

This method of construction proved very satisfactory, for, had the whole bore of sewer, which was 12 ft. 6 in. in size, been removed at once, sheeting in all probability would have been required to protect the arch excavation, owing to the wet sand in the invert; whereas, the excavation in the entire length of tunnel, with the exception of 50 ft. where a dry sand pocket in the arch was encountered, was carried on without the aid of timbering, which is a very heavy item of expense in tunnel construction, especially of this size. By not removing this bench it provided a working place both for mining and placing concrete in the arch. Such a bench would have had to be constructed had the whole size of sewer been removed.

Another innovation contrary to usual method of sewer construction was that the excavation was carried on at night and concrete and brickwork were placed in the day time. This proved much more satisfactory for the engineer and inspector, as it was possible to see that the materials were properly prepared before going into place.

The following figures are from cost data kept by the writer, who was resident engineer on this section.

Labor.		Cost per		Remarks.
	Cu. yds.	cu. yd.		
Excavation ..	11,332	\$ 0.62		Done with clam, including placing sheeting, pumping, etc.
Backfilling ..	3,960	0.15		Done with clam, including pulling sheeting.
Surplus		Nil		Just placed along line of sewer.
Forms				Wooden forms, 3c. to place and 6c. for material. Steel forms, \$900 rental for 60 lin. ft. of 8 in. dia.
Concrete—				Including placing forms, heating material and finishing, not including cost of material, as same forms are used over again.
Open cut...	3,352	1.10		
Tunnel—				Including placing forms, heating material and finishing, not including cost of material, as same forms are used over again.
Arch	1,731	1.75		
Invert	1,762	2.25		Including placing forms, heating material and finishing, not including cost of material, as same forms are used over again, and form-work in four manholes.
Brickwork—				Including trimming off concrete, etc.
Invert	691	6.15		
Underpinning	200	2.99		Average of 3 cu. ft. per lin. ft. of 1,790 ft. sewer.
Tunnelling—				Including sinking three shafts, hauling to and handling at dump.
Arch	4,435	1.60		
Invert	4,610	1.40		Including sinking three shafts, hauling to and handling at dump.

Material.

Concrete—			
Stone	6,500	\$ 1.50 cu. yd.	Stone and gravel used.
Sand	3,900	1.00 cu. yd.	
Cement	33,200	0.40 bag.	
Brick Invert—			
Brick	305,400	9.00 per M.	
Sand	380	1.00 cu. yd.	
Cement	3,845	0.40 bag.	
Underpinning—			
Brick	61,400	9.00 per M.	
Sand	70	1.00 cu. yd.	
Cement	695	0.40 bag.	
Lumber	41,600	22.00 per M.	Left in trench and tunnel.
“	23,000	15.00 per M.	
Reinforcing .	4,100	0.04 lb.	Used in Sec. B and in manholes and junction chamber.

These figures do not include any overhead expenses or any allowance for depreciation of plant.

Work commenced November 20th, 1914, and was completed September 30th, 1915.

	Lin. ft.
Length of sewer in contract.....	3,405
*Length of sewer constructed	3,425
Length of sewer in open cut.....	1,635
Length of sewer in tunnel	1,790

* Twenty lin. ft. of extra sewer.

	Lin. ft.
Length of 8' 0" square base and circular top.....	1,269
8' 0" square base and top.....	72
9' 6" square base and circular top.....	295
9' 6" circular base and top	479
9' 3" circular base and top	610
9' 3" square base and circular top.....	700

Material used in construction—

Arch —18 in. class "B" concrete.

Invert—14 in. class "B" concrete and one ring of hard shale brick.

This work was carried out under the direction of Mr. R. C. Harris, Commissioner of Works, and Mr. Geo. G. Powell, deputy city engineer. Mr. W. R. Worthington is assistant engineer in charge of the sewer section, Department of Works, and Mr. W. G. Cameron was division engineer supervising the work.

POWER ENTERPRISES AT EDMONTON.

During the year it is the intention of the Edmonton Power Co., a corporation with headquarters at Montreal, to construct a dam across the Saskatchewan River at Rocky Rapids, about 75 miles west of Edmonton. The dam will be about 1,000 ft. with a head of 80 ft. Power will be transmitted to Edmonton and the city has entered into a contract with the power company to pay for the power delivered at the city limits. A railway will be built from the city to the dam, this wall will be about 80 miles, equipped for electric power. The firm of Fairchild, Jones and Taylor, consulting engineers, Edmonton, will do the engineering on the railway, according to a recent announcement. Total cost of undertaking including dam, railway and transmission line will be about \$6,000,000. Edmonton has given a franchise to the Northern Alberta Gas Co. to sell natural gas in the city at 25 cents per 1,000 and this company will build a pipe line and distribution system. The line will be about 90 miles long and will supply small towns between the gas field and the city. The gas field is on the Battle River Anticline southeast of the city. The same firm will do the engineering. The cost of the work is estimated at about \$4,000,000.