

## METHODS OF REFUSE DISPOSAL FOR TORONTO.

In a report to the City Council, submitted on October 25th, 1911, Messrs. Rudolph Hering and John H. Gregory, consulting engineers, of New York, gave the results of their investigation into the refuse disposal question of Toronto. A digest of this report follows:

Four separate projects were considered: Two contemplated the incineration of the garbage, rubbish, and a portion of the ashes, (A) without and (B) with the utilization of the salable part of the rubbish. The other two projects provided for the reduction of the garbage and the incineration of the rubbish. (C) without and (D) with the utilization of the salable part of the rubbish. Street sweepings, dead animals, etc., are satisfactorily disposed of by the city's present methods and are not considered in the report.

The comparison of the four projects is based upon plant capacities sufficient to dispose of the refuse from a population of 600,000, which, it is thought, will be reached in 10 years; Toronto's population by the 1911 census is 376,240. The total weight of garbage, rubbish and ashes collected in Toronto amounts to about 0.55 ton per capita per year; the relative amounts per capita per year are, garbage 0.1 ton, rubbish 0.05 ton, and ashes 0.4 ton. On this basis the total estimated weight collected from a population of 600,000 would be 60,000 tons of garbage, 30,000 tons of rubbish, and 240,000 tons of ashes per year, a total of 330,000 tons.

**Project A.**—In this project it is proposed that all of the garbage and rubbish, together with ashes amounting to 20 per cent. of the mixture, be incinerated, the remainder of the ashes to be used for fill. With a population of 600,000 the average daily amounts to be incinerated would be: Garbage, 200 tons; rubbish, 100 tons; ashes, 75 tons; total, 375 tons. Studies of the cost of construction and cost of hauling led to the conclusion that two incinerator plants, each of a daily capacity of 215 tons of mixed refuse, would be sufficient. In project A it was assumed that the garbage and refuse would be collected together and the ashes separately. No boilers or equipment to produce power are considered in this project on account of the cheapness of electric power from Niagara Falls. As there is believed to be no market for clinker at present in Toronto no clinker mills are included in the cost of construction.

The cost of constructing the two incinerators is estimated at \$478,400. The operating expenses, including interest and sinking fund charges, are given as \$124,940 per year for the two units, or at a rate of \$1.11 per ton of refuse handled.

**Project B.**—Project B, for two 195-ton incinerators, is similar to project A, except that the garbage and rubbish are to be collected separately and sorted over to recover salable material. Only a portion of the ashes would be delivered at the incinerators, the remainder being used for filling. The estimated average daily weights to be handled in project B are somewhat less than in project A. For 600,000 population there would be 200 tons of garbage, 67 tons of rubbish, and 68 tons of ashes daily, a total of 335 tons. It is assumed that two-thirds of the total rubbish collected would be burned, the other one-third being picked out and sold.

The estimated cost of constructing the two 195-ton incinerators, including means for picking out and handling the salable portions of the rubbish, is estimated at \$489,300, with annual gross operating expenses of \$166,570. In Buffalo, N.Y., the average receipts from the sale of material picked out from the rubbish for a period of over 4 years were \$2.34 per ton of rubbish handled; on the basis of \$2.25 per ton for Toronto the sale of the picked material will yield an income of \$67,300 per year, thus giving a net annual cost of operation of \$99,070, or 89.9 cents per ton of refuse handled. By

comparing the operating costs of projects A and B it is seen that the picking out of the salable parts of the rubbish will result in an estimated annual saving of \$25,870.

**Project C.**—In this project it is proposed that the garbage, rubbish, and ashes be collected separately; that the garbage be disposed of by the reduction process (grease and tankage being recovered); that all of the rubbish be incinerated; and that all of the ashes be removed to dumps and used for reclaiming low land. The average daily amounts to be disposed of, under this project, with a population of 600,000 are: Garbage, 200 tons; rubbish, 100 tons; ashes, 800 tons; total, 1,100 tons.

Project C provides for two 60-ton rubbish incinerators within the city limits and a garbage reduction works located about 10 miles east of the city near the shore of Lake Ontario. At each incinerator site it is proposed to install a loading-station with a railroad siding extending through it. Garbage wagons would be driven into the building and their loads dumped into special steel railroad cars of 40 tons capacity each, the car-body to be semi-circular and set on trunnions to facilitate the discharge of its load at the reduction works.

The reduction works would have a capacity of 240 tons per 24 hours and would comprise an unloading building, conveyor, digester building, containing digesters and presses for the cooked material, a dryer building where the moisture from the pressed tankage would be driven off, and a percolating building in which grease would be extracted from the dry tankage by means of the naphtha process. The liquids removed from the digester building would go to a grease separating and evaporating building. The syrup resulting from the evaporation of the liquids remaining after the grease had been drawn off would be mixed with the percolated tankage and dried, after which the tankage would be ready for shipment. It is proposed to operate all of the equipment at the reduction works power-plant by electricity, purchased from the Hydro-Electric Commission.

The estimated cost of constructing the two 60-ton rubbish incinerators, without means for picking out the salable material, is \$227,700, including land. The operating charges for the two units, based on a population of 600,000, is \$47,180, or at the rate of \$1.573 per ton of rubbish handled.

The garbage reduction works, including loading stations, railroad sidings, power-line, etc., will cost \$538,200 and the gross annual cost of operation of 600,000, will be \$169,970.

In estimating the receipts from the reduction works at Toronto it is assumed that, with the naphtha process, the amount of grease recovered would be 3.5 per cent. and the dry tankage 15 per cent. of the weight of the garbage reduced and that grease would bring 3.5 cents per pound and tankage \$7 per ton. On this basis the receipts from the sale of grease and tankage would be \$210,000 per year giving a total net income of \$40,030 annually, or 66.6 cents per ton of garbage.

Combining the estimates for the two incinerators and the reduction works, the construction costs for project C are \$765,900 and the operating expenses \$7,150 per year.

**Project D.**—This project is similar to project C except that the salable parts of the rubbish would be picked out and sold. The garbage, rubbish and ashes would be collected separately. The estimated daily average weights to be dealt with are garbage 200 tons, rubbish 100 tons, ashes 800 tons, the latter to be used entirely for fill. Of the total weight of rubbish only 67 tons would be burned in incinerators each day, the remainder being picked out and sold. Two 40-ton rubbish incinerators and one 240-ton reduction plant are recommended. The works are all practically a duplication of those described under project C.

The estimated cost of constructing the two 40-ton rubbish incinerators, including means for sorting out and handling