

DISCUSSION.

Mr. W. H. German, in opening the discussion, said the subject of sewerage was one of the most vital, especially in Sydney, where there was a great number of low-lying areas. Some time ago he had taken a great interest in sewerage matters, but it was from a municipal rather than an engineering point of view, and he remembered coming across a very wise remark to the effect that a sewerage rate was one of the best forms of life insurance, and a perusal of statistics went far to prove the wisdom of the saying. Of course, in low-lying areas the cost of sewerage must be much greater than where a gravitation scheme could obtain. In the instance of Double Bay, where the Shone system had been initiated, he gathered from the paper that the annual cost, that was taking interest on the capital outlay and the annual working charges, was something like 6d. per 1000 gallons raised, based, he believed, upon the present population, but in future, with the increase of population, the figure was expected to come down to 4d. It would be interesting to him (the speaker) if the author would give a nidea of what the rate would be if the area dealt with had to be carried out on the merits of the Shone system only. The collecting chambers were based on area of 200 square feet to each resident, and a rainfall of 2 inches in 24 hours, and from statistics this was a very fair amount to allow, but what would happen if there were an extraordinarily heavy fall? For instance, he remembered that one afternoon 6 inches of rain fell between 2 o'clock and 5. In this case he presumed the chambers would fill the pipes, and there would be an overflow. This would possibly not be a very serious matter. He had nothing further to say on the Double Bay scheme except that he had paid a visit to the air-compressing station, and was pleased with the ingenuity of the designer and the excellent care taken of the machinery, and there seemed no needless expenditure of money. With reference to the further scheme that was in progress for dealing with the other low-lying levels in and around Sydney, it would be very gratifying if it were more widely known that such a progressive scheme was in course of construction, for the pollution of the

harbor was a serious matter, and he took it that upon the completion of the scheme spoken of in the paper this pollution would practically cease, or be very largely diminished. The paper showed that three systems had been considered, viz., (1) the Shone system at Double Bay, (2) a scheme for pumping by means of hydraulic pumps, and (3) electrically-driven pumps. The latter had been chosen as the most economical. He could not say that he had followed through the figures, though he had casually glanced at them, and had wondered why if it answered to drive the pumps by electrical energy it would not have done for the Shone ejectors to be worked with compressed air as at Double Bay, ought likewise to be connected by electrical energy from the same source. As it was considered necessary to compress the air of the maximum pressure for the high lifts of sewage, he would like to know whether it would not be advisable to use reducing valves for the air going to the low-lift ejectors.

The paper had finished up with a short description of the septic system, which to him was most interesting, and he noted that this scheme was being carried out successfully at Rookwood and some places in England, and he could well understand that such a system would be eminently suitable where the matter could be easily collected and dealt with, but he doubted its applicability to closely-populated districts. Some years ago, when he was associated with a proposal for sewerage in Manly, he was a very ardent advocate of the gravitation scheme, which had since been carried out, but only a few days ago, a very prominent opponent of the scheme at that time, having heard of the success of the septic system, had twitted him with being in a hurry then. He did not take the rebuke very seriously, however, but it was quite possible he might have to go back on it. He could not let the opportunity pass without expressing his keen appreciation of the paper. It had covered an immense amount of ground, and contained ample matter for discussion. He had not thought fit to offer any criticism, because he must admit he really knew little of the subject. He might mention that one object he had in going out to Double Bay was to see the spur gearing at-

tached to the motors, and it struck him as a most happy solution of the question of either multiplying or reducing the speed, and he intended adopting it in some shafting in his company's works.

Mr. Kenway (a visitor) regretted that owing to the length of the paper the septic tanks had received so little of the author's attention. He would like to say that if the septic system was further developed it simplified the system by reducing a great number of their necessities. In dealing with matters like half-digested grass, etc., which are found in the paunches of animals, and which create noxious liquors, if this system could be adopted it would be of the utmost importance. At present trades of this kind were limited to certain areas. He would like to ask, by the experience already gained, whether there was any standard of saturation of organic matter which limited the operation of the septic action, and whether the presence of sulphur used for cleansing or other chemical killed the bacteria necessary for the septic system, and also whether the temperature of the water affected the action. Another way of putting his question was whether the entrance of certain organic matters which were already partially decomposed would upset the whole system by creating a nuisance?

Mr. Gummow said there was one question, that of the covered or uncovered septic treatment, and whether with uncovered tanks it would not be a nuisance during the period that the sewage was being sterilised. He believed the Double Bay system only gave about 35 per cent. efficiency, and that seemed to be very low.

Mr. Fitzmaurice said the paper was a very exhaustive one. With reference to the cost, did the Railway Commissioners charge for the current generated at the Rushcutter's Bay station, or the amount delivered at the pumping, 1d. per unit being a very low rate indeed, and in addition the cost of maintenance of the accumulators must be taken into consideration. The paper stated that when the station shut down the accumulators took charge of the work, and when the pumps were not working the current was put in the accumulators for reserve. That was, the engine worked 15 hours, and

the accumulators 9 hours. He would like to know what amount of current was put into the cells, and what was taken out of them. It was possible, in charging with the current to waste energy at a very great rate by overcharging. He had noticed that in the system of indicating high and low water levels the instrument used was a very sensitive one, and yet not too delicate. The system of mains employed was paper insulated, lead-covered cables. He presumed the conduits were properly ventilated and drained. In his department, where the conduits had not been drained or ventilated, and where lead-covered cables were used the electrolytic action on the lead was very severe, and he did not know what caused this action. The pipes were of the ordinary earthenware and stone-glazed pattern. It might be due to the jointing of the pipes, but in one particular case it was not, and the lead covering was pitted throughout the length. With regard to the automatic gear at the station he was struck with its correct working, but he did not favour automatic appliances as a rule. They were all very well until something went wrong, and it happened that while he was at the station something did go wrong; it was only a trivial matter connected with the opening of a cock, and it was soon set right. The paper stated that the cost was estimated at $\frac{3}{4}$ d. per kilowatt hour. Was it proposed to get the current at that price? The speaker would like to have the cost per kilowatt hour including attendance.

Mr. R. S. Simmonds referred to the action of the lead-covered mains spoken of, and said that it had been said that it was probably due to the sodium in the conduits, but sodium could not be present in the conduits. The method of manufacture precluded this, as the kilns were heated to a very high temperature—sufficiently high to cause vitrefaction of the ware; while the fires were at their highest common salt was thrown on them, and the high temperature of the fires decomposed the salt into its elements sodium and chlorine; the sodium then combined with the silicate of alumina in the clay, and formed a most stable compound, whilst the chlorine escaped through the chimney stack in the form of hydrochloric acid gas. It was ap-

parent then that there could not be free sodium, for if there were the burning kiln giving off carbon di-oxide would instantly form the sodium into carbonite. He was inclined to think that the action was a local one. The zinc in a Daniels cell was found pitted in the same manner as the piece of cable that the author had shown to the speaker. It was recognised that lead was one of the most difficult metals to get pure, and the current travelling along the cable would induce local action between the lead and its impurities.

Mr. McKenzie said he had not sufficient knowledge of the works to appreciate the paper. He had visited one or two of the stations—one at Rushcutter's Bay and another at Marrickville. He had been very much interested in the Rushcutter's Bay system, as it was the first opportunity he had had of becoming acquainted with the Shone system of dealing with sewage. With regard to the loss of efficiency, whilst he was not prepared to go into it in the most exact manner, he must nevertheless see that it had the advantage of enabling the sewage to be dealt with and pumped up to a higher level without creating a nuisance. Some reference had been made to the automatic gear, but as he understood there was to be a central station which would control these out stations, any difficulty or accident to the automatic appliances would be taken up at the central station. He had visited the septic tanks, and had observed their working, and also the outfall works at North Sydney, and had compared that system with the septic tanks, and there was no doubt in his mind that the septic tank was far in advance of the old system of precipitation and filtration as adopted at North Sydney. The septic was the most perfect because it was the natural method of dealing with sewage. It had apparently acted in England with as much success with the open as with the closed tanks, although with the climate of Australia he believed a considerable amount of effluvia would be given off by the open tank.

Mr. Cutler in his reply said that in order to obtain the highest efficiency it must be remembered that in the case of pumping sewage, the pumps must be capable of dealing with the discharge at all hours of the day and

night, and must also have a large reserve to meet unduly heavy flows. As far as every engineer knew, it was advisable to keep the size of pumping appliances as near as possible to the actual work required of them. Several questions had been asked, and he would do his best to reply to them. Mr. German had suggested the use of reducing valves in the air mains at those ejector stations where the height of the lift was much lower than the maximum lift on the system. There was no doubt that the use of reducing valves would be a material help, but it did not get over the fact that the air had to be compressed up to the maximum required at the compressing station. In fact, air pressure could not be adapted to the varying requirements of the different lifts nearly as economically as electric motors. As to why the system in vogue at Double Bay had not been extended so as to deal with the whole of the low-level areas, he would point out that Double Bay was peculiarly situated. The surface of the ground, which was almost wholly sand, was only a few feet above sea level, and it came much cheaper to have several collecting chambers at only a few feet below the surface than to incur the cost of a system of sewers sufficiently deep to drain the whole area to one spot. As it was, considerable difficulty had been met with from inflowing water even at the comparatively shallow depth at which the excavations had been carried out. The probable rate on the Double Bay system would have been 2s. 3d. if a special rate had been struck for this valley, but that he (the author) did not think that it would be fair to separate each small area of one general sewerage scheme and strike special rates on each area to cover the cost of the scheme in each locality. Mr. German also wished to know what would happen if the rainfall was so excessive that the ejectors could not cope with the discharge of the sewers. He (the author) pointed out that in all cases overflows were provided into the harbors so that no damage could occur to the general system or to the houses connected thereto. As to Mr. German's friend who had twitted him about not waiting for the septic system, he could tell Mr. German that no system, septic or otherwise, was in his opinion equal to a good natural

outfall into the sea, when conditions were such as to permit of it.

With regard to the point raised by Mr. Kenway, as to whether the refuse from abattoirs and meat works could be dealt with by the septic system, he was of the opinion that if the capacity of the septic tanks was increased in proportion to the amount of matter held in solution, that the septic system would be found to work satisfactorily. As a matter of fact, quantities of paper banana skins, dead cats, and other things came down in the sewage; they all went into the septic tank, but they never came out.

Mr. Fitzmaurice wished to know the cost per kilowatt hour, including attendance. He (the author) estimated that the cost per horse-power hour, including attendance, interest on capital, cost, repairs, and renewals, would amount to $2\frac{1}{2}d.$ The cost of the current was $1d.$ per B.T.U. at the Ultimo generating station, and $1\frac{1}{2}d.$ per B.T.U. at the Rushcutter's Bay station. As to the deterioration of the lead covering on the cables, it would probably be found to be due to local action caused by a leakage of the current. So far as the accumulators at Double Bay were concerned, up to the present they had not had a twelve-hour continuous run, and therefore no tests had been made as to what efficiency the batteries would show under such conditions.

Referring to the question of open or closed septic tanks, undoubtedly with the open tank the contents might look and smell unpleasant, but such slight smell as there was, was only in the neighborhood of the tanks, and was of such a nature that it was unnoticed by any person accustomed to work on sewerage works, and if any other persons found their way there, and then complained about the smell, well, all he had to say was that sewerage works were not intended to be the resort of the general public. Mr. Davis, the Engineer-in-Chief for Sewerage Construction, who had just returned from a trip to England, where he had paid special attention to this matter, had told him (the speaker) that some of the open septic tanks, after they had been working some little time, simply looked like large tanks filled with earth, and gave so little

indication of what they were that a person who did not know might unwittingly attempt to walk across them instead of round.

In reply to Mr. Gummow, the author stated that he believed the efficiency obtained at Double Bay was as high, if not higher, than that obtained from any similar installation. At some trials carried out by Professor Unwin, the efficiency was stated as being 37 per cent., but it must be remembered that the efficiency in all cases would vary, as with a low lift the efficiency would be lower, and with a higher lift higher.

The estimated efficiency of the whole system now under construction is 47.6 per cent., and the author did not think so high an efficiency could be obtained under any other method.

