

and Sheffield Sewage Disposal Works, where the activation by aëration and activation by agitation processes respectively are under investigation, it would appear that the residual sludge from such processes contains a higher percentage of nitrogen, and consequently as a fertilizer would be of greater value than sludge produced in the ordinary way. Experiments have been commenced to ascertain its fertilizing value, but further investigation is necessary to find out the best method of dewatering and drying.

"We are strongly of opinion that the time has arrived when a government committee should be appointed to follow the recent developments in the treatment of sewage and the recovery and utilization of by-products, with a view to collecting information for the guidance of local authorities and for the benefit of agriculturists."

This document from which the writer has taken extracts shows that the committee were under no illusion about the

difficulties which must be overcome if substantial progress is to be made. Underlying the report there is a conviction that it is a matter of great importance that both fertilizers and fat should be recovered, that manure for which arable and pasture lands are yearning should not be thrown away. There is no suggestion that local authorities should spend a shilling to recover elevenpence, but it is implied that some local authorities have unwittingly allowed valuable substances to go to waste by failing to erect suitable plant for their recovery.

The need for creating this attitude of mind has been reinforced by the war. It has been proved that the efficient cultivation of the soil, which is impossible without manure, is quite as essential for the Defence of the Realm as the building of ships, and so, too, it may prove that the conservation of nitrogenous matter which now goes to waste is a national necessity.

COST OF CONSTRUCTING SEWERS AND WATER MAINS IN MONTREAL SOUTH, QUE.

DURING 1918, about 22,230 ft. of 6-in., 8-in. and 10-in. water main, and 25,300 ft. of 24-in., 12-in. and 9-in. sewer were constructed for the town of Montreal South, Que. The work was done by contract, and the following figures are the actual cost to the contractor. The contractor, by the way, made no profit.

The sewer work covered the construction of mains in 17 streets. The material in which the trenching was done consisted of hard pan at the surface, a layer of shale, a bed of trap rock 3 to 5 ft. thick at 5 to 8 ft. from the surface, and shale below the trap rock. The rock excavation was paid for at the rate of \$4 per cubic yard over the other material. The rates of pay for labor were as follows:—

	Per hour, cents.
Common labor	35
Pipe layers	37½
Drillers	40
Blacksmith	40
Foreman	45
Single horse and driver	40
Double team	70

The units costs on four jobs were as follows:—

	Job No. 1. 24-in. sewer, per lin. ft. of sewer.	Job No. 2. 12-in. sewer, per lin. ft. of sewer.	Job No. 3. 12-in. sewer, per lin. ft. of sewer.	Job No. 4. 9-in. sewer, per lin. ft. of sewer.
Materials:—				
Pipe	\$1.800	\$0.590*	\$0.580*	\$0.370*
Cement and oakum for joints .....	.160	.052	.052	.040
Manholes† .....	.270	.290	.246	.218
Coal and oil .....	.015	.012	.012	.009
Total material ..	\$2.245	\$0.944	\$0.890	\$0.627
Labor:—				
Cartage	\$0.065	\$0.050	\$0.050	\$0.027
Excavation and pipe laying	1.755	1.940	1.850	1.590
Rock extra	1.947	2.082	1.265	1.006
Back filling .....	.717	.624	.605	.515
Total labor	\$4.484	\$4.696	\$3.770	\$3.138
Grand total, material and labor	\$6.729	\$5.640	\$4.660	\$3.765

*Pipe and branches. †Brick with concrete bottom and cast-iron cover, cost \$70 each.

Job No. 1 consisted of 1,780 ft. of 24-in. vitrified pipe sanitary sewer with 7 manholes. The average cut was 9½ ft. in hard pan, shale and trap rock. The total excavation was 2,350 cu. yds. with 867 cu. yds. of rock extra.

Job No. 2 consisted of 2,970 ft. of sanitary sewer, 107 6-in. branches, and 12 manholes. The average depth was 10 ft. in hard pan, shale and trap rock, with the latter close to the surface in places and varying 3 to 5 ft. in thickness

between shoals. The total excavation was 3,260 cu. yds. with 1,550 cu. yds. of rock extra.

Job No. 3 consisted of 11,650 ft. of 12-in. sanitary sewer laid in five streets, 296 6-in. branches, and 41 manholes. The average cut was 8½ ft. in hard pan, shale and trap rock.

Job No. 4 covers 8 to 10 ft. of 9-in. sanitary sewer on nine streets with 284 6-in. Y-branches, and 27 manholes. The average cut was 8 ft. in hard pan, shale and rock.

Owing to the direction of veins in the rock, practically the whole of the work was done by hand, except the heavy fill on backfilling, which was done by steam tractor shovel.

The water main construction involved the laying of 3,560 ft. 10-in., 7,070 ft. of 8-in., and 11,600 ft. of 6-in. Class C cast-iron pipe. All the materials except the valves were imported from the United States. Cast-iron pipe and fittings cost \$46.00 per ton (2,000 lb.) on car Philadelphia. Freight and duty brought the cost to \$77.00 per ton on car 2 miles from line of work. The rates of pay were as follows:—

	Per hour, cents.
Common labor	30
Pipe layers	35
Foreman	40
Single horse and driver	40
Double team	70

The following figures represent materials and laying pipe and not excavation, as the work was done under separate contract during the laying of sewers. The sewer contract providing for the backfilling over the sewer pipe to the depth of 1 ft. to allow the water main to be laid, the sewer contractor completing the backfilling.

	10-in. main, per lin. ft. of main.	8-in. main, per lin. ft. of main.	6-in. main, per lin. ft. of main.
Materials:—			
Pipe	\$2.747	\$2.040	\$1.387
Gate valves and boxes¹ .....	.109	.111	.060
Hydrants¹ .....	.109	.119	.128
Leadite² and coal oil for heater .....	.080	.067	.051
Total materials	\$3.045	\$2.337	\$1.626
Labor:—			
Cartage from cars to line of work³	\$0.035	\$0.025	\$0.017
Grading trench, pipe laying, packing pipe in trench, testing .....	.437	.378	.279
Total labor	\$0.472	\$0.403	\$0.296
Grand total labor and material	\$3.517	\$2.740	\$1.922

¹6 10-in. double gate valves and boxes at \$65 each, and 6 6-in. balance valve hydrants (6 ft. fill) at \$65 each, with 10-in. main; 19 8-in. double gate valves and boxes at \$41.50 each, and 13 6-in. balance valve hydrants at \$65, with 8-in. main; 22 6-in. double gate valves and boxes at \$31.50 each, and 22 6-in. balance valve hydrants at \$65, with 6-in. mains.

²Leadite at 20 cents per lb.

³Cartage at \$1 per ton.

The above information was written by Ernest Drinkwater, consulting engineer, Montreal, for "Engineering and Contracting," Chicago, to whom *The Canadian Engineer* is indebted for same.