In any experimental work connected with settling tanks it is well to bear in mind the fact that the temperature of the liquid plays a considerable part, especially as regards the finer particles. For example, with a temperature of 74 deg. Fahr. it has been found that a fine particle will settle twice as fast as with a temperature of 32 deg. Fahr. Another point of importance is that with most sewages the lighter and more putrescible suspended solids are apt to be carried some distance down the ordinary rectangular tank before settling—*i.e.*, to a position where means for frequently drawing off these fine solids is rarely present.

Closely connected with tankage of sewage is the use of precipitants. One of the results of the war has been to restrict the use of certain precipitants involving the use of sulphuric acid, such as abumino-ferric—made by treating bauxite with sulphuric acid. In place of this precipitant, and also in lieu of sulphuric acid, what is known as "nitre-cake" (acid sulphate of sodium) has been somewhat largely used, this by-product resulting from the manufacture of nitric acid. Unfortunately, nitre-cake is a heavy and bulky precipitant, and its application to sewage liquors by no means so easy as alumino-ferric, although for certain purposes, where large quantities are not required, it can be obtained in powder form.

The day of precipitants is by no means over; they will probably be employed more frequently in the future, especially in cases where the effective removal of the finer putrescible solids is called for, and also where trade wastes are to be considered, either separately or in conjunction with sewage.

There is little doubt that, given efficient organization, sewage sludge could have been used for agricultural purposes far more freely than hitherto, even admitting that the percentage of actual manurial constituents in it is generally low judged by chemical analysis, and that it usually contains more or less grease, which makes it difficult to manipulate. It is quite possible that in the near future there may be a considerably increased demand for sewage sludge by farmers, and as the price of nitrogen increases, sewage sludge will probably become more valuable. In the case of a large sewage farm which I visited somewhat recently large quantities of air-dried sludge have been disposed of to farmers for years past at 3s. per load.

It is very usual to arrive at the value of sewage sludge by comparing it with sulphate of ammonia as a standard. The nitrogen in sulphate of ammonia, however, is in a readily available form, and its effects are practically limited to the year of application. The nitrogen in ordinary sludge sewage, on the other hand, is not as a rule readily yielded up to plant life, and in assessing the value of a manure, ease of decomposition is the chief point to be considered. There is nitrogen, for example, in leather, but it is only rendered available very slowly under natural conditions. The stimulating effects of an artificial manure are admittedly evanescent, and it possesses no "staple," whereas with sewage sludge the manurial effect is spread over a considerable period, while its cheapness renders possible the application of heavy dressings in order to compensate for comparatively low fertilizing value. I would direct the attention of all interested in sewage sludge to an order issued last October by the Ministry of Munitions concerning compound fertilizers and regulating the sale of these on a new basis. This should have the effect of stimulating the use of ordinary air-dried sewage sludge in compound manures, the unit rate for nitrogen in sewage sludge being 7s. 6d., as against 17s. 6d. in the case of nitrogen derived from sulphate of ammonia, nitrate of soda, etc. The word "unit" is defined to mean 1 per cent. by weight in one ton of compound fertilizer. It follows that a sewage sludge containing one unit of nitrogen would have a value of 7s. 6d., and in most cases it would be easy to air-dry sludge down to a point where the contained nitrogen reached 2 per cent.

With regard to the use of wet sludge, I may refer to the plan adopted at the Wolverhampton sewage farm by William Clifford, A.M.Inst.C.E., the engineer and manager. The method has now been in use for some four years, during the months of September to April. Briefly, the wet precipitation sludge is forced by compressed air through 4-in. diameter light iron pipes, provided with flexible joints, and irrigated upon farm lands in the neighborhood of the works. The farmer provides the horses and ridge plough, and the sewage works staff the labor. A nominal charge of 10s. per acre is made, but instead of payment in money an equivalent in horse hire is taken. On grass land the liquid sludge is brushed over the surface with bass brooms. From May to August the sludge is irrigated over some 6 to 7 acres of land adjoining the works. After each dressing a cultivator is passed over the land, and deodorization is found to be satisfactory. A good dressing serves for a root crop and a straw crop, or, alternatively, two grass crops. Given sufficient storage, it is considered that it would be practicable to dispose of the whole year's make of sludge in eight months.

LETTER TO THE EDITOR

Garbage and Refuse Disposal

Sir,—We read with much interest the article by Dr. Rudolph Hering in *The Canadian Engineer* of March 14th, and only wish the same article would be reprinted in all the engineering magazines throughout the whole of this continent. The writer has been interested in the question of incineration for many years, in Europe and America, and has developed a plant with many of the features about which Dr. Hering writes.

If only it were possible to get all municipalities to study every word in that article, much of the money now spent on experimenting would be used in erecting plants which would destroy their refuse and garbage, and give them a clean town or city.

Then the question of cost arises. We find that some of our competitors are erecting plants where the cost for burning is as high as $1.50 per ton of garbage burned, while we have plants that are doing it for as low as 28 cents. This, of course, is low, but it can be done, particularly if there be sufficient garbage and refuse to keep the plant in continual operation. This is, however, impossible in any of the towns or cities where we have built incinerator plants.

We have just completed a five-cell plant at Windsor, Ont. This plant is burning all the city's garbage, etc., without the use of any fuel, but, just as Dr. Hering says, the fireman needs to be intelligent, for they will use up any amount of fuel if one allows them to have it. We put in an oil burner to each cell, for use only when starting the fires or when the garbage is exceptionally wet, but most of the firemen seem to delight in seeing the oil burned, and it takes a little time to teach them that they do not need it. We have succeeded in making our plants destroy all ordinary garbage and refuse without using any fuel except that found in the garbage itself.

J. G. PICKARD,
Canadian Incinerator Co., Limited.

Windsor, Ont., March 16th, 1918.