

for at least eight hours previous to the commencement of the trial, and was thoroughly warmed up. It ran satisfactorily throughout, with the exception of a slight vibration, caused by some of the cams operating and the valves on the low pressure cylinder not working quite smoothly.

The poppet valves on the intermediate and low pressure cylinders are arranged to be closed by springs or by air pressure; during the test the spring closure was used, the air compressor being used simply to keep air in the air chambers of the pumps.

Towards the end of the test a small leakage of steam from the high pressure cylinder jacket developed owing to a slight failure of the packing; the drip was caught, and from it the total loss due to this leak estimated. The weight was added to the total weight of water measured on the scales.

Observers.

The observers worked in eight-hour shifts, but each shift was present for about ten hours. These men were all skilled in such work, being students in the fourth year of the Faculty of Applied Science and Engineering of Toronto University.

The trial was under the direction of Professor Robert W. Angus, and was carried out by Mr. M. R. Riddell, in conjunction with Mr. W. W. Gray and Mr. J. J. Traill, all of the Faculty of Applied Science of the University of Toronto.

All calculations from the original observation sheets were made by Mr. Riddell. These calculations have been thoroughly checked.

Mr. Hill watched the test in the interest of the contractors.

The engineers and firemen at the pumping station were under the direction and control of the station engineer.

Measurements of the Pumps Used in Computations.

High-pressure Plunger—	
Stroke, actual	inches, 35.947
Diameter, actual	21.751
Displacement per revolution	cubic feet 7.730
Intermediate-pressure Plunger—	
Stroke, actual	inches 36.007
Diameter, actual	21.757
Displacement per revolution	cubic feet 7.747
Low-pressure Plunger—	
Stroke, actual	inches 35.972
Diameter, actual	21.760
Displacement per revolution	cubic feet 7.742
Total displacement per revolution	cubic feet 23.219
Total displacement per revolution	imp. gals. 144.699
Volume of imperial gallon	cubic inches 277.274

Observations and Results.

Date of Trial—
2.30 p.m. Thursday, April 8th, to 2.30 p.m. Friday, April 9th.

Duration of Trial—24 hours.

Corrected Average Pressures—

Boiler pressure by gauge, pounds per sq. in.	150.21
At engine pressure by gauge, pounds per sq. in.	148.85
In first receiver by gauge, pounds per sq. inch.	24.04
In second receiver by gauge, pounds per sq. inch (below atmosphere)	4.09
In intermediate jacket by gauge, pounds per sq. inch	39.08
In low pressure jacket by gauge, pounds per sq. inch	1.17

Vacuum by gauge, ins. mercury	27.39
Pressure on discharge main, pounds per sq. inch.	85.14
Pressure on suction main, pounds per sq. inch.	25.16
Height of centre line of discharge main above centre line of suction main at point of gauge attachment	feet 0.7
Corresponding pressure, pounds per sq. inch.	0.30
Total pressure, difference on pumps, pounds per sq. inch	60.28
Barometer, average, at pump floor level and temperature, ins. mercury	29.54

Average Temperatures—

Of engine room, degrees Fahr. (lower platform)	76
Of boiler room, degrees Fahr.	66
Of exhaust steam, degrees Fahr.	105.5

Calorimeter—

Pressure of supply steam at calorimeter, pounds per sq. inch	148.85
Pressure of steam in calorimeter (1 in. mercury = .4908 pounds per sq. inch)	1.21
Temperature in calorimeter, degrees Fahr.	298
Moisture in steam, per cent.	0.72

Speeds—

Total number of revolutions by counter	43,185
Average revolutions per minute	29.99
Average plunger speed, feet per minute	179.814

Water Pumped—

Total number of revolutions	43,185
Plunger displacement per revolution, cubic feet.	23.219
Plunger displacement per revolution, imp. gals.	144.699
Displacement in twenty-four hours, imp. gals.	6,248,813

Work Done—

Total number of revolutions	43,185
Displacement per revolution, cubic feet	23.219
Total pressure difference on pumps, pounds per sq. inch.	60.28
Work done per revolution, ft. pounds	201,542
Work done in twenty-four hours, ft. pounds.	8,703,603,033

Steam Used by Engine—

Total condensation from condenser, pounds.	45,091
Total condensation from jackets, receivers, etc., lbs.	8,072
Total steam used by engine, pounds	53,163

Duty—

Work done by pump in twenty-four hours, ft. pounds	8,703,603,033
Steam used by engine in twenty-four hours, lbs.	53,163
Duty per thousand pounds of steam used, ft. lbs.	163,715,423
Duty required by specifications, ft. lbs.	160,000,000

NEW INCORPORATIONS.

Oshawa, Ont.—Matthew Guy Carriage & Automobile Co., \$250,000; R. W. Eyre, W. D. Earngey, J. J. Hubbard.

Toronto, Ont.—Electric Installation Co., \$40,000; J. B. Ferris, J. P. Archer, A. B. Colville, Bremner Porcupine Mines, \$1,000,000; R. W. Hart, M. Gordon, C. H. C. Leggott. Canadian Electric Fixture & Contracting Co., \$40,000; S. Wood, H. M. Van Gorder, W. Burton. Metal-Workers' Specialties, \$40,000; H. B. Nicol, W. Cowan, J. C. Cole. Canadian Commandite Co., \$500,000; J. S. Lovell, W. Bain, R. Gowans. Dominion Graphite Co., \$500,000; J. S. Lovell, W. Bain, R. Gowans.