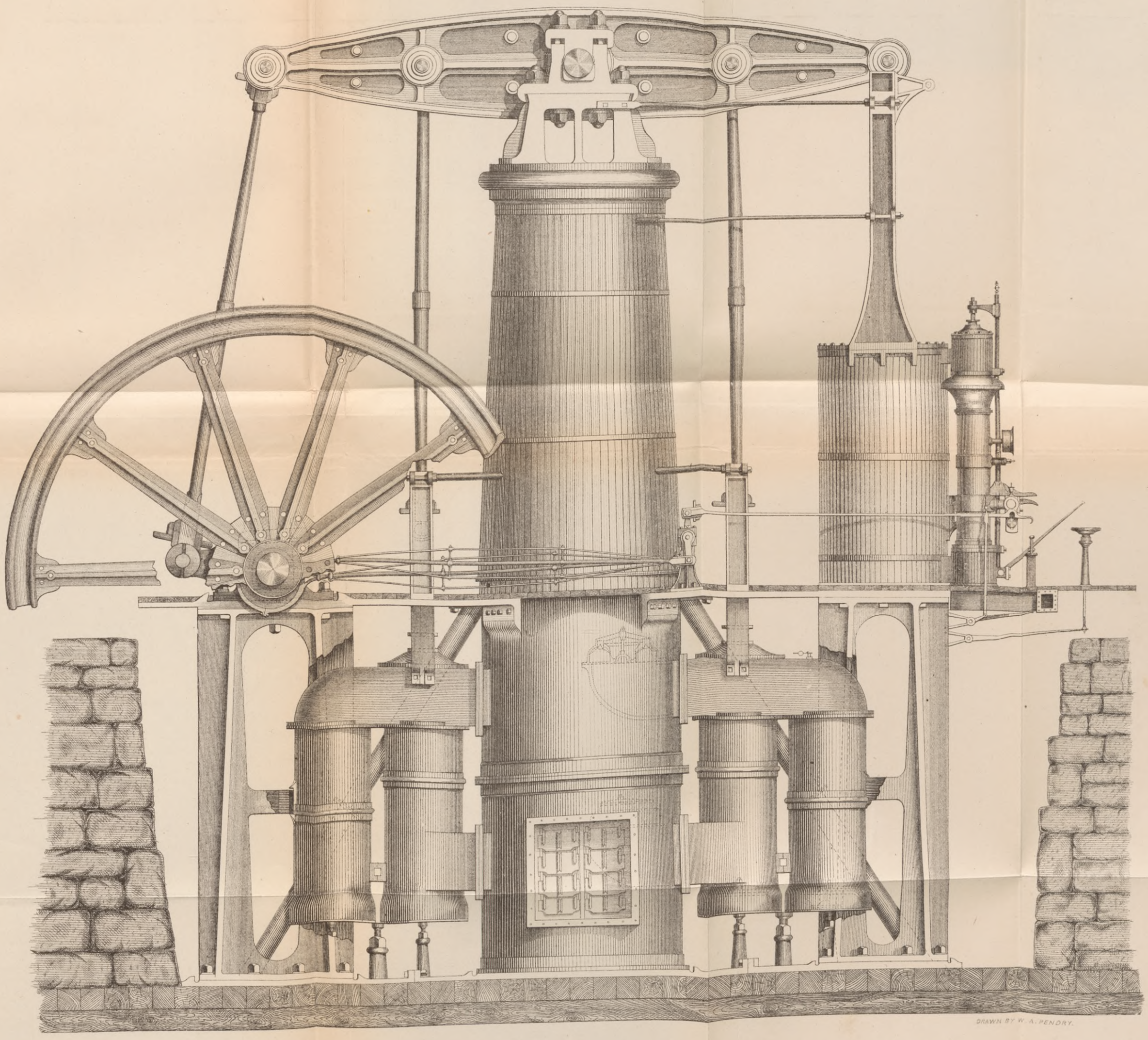
PUMPING ENGINE

DESIGNED BY JOHN E. EDWARDS.

DETROIT WATER WORKS

Constructed by the "Dry Dock Engine Works," Detroit.



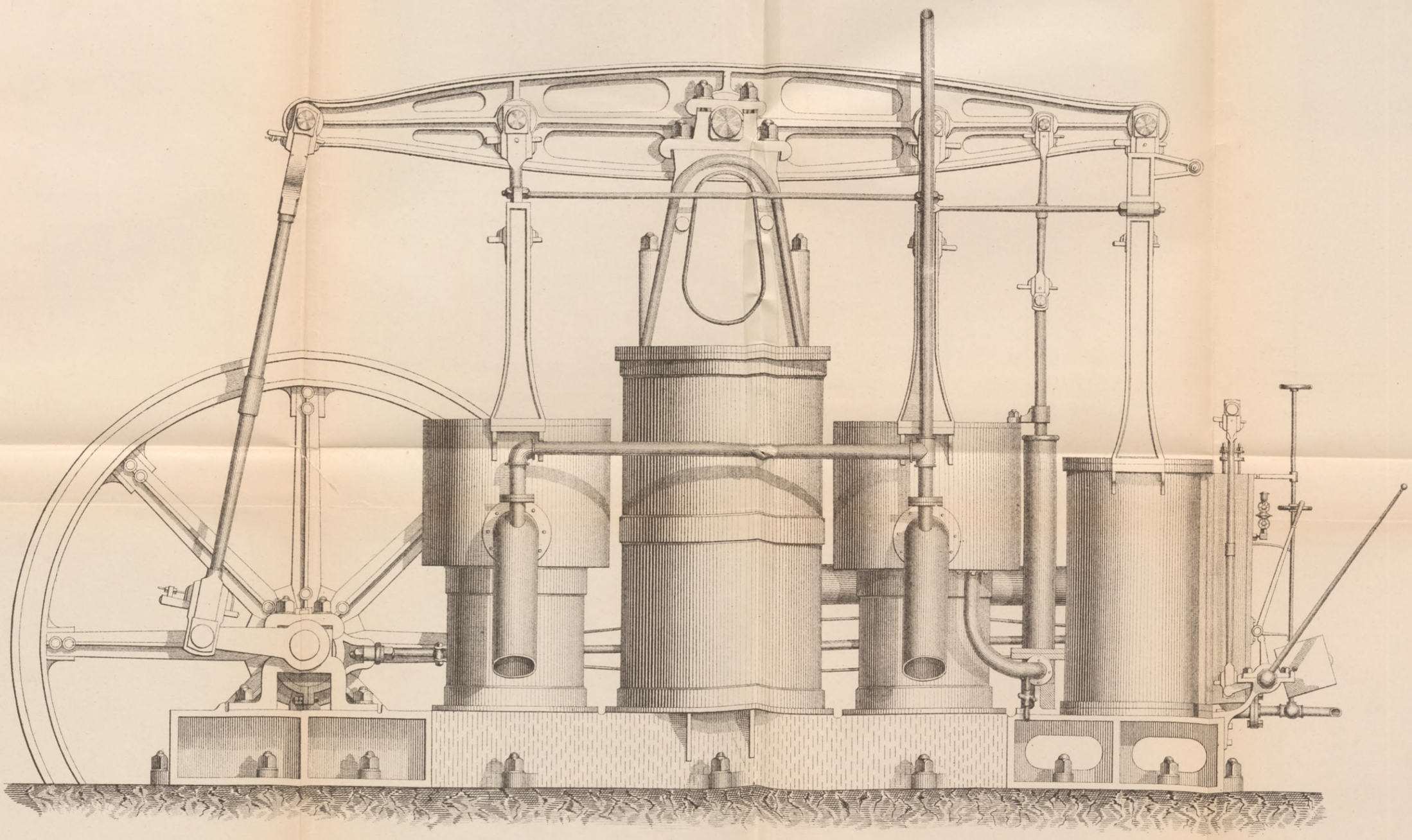
DRAWN BY W. A. PENDRY.

Scale ¼ in = 1 foot.

Dimensions:

Diam: of Cylinder 60 in: Stroke 96 in.
Diam: of Pump 38 " " 48 "
Capacity 16 to 18,000,000 Galls. per 24 hours against head of 100 feet.

The Calvert Lith. Co. Detroit.



AUXILIARY ENGINE

FOR WORKING AIR AND FEED PUMPS OF LARGE PUMPING ENGINE

DETROIT WATER WORKS

Designed by I. E. Edwards. Constructed by the "Dry Dock Engine Works" Detroit, 1871.

Scale ½ in. = 1 Foot.

DRAWN BY W. A. PENDRY. DETROIT.

Diam. of Steam Cylinder 26 in.
" " Air Pump 30 "

Stroke of Steam Cylinder 4 feet.
" " Air Pump 2 "

The Calvert Lith. Co. Detroit.

REPORT OF THE ENGINEER.

ENGINE HOUSE, DETROIT WATER WORKS,
31st December, 1871.

To the Honorable Board of Water Commissioners:

Gentlemen,—The undersigned, in accordance with the requirements of tne ordinance, respectfully submits the following statement of all matters pertaining to this department, showing the condition of the engines and pumps, with the duty performed for the year ending this date. The following table will show the operations of each engine for each month during the year.

ENGINE NO. 1.

1871. MONTH.	Time run.	Number of Revolutions.	Number of Gallons.	Cords of wood Consumed.	Cost of wood Consumed.	Pounds of coal Consumed.	Cost of coal Consumed.	Total cost in wood and coal together.
	h. m.						$	
January	38 25	38,188	7,097,621	16¼	$61 84	.....	.....	.....
February	50 05	51,440	9,560,638	15½	60 99	6,258	24 24	.....
March	82 25	68,466	16,070,942	.....	.....	41,828	162 07	.....
April	115 20	118,019	21,935,011	40½	118 94	12,500	48 73	.....
June	44 40	46,135	8,574,651	18	56 15	.....	.....	.....
November	216 25	231,582	46 547,982	110¼	324 46	.....	.....	.....
December	93 20	94,963	19,087,563	31	92 69	10,105	35 36	.....
Total	640 40	648,793	128,874,408	231½	$715 07	70,691	$270 40	$985 47

ENGINE NO. 2.

1871. MONTH.	Time run.	Number of Revolutions.	Number of Gallons.	Cords of wood Consumed.	Cost of wood Consumed.	Pounds of coal Consumed.	Cost of coal Consumed.	Total cost in wood and coal together.
	h m.							
January.....	678 55	453,642	157,146,125	. ....	$.....	236,200	$930 85	.....
February.....	582 15	399,858	238,514,809	¼	1 87	381,342	1,432 21	.....
March	582 55	384,002	133,022,132	1	3 87	352,173	1,366 83	.....
April.....	546 35	359,922	124,680,580	240	650 13	43,100	167 01	.....
May.....	705 45	486,270	168,448,790	355½	1,070 38	.....	.....	.....
June.....	269 40	197,596	68,449,230	129¼	438 70	.....	.....	.....
November....	508 45	351,060	121,264,631	287¼	845 28	.....	.....	.....
December....	668 30	448,835	169.421,730	278½	832 69	89,694	313 94	.....
Total.....	4,543 20	3,080,186	1,180,948,027	1272	$3,842 92	1,102,509	$4,210 84	$8,053 76

ENGINE NO. 3.

June.....	288 50	124,968	116,220,240	234	$689 30	.....	.....	.....
July	541 35	26,403	210,554,790	453¼	1,324 49	.....	.....	.....
August	588 00	247,327	230,014.110	462	1,318 34	.....	.....	.....
September...	574 10	234,735	218,303,550	440	1,229 85	.....	.....	.....
October.....	584 50	231,436	215,235,480	380	1,079 86	.....	.....	.....
Total	2,576 35	864,869	990,328,170	1969¾	$5,641 84	.....	.....	.....

THE WORKING OF THE THREE ENGINES ADDED TOGETHER.

January.....	717 20	491.830	164,243,746	16¼	$61 84	236,200	$930 85	$992 69
February.....	632 20	451,298	248,075,447	16	62 86	387,600	1,456 45	1,519 31
March.....	665 20	452,468	149 093,074	1	3 87	394.001	1,528 90	1,532 77
April.....	661 55	477,941	146,615.591	280½	769 07	55,600	215 74	984 81
May.....	705 45	486,270	168,448,790	335½	1,070 38	.....	.....	1,070 38
June.....	314 20	363,699	193,244,121	381¼	1,184 15	.....	.....	1,184 15
July.....	541 35	26,403	210.554,790	453¼	1,324 49	.....	.....	1,324 48
August.....	588 00	247,327	230,014.110	462	1,318 34	.....	.....	1,318 34
September ...	574 10	234,735	218,303,550	440	1,229 85	.....	.....	1,229 85
October	584 50	231,436	215,235,480	380	1,079 86	.....	.....	1.079 86
November....	725 10	581,643	167,812.613	397½	1,169 74	.....	.....	1,169 74
December....	761 50	543,798	188,509,293	309½	925 38	99,799	349 30	1,274 68
Total.....	7,760 35	4,593,848	2,309,150,605	3472¾	$10,199 83	1,173,200	$4,481 24	$14,681 06

INVENTORY OF FUEL, &c., ON HAND, 1st JAN., 1871.

Wood	284 cords	$834.96
Coal	726 $\frac{10}{100}$ tons	5,630.37
Lard Oil	12 gallons	7.20
Petroleum Oil	207 gallons	124.20
Engine Rags	394 lbs.	35.46
		$6,632.19

PURCHASES FOR 1871.

Wood	4292¼ cords,	costing	$13,890.81
Coal	304 tons	"	2,356.00
Lard Oil	507 gallons	"	345.11
Engine Rags	538 lbs.		43.04
		Total cost of purchases	$16,634.96

CONSUMPTION FOR 1871.

Wood	3517¼ cords,	cost	$10,331.83
Coal	586 $\frac{12}{100}$ tons	"	4,481.24
Lard Oil	370 gallons	"	251.60
Petroleum Oil	204 gallons	"	91.80
Engine Rags	887 lbs.	"	70.96
			$15,227.43

INVENTORY OF FUEL, &c., ON HAND 31ST DEC., 1871.

Wood	1109 cords	$4,436.00
Coal	443 $\frac{19}{100}$ tons	3,331.70
Lard Oil	149 gallons	110.26
Petroleum Oil	3 gallons	1.86
Engine Rags	45 lbs.	3.60
		$7,883.42

WOOD PIPE BORING SHOP.

This engine has run 69 days. There has been sawed, bored, reamed and banded 5296 wooden pipes, each eight feet long. Wood consumed, 34 cords, cost $93.50. Oil consumed, 34½ gallons, cost $34.50. Engine rags, 10 lbs., cost 80c.

TESTING AND WEIGHING.

There has been tested and weighed 137 eight-inch iron pipes, 190 six-inch, and 305 four-inch.

There was delivered to the Superintendent of Extensions and Repairs about ten cords of soft wood, cost $27.50.

RESERVOIRS.

Were thoroughly cleaned during the summer, and they are now in as good condition as they can be. The house of the reservoir-keeper will require some repairs the coming Spring.

OLD ENGINES.

I stated in my last Annual Report that considerable repairs were necessary to be made to both the old engines. Engine No. 1 (or the one built by the Detroit Locomotive Works) had the piston faced, a new set of packing rings, pump bored out, and a new plunger for same. The piston of engine No. 2 (or that built by Jackson & Wiley) was badly fractured. It has been taken out and a new one put in its place. Both engines are now in good working order.

INLET PIPE.

The pipe was extended into the river 160 feet the past summer, for the purpose of avoiding any and all the shore wash. The pipe is now extended 290 feet from our dock; and I am gratified in being able to state that the water is pure and free from all shore matter. The holes in the strainer were made larger (from ½ inch to ¾ inch), and two additional pieces of strainers were put on the out-end of the pipe, one leading up the river and the other down the river,—each 20 feet in length and perforated with ¾ inch holes on the upper half of the circle.

This addition to the strainer was for the purpose of removing the accumulation of ice on the strainer in the winter; but, I am sorry to say, that this has not been wholly accom-

plished. At the same time, I find a very great improvement from what it was in previous winters; and there has been no time this winter but the engine could run at a slow speed.

The additional pieces of inlet-pipe were made by J. & T. McGregor, boiler makers, and were placed in position by John Quinn, submarine diver, who exhibited much skill and good judgment in doing the work.

FORCE MAIN.

I would respectfully recommend to the Board an additional force main, as the want of it is much felt from the inadequate size of the present one, when the large engine is at work or when the two old engines are working together, (as they will have to do when the large engine is at rest). Much complaint is made for want of a supply of water by those persons who live in the higher parts of the city, and which is owing to a want of capacity in the distributing pipes. To correct which I would recommend an additional force main laid from the engine house down through the center of the city, to be connected with all the distributing pipes it would meet. This would give from 10 to 15 feet better head, and at the same time lessen the friction on the pumps and increase the duty of the pumping engines.

BOILER AND BOILER HOUSE.

The boiler purchased from J. & J. Brennan in 1865 (to replace the small tubular boiler) is gradually giving out, as considerable repairs were made to it the past year. (The boiler was built in 1855, and used as a marine boiler before being purchased by the Board.) I would therefore respectfully recommend the providing an additional boiler. I am sorry to say the boiler house is so limited in length no well

proportioned boiler for generating steam with economy can be put in and leave space enough for the fire-room, as the house stands between the old engine house and the base of the chimney. There is no room for improvement, which compels us to adapt the boiler to the space we have.

NEW ENGINE

Was started for trial and acceptance on the 29th day of March, and ran 5,011 revolutions. The speed of the engine was varied from 7 to 13 revolutions per minute. It was evident to all concerned that the engine in all its parts ran steadily and smoothly. After completing the alterations and repairs that were necessary to the engine house, the engine was started for duty on the 9th of June, and supplied the city with water to October 31st without any interruption. The annexed table will show that during that time the engine pumped 990,328,170 gallons of water, at a cost of $5,641.84, or, in other words, 1,755 $\frac{33}{100}$ gallons for one cent cost of fuel. (The other two engines have pumped 1,309,822,435 gallons at a cost of $9,039.23, or 1,449 gallons for one cent cost of fuel), showing 306 gallons in favor of new engine. As soft wood was burnt for fuel through all the summer months, and differs much in quality and lengths, I cannot accurately estimate how much of this wood would be equivalent to one ton of coal, but the coming month of January we shall be burning Lackawanna coal and I shall be able to ascertain the duty of the engine; but the duty developed by pumping engines depends in a great measure upon the efficiency of boilers, and the boilers at these Works having been made for wood fuel, and with the small area of the present force main a very high duty cannot therefore be expected when burning coal.

I would here say that much credit is due the "Dry Dock Engine Works" for a liberal construction of the specifications, and also Mr. James Morrison, for the skill he exhibited in erecting the engine.

AUXILIARY ENGINE FOR AIR PUMP.

It was necessary in arranging the plan for the new engine to adapt the engine to an unoccupied building then on hand, and want of room compelled the adoption of an auxiliary. Since the engine has been at work I find this arrangement to be very economical, and much more convenient than the ordinary way; the pump well and also the receiving well in the yard being emptied and cleaned out in a very short time.

The following table will show the number of U. S. standard gallons of water distributed daily for eleven years ending 31st December, 1871, with the yearly distribution and increase for same period:

YEAR.	AVERAGE DAILY DISTRIBUTION.	YEARLY DISTRIBUTION.	YEARLY INCREASE.
1861	2,479,807	895,129,423	.....
1862	2,725,878	994,945,329	99,815,906
1863	2,837,803	1,035,798,043	40,852,714
1864	2,839,078	1,036,263,432	465,389
1865	2,875,384	1,049,514,887	251,455
1866	3,277,484	1,196.317,922	146,803,035
1867	3,905,576	1,425,535,230	229,217,308
1868	4,565,877	1,666,545,125	241,009,895
1869	4,511,809	1,646,810,325	* 19,734,800
1870	5,112,494	1,866.060,068	219,249,743
1871	6,301,783	2,300,150,605	‡ 434,090,537

* In 1869, it will be seen, the distribution was less than in 1868, owing to the very wet season.

‡ The great increase shown in 1871 was owing to the great drouth we had during the summer months, the demands at times being over eight million gallons daily.

From the above table it will be seen that in three years the two old engines will be required to work together to their full capacity, which will be ten million gallons in twenty-four hours, consequently they cannot be relied on beyond that time for a reserve power in case of accident to the large engine. In view of this fact I beg to call the attention of your Board to the limited ground in connection with the Works now under your control, and which is the more necessary as, by the growth of the city, the employment of the property immediately adjacent to our Works subjects us to greatly increased risk from fire.

All of which is respectfully submitted,

JOHN E. EDWARDS,
Engineer.