

The Canadian Engineer

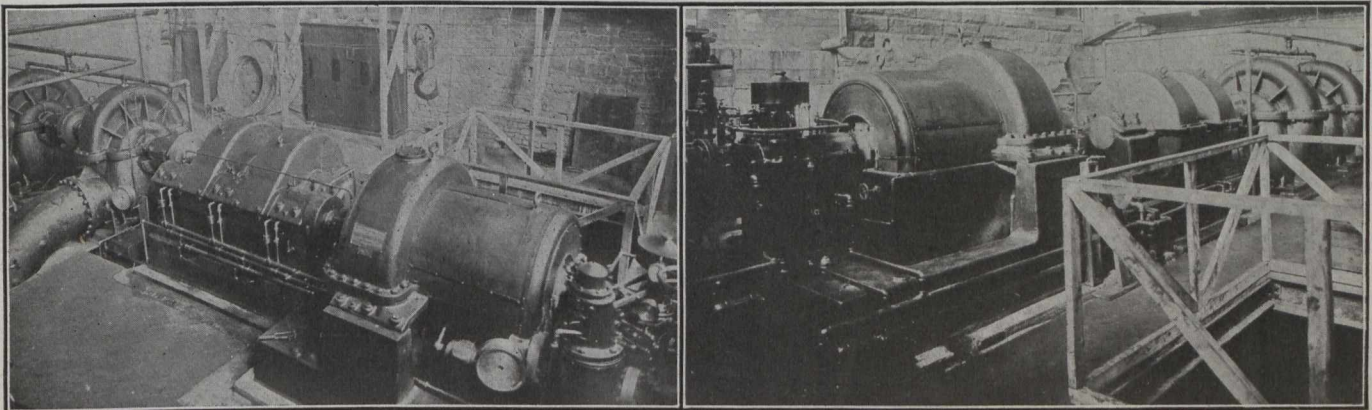
A weekly paper for engineers and engineering-contractors

PUMPING STATION EQUIPMENT AT TORONTO

DESCRIPTION OF THE STEAM-TURBINE-DRIVEN CENTRIFUGAL PUMPS AT THE JOHN STREET AND HIGH LEVEL PUMPING STATIONS.

THE two pumping stations of the Toronto waterworks epitomize, it might be said, the whole development of waterworks pumping machinery in America, although at the present time some of the oldest units are being discarded in favor of more modern and economical apparatus. The John Street pumping station, which is the main station, supplies all sections south of College and Gerrard Streets, and delivers water to two large mains, one going to the reservoir in the northern part of the city at a pressure of 20 lbs., and the other to the centrifugal pumps in the high level pumping station,

driven by a triple-expansion condensing engine, running at a speed of not over 350 r.p.m., and (c) a centrifugal pump driven by steam turbine, the pump speed not to exceed 750 revolutions; the capacity in each case to be not less than 15,000,000 Imp. gal. of water for 24 hours against a pressure difference of 105 lbs. per sq. in. between the suction and discharge mains. It was provided in the specification that a duty in excess of 100,000,000 ft.-lbs. per thousand lbs. of saturated steam should be guaranteed with a bonus of \$1,500 for each million ft.-lbs. in excess of the guarantee, the total bonus not to exceed



Front and Rear Views of the Two 24,000,000-gallon-per-day Units in the John Street Station, Toronto.

about three miles north. It contains two 10,000,000-gallon horizontal compound Worthington duplex pumps which, though installed about 25 years ago, are still used at certain periods. There are also two 15,000,000-gal. vertical triple-expansion high-duty reciprocating pumping engines, built after Allis-Chalmers designs by the John Inglis Co., of Toronto, installed eight and six years ago respectively, and four 13,500,000-gal. single-stage centrifugal pumps, operating against a head of 110 lbs. and driven at 750 r.p.m. by Canadian-Westinghouse 1,500-h.p. motors. The latter pumps were installed about two years ago and are operated with Niagara power. There are also two 5,000,000-gal. centrifugal pumps directly connected to steam turbines, and two other pumps of the same capacity and make, directly connected to Westinghouse motors, all intended for high-pressure fire service.

With a view to increasing the capacity and economy of this station, specifications were issued in October, 1912, for machines of three different types: (a) A self-contained vertical triple-expansion fly-wheel plunger pumping engine with jacketed steam cylinders; (b) a centrifugal pump

\$10,000, and a penalty of \$2,000 for each million ft.-lbs. less than the guarantee; a deficiency of more than 5,000,000 ft.-lbs. below the guaranteed duty to render the pump subject to rejection. It was further provided that the steam pressure should be 150 lbs. gauge at the boiler, and that the steam should not contain more than 1½% of entrained water, also that the steam consumed by the auxiliary pumps, jackets, reheaters, air pumps, air compressors, boiler feed pumps, all of which were to be supplied by the contractor, was to be included in figuring the duty.

The decision as to the type and make of pump was made on the basis of net economy, or lowest cost per gallon of water handled; that is, interest and depreciation charges on the cost of machinery, foundations and buildings and expenses for labor and supplies were taken into consideration as well as steam consumption. The contract was awarded to the Turbine Equipment Co., Ltd., of Toronto, representing the DeLaval Steam Turbine Co., of Trenton, New Jersey, for a 1,400-h.p. steam turbine designed for a speed of 3,600 r.p.m. driving, by means of double helical speed-reducing gears, two 24-in. centri-