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REPORT

OF THE

Newark Aqueduct Board

FOR THE

YEAR ENDING DECEMBER 1, 1875.



Newark, N. J.:

PRINTED AT THE OFFICE OF THE DAILY JOURNAL.

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Office of Newark Aqueduct Board,

JANUARY 5TH, 1876.

The accompanying Report was this day submitted, accepted, ordered printed and sent to the Common Council as the Report of the Board for the year ending December 1st, 1875.

T. F. BALDWIN,

Secretary

R E P O R T.

To the Newark Aqueduct Board :

GENTLEMEN.—The following report of the condition and operation of the Water Works for the past year is submitted.

The work of the pumping engines, a detailed statement of which is herewith given, was as follows :

Time of working engines, 7,807 hours, 21 minutes.

Gallons of water pumped, 1,947,776,390.

Tons of coal consumed, 2,391⁶⁵.

Highest daily consumption, 6,200,800 gallons.

Lowest daily consumption, 4,379,389 gallons.

Average daily consumption, 5,471,283 gallons.

The cost of raising water per million gallons was \$12.89.

Cost per million gallons raised one hundred feet, \$7.32.

Cost per thousand gallons delivered in reservoir, .01³⁸⁹/₁₀₀₀ cents.

Engine No. 3 was completed and started pumping March 25th. This engine is of the compound duplex form, and similar to the first two, but of larger dimensions. It has high pressure cylinders, 29 inches, and low pressure, 52 inches diameter; plunger 28 inches in diameter and 50 inches stroke. It will deliver at forty-five strokes per minute eight million gallons in twenty-four hours, and may easily be run at fifty strokes, increasing its capacity to nine million gallons. With the three engines we have capacity for raising, in an emergency, twenty million gallons per day.

During the months of April and May engine No. 2 was thoroughly overhauled, and the whole pumping machinery

is now in excellent condition, and reflects credit on the engineer in charge.

The amount charged to repairs and improvement of pumping engines (see Statement B) is \$1,018.19. This includes cost of repairs and reconstruction of feed pump and removal of the same from fire room to engine room, new grate bars and repairs to furnaces and boiler settings. All the needed repairs and work on the engines have been done by the regular force at the engine house.

The engine house and buildings occupied by the employes have been painted, and the ordinary labor has been bestowed on the grounds around the buildings necessary to give the whole a neat appearance.

The work of setting a check valve for No. 2 engine was done in October. This was a work of considerable difficulty, on account of the contracted space in which it sets, the trouble from water and the necessity of suspending pumping entirely while it was being done. It was skillfully managed by Mr. Richardson.

The only work required at the Receiving Reservoir was the repointing of the parapet wall, and replacing a part of the exterior sodding on the east side, which slipped in consequence of the unusually heavy rains during the Summer. The labor that has been bestowed on the grounds around this reservoir, as well as those in the vicinity of the engine house, has rendered those portions of the work very attractive, and our citizens can find in this neighborhood no more agreeable resort.

On the line of the supply main, the only work of any consequence was the removal of a cracked twenty-four inch pipe on Belleville avenue, near the junction of Bloomfield avenue.

The decision of the Referee in the matter of repairs of low service reservoir was rendered in May, in favor of the contractor, Mr. Sanford. In accordance with this, the Board

have settled for work done, and decided to continue the work of repair on the plan of removing all the material of the bottom down to the rock. The contract for this work was awarded to Messrs. D. W. Crane & Co., who are now engaged upon it. Very little of this work can be done during the Winter, and it is consequently nearly suspended at the present time.

The High Service Engine House, a handsome and substantial structure of brick and stone, is nearly completed, and the work of setting up the permanent engine for this service is ready to be commenced. The water from the supply main is discharged into a well in the engine house, from which the engine draws it, and the surplus discharges through an overflow pipe into the pipes of the lower level, or into the low service reservoir when it is completed. The overflow of the pump well is 114 feet above tide water. The feed pipe discharges under a head of 50 feet. The high water level of the high service reservoir is 225 feet above tide water.

The engine is designed to deliver the water thirty-five feet higher than this; either over the top of a stand-pipe of this height or through a contracted opening which will accumulate the pressure on the pipes to an equivalent amount.

. On the morning of the 20th of November a leak was discovered in the north bank of the high service reservoir, directly over the influent pipe. The water was drawn down about ten feet, at which depth the leak entirely ceased, and it has since been kept at this level. The approach of Winter rendered it imprudent to undertake the examination and repair of the leak. The same pressure is maintained on the pipes of the upper level, as with the full reservoir, by partially closing the gate on the influent pipe. This will be understood by an explanation of the mode of supplying this level. The main from

the high service pumping engine passes through Norfolk street and South Orange avenue, and enters the high service reservoir near the N. E. corner. The same pipe continues along South Orange avenue and enters through the gate house at the N. W. corner. The pipe entering at the N. E. corner has a check valve opening inwards, whilst the other has one opening outwards, so that the water can enter the reservoir only through the former, and be drawn from it only through the latter. The main, before it reaches the reservoir, gives off its branches for the streets of this level, by which the whole level is supplied, and only the surplus reaches the reservoir, to be drawn from it when the pumps are not at work.

If this surplus is passed into the reservoir through the gate wide open, the pumps will work against the pressure due to the height of water in the reservoir, but by contracting or throttling this opening the pressure may be increased to any amount consistent with safety of working. If it is desired to obtain a head of 35 feet above the high water level of the reservoir, we have only to contract the opening to such an amount that it will require a head of 35 feet to pass the surplus water through the given opening. This additional head will be effective whilst the pumps are running, but will fall immediately when the pumping ceases, and the supply will then be derived from the reservoir.

The statement appended marked B, shows the amount of pipes laid during the year to be 44,986 feet, making the whole amount connected with the works 122 miles 3,831 feet.

Considerable pipe has been laid in place of small and old pipe taken up or abandoned, of which the amount is 5,367 feet.

The number of fire hydrants set during the year is 91 ; of taps for services inserted, 784.

Nearly all of the old pipe of three inches diameter and

under has now been replaced by larger pipes with fire hydrants attached, the effect of which is very apparent in the increased efficiency of the fire service, and the improved quality of water.

It has been found necessary this year as in years past, to lay a considerable quantity of pipe in sections of the city sparsely populated, and which yield but a small income on the outlay, but which, nevertheless, are entitled to proper protection against fire. For this reason, under our present system of collecting water rents from property only which uses water, our income is inadequate to meet the interest on the bonds and pay the running expenses. The Board have in former years, been satisfied of the justice and propriety of assessing all property in front of which pipes are laid, and collecting the tax from this office, as a proper part of their revenue from the works. The legislative enactment to this end was never enforced, but was repealed the year after its passage. The necessity of providing for this deficiency has imposed on the Common Council the duty of adding in the tax levy an amount sufficient to cover it, which under the proposed law would have been collected as a direct water tax.

The present law requires the amount of deficiency tax to be paid to this Board on or before the first day of October in each year. The practice has been to pay the amount as collected, which has fallen short of the amount required, and there is now due for this and previous years \$79,292.59.

The amount received from water rents for the year was \$133,874.41, an increase of 8,457.22 over the previous year, or $6\frac{74}{100}$ per cent., whilst the increased consumption was $11\frac{52}{100}$ per cent. A part of the increased consumption was doubtless due to the thorough system of flushing the pipes which has been practiced during the year.

The system of measuring water through meters has enabled us to fix rates in many cases where it was impossible

to make any reliable estimate of the quantity consumed, and has in many instances served to indicate the use or waste of large quantities when it could hardly have been needed or expected. It may be safely said that the investment for meters is one that pays, in yielding an increase of revenue, in detecting waste, and in the equitable adjustment of water rents which can be made in no other way. What is needed is the more extended application of the system.

The unprecedented cold of last winter was the cause of considerable trouble to the works by the freezing up of street mains. The statement appended shows those thus affected. The total length of pipe relaid for this cause was 3,927 feet. The pipes laid during the past year have been put at a greater depth than heretofore, being covered four and a half feet, and in tapping for services, all pipes less than four and a half feet deep are tapped on the side. Many hydrants were frozen up and it was only by the utmost and watchfulness that they could be kept in a condition for service.

The quality of the water during the year has been excellent, and there has been but little cause of complaint; certainly less than in many cities whose sources of supply are considered more pure than ours.

The chemical analysis of the water of the Passaic River shows it to be fully equal to many waters in good repute, and it has been "classed among the eminently good and potable waters." The increase of population along the banks of the river above and below our pumping works, by the increase of sewerage pollution tends to deteriorate the quality of the water, which every means should be taken to guard against.

The practice of discharging the sewerage of Newark directly into the river, and especially above the mouth of Branch Brook should be discontinued, and the sewers should

either be discharged into settling basins or their outlets carried further down the river.

As a necessary condition of good healthy water is good aeration, some means may be adopted to secure this. During the greater part of the year, the water is clear and free from impurities, but in the Summer season when the water absorbs but about half the oxygen that it does in Winter, the decay of impurities gives the unpleasant taste and smell of which complaint is made.

“Putrefaction once begun, goes on without oxygen, and it is the office of oxygen to attack and destroy the offensive and poisonous products by converting them into carbonic acid, water and nitric acid.”

Professor Wurtz in his report on the condition of the Passaic river water, made in 1873, after considering the advantages of proper aeration suggests “that if means were adopted to keep the water in one of your reservoirs in a condition of gentle agitation, or rather intestinal motion, in every part, so as continually to turn up new surfaces to the air, the absorption of oxygen would be enormously promoted. To support this, he says that “water taken from the reservoir was found to absorb oxygen from the air in twelve hours to the depth of 4.75 inches, and in twenty-four hours to the depth of but 7.5 inches. After this, the absorption was very slow, and in two days was almost imperceptible.”

If this suggestion is of practical value, as it seems to be, may not the same end be accomplished in our case, by conducting a supply of air into and through the water as it flows to the pumps? Some such means as the following may be adopted. A pipe may be laid from the point where the water flows from the basins to the pump well, and connected with a pump suitable for forcing a supply of air. The pipe to be carried down near to the bottom of the basins, and the air supplied by the pump to escape from

the perforated end ; and rising in bubbles to the surface, all the water flowing to the pumps would be brought in contact with it. The experiment would be inexpensive and promises good results.

The receipts for the past year from all sources were \$619,308.46, expenditures, \$504,742.15, the details of which are shown in the statement annexed. The whole amount of bonds outstanding is \$2,976,000, of which amount \$180,000 falls due on the first of February next. Of the amount authorized by the Legislature \$194,000 remains to be issued. There is to the credit of the Sinking Fund, \$107,213.64, of which \$100,000 is invested in Bonds.

Respectfully submitted,

G. H. BAILEY, Engineer.

J. B. WARD, Superintendent.

December 1st, 1875.

STATEMENT A

STATEMENT OF WORK OF PUMPING ENGINES FOR THE YEAR ENDING DECEMBER 1st, 1875.

MONTHS.	NO. 1 ENGINE.	NO. 2 ENGINE.	NO. 3 ENGINE.	NUMBER OF STROKES NOS. 1 AND 2 ENGINES.	NUMBER OF STROKES NO. 3 ENGINE.	COAL PUMPING.	COAL BANKING.	ASHES.	TOTAL GALLONS.
	H. M.	H. M.	H. M.						
December.....	181.25	486.11		1,805,093		361,829	32,520	53,845	135,761,044
January.....	354.20	365.55		2,009,832		388,315	40,126	59,162	151,160,564
February.....	595.20	139.30		2,106,284		412,594	32,077	68,333	158,413,620
March.....	623.50	119.00	32.05	2,046,262	9,086	432,608	47,070	66,601	165,181,451
April.....	237.05		294.18	671,735	800,752	384,307	41,792	57,351	152,304,776
May.....	438.02		168.25	1,240,510	441,776	382,538	27,714	50,316	149,455,774
June.....	94.35	36.00	412.30	359,232	1,122,936	393,691	43,198	53,025	169,754,232
July.....	69.35	181.25	387.50	685,275	1,002,558	428,992	48,106	60,628	178,974,679
August.....		112.50	435.00	365,288	1,185,884	404,207	37,653	55,466	178,211,025
September.....	57.50	468.30	199.55	1,531,556	557,278	447,062	19,206	62,158	186,023,932
October.....	77.15	509.03	104.55	1,694,126	303,848	405,016	32,126	58,674	166,037,335
November.....		531.30	93.12	1,579,992	296,332	495,285	19,286	56,108	156,497,958
Totals.....	2,729.17	2,949.54	2,128.10	15,809,223	5,720,450	4,936,444	420,856	701,667	1,947,776,390

Largest daily consumption (September), 6,200,798 gallons.

Smallest daily consumption (December), 4,379,388 gallons.

Average daily consumption during the year, 5,471,283 gallons.

STATEMENT B.

PIPES LAID IN 1875.

STREETS.	FEET.	DIAM.	STOPS.	HYDTS.
Wilbur's Alley.....	175	3 in.	1	
Hamburg place, from Berlin street east.....	1800	4 in.	2	3
Eighth avenue, west of Fehleisen's brewery.....	450	4 in.	1	2
Cabinet, from Norfolk street to Wallace place.....	445	4 in.	1	1
Plum, from Washington to Plane.....	417	4 in.	1	
Willow, from Washington to Plane.....	334	4 in.	2	
Chapel court, from William to Pearl, Pearl to Halsey	514	4 in.	2	1
Nicholson, from William to Augusta.....	392	4 in.	1	1
East Kinney, east N. J. R. R.....	450	4 in.	2	1
Union, from Ferry to Market.....	404	6 in.	2	
Congress, from Ferry to Market.....	724	6 in.	2	2
Monroe, from Elm to Market.....	2152	6 in.	8	5
Chambers, from Ferry to Market.....	950	6 in.	2	2
Frederick, from Ferry to Market.....	810	6 in.	2	2
Alyea, from Ferry to Paterson.....	560	6 in.	2	1
Niagara, from Elizabeth to Berlin.....	1736	6 in.	3	1
Magazine, from Berlin to Ferry.....	2125	6 in.	4	4
Barbara, from Niagara to Magazine.....	776	6 in.	3	2
Berlin, from Magazine to Hamburg place.....	1509	6 in.	4	3
Kossuth, from Magazine to Hamburg place.....	1519	6 in.	4	3
Houston, from Hamburg place to Elm road.....	1620	6 in.	4	4
Elm road, from Houston to Oliver.....	243	6 in.		1
Oliver, from Elm road to Jefferson.....	2517	6 in.	8	4
Napoleon, from Hamburg place to Elm road.....	1573	6 in.	4	4
Elm, from Adams to Lang street and Hamburg pl..	2080	6 in.	3	4
Sixth avenue, from Stone to Cutler.....	371	5 in.	1	2
Dickerson, from Norfolk to Actien.....	487	6 in.	2	2
Taylor, from Summer avenue to Garside.....	415	6 in.	2	1
Garside, from Taylor to Karney.....	275	6 in.		
Wallace, from South Orange avenue to Bank.....	1221	6 in.	3	3
Monmouth, from Waverly place to Spruce.....	822	6 in.	2	1
Myrtle avenue, from Sussex avenue to Orange.....	791	6 in.		1
Court, from High to Lincoln.....	397	6 in.		1
Court, from West to Belmont avenue.....	1343	6 in.	3	
Camden, from Warren to Cabinet.....	770	6 in.	2	2
Bergen, from Court to South Orange avenue.....	1157	6 in.	1	1
Charlton, from Kinney south.....	803	6 in.	3	1
Charlton, from Waverly place to Avon avenue.....	1145	6 in.	3	3
Magnolia, from Springfield avenue to Spruce.....	910	6 in.	2	2
Spruce, from Magnolia to Waverly place.....	365	6 in.		
Second av., from Mt. Prospect av. to Wakeman av.	840	6 in.	1	2
Komorn, from Magazine to Main.....	261	6 in.		
Ninth st., from 6th ave. through 5th. to Roseville av.	907	6 in.	3	1
Seventeenth street, from 18th to 19th avenue.....	576	6 in.	1	1
Central avenue, from Newark to Jay.....	481	6 in.	2	2
Central avenue, from Burnet to High.....	250	6 in.		
Avon avenue, from Charlton to Quinton.....	300	6 in.		
N. J. R. R. ave., from R. R. place to East Kinney...	225	6 in.	2	1
Plank road, from junction of Bowery and Ferry, east	3389	6 in.	1	3
" " " " " " " " " "	210	4 in.		

STATEMENT C.

PIPES RELAID TO REPLACE SMALLER ONES.

STREETS.	FEET.	DIAMETER.	STOPS.	HYDRANTS.
Court, from Broad to Plane.....	1087	10 in	2	1
Nevada, from Court south.....	31	6 in.	1	1
William, from Broad to Washington.....	880	6 in.	3	4
New, from Broad to Washington.....	801	6 in.	4	2
Orchard, from Walnut to Kinney.....	719	4 in.	1	
Park, from Mulberry to Cherry.....	465	4 in.	1	
Cross, from Broad to R. R. roundhouse.....	387	4 in.		
Clinton, from Mulberry to Lawrence..	352	4 in.	1	
Division place, from Park to Centre.....	645	4 in.	2	1

STATEMENT D.

PIPES RELAID ON ACCOUNT OF BEING FROZEN AND BURSTED.

STREETS.	3 IN.	4 IN.	6 IN.
Spruce, west of Washington (Hydrant)		400	
Kinney, from Broad to Orchard.....		383	
Alley in Kinney street.....	300		
Astor, east of Pennsylvania avenue.....		600	
Murray.....		60	
Wright.....		24	
Cottage.....		216	
Walnut, between Mulberry and railroad (stop).....		240	
Cherry.....		132	
Bleecker.....		120	
Academy, between Plane and High.....		24	
Academy, between Halsey and Washington.....		192	
Walnut, between Mulberry and Broad..	60		
Rector.....		228	
Bowery, west of Freeman.....			96
Eighth avenue.....		84	
Bridge, between Atlantic and South Bridge.....	36		
Mulberry, north of Park.....			96
South Canal, west of River.....		96	
Elizabeth, between Niagara and Hamburg place.....		240	
Mechanic, between Lawrence and Ward.....		48	
Hamilton, between Liberty and Ward.	36		
Market, between Fillmore and Frederick..			24
Union.....			96
Newark street bridge.....			48
Sussex avenue bridge.....			48

STATEMENT E.

RECEIPTS AND EXPENDITURES FOR YEAR ENDING DEC. 1, 1875.

ACCOUNTS.	RECEIPTS.	EXPENDITURES.
Cash Deficiency Dec. 1, 1874.		\$5,392 48
Water Rents.....	\$133,874 41	
Bonds.....	396,000 00	
Interest and Premium on Bonds.....	16,313 42	206,510 60
Special Tax.....	59,146 56	
Services.....	4,878 86	3,232 33
Received from City for Fire Hydrants,.....	8,000 00	
Real Estate and House Rents.....	1,085 21	6,083 17
Fuel account, overpaid freight refunded....	10 00	
Iron Pipes.....		38,944 65
Labor Pipe Laying.....		17,235 83
Street Mains, Tools and Materials.....		4,966 99
Fuel.....		20,192 35
Fuel High Service.....		5,597 49
Engineers and Firemen's Wages.....		7,870 62
" " " High service.....		1,927 66
Engine Stores.....		1,194 92
" " High Service.....		293 93
Pump Main.....		916 54
Repairs and Improvements to Receiving) Reservoir.....)		496 20
Engineers' and Firemen's Dwellings.....		316 00
Repairs and Improvements to High Ser-) vice Engine.....)		200 81
Repairs and improvements to Engine) House.....)		1,621 52
Repairs and Improvements at Passaic) River.....)		957 58
Repairs Street Mains.....		5,081 44
Repairs to Hydrants.....		1,352 50
Stopcocks and Hydrants.....		10,871 69
Engine No. 3.....		39,913 79
Water Meters.....		491 91
Expense.....		23,109 54
Repairs and Improvements to Engine) and Boilers.....)		1,018 19
Repairs and Improvements to High Ser-) vice Reservoir.....)		979 87
Fencing Lot High Service Reservoir.....		961 87
Low Service Reservoir.....		55,295 35
High Service Engine House.....		15,894 46
High Service Pumping Engine (new)		9,504 90
Sinking Fund. . .		16,315 00
Cash Balance Dec. 1, 1875.....		114,566 31
Total.....	\$619,308 46	\$619,308 46

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