# SEWAGE DISPOSAL IN FLAT DISTRICTS

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One of the most difficult problems with which the municipal engineer comes in contact is that of the disposal of sewage in level districts, where there is not sufficient fall for a gravity system of sewer pipes. This condition exists, to a greater or less extent, in some part in almost every city and town in the United States.

There have been heretofore two methods for tee disposal of sewage in such districts, which have been generally used. They are, either pumping the sewage direct, or giving an impetus to its flow by means of compressed air. Where pumping is done, it is usual to conduct all of the sewage through various sized conduits, depending of course upon the tributary population, to a common sump or sewage well, by gravity, and from thence to pump it to an outlet. It is frequently necessary, if the area to be sewered is large, to have more than one of these sewage wells. In some cases, as, for instance, in New Orleans, there are many of them.

The method of disposal of sewage by compressed air entails the use of air pipes alongside the sewage pipes, from which air is passed by means of an engine and compressor. The sewage collects by gravity into steel tanks and the intermittant entrance of air into the said tanks discharges the sewage onto a higher plane, from whence it again runs by gravity to another tank, where the same operation is repeated, until finally the sewage is discharged into an outlet.

The principal objection to both methods outlined above is there expense. In the case of pumping, it is readily seen that the expense of engineers and firemen, fuel, etc., together with interest on the cost of the machinery, is quite large. This objection is sometimes partially overcome by the introduction of electric pumps, which can be operated from a central station, but the cost of electric current must also, in that case, be figured. In the case of a compressed air system, the expensive features are the same as those of the pumping system, plus interest on the cost of the air conductors and the increased cost of maintenance of such a system.

In our city we were confronted with conditions somewhat similar to those outlined in the first paragraph of this paper—that is to say, we have a large flat area on Minnesota Point, where the average elevation of the ground above Lake Superior is not more than six feet, and as this district has become densely populated during the last few years, on account of better connections being established between the city proper and Minnesota Point, it was necessary to design some system which would provide adequate sewering facilities for this district. As the water mains had just been laid throughout the streets and avenues on Minnesota Point, and as our water pressure in the mains is excellent, it occurred to me that some kind of water engine could be designed which would give an impetus to the flow in the sewers. My assistant, Mr. Axel Wilson, therefore went to work and designed a machine which may be called a hydraulic sewer ejector.

The machine consists of a receiver, into which the sewage flows by gravity. When the receiver is full, a ball float is raised by the sewage which automatically opens a valve from the water supply of the city into a water cylinder, the size of which is proportioned to the water pressure and capacity of the sewage receiver. The sewage is thus elevated some three or four feet, where it again runs by gravity to a second ejector, and so on throughout the length of the area sewered, until it finally arrives at the outlet in the lake. The machine is completely automatic and requires no attention whatever.

Of course it will be readily seen that the cost of operation of such machines is comprised of the interest on the cost of installation and the amount of water used from the mains. We have installed one of these machines in our Lake avenue sewer. This sewer is almost perfectly level, and when the water is high in the lake the sewage does not flow. The machine was installed to overcome this objection, and it has done so perfectly.

The proportions of the water cylinder to the sewage receiver are as 7.5 gallons to 240 gallons. In other words, we use about 3 per cent. of volume of water to that of sewage moved. We have, of course, a pressure of almost 100 pounds per square inch in the mains on Lake avenue, which accounts for the economy in the amount of water used. At our city rates, which are two cents per 100 feet, the sanitary discharge of said sewage, which sewers about 20 acres, costs, since the introduction of this machine, about 2½ cents per day for water.

It is to be presumed that some kind of water pressure is available wherever a sewer system is in operation. This water pressure may vary greatly in different cities, but it will generally be found that the best pressure in the system is obtainable in the low-lying districts where these machines ordinarily would be installed. I have therefore appended a table based on the amount of sewage contributed by a population of 10,000 people at 60 gallons per capita per day, to be lifted four feet, the cost of operation being based on our own meter rates of two cents per hundred. The table allows for friction in the apparatus.

Table of Efficiency of Hydraulic Ejector Under Different Water Pressures.

| Water Pres. per sq. in. | Per Cent. of Water Used | Volume in cu. ft. per Day | Cost per Day at 2c per 100 | Cost per Capita per Annum |
|---|---|---|---|---|
| 25 lbs.... | 12.12 | 9,696 | $1.94 | $0.07 |
| 30 lbs.... | 10.14 | 8,112 | 1.62 | 0.06 |
| 40 lbs.... | 7 58 | 6,064 | 1.22 | 0.05 |
| 50 lbs.... | 6.06 | 4,848 | 0.97 | 0.04 |
| 60 lbs.... | 5.07 | 4,056 | 0.81 | 0.03 |
| 70 lbs.... | 4.34 | 3,472 | 0.69 | 0.025 |
| 80 lbs.... | 3 79 | 3,032 | 0.61 | 0.023 |
| 90 lbs.... | 3.37 | 2,696 | 0.54 | 0.02 |
| 100 lbs.... | 3.04 | 2,432 | 0.49 | 0.018 |

I believe that machines of this design are applicable and will soon be in common use in all districts where other than gravity means of sewage ejection must be used. This machine is also applicable, as will be readily seen, to the drainage of cellars or basements which are below the sewer lines in the streets, and could also be used for the purpose of raising water, similarly to the use of a hydraulic ram.—Improvement Bulletin.

## PERSONAL.

Mr. Geo. McLean, who for the past ten years has been City Treasurer of Guelph, died on March 16th.

Mr. F. W. Flater, C.E., of Chatham, Ont., has been appointed engineer for the Township of Harwich.

Mr. J. M. Moore, superintendent of the waterworks department, London, Ont., has resigned that position.

Mr. H. T. Haffner, architect, of Winnipeg, has left for Victoria, B. C., and will not return to the city for three months.

Mr. J. Forrest, C.E., of Brussels, Ont., will superintend the construction of the Kemptville section of the Canadian Pacific Railway double track.

The Winnipeg Foundry Co., Winnipeg, a lately incorporated syndicate, have started business at corner of Flora avenue and Robinson street.

A new company of contractors has been established at Winnipeg under the name of Cotterell, McElveny & Company. Mr. E. H. Cotterell was formerly practicing as civil engineer in Winnipeg. The company who make a specialty of reinforced concrete constructions have their offices in McLean Block.