NITROGEN FROM SEWAGE.*

By Dr. S. Rideal, F.I.C., F.C.S.

Copeland, at Milwaukee, has recently discussed the question, "Is the Recovery of Nitrogen in Sewage Sludge Practicable?" and shows the nitrogen changes of Milwaukee city sewage by Imhoff and activated treatment as follows:—

		Parts per 1,000,000.		
		Sewage.	Imhoff effluent.	Activated effluent.
August	N as NH_3	14.6	16.2	3.8
September		13.5	15.4	5.7
		14.0	15.8	4.7
August	N as N_2O_5	.13	.13	6.0
September		.14	.09	5.01
		.135	.11	5.5
August	N as Organic	29	27	6
September		29	27	9
		29	27	7.5

At Milwaukee 0.25 cub. ft. of air per minute per square foot of tank surface, with a period of four hours' aeration with a sludge content of 25 per cent., is being adopted.

We see that (these are parts per 1,000,000, but, as American sewage is ten times weaker than English, the foregoing figures are comparable with ours at part per 100,000) the Imhoff effluent is very similar to the raw sewage, but that the activated effluent has more than half its ammonia oxidized, while only 25 per cent. of the organic nitrogen is retained. The sludge is richer in organic nitrogen by this latter amount, but some of the ammonia—about 5 parts—must be removed by the air.

If air be passed through the sewage or the Imhoff effluent without nitrification taking place, 10 parts per 1,000,000 of ammoniacal nitrogen should be present in it. Experiments are required to ascertain the conditions which have prevented the removal by the air of the residual 4.7 parts of ammonia in the activated sludge working.

Its subsequent recovery as sulphate of ammonia should present no difficulty, as the absorption of gaseous ammonia from the exhaust air by sulphuric acid is common practice in gasworks.

Mr. Copeland points out that the organic nitrogen of the original sewage passes away in the effluent from the Imhoff tank, but is retained by the activated treatment in its sludge.

This sludge is, therefore, the richest in nitrogen, and has the greatest manurial value. From the point of view we are now discussing, there is little possibility by any of the known processes of converting the organic nitrogen of sewage directly into ammonia or nitric acid in a form available for explosive manufactures, except destructive distillation.

Dried activated sludge (with 10 per cent. moisture) contains, according to Copeland, 5 to 9 per cent. of nitrogen, and such a sludge if retorted should give higher yields of ammoniacal liquor than are obtained in gasworks from ordinary coal.

Nitrates from Effluents.—My last suggestion deals with the recovery of nitrates from effluents.

The American weak sewage gave us 5 parts per 1,000,000 of nitric nitrogen in the activated effluent. In England our best bacterial beds give us up to 10 parts per 100,000.

In 1898 I made my first analyses of a camp effluent, that from the Caterham Barracks, where we then had a raw sewage with 17.2 parts of total nitrogen, and after a very efficient filter (put in by one of your past-presidents, Mr. Moncrieff) I found over 50 per cent., viz., 9.0 parts of nitric nitrogen in the effluent. There were still 5.0 parts of unoxidized ammonia, and this could easily be oxidized, making 14.0 parts of nitric nitrogen, or 14 lbs. per 10,000 gallons, equivalent to 85 lbs. of nitrate of soda per 10,000 gallons.

The natural concentration of sodium nitrate solutions in Chili might give us suggestions for the evaporation of this large volume of water. A filter-bed with no effluent drain protected from rainfall, if irrigated with such an effluent, would gradually concentrate the nitrate, and this season at each works we could ascertain the rate of evaporation under our climatic conditions.

If in a cucumber frame, 6 ft. by 4½ ft., 3 gallons could be evaporated per day, the earth at the end of a year would contain 9.3 lbs. of nitrate of soda. Drying sheds can also be heated by waste steam from the destructors, and a few degrees is often sufficient to raise the temperature above the wet bulb and thus ensure constant evaporation, even on days when the air is saturated.

America, although not fighting, has grappled with the problem this year, and is determined to create her own nitrate supply. I understand the Government have granted $20,000,000 towards founding the new industry.

*Abstract of paper read before the Association of Managers of Sewage Disposal Works.

T. R. DEACON ADDRESSES MANITOBA BRANCH OF CANADIAN SOCIETY OF CIVIL ENGINEERS

"A View of Necessary Action for After-the-War Conditions," was the subject of an address by T. R. Deacon, C.E., ex-mayor of Winnipeg and manager of the Manitoba Bridge & Iron Works, delivered before the regular February meeting of the Manitoba Branch of the Canadian Society of Civil Engineers.

Mr. Deacon pointed out the necessity for action to meet the conditions in Canada arising from the war. He believed that in the solving of a great number of problems, and in carrying out the industrial work after the war, the engineers would have a very considerable part. That there would be a large demand for engineers would be due to the work which of necessity must be carried forward to utilize the energy represented by the 400,000 men now in the army and 80,000 to 100,000 men engaged in munitions and kindred work.

In brief, said Mr. Deacon, the problems Canada must face at the close of the war are:—

1. Payment on a national debt which will probably amount to $5,000,000,000.
2. An annual pension fund.
3. The utilization of some 80,000 to 100,000 men at present engaged on munitions and kindred employment, who will be immediately thrown out of work on the cessation of hostilities.
4. The return of some 400,000 men from the front, comprising some of the best blood and energy of the country.