REPORT OF DUTY TRIAL ON THE SIX MILLION IMPERIAL CALLON PUMPING ENCINE AT THE HIGH LEVEL PUMPING STATION, TORONTO WATER WORKS.

(Continued from page 723.)

(b) Jacket and Reheater Piping.—The jacket supply is drawn from the main steam pipe on the boiler side of the throttle valve and connects directly with the high pressure jacket.

On leaving the high pressure jacket the steam passes, by means of a 1¼-in. pipe, to the reheating coil in the first receiver, from which it is conveyed through a 1¼-in. pipe containing a 1¼-in. globe valve and a 1¼-in. reducing valve, (set for reducing the pressure from 150 pounds to 40 pounds), to the intermediate jacket. This 1¼-in. pipe also contains a 1-in. safety valve set at 50 pounds.

After passing through the intermediate jacket the steam passes through a 1-in. pipe which is enlarged to $1\frac{1}{4}$ -in. into the two reheating coils in the second receiver, which coils are arranged in parallel. The steam leaves these coils through a single $1\frac{1}{2}$ -in. pipe, on which is a globe valve, a $1\frac{1}{2}$ -in. reducing valve set for reducing the pressure from 40 pounds to 3 pounds, and a safety valve set at 7 pounds. This $1\frac{1}{2}$ -in. pipe delivers the steam into the low pressure jacket.

On leaving this jacket a $1\frac{1}{2}$ -in. pipe, which is reduced to $1\frac{1}{4}$ -in. and finally to $\frac{3}{4}$ -in. delivers the steam to a trap from which it passes by a $\frac{3}{4}$ -in. pipe to the sewer.

For drainage from the jackets and receivers and the reheating coil ¾-in. pipes are arranged as shown.

(c) **Other Piping.**—A 1¼. in. pipe is connected from the main steam pipe on the boiler side of the throttle to the first receiver for starting up. This pipe contains a 1¼-in. globe valve.

Air discharge pipes each ¼-in. diameter and supplied with a valve are placed at the top of each cylinder jacket.

A 1-in. safety valve set at 40 pounds is placed on the first receiver and a similar valve set at 7½ pounds on the second receiver.

The high pressure cylinder has Corliss admission and exhaust valves, and on the intermediate cylinder Corliss admission valves are used, while for the exhaust for this cylinder and the admission and exhaust for the low pressure cylinder poppet valves are used.

The speed of the engine is controlled by a flyball governor which operates on the high pressure valves only and in case the speed becomes excessive this governor also opens a valve in the condenser so as to admit air to the latter and "break" the vacuum.

Feed Water and Condenser Piping.

The feed water and condenser piping scheme is shown on Figs. 2 and 3.

The cooling water for the condenser is taken from and again returned to the suction pipe of the engine. A butterfly valve is placed in the main 24-in. suction pipe and the cooling water is drawn from this pipe, on the side of the butterfly valve remote from the pump, through an 8-in. valve and pipe passing into the condenser. After passing through the condenser the water is returned to the suction main through an 8-in. pipe and valve, but on the side of the butterfly closest to the engine. By the proper adjustment of the butterfly valve any desired proportion of the water may be sent through the condenser.

The area of the butterfly valve is about 80 per cent. of the area of the 24-in. pipe, but it is never set at less than $22\frac{1}{2}^{\circ}$ to the normal to the pipe axis and when fully

open is turned parallel to the pipe axis in which case it offers practically no resistance to flow and very little water would pass through the condenser.

The exhaust steam first passes through a feed water heater and then on to the condenser. After being condensed the steam passes through a 6-in. pipe to the air pump from which it is discharged to the sewer.

The feed water is drawn from the main suction pipe through a 2-in. pipe, containing a valve, into the well. From the well a 2-in. pipe delivers the water to the feed pump from which it is discharged through a 2-in. pipe. As shown on the drawings the water may be sent through the heater or not as desired. A by-pass of 1½-in. pipe and containing valves is connected from the suction to the discharge pipe of the feed pump.

Pumps.

The pumps are single acting, and corresponding to each plunger there is one suction and one discharge chamber. The valves are arranged in cages, there being for each plunger seven valve cages, each cage containing 25 valves. There are thus 525 suction valves and 525 discharge valves.

The area through each of the valves is given on the drawings as 5.95 sq. in., but this was not verified.



NOMINAL DIMENSIONS OF ENGINE AND PUMPS.

Note:—The dimensions given in the following table are all taken from the working drawings but were not verified, as they are not essential to the duty trial. The exact diameter and stroke of each plunger is given elsewhere, but the sizes given on the drawings are set down here for convenience.

1.--Nominal Dimensions of the Engine.

light i lessure oyninder.	
Diameter of pistonin.	17
Diameter of counterbore of cylinderin.	173/8
Diameter of piston rodin.	4
Stroke of pistonin.	36
Clearance (least distance from piston to	
cylinder head)in.	1/4