

REPORT OF DUTY TRIAL ON THE SIX MILLION IMPERIAL GALLON PUMPING ENGINE AT THE HIGH-LEVEL PUMPING STATION, TORONTO WATERWORKS.

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The city of Toronto has two pumping stations for the supply of water to the city proper, exclusive of that supplied to the residents of Toronto Island. Of these two the main pumping station is situated at the foot of John Street, close to the bay, and all the water supplied to the city passes through pumps in this station, the pressure being maintained at slightly over 90 pounds per square inch.

As the ground rises very rapidly as one proceeds northward from the bay, the pressure in the northern part of the city produced by the pumps at the main pumping station, would be rather low and in the district near the Canadian Pacific Railway does not much exceed 21 pounds per square inch.

In order to maintain the proper pressure in the northern part of the city the High Level Pumping Station was built on

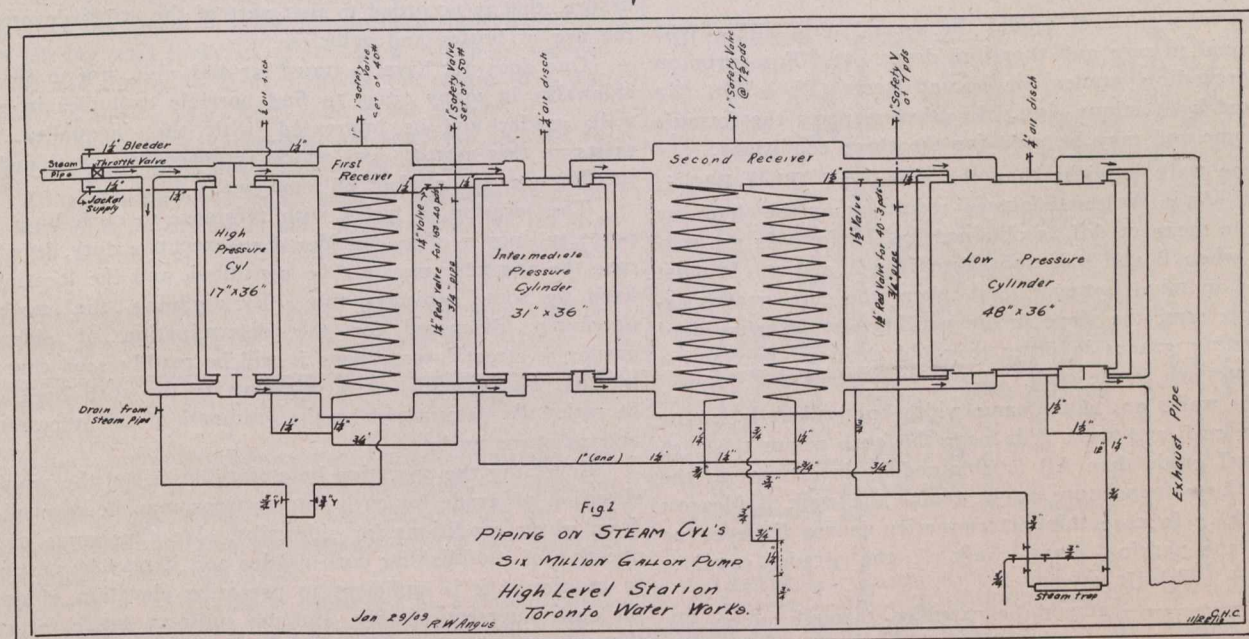
pressure of 100 pounds per square inch for fire purposes.

The nominal diameters of the steam cylinders as given on the working drawings are 17-in., 31¼-in., and 48-in., respectively, and the nominal diameter of all water plungers is 21¾-in., the stroke for all plungers and pistons being 36-in. For the duty trial the diameters and strokes of the water plungers were determined with great care, as is explained later, but the dimensions of the steam cylinders were not verified.

To the crosshead of the low pressure plunger are attached the feed pump, the air pump, and an air compressor for providing compressed air in the discharge air chambers and also for the operation of the steam cylinder poppet valves if desired.

The engine has three cranks placed 120 degrees apart, the sequence being high pressure, low pressure and intermediate pressure. The crank shaft is made in two parts, which are joined together at the central crank by a sliding block which gives the shaft some flexibility without affecting its working.

Steam Cylinders and Piping.—A diagram of the steam piping for the engine is given at Fig. 1, which shows the main steam piping as well as that for the jackets and re-



Poplar Plains Road a short distance above the Canadian Pacific Railway tracks.

The growth of the northern part of the city has been very rapid of late years and the consequent consumption of water has so increased that the pumps originally installed in the station were unable to maintain a sufficiently high pressure, so that an additional pump, having a capacity of six million Imperial gallons per day against a pressure of 75 pounds per square inch, has been installed and it is this latter pump with which this report deals.

Description of the Engine.

The engine tested is a three-cylinder vertical, triple-expansion crank and fly-wheel pump having three single acting plungers direct-connected to the pistons of the three steam cylinders. It is designed to give a discharge of six million Imperial gallons per twenty-four hours against a discharge pressure of 75 pounds per square inch for domestic purposes but is also capable of giving the same discharge against a

heaters. Each of the cylinders is provided with a steam jacket, and receivers are placed between each pair of cylinders, a reheating coil being placed in each of the receivers. The sizes and arrangement of pipes are shown on the drawing and are as follows:—

(a) **Cylinder-Steam Piping.**—After passing the throttle valve the steam main has two five-inch branches, one of which carries steam to the top of the high pressure cylinder, the other to the bottom of the same cylinder. The exhaust from the high pressure cylinder is conveyed by two pipes, each 5-in. diameter, to the first receiver where it is reheated before being delivered to the intermediate cylinder through two pipes each 8½-in. diameter.

From the intermediate cylinder the steam passes through two pipes into the second receiver where it is again reheated before being sent to the low pressure cylinder. After passing through the latter cylinder the steam is conveyed by the 16-in. exhaust pipe to the heater and finally to the condenser.

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