REPORTS ON TRIALS OF DUTY AND CAPACITY OF THE PUMPING ENGINES NO. 2, AT RIDGEWOOD, AND OF NO. 1, AT PROSPECT HILL, MADE IN 1861-'2

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Reports on Trials of Duty and Capacity of the Pumping Engines No. 2, at Ridgewood, and of No. 1, at Prospect Hill, made in 1861-'2 by Various

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Trieste

BROOKLYN WATER WORKS.

REPORTS

ON

TRIALS OF DUTY AND CAPACITY

OF

THE PUMPING ENGINES

NO. 2, AT RIDGEWOOD,

AND OF

NO. 1, AT PROSPECT HILL,

MADE IN 1861-'2.

NEW YORK:
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1862.

REPORTS.

Report of Messrs. Smith, Graff, and Worthen on the second Brooklyn Pumping Engine at Ridgewood.

JAS. P. KIRKWOOD, Esq.,

Chief Engineer, Brooklyn Water Works.

DEAR SIR: Agreeably to the request in your communication of the 21st instant, and in conformity with the agreement between the parties thereto annexed, we have made an experimental test of the working qualities of the second Ridgewood Engine only, the Prospect Hill Engine being not yet in condition for trial. The results are as follows:

The test for duty, continued during 24 hours, gave for the combustion of 1 lb. of coal an effect of 589,854 lbs. ft., or 10,146 lbs. ft. less than that required by the contract.

The test for capacity, continued during 16 hours, gave, as measured in the

Reservoir, . . .	10,403,414 galls.
By Weir, . .	10,275,164 "

thus complying with the contract, whatever measures be adopted.

The experiments were conducted, on the 23d and 24th insts., upon the same general principles as on the No. 1 Engine; except that, on account of the fulness of the reservoir, and shortness of time, the experiments on duty and capacity were not entirely distinct, but some 8 hours' work has been used in common with both tests; and the

principle of continuous firing has been adopted, instead of drawing the fire as before.

In regard to the character of the workmanship of the machine, and the material of its construction, on the whole, both are extremely satisfactory; there are some minor details which are deficient, and which should have been attended to previous to the trial, but which may be easily perfected at a very moderate outlay. The engine has been used but 9 or 10 days, and is subject to all the disadvantages of new work; we are confident that, after having been used a longer time, and with slight modifications, it will easily come up to the required test of duty, and as a working machine prove itself superior in every respect to the first engine.

FREDERICK GRAFF,
W. E. WORTHEN,
ERASTUS W. SMITH.

October, 1861.

NOTES ON THE TRIAL OF RIDGEWOOD ENGINE No. 2, *Oct.* 23 *to* 25, 1861.

The steam pressure in the boilers ranged from 14½ to 18 lbs.; the average pressure was about 15½ lbs.

Number of strokes of engine during 16 hours' trial for capacity, from 2 P. M. Oct. 24, to 6 A. M. Oct. 25, 10,232.

The water was measured in the Reservoir, from 9:15 P. M. Oct. 23, to 6 A. M. Oct. 25, and at the conclusion of the experiments the loss by leakage was gauged, and allowance made therefor. The quantity thus measured, as delivered into the Reservoir during the 16 hours, from 2 P. M. Oct 24, to 6 A. M. Oct. 25, was

1,331,637 cubic ft. or 10,403,414 galls., N. Y. standard, or, divided by the number of strokes,
130.144 cubic ft. per double stroke,
or 1016.25 galls. "

As a check upon this measure, a weir was made upon the platform over which the water was delivered into the Reservoir, and the capacity of the pump was estimated from the heights above the weir, taken every 5 minutes during 4 hours, from 2 to 6 P. M., Oct. 24.

Capacity of pumps, as measured by weir,
128.54 cub. ft. per double stroke,
or 1004.22 galls. "

Formula for weir discharges from Mr. Francis' hydraulic experiments:

$$Q = 3.33\ (l - \tfrac{2}{10}h)\ h^{\frac{3}{2}}$$

l = 7.25 ft. h by average 0.993.

Capacity of pump by measure and calculation for a stroke of 9.75 ft., 134 27 cubic ft. per double stroke,
or 1048.98 galls. " "

The Ridgewood Engine No. 2 not having complied with the contract requirement for duty, as by the report of the engineers, Messrs. Graff, Worthen, and Smith, another trial was deemed necessary, and it was resolved by the Board of Water Commissioners, that their engineer, Mr. Worthen, "be requested to make the second test of said engine, and also to test the engine at Prospect Hill Reservoir."

Time was given for the carrying out of some slight alterations that were found useful by the former trial, and a defect having been found in one of the expansion pipes, it was taken out and a new one was put in; and the second trial was commenced on Jan. 9, 1862. The general results of the test were given in a brief note to the chief engineer, Mr. Kirkwood, on the 16th, but the full report (as follows) was not communicated till Feb. 13.

Report of Mr. Worthen on the second Ridgewood Pumping Engine.

JAMES P. KIRKWOOD, Esq.

Dear Sir : In my previous communication (of the 16th ult.) with regard to the duty and capacity of Ridgewood Pumping Engine, No. 2, as tested by me on the 9th and 10th ult., the results were stated as follows :

606,613 lbs. ft. duty for every lb. of coal consumed.

10,554,102 gallons per 16 hours as the rate of discharge into the Reservoir during the 24 hours of trial.

These calculations were based on investigations conducted as in the previous experiments on the No. 1 Engine, with the exception, that the firing was continuous, and both duty and capacity were tested at the same time.

The load on the pump pistons was ascertained, by observations on the gauge attached permanently to the rising main, and placed beneath the vacuum and steam gauges of the cylinder ; to which is added the static pressure due to the height of the gauge above the average level of the water in the pump well. The boilers were fired up early on the morning of the 9th, and the engine was run intermittently till about 12 M., when everything was ready for trial ; the first coal was weighed 12 h. 30 m., and record was then taken of every shovelful of coal that was thrown on the grates, and upon what grates it was thrown. The coal was weighed in lots of 3,000 lbs. each; record was taken of the time when each lot was cleaned from the floor, and from the number of shovelfuls in each lot, the weight of

each shovelful is estimated and plotted on the profile hereto annexed.* The horizontal lines represent hours, a division of 10 to the hour, or 6 minutes to each small division; the perpendicular divisions represent the weight of coal, 100 lbs. to each small division. By observation of a profile thus constructed, it will be seen how much coal is consumed from hour to hour, and with what care the firing was conducted. During the whole experiment the fire, water, and steam, were kept as nearly constant as possible.

The firing was continued and coaling noted till after 4 o'clock P. M. on the 10th ult., but the time selected for the experiment has been the 24 hours, from 2 P. M. 9th, to 2 P. M. 10th; the quantity consumed has been taken from the profile. As in the experiments on No. 1, the quantity of coal in the ashes and cinder, during the whole firing, has been taken, and the percentage due to the quantity consumed during the test has been deducted. This, with a small deduction of coal, for an excess of $\frac{1}{2}$ inch of water in the boilers, at 2 P. M., 10th, over that at 2 P. M. on the 9th, has been taken as the net consumption on which the above calculation of duty has been based.

As in these last tests the responsibility for the accuracy of the experiments rested upon myself alone, and that the data obtained might be open to inspection of parties not present, in addition to observations of the gauge, cards were taken from indicators at the top of both pumps, in the positions *I*, *I'*, shown on PL. I., two at each place every hour; a few of the cards are annexed, but the average was taken for the whole 24 hours, 50 from each pump.

From the average thus taken the duty has been calcu-

* The profile accompanying the Report has not been printed, but its construction will be understood from the partial one now attached to the Report on the Prospect Hill Engine.