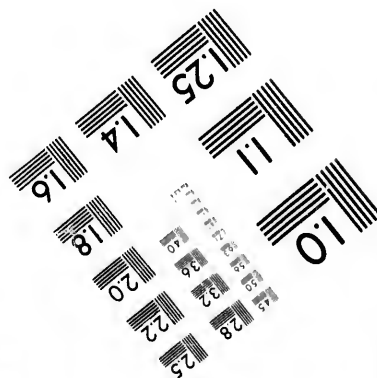


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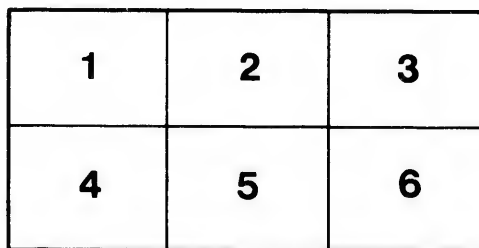
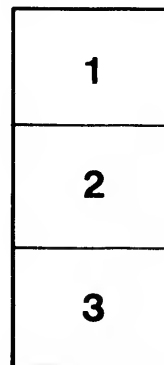
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REPORT

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OF

SAMUEL RISLEY, Esq.,

CONSULTING ENGINEER,

ON THE

ERECTION OF A NEW

STEAM-PUMPING APPARATUS

FOR THE

MONTREAL WATER WORKS.

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FS012
1869
R32R

MONTREAL:

PRINTED BY THE MONTREAL PRINTING AND PUBLISHING COMPANY

1869.

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REPORT.

TORONTO, 9th June, 1869.

JOHN MCGAUVREAN, Esq.,
Chairman Water Committee,
City Council, Montreal.

SIR,—In compliance with a Resolution of your Committee, dated Montreal, 11th May, 1869, requesting me to prepare plans and specifications for a Steam Pumping Engine in accordance with the general plan of the Hamilton Engine, with any modifications or improvements which may be found expedient, the pumping capacity of the engine to be from three to four million gallons per diem,—

After a personal inspection of the Pumping Engines in the cities of Hamilton, Chicago, Buffalo and Detroit, particulars of which are herewith appended, I beg leave to submit the accompanying plans and specifications, in which the general features and outline of the Montreal Engine have been followed, doing away, however, with the low pressure system, using instead cylinders of equal power at each end of the beam.

The general plan of the Hamilton Engine could not be carried out, for want of room in the present Engine-house building. Were it desirable to do so, the enormous consumption of fuel would not justify its adoption under any circumstances by your Committee.

It is proposed to alter the boilers of the Hamilton Engines, substituting Tubular Boilers, similar to those used in the Montreal Engine, for the Cornish Boilers now used, by which some saving in fuel will be effected, but not to the extent, I think, apprehended.

The adoption of the plans herewith submitted would make the two Steam Engines in all respects, except the low pressure

cylinders, of uniform dimensions, a matter of some considerable importance in duplicating the parts, as well as in other respects.

Should the Low Pressure Cylinder be found inferior to the plan now proposed, it may at any time be removed, and a small cylinder take its place at trifling expense.

It will be seen that I have added greatly to the strength of the framing of the Engines, with modifications in the details, in view of securing a more effective Engine.

I have to add, that I have seen no Engines in any of the cities I have visited, nor do I know of any Pumping Engine of the capacity of the Montreal Engine, pumping against the high head of water it does, that at all approaches it in speed and pumping efficiency. The Buffalo Engine, under a head of only 88 feet, makes but four strokes per minute. None of the other Engines named exceed twelve strokes per minute. While the Montreal Engine, working at its best speed, under a head more than twice that of the Buffalo Engine, makes eighteen strokes the minute, equal to a velocity in the pumps of 80 to 216 feet per minute. This remarkable result has had great weight with me in recommending this plan of Engine for your adoption, nor do I think, with the improvements I have suggested in the plans and details, taken as a whole, a better design for a Pumping Engine could be devised.

In conclusion, I have to urge upon your Committee, if it is decided to build a second Engine, the importance both to yourselves and the contracting parties for the work of the necessity for prompt action in this matter, the time is so short to do the work; and should the whole field of details and plans be required to be gone over again, we shall require the same great exertions to be made, attended with the same anxiety and expense as we have incurred in the construction of the present Engine.

I am, Sir,

Your most obdt. servant,

SAML. RISLEY,

Consulting Engineer.

The Engine should be finished under steam by the first of December next. This would give but bare time to make the necessary adjustments so essential in all Pumping Engines before putting them into actual service.

In respect to the cost of the Engine, to the best of my judgment the contractors have made nothing by their contract for the present Engine, assuming their price to have been remunerative under ordinary time being allowed them to do the work. The new Engine, except in the item of two boilers in place of four, will be rather more expensive than the present one, as the framing will be much heavier, and there will be a heater and some additional connections. Deducting the price of the two boilers and their appurtenances, say \$2,500, I think the cost of the new Engine may be set down at the price of the old one, namely, \$33,500, allowing the \$2,500 to cover the increased power of the Engines, for which the contractors claim a bonus of \$10,000.

Yours respectfully,

S. RISLEY.

MONTREAL PUMPING ENGINE.

Double Cylinder Beam Engine, the Steam Cylinders placed at each end of the Beam, directly over the Pumps.

| | | | | | |
|---|---|---|---|---|--------------------|
| Diameter of Low Pressure Cylinder | - | - | - | - | 44 inches |
| Stroke of Piston | " | " | - | - | 6 ft. |
| Diameter of High Pressure Cylinder | - | - | - | - | 26 inches |
| Stroke of Piston | " | " | - | - | 6 ft. |
| Revolutions of Engine | - | - | - | - | per minute |
| Height of column | - | - | - | - | 185 ft. |
| March, 1869—131 hours pumping, quantity | | | | | 19,455,115 gallons |
| Imperial gallons per 24 hours | - | | | | 3,747,504 " |
| Consumption of fuel | " | - | - | - | 133,000 pounds |
| Do per 24 hours | - | - | - | - | 24,464 " |
| April—100 hours pumping, quantity | - | - | - | - | 15,426,073 gallons |
| Imperial gallon per 24 hours | - | - | - | - | 3,702,000 " |
| Consumption of fuel | " | - | - | - | 32,300 pounds |

HAMILTON PUMPING ENGINE.

Double Cylinder Beam Engine, the Steam Cylinder placed at one end of the Beam, the Low Pressure Cylinder outside of the High Pressure. The Pump is worked from the Beam inside the High Pressure Cylinder; the Crank Shaft at the opposite end of the Beam from the Steam Cylinders.

| | | | | | | |
|---|---------|-----------|---|------------|---|-------------------|
| Diameter of Low Pressure Cylinder | - | - | - | - | - | 42 inches |
| Stroke of Piston | - | - | - | - | - | 8 ft. |
| Diameter of High Pressure Cylinder | - | - | - | - | - | 24 inches |
| Stroke of Piston | - | - | - | - | - | 6 ft. |
| Diameter of Pump | - | - | - | - | - | 24 inches |
| Stroke of Pump | - | - | - | - | - | 4 ft. |
| Revolutions of Engine | - | - | - | - | - | 10 per minute |
| Height of column | - | - | - | - | - | 185 ft. |
| March—131 hours pumping, quantity | - | - | - | - | - | 7,043,369 gallons |
| Consumption of fuel | - | - | - | - | - | 53,880 pounds |
| Consumption of fuel as compared to the Montreal | | | | | | |
| Engine, | 56,880, | 7,043,369 | = | 19,455,115 | = | 148,833 " |
| Deduct for raising steam | - | - | - | - | - | 8,400 " |
| Quantity per 24 hours | - | - | - | - | - | 1,289,625 gallons |
| Consumption per 24 hours | - | - | - | - | - | 9,871 pounds |

CHICAGO ENGINE.

Two Single Cylinder Condensing Beam Engines, connected to one crank shaft. The Steam Cylinders connected to one end of the Beam and the Crank Shaft to the other. The Pumps are worked from the Beam inside the Steam Cylinders.

| | | | | | | |
|----------------------------------|------------|---------|---|---|---|----------------|
| Diameter of Steam Cylinders | - | - | - | - | - | 44 inches |
| Stroke of Pistons | - | - | - | - | - | 9 ft. |
| Double acting Plunger Pumps | | | | | | |
| Diameter of Pumps | - | - | - | - | - | 34 inches |
| Stroke of Pumps | - | - | - | - | - | 5 ft. 6 inches |
| Height of column | - | - | - | - | - | 100 ft. |
| Consumption of fuel pumping | 17,465,115 | gallons | - | - | - | 58,700 pounds |
| Relative duty to Montreal Engine | - | - | - | - | - | 107,000 " |
| Height of column | - | - | - | - | - | 100 ft. |

BUFFALO ENGINE.

One Condensing Beam Engine. The Steam Cylinder is placed at one end of the Beam and the Crank Shaft at the other. The Pump is worked directly under the Steam Cylinder, having the same stroke of piston.

| | | |
|----------------------------|-----------|-----------|
| Diameter of Steam Cylinder | - - - - - | 65 inches |
| Stroke of Piston | - - - - - | 10 ft. |

Double acting Plunger Pump

| | | |
|--|-----------|---------------|
| Diameter of Pump | - - - - - | 31½ inches |
| Stroke of Pump | - - - - - | 10 ft. |
| Revolutions | - - - - - | 4 per minute |
| Height of column | - - - - - | 88 ft. |
| Consumption of fuel pumping 19,455,115 gallons | - | 50,000 pounds |
| Comparative consumption to the Montreal Engine | 107,000 | " |

DETROIT ENGINE

Horizontal Condensing Engine. Double acting Pump, worked directly from the Piston Rod.

| | | |
|--|-----------|---------------|
| Diameter of Steam Cylinder | - - - - - | 42 inches |
| Stroke of Piston | - - - - - | 8 ft. |
| Diameter of Pump | - - - - - | 24 inches |
| Stroke of Pump | - - - - - | 8 ft. |
| Revolutions | - - - - - | 12 per minute |
| Pumping 19,455,115 gallons—Consumption of fuel | 42,000 | pounds |
| Comparative consumption to the Montreal Engine | 109,000 | " |

SCHEDULE,
*Showing the duty of the New Steam Pumping Apparatus, during
 March and April last.*

| COMMENCED. | | ENDED. | | Quantity of Coal consumed, per ton of 2240 lbs. | Quantity of Coal. | Number of Hours. | Gallons Pumped. | Average Pressure of Steam. | Average Pressure of Water. |
|------------|------------|---------|------------|---|-------------------|------------------|-----------------|-------------------------------|-------------------------------|
| DATE. | HOURS. | DATE. | HOURS. | | | | | | |
| Mar. 20 | 4.00 P.M. | Mar. 21 | 4.30 P.M. | 12 | Am. C'land. | 24.30 | 3,547,592 | 42½ | 72 |
| " 21 | 4.30 " | " 22 | 6.30 " | 12 | Scotch, | 26.00 | 3,853,950 | 43½ | 75 |
| " 22 | 6.30 " | " 23 | 9.30 " | 12 | Am. C'land. | 27.00 | 3,969,801 | 41 | 77 |
| " 23 | 9.30 " | " 24 | 9.00 " | 12 | Scotch, | 23.30 | 3,573,336 | 41½ | 79 |
| " 24 | 9.00 " | " 26 | 3.20 A.M. | 12 | Am. C'land. | 30.20 | 4,510,436 | 40½ | 76½ |
| " 26 | 3.20 A.M. | " 27 | 6.30 " | 12 | Lehigh, | 27.10 | 4,083,077 | 41½ | 78½ |
| " 17 | 6.30 " | " 28 | 8.00 " | 12 | Lehigh, | 25.30 | 3,810,186 | 41 | 67½ |
| " 30 | 2.25 P.M. | " 31 | 12.40 P.M. | 12 | Scotch, | 22.15 | 3,375,104 | 37½ | 74½ |
| April 1 | 11.40 A.M. | April 2 | 9.00 A.M. | 12 | Scotch, | 22.40 | 3,202,616 | 38½ | 78 |
| " 2 | 9.00 " | " 3 | 8.00 " | 12 | Scotch, | 23.00 | 3,542,443 | 40½ | 83 |
| " 3 | 9.20 " | " 4 | 5.30 " | 12 | Scotch, | 20.10 | 3,058,446 | 42 | 88 |
| " † 4 | 5.30 " | " 5 | 12.15 A.M. | 12 | Scotch, | 18.05 | 2,734,924 | 52½ | 86½ |
| " ‡ 5 | 12.15 P.M. | " 6 | 8.00 " | 12 | Scotch, | 20.45 | 3,091,914 | 40½ | 84 |
| " 6 | 8.00 " | " 7 | 4.20 " | 12 | Scotch, | 20.20 | 3,054,914 | 42½ | 84 |
| " 8 | 6.45 " | " 9 | 3.35 A.M. | 12 | Scotch, | 20.50 | 3,485,805 | 41½ | 86 |

† Engine was stopped at 6.20 P.M., April 4th, and started again at 7.00 A.M., April 5th.

‡ Engine was stopped at 7.10 P.M., April 5th, and started again at 6.10 A.M., April 6th.

LOUIS LESAGE,
Superintendent of Water Works.

Montreal, 26th May, 1869.

