is absorbed. When such sludge is applied to a bed, only the coarser particles remain on the surface. Owing to its fluidity, much of the finer material penetrates into the interstices in the medium, some of it indeed passing all the way through. The surface layer becomes more and more dense through the accumulation of particles of sludge which penetrate it successively with new applications until finally it becomes impervious.

"The rotting process, however, produces a radical change. The colloids are broken down. The sponge-like structure with amorphous cell walls referred to, disintegrates and loses in the act, its capacity for holding water. In the second place organic matter, such as fragments of animals and plants which are very common in household waste, is destroyed. These substances which have naturally a very large water content, are found in very small quantities if at all in decomposed sludge, so that the difference in the water content between fresh sludge and decomposed sludge must to some extent be regarded as a measure of the completeness of the decomposition.

"The most important element making for the separation of water from decomposed sludge is the contained gas. The gas in decomposed sludge under thirty feet of water sustains a pressure substantially twice that which acts upon it when it comes to the surface. Immediately on release of the water pressure, the confined gas swells and the sludge becomes frothy and foamy. The water being heavier, sinks to the bottom, passes down through the medium and drains away. This phenomenon may be illustrated in a very simple manner. If a glass beaker of decomposed sludge freshly drawn from an Emscher tank be permitted to stand for a few hours, it will be observed that the light and gas-containing portion will rise to the surface, incidentally increasing the depth. Meanwhile, the clarified water will have settled to the bottom. An examination of the floating matter shows the presence of many gas sacks or cells. In the course of time, a portion of the sludge, having lost its gas content, will sink to the bottom, thus indicating that this sludge, without the increased buoyancy given it by entrapped gases, is heavier than water. If, on the other hand, fresh sludge be placed in another beaker, its solid contents will settle to the bottom, and if it be examined later, it will be found that the separated water is at the top instead of at the bottom. In this lies a most important difference.

"Accompanying the destruction of the colloidal and organic matter, is a partial decomposition of the fats. In European sludges the fat content will average ordinarily 15% of the dried constituents."

The difference between good and bad sludge is defined; the effects of metallic salts upon sludge and of acid-forming ingredients are observed.

The paper goes on to enumerate the recommendations of Prof. Hyde and Mr. F. E. Daniels as essentials to be observed in the operation of a sewage treatment plant:—

1. If the velocity in the feeding channels be not sufficiently high to be self-cleansing, the deposits should be swabbed out semi-weekly in summer and less frequently in the colder season. If they become septic they are a source of disagreeable odors. Such deposits in feeding channels in which the flow is periodically reversed, are more likely to be found at the inlet end because of the diminished velocity there.

2. With equal frequency, too, should the sides and sloping floors of the sedimentation chamber be cleared of adhering matter. On floors of flat slope and rough finish the accumulation is most rapid; on others it is less so None are entirely immune. Instances have occurred in which the slots leading to the sludge digestion chamber have been completely choked by this matter. Ebullition of gas from the upper chamber is evidence that it has begun to septicize. A long-handled squeegee should be employed to clean the surfaces and to push with the least disturbance possible, the accumulations into the chamber below.

3. The tendency on the part of scum to collect in gas vents is well known. Since this scum must have been previously heavier than water, its later buoyancy is due in the main to the entrapped gases of decomposition. It will be seen that an existing scum tends generally to become thicker since particles that float up adhere to the mass of accumulations already floating and remain. Other wise on losing their gas content, they would sink again. Scum formation tends to be greatest where evolution of gas is greatest. This state occurs usually in the comparatively early history of the life of plants when a mass

Sedimentation Tanks in Canada

Hydrostatic Head on Sludge Outlet	Sludge-Drying Area	SUPPLEMENTARY PLANT	Separate or Combined System	Capacity of Plant, Gallons per day	Cost of Plant exclusive of Sewers	DESIGNER	REMARKS
5 ft.	1,200 sq. ft.	Chlorination plant, sludge beds	Separate	1,080,000 (Imp.)	$8,800	T. Aird Murray and T. Lowes, Toronto	Sewage is chlorinated before entering tanks
6 ft.	4,680 sq. ft.	Grit chambers, sludge beds	Combined	1,500,000 (Imp.)	$35,000	Eng. Dept. City of Edmonton, A. J. Latornell, Chief	Filters to be added. Reversible flow
6 ft.	10,900 sq. ft.	Screens, grit chamber sludge pump, sludge beds, percolating filter (future).	Combined	5,880,000 (Imp.)	$70,000	A. F. Macallum and B. E. T. Ellis, Hamilton	Flow is reversible
12 ft.	625 sq. ft.	Grit chamber, pumping station, force main, sprinkling filters, sterilizer, secondary settling plant, sludge beds	Separate	270,000 (Imp.)	$15,000	A. K. Mitchell, Victoria	Vent is provided over central stack. Cost given is exclusive of pumping station
7 ft.	60,000 sq. ft.	Pumping plant, sprinkling filters, final settling plant, sludge beds	Separate	6,000,000 (Imp.) maximum	....	R. H. Parsons, Peterboro	Sterilizing plant may be added
7⅔ ft.	....	Screens, grit chamber, sprinkling filters, sludge beds	Both	1,350,000 (Imp.)	$15,500	A. B. Manson, Stratford	....
6 ft.	1,050 sq. ft.	Percolating filters, secondary settling tanks, with sub-irrigation sludge beds	Separate	540,000 (Imp.)	$19,000	Murray & Lowes, Toronto	....