Lethbridge Sewage Disposal Works

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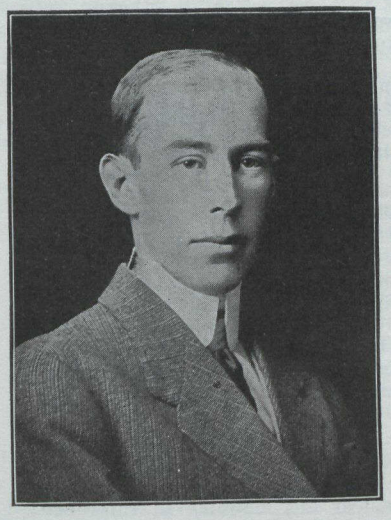

The city of Lethbridge is situated on a level plateau about 250 feet above the Belly River. Lethbridge is the principle centre of population in southern Alberta and has had a steady growth since the time of the installation of its first waterworks system in 1904. At the present time the population is about 12,000. With the extension of sanitary sewers the volume of sewage is rapidly increasing. The water pumped averages 1,300,000 gallons per day, and the waste returned to the disposal works is in the vicinity of 1,000,000 gallons per day. The city has a separate sewerage system, and three converging outlets bring all the sewage to the site of the works by gravity

The plant located on flat ground near the river edge, is ideally situated, being more than 200 feet below the settled portion of the city. The general design of the works was prepared by the consulting engineer, Mr. T. Aird Murray, who was engaged by the city for that purpose; and after the plans had been completed,, they were carried out by the author, and City Engineer. After the general design was made, a number of improvements were suggested by the author and in addition certain other changes were made, having in view saving in first cost All alterations were referred for approval to the consulting engineer.

The principle part of the construction was carried out under contract, this including all concrete work, the building of the chlorinating house, and the setting of all pipes and machinery. The filter machinery itself was furnished by Adams Hydraulics, Limited, of York, England. A contract was also executed between the city and the principle contractor to fill two of the circular filters with filter medium, some of which had already been placed near the site during the slack time of the previous winter. The city filled the third filter with screened gravel after the contractors were away from the ground.

In the design of the sedimentation tanks there was sufficient novelty to evoke considerable discussion at the meeting of the Dominion Health Commission in Montreal in 1911, and as a consequence some details of the design were altered, but the general type remained the same The particular type of tank installed has been known as the "Lethbridge" tank. There is nothing unusual in the design of other parts of the plant, which is intended to treat the sewage of the city by preliminary screening, sedimentation, sprinkling filters and a further passage through small sedimentation tanks. The liquid thus purified is passed through a narrow baffle-race where chlorine solution may be applied.

Detritus Tanks.

The detritus tanks which contain the screens are in duplicate and have hopper bottoms, each equipped with a sludge valve. The screens do not reach to the bottom of the chambers. They are of ½-inch openings. After passing through the screens, the liquid passes over a weir into a collecting channel, and is then distributed through two 18-inch pipes controlled by penstocks into the distributing channels of each sedimentation tank. The sludge or detritus in the compartment of the ditritus chambers is intended to be disposed of through sludge pipes discharged by gravity into one of the sludge beds. Each detritus tank in volume contains 675 cubic feet. The liquid surface area is 120 square feet and the area of the screen, including openings, is 52 square feet.

Filters.

The filters are three in number with concrete floors and have their surfaces exposed to the weather. They are placed in ust a position so that the circular walls surrounding them do not meet at the point of contact of each filter. The walls are of concrete, and the filters are built on the natural soil, except at one place, where it was found that the ground was not sufficiently high to carry the floor. At this point the outside walls were carried down to the proper foundation, and the space between the ground level, and the under side of the concrete floor was filled with gravel, the maximum fill being in the vicinity of two feet.

These tanks, for the purpose of obtaining further settling of the partially purified liquid after passing through the filters, are constructed in duplicate, and are built adjacent to the filters, and at a depth sufficient to provide a good fall from the central collecting channel of each filter to the distributing channels of the tanks. They have each a capacity of 4,120 cubic feet.

Sludge Beds.

The sludge beds are in duplicate and are simply rectangular excavations in the soil. It was not found necessary when the plant was constructed to do anything towards putting in a gravel or broken stone bottom to these beds, as there are strata of gravel in the excavation which carried away moisture from the deposited sludge in a most effectual manner. This was taken advantage of in the construction of the sludge beds. A narrow roadway at the end of each bed gives access for carts for removing the dried humus. Each bed has a surface of 480 feet.

Operation and Maintenance.

Operation of the plant was commenced in the month of October, 1912, and the apparatus was given a fair trial before heavy frosts set in. Some difficulty was encountered in obtaining a proper seal in the drums of the rotating filters, and it required a considerable length of time to find out the exact cause of the defect. After careful examination it was found that the upper portion of the drum had developed a very small leak which allowed the air gradually to escape, with an ultimate loss of the seal. This was easily repaired and continuous running of the filter units was then possible.

After the plant had been operating for a month of two, severe frosts were experienced, which caused considerable ice to form on the top of the exposed filter beds, and on one occasion, after a snow fall of some six or eight inches, one of the filters was started up with the expectation that the warm sewage would melt the snow. Unfortunately, however the weather suddenly became colder, and instead of the snow disappearing, it was changed into ice, and it was found impossible to get rid of this accumulation until it was removed entirely from the filters. This was the only time that there was any trouble with the revolving arms on account of the accumulations, and it should never recur, as the operator has had the benefit of past experience.

The filters are all thrown into use by the opening of penstocks by hand, which would appear to be a better arrangement than automatic control, for the reason that the winter conditions are sufficiently severe to cause freezing in the drums of filters which might be thrown out of commission for any length of time unless these were drained. Every time a filter is shut down, therefore, the operator proceeds to drain out the drum forming the air seal.

The difference in level between the surface of the liquid in the sedimentation tanks and the top of the riser at the centre of each filter gave considerable trouble when a large volume of sewage was delivered to the plant. There was a noticeable surge in the distributing chamber at the entrance to the filters, and frequently the top of the riser would overflow, thus discharging unfiltered sewage into the humus tanks. It was deemed advisable to make an overflow from the distributing chamber, and this was accomplished by cutting through one of the walls of the chamber and inserting a 12-inch pipe delivering into a trough laid on the top of the filter medium between filters Nos. 1 and 2 at a place not reached by the distributing arms. This arrangement seems to give satisfaction, and one or twice each day there is a surge which is efficiently taken care of in this way.

The design provides for a capacity of two million imperial gallons daily for a population of 20,000 inhabitants using a maximum of 100 gallons per day.

The total cost of engineering and construction amounted to $84,000, or $4.20 for each unit of population with the plant operating to capacity.

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