing cesspools into which the contents from the water-closets were to be emptied, and cesspools were constructed within the basements, yards, and gardens of London houses by tens of thousands, some larger houses having several. In course of time an overflow from a cesspool, cesspit, or ashpit, was permitted to connect to a sewer."†

† Extract from "Report of a Committee appointed by the President of the Local Government Board to enquire into the several modes of treating town sewage, London, 1876."

But whilst water supply and sewerage were the two chief branches of sanitary engineering, and were accredited with the production of the greatest benefit to a community, there were numerous minor, but nevertheless important, branches, such as food supply, ventilation, warming, lighting, scavenging, subsoil and surface or rain water drainage. All these demanded attention, and, receiving it, produced the best results, and led towards the attainment of the acme of sanitary achievements—pure soil, pure air, pure water and pure food. It was not usual, however, to regard the sanitary engineer as a person charged with the direction of all these various branches. An American writer had called him a "scientific scavenger," which name would no doubt be thought to be very fit by the general public. Sanitary engineering had not made the progress in America that it had in the United Kingdom, but during recent years public attention had been aroused, and there was no doubt that now the Yankee had got a firm grip of the subject he would bring it to an issue (as he generally did with his undertakings) second to none. The following quotation would show how the subject was likely to be handled, thus:—It was taken from a report of Mr. O. W. Wight, to the Common Council of Detroit, Mich.:—"The soil where man dwells is sacred, and it is sanitary sacrilege to pollute it. He who fouls the air that he breathes himself, or the water that he drinks, or the food that he eats, is a barbarian who might learn wisdom from the cat, or decency from any swine not demoralized by contact with man. He who fouls the air that another must breathe, or the food that another must eat or the water that another must drink, is a criminal, to be classed with those who maim and kill." These words were worth remembering, and applied equally well to the actions of communities. Several years ago when the land mania was raging, he, the speaker, read the prospectus of a company among the advertisements in the *Sydney Morning Herald*. The land to be operated on was situated at Marrickville, and contained some deep clay pits and a brick yard in working order. It was pointed out that there was an abundance of clay and of great depth; the excavations could be used as a tip for the rubbish of the

neighbourhood, and when levelled up, the surface could be sold for building purposes! He did not know whether the venture was a success—the company only intended to do what unfortunately too many private individuals had done, and were now doing in and around the city and suburbs, and not only individuals, but municipal authorities also on a much larger scale. The legacy for the future inhabitants of the sites was physical weakness, disease and death. The continuance of the disposal of the refuse in tips was criminal, and could not be justified in any way. In a paper he had the honor of reading before this association a few years ago, he drew special attention to the necessity for a special treatment of the main lines of natural drainage, and the adjoining low-lying ground. Nothing could well be done unless special legislation was obtained. This was still a great want, and the sooner the want was satisfied, the better it would be for the present and future generations.

Mr. E. W. Cracknell considered the subject under discussion of great importance to the general public as well as to the members of this Association, and should claim more than ordinary attention While thoroughly concurring with the author's statements, he (the speaker) wished to make the following comments on his valuable paper:—

The ruins of ancient cities showed that sanitary engineering was one of the oldest branches of our profession, and though the works of the ancient Romans existed to this day, proving that they possessed a considerable knowledge of sewer construction, sanitary matters were neglected from the fall of the Roman Empire to the middle of the 19th century, about which time municipal authorities in most large cities became impressed with the necessity of attending to these important matters; large sums of money were spent, chiefly in constructing sewers; modern engineers introduced many sanitary improvements, and though Governments had made laws to protect the public health, the sanitary branch of our profession was still in a most unsatisfactory state, for a glance at the proceedings of the Institute of Civil Engineers would show that a great difference of opinion existed

among engineers on several very important sanitary matters. When we remember that the London sewerage was dealt with by a Royal Commission in 1884, and the question supposed to be settled by the sewers being carried further down the river and provided with sludge tanks and arrangements for precipitating with lime and sulphate of iron, the effluent to be discharged below low water during ebb tide and the sludge taken to sea or used as manure; and that there appeared in a recent number of *Engineering* (April 11th, 1890) an article stating that the disposal of London sewage was again exciting public interest, and proposals are spoken of, one of which was to carry the sewage some 46 miles further, discharging into the North Sea. The present unsatisfactory state of the Thames seemed to prove the following remarks of Dr. A. Pfeiffer, of Wiesbaden, which were taken from vol. 93 of the Proceedings of the Institute of Civil Engineers, page 540. It was there stated :— "That it would not be possible to render the effluent so acid or so alkaline that no bacteria could continue to exist therein, because fish would be destroyed in the rivers, and the waters would be rendered useless for domestic and economic purposes. Before the influence of bacteria was so well known as it now is, it was thought all sufficient if the effluent from the sewage after treatment with lime, magnesia, alumina, or salts of iron, was rendered clear to the eye, whereas it is no longer a matter of doubt that this clarification is only a treacherous mask, and that, as the food-stuffs of the bacteria remain in the water it will soon again decompose and become filled with these organisms. It must then be evident that no chemical treatment can comply with the requirements of modern science."

From the above there did not seem to be much hope of a satisfactory solution being arrived at by the chemical treatment of sewage.

The results obtained from sewage farms varied in different localities, and must depend very much on the nature of the ground and the management of the farms.

Many of the difficulties in dealing with sewage had been attributed to the fact that storm waters were usually admitted,

which varied the sewage and diluted it to such an extent that it was difficult to treat in any way, especially on a sewage farm.

Without going into the merits or demerits of the separate and combined systems of water carriage, he might state that the former had been in operation in the City of Denver since 1880, and was started at Memphis before that date, but he had seen in an extract from the City Engineer's report of the City of Denver for 1887 that the time had arrived when the present outfall would have to be carried two miles further down the stream. From which we might reasonably infer that a nuisance existed at the outfall.

The foregoing remarks showed that the disposal of sewage was still a vexed question which engineers must solve before the water carriage system could be regarded as complete.

Another unsolved problem was the disposal of sewer gas which was formed, especially where soil pipes were connected with the sewers, for no matter how rapidly the sewage was carried to its destination, more or less sewer gas would be found, which, in the best regulated systems, found its way into the air a little above the house tops where it contaminated the atmosphere, and must render the upper stories unhealthy in thickly populated localities, more particularly where the height of the houses varied. These remarks also applied to Liernur's system for ventilating pipes carried up from the pans which were trapped with fœcal matter, the vacuum only acting once in twenty-four hours.

The decrease of the death rate in the City, and corresponding increase in the suburbs, was rather misleading, for this was partly due to the much-abused trams and railways, which enabled those at business in the City to live in the suburbs; and, though many might be poisoned by unhealthy surroundings while in the City, they went home to die, thus unfairly increasing the suburban death rate.

The disposal of city refuse was a subject mentioned by the author, and though he (the speaker) agreed with his remarks, he thought a few facts bearing on this important subject would not be out of place. From the Corporation returns for last year, he found that there were 103,966 loads of rubbish removed from

the City, exclusive of dead animals. If we deducted the sand and mud, we have 90,732 loads of putrescible matter, together with the following dead animals:—23,327 dead fowls, 2,762 dogs, 7,007 cats, 43,014 rats, 660 goats, 147 rabbits, 42 diseased dogs, 20 monkeys, 2 pigs, and 1 native bear.

The above, compared with returns of rubbish collected in English cities, showed that there was considerably more rubbish produced per head of population here than in England, and an examination of the refuse removed from houses here proved it to be much more offensive, as it contained considerably more animal and vegetable waste, which was probably accounted for by the hot climate and more plentiful supply of meat.

The present system of depositing this enormous mass of putrescible matter in the outskirts of the city, adjacent suburbs and public parks, must materially increase the suburban death rate, and prove injurious to the public health. Some of the localities in which this matter was deposited were Sydney Common, Moore Park, Pyrmont, Camperdown, Rushcutter's Bay, Waterloo Park, and the Centennial Park. One of the largest of these tips as they were usually termed was situated behind Mount Rennie, with one entrance in Dowling-street, and one from the Randwick-road, beyond Moore Park. This entrance had an agricultural appearance, and at first sight might lead anyone to suppose it led to a dairy farm, provided the wind was from the north-east. After passing through a wooden gate, and walking a few hundred yards, the nuisance arising from the tip became unpleasantly suggestive. The higher parts of the ground were composed of refuse in various stages of decomposition. The lower parts were shallow water holes, or swamps into which refuse was tipped. On the occasion of his visit to this spot, the noxious vapours and swarms of flies prevented him from closely examining the more modern parts of this interesting locality. Men were busy burning the more inflammable refuse, while others were collecting articles of value, but he noticed several dead animals, and having smelt more than he cared for, he made for the nearest sandhill, but before reaching it, found himself in the nightsoil department, through which he

picked his way carefully, and, reaching the summit of the next sandhill, found himself in the model suburb of Kensington. The top of the sandhill was being removed to fill the low lying parts. Streets were curbed, guttered and formed, and though the sewage was being attended to, he should not care to reside in this, otherwise pleasant locality. After his experience in reaching it, he should not think the distance more than a quarter of a mile from the worst part of the tip, and the effects of a hot westerly wind, or a sultry summer night could be better imagined than described.

During last summer, large portions of the Centennial Park were manured with refuse, which not only emitted noxious vapours, but produced swarms of insects which invaded the houses for some distance round the park. Towards the end of the summer, he saw by the newspapers that in one month there had been 46 cases of typhoid in the city and suburbs of which 23 were in Waverley and Randwick. As these suburbs adjoined the park, these facts would speak for themselves. Most sanitary authorities agreed in saying that putrescible matter should be destroyed by fire, and about 30 years ago furnaces were erected in several English towns; but on account of their faulty construction many had to be abandoned. Since then several patents had been taken out, and the results of past experience, together with careful attention to the laws of combustion, had overcome all difficulties in dealing with this matter, and all city refuse could now be burnt to ash and hard clinker, without smoke or nuisance of any kind.

The author pointed out the necessity of a Public Health Act, and as this matter had been talked of in Parliament, we might reasonably expect some legislation in this direction, in view of which he thought the members of this association should fully discuss this important subject, as we could not expect statesmen to make satisfactory laws on matters of this kind, unless we as engineers informed them what could be accomplished by modern engineering.

Mr. Haycro't considered the paper more valuable from an historical than from an engineering point of view. No doubt, as

pointed out by Mr. Smail, the Act should be extended to the suburbs. It was in existence in the City and had done a great amount of good, and would have ten times the scope of doing good in the suburbs. As regarded the licensing of plumbers by the Board, though he thought it very desirable, yet he had found it in many cases inoperative. He had known of cases in which licensed plumbers had employed their unlicensed apprentices to do the work. Perhaps the Board could see some way of compelling apprentices to pass an examination, or else make a master keep a strict eye over them. There was one point connected with the public health that was not touched on, and that was the absence of public urinals in the streets of Sydney; and, indeed, in the suburbs. It was a vital point connected with the public health, and its neglect was a disgrace to a city like this, which claimed to be in the van of civilisation.

Mr. Cruickshank stated that his knowledge of sanitary engineering was very limited, but he had listened with a great deal of pleasure to the gentlemen who had spoken on the subject. Mr. Cracknell's statistics about the dead animals reminded him of what he read a short time ago about the old Romans, who were remarkable for their cleanliness. But he had also read a remarkable expression by an eminent doctor, who stated that after the decline and fall of the Roman Empire, nobody had a bath for a thousand years.

Mr. Smail, to the various remarks, said he felt exceedingly gratified at the reception accorded to his paper. It gave him the greatest pleasure to advance our calling in every possible way he could. He did not pretend to be a philanthropist in trying to advance the good of his native city; but he might say that for very nearly twenty years he had studied this question, and with the magnificent climate, and other advantages we possessed here, he could not see why the death rate of our city should not be even less than that of the healthiest city in the world—London. We had a system of sewerage here instituted thirty years ago. For the last eight months he had been burrowing under Sydney, and it had been a perfect marvel to him that the death-rate had

been so low as it had, considering the existing state of things. He thought every engineer, whether in the metropolis or the suburbs, would agree that, unless the powers conferred upon the municipal authorities were compulsory, all their efforts for good would be rendered nugatory. Outside influence was brought to bear, and the fact of the matter was, that the engineer, who ought to be the person to deal with the matter, had his opinions ignored, on account of individual interests, and the community suffered. Mr. Henson had touched upon another important branch of sanitary engineering —viz., the water supply. He had mentioned that in his paper, and acknowledged that with a proper system of sewerage, a water supply would cause a reduction of the death-rate. Mr. Cracknell had treated us to a very statistical and amusing description of Moore Park. He had not exactly the pleasure of investigating that locality himself, but he perfectly agreed that the obnoxious manner of disposing of house refuse was likely to be dangerous to human life. Mr. Haycroft touched on certain matters regarding urinals. While agreeing with him, he (the speaker) might point out that it would be absolutely impossible to touch upon every detail in sanitary engineering in one paper; at the same time, it must be acknowledged that this matter was a disgrace to the City. In other cities these conveniences were to be found everywhere, either gratis, or for a small fee. Another matter Mr. Haycroft had referred to was the licensing of plumbers. This was one thing they did claim credit for. They had a number of licensed plumbers who did plumbing work under proper control. The fact that licensed plumbers employed their apprentices to do the work did not militate against the system; for how could an apprentice become a capable plumber unless he assisted in the work. But the man who held the license was made responsible for the work, and it was a fact not generally known that a person who employed a plumber, need not pay him until he produced a certificate from the Board inspector that the work has been properly carried out.