

of the water courses, consequently they are crooked, and in too many instances situated on private property. In later years the Government, through its Board of Works, constructed a number of sewers, varying from 12 to 24 ins. in diameter, without regard to any systematic plan. The pollution of the water front of the harbour and necessities of life demanded a better arrangement. Messrs. Kinipple and Morris, M.M. Inst. C. E. of London, were again consulted, and prepared plans for a system of sewerage on the combined system. They proposed to collect the sewerage at a point in the eastern end of the harbour, and either discharge it there at the level of half tide, or raise it by pumping to a higher level and discharge it into the open sea. They strongly recommended the latter course, in which they were undoubtedly correct. Two outlets were proposed: one directly into the open ocean, by which plan the works would have cost £80,116 stg. (\$390,165); the other at the entrance to the harbour at a rock locally known as the "chain" rock. By this system the works would have cost £74,886 stg. (\$364,595). Their scheme proposed 19 miles of sewers. No action appears to have been taken on this report.

Some years after, in 1886, Mr. H. C. Burchell, M. Can. Soc. C. E., the Government engineer, was instructed to report on the sanitary condition of the city, which was followed up by another report from him in February, 1887, "on the subject of improved sewerage for the town of St. John's." Mr. Burchell went over the ground very carefully, and prepared an exhaustive and valuable report, in which he differed materially from Messrs. Kinipple and Morris, and recommended the separate system, leaving the existing sewers for storm water and surface water sewers. He selected his point of outfall at the chain rock. Under his proposal there were about 14½ miles of sewers, which he estimated to cost \$205,875.

In March of 1889, the City consulted Mr. Rudolf Hering, M. Can. Soc. C. E., who prepared the scheme which is now being carried out. He recommended the Rawlinson's system of small sewers, the principles of which are well known to the members of the Society. He adopted the chain rock as the permanent outfall. Under his directions, the City Engineer, the late Mr. C. F. Harvey, has worked out the details of the system. There are 15½ miles of sewers contemplated, at a cost of \$272,183. Mr. Harvey added \$75,000 for improvement of old sewers, culverts, superintendence, storage, etc., otherwise his estimate would not differ materially from Mr. Burchell's.

Copies of these three reports can be found in the library.

The intercepting sewer was calculated to receive as much roof water as the maximum quantity of sewage, which was assumed at 12.5 cubic feet per section, for 60,000 persons, on a basis of 75 gallons per head per day.

The grades are steep everywhere, except for the intercepting sewer on Water street, which is 1 in 1000. A portion of this sewer (and the most difficult portion), the outfall and the portion next to it, are now being constructed. About 2,000 feet are in tunnel work. The Huronian rocks are generally very hard, and form a good roof for the tunnel, which will dispense with the need of arching the culvert, except in a few places where the rock is much shattered, and pockets of loose earth are encountered.

A good many lateral sewers have been laid, which are temporarily connected to the existing surface water sewers. As the construction of the Water street intercepting sewer is completed, the several lines of branch sewers will be connected to it, leaving only storm water to escape into the harbour. The western portion of the city lies rather low, the intercepting sewer for it is also on Water street, with a temporary outfall into the harbour; it is intended eventually to raise this by pumps for a short lift, and discharge the sewage at the permanent outfall.

A temporary outfall has been selected at the eastern end of the harbour. The permanent outfall will be at the mouth of the harbour, at the "chain rock"; at this point the discharge will take place into a strong current and ensure perfect security. The outfall sewer will be in rock tunnelling for its entire length, and discharge 6 inches above low water mark: the cost is estimated at \$35,000.

The ordinary range of tides is 3 feet 6 inches, extreme tides rise to 5 feet 3 inches.