

#14

REPORT

Albany Water Works OF THE

WATER COMMISSIONERS

TO THE

COMMON COUNCIL OF THE CITY OF ALBANY,

AND

THE REPORTS OF THE SUPERINTENDENT
OF THE WATER-WORKS

AND

ENGINEER-IN-CHIEF OF STEAM POWER,

FOR THE YEAR 1886.



ALBANY:
THE ARGUS COMPANY, PRINTERS,
1887.

REPORT OF THE WATER COMMISSIONERS.

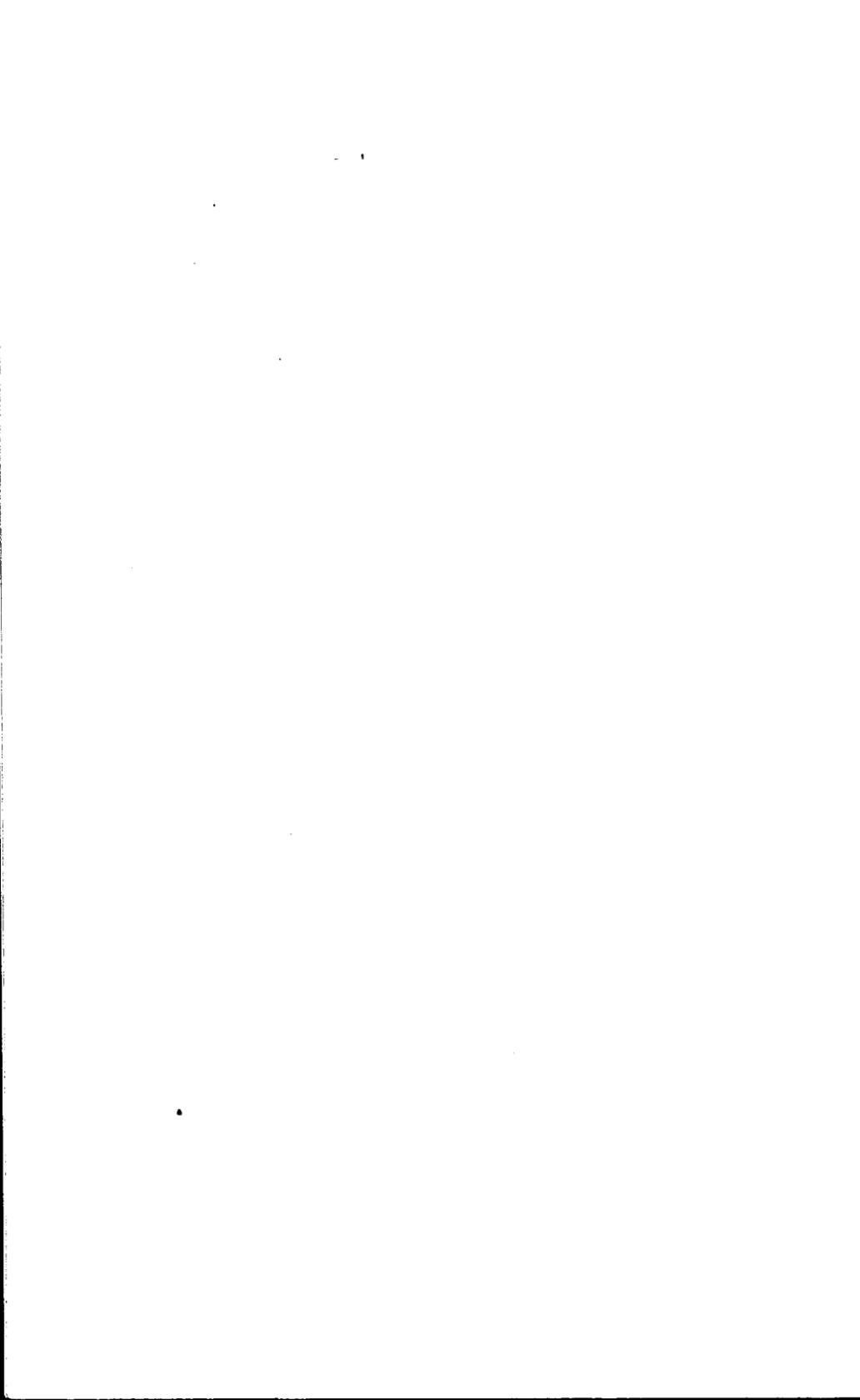
WATER COMMISSIONERS' OFFICE, }
ALBANY, *February 5, 1887.* }

*To the Honorable the Common Council
of the City of Albany :*

The annual reports of George W. Carpenter, Superintendent, and John H. Mars, Engineer of the Pumping Department of the City Water-Works, have been received and approved by the Board, and are herewith submitted.

The report of the Superintendent, besides being a full exhibit of the details of the water-works system, contains many valuable statistics of interest to the public.

Tivoli Lake, although at present under the ban, and condemned, as it were, is, in the absence of any other supply, indispensable ; it furnishes over a quarter of the city's supply, and the pumping engines are unable to pump the balance. The contemplated improvements and provision for the renovation of this lake, and its drainage, were stopped by the Driven Well Law, of 1885. The question of entirely abandoning a gravity supply of four or five million of gallons daily, which competent and disinterested authorities claim can be purified, is a grave one, of interest to the taxpayer, and should not be lightly passed upon.



In any case, or with any water supply, or with any new reservoir or lake, constructed to take the place of this, provision must be made for the storage of water from Patroon's Creek; otherwise, the lower service, east of Pearl street, will be exposed to a deficiency of head, in case of fires, a scanty service, and water famines.

It will also be noticed, the city has not increased its water supply proportionately with increase of population.

The waste of water, and its remedy, is a problem affecting greatly the water supply, and worrying the water boards of all cities.

Waste should enter into the calculation of quantity needed, as much as legitimate use. Water meters in tenement houses, and rigid economy in the use of water, affect the public health, to which an abundance, and unlimited supply and a frequent flushing of drains is essential.

The report of the Engineer gives detailed statements of the eleventh annual report of the river pumping engines, supplying Bleecker Reservoir, and the ninth annual report of the high service pumping engines.

The number of days of continuous service of the engines, the improved boilers now in use at the lower works, and the saving of coal by the use of the filters of the Albany Steam Trap Company, will command especial attention.

The increase of pumping at the Prospect Hill Reservoir, since the commencement of the upper service, in 1878, is about 113 per cent.

As in last year's report, attention is now called to the fact that the consumption of water during the winter has exceeded the combined Tivoli Lake and pumping supply, and there is seldom over a week's reserve supply for the city in Rensselaer Lake, in case of accident to the pumping engines.

A statement of receipts and disbursements of the Water Commission, of the Water Debt Sinking Fund, and of an investment of the same, is hereto appended.

STATEMENT OF RECEIPTS AND DISBURSEMENTS,

From November 1, 1885, to November 1, 1886.

Balance on hand November, 1, 1885,.....	\$49,312 94	
Receipts, Nov. 1, 1885, to Nov. 1, 1886....	174,950 90	
Disbursements, Nov. 1, '85, to Nov. 1, '86.		\$163,760 03
Balance on hand, November 1, 1886.....		60,503 81
	<u>\$224,263 84</u>	<u>\$224,263 84</u>

RECEIPTS.

General water rents	\$120,420 04
Special rates.....	52,697 37
Sale of old material, rent of houses, etc.....	1,113 86
Interest on deposits.....	719 63
	<u>\$174,950 90</u>

DISBURSEMENTS.

Office expenses, including Superintendent, clerks, etc..	\$6,338 23
Bleecker reservoir, keeper, and running expenses.....	1,342 93
Tivoli lake, " "	745 15
Rensselaer lake, " "	963 75
Maezlandt Kill, incidental repairs.....	317 34
Stable and storehouse, hay, straw, etc.	869 95
Conduit repairs	88 25
Refunded water rents.....	252 63
Insurance and taxes	486 43

Printing and advertising	584	34
Regular employes	7,971	55
Incidental expenses, inspectors, watchmen, etc.....	5,859	07
Pipe, hydrants, stop-cocks, etc.....	3,406	80
Repairs, pipe, hydrants, stop-cocks, etc.....	1,601	06
Laying pipe, labor, lead, packing, etc.....	5,041	03
Supplemental reservoir, coal, employes, etc.....	9,487	35
New pumping engine, coal, employes, etc.....	37,477	43
Drafts of Special Water Commission.....	5,696	74
Interest on water debt.....	65,230	00
Annual contribution to sinking fund.....	10,000	00
		<u>\$163,760 03</u>

WATER DEBT SINKING FUND.

Cash on hand, November 1, 1885	\$32,988	84
Annual contribution.....	10,000	00
Interest on deposits.....	694	53
Interest on investments.....	300	00
Cash on deposit, November 1, 1886.....	<u>\$43,983</u>	<u>37</u>

INVESTMENT.

Water bonds, 6%, due 1893, Nos. 2 to 6, inclusive.....\$5,000 00

As recommended in the reports of the Water Commissioners, for many years, another and more powerful engine is necessary for the water supply, the old engine to be kept in reserve, or as an additional supply to the new engine, which supply will be necessary before many years, and at the present rate of increase, a service of twenty million gallons daily will be necessary.

A late statement to the Common Council, in reference to a new water law, follows; the law is not yet settled upon.

January 6, 1887.

*To the Honorable the Water Committee
of the Common Council, City of Albany :*

GENTLEMEN.—I have no wish to shirk any responsibility for advocating and being instrumental in having passed and signed by the Governor, the law of May 12, 1884. It was avowedly asked for and passed to enable the Water Commissioners to act independently of the Common Council, which had in 1880, 1881 and 1882, ignored, persistently, the recommendation of the Commissioners to duplicate the pumping works, and lay additional mains to render the service effectual in several sections of the city. It was also proposed in the use of the appropriation of \$400,000 to deepen Tivoli Lake and protect it from drainage and impurities, caused by the negligence of the Common Council for years in disregarding the warning and suggestions of City Surveyor Bingham, laid before them in 1873.

In September of that year, he notified that body that there was an immediate necessity for a sewer to protect the water in Tivoli Lake from contamination, and that no street drains could be laid in First, Second, Lumber, Colonie, Quail or Ontario streets, until such sewer was constructed.

Notwithstanding this, several of the above streets have been graded, and water mains laid therein, by direction of the Common Council, without any regard to Mr. Bingham's recommendations.

On February 3, 1873, Alderman Moore endeavored to pass a resolution in the Common Council for an inquiry into the matter, and an estimate of the cost of said proposed sewer, but on motion of Alderman Brumaghim, even this was laid on the table.

On the the 20th of June, 1881, the Common Council directed the Street Commissioner to lay a suitable drain to protect the Tivoli Lake Reservoir from the drainage of Second, and other streets.

Notwithstanding the objections of the Water Commissioner, the Second street drain was laid, but *no* suitable drain or sewer, to receive the drainage and protect the reservoir.

The law passed May 12, 1885, provides that the proposed driven well water supply is to be handed over to the old Board of Water Commissioners, when completed. This bill should not become a law, without a provision in it for increased pumping facilities to dispose of the new water supply, or another law should be passed

for that purpose. A law similar to the one of 1884, then recommended by the old Board of Water Commissioners, and which was superseded by the law of 1885, should be re-enacted.

The city of Albany is now dependent upon one old-fashioned engine, not of the most improved construction. It is an engine peculiarly liable to accident, being forced to work twenty-four hours daily, seven days in the week, and even when urged beyond its capacity, is unable, in certain conditions of the weather, to retain the water in the reservoirs at its proper level.

The law of 1884 was in effect repealed, when the new Water Commission was appointed, yet it is as much needed for the pumping of the new supply, as it would have been for the old. The new supply, to be effective, must provide for fifteen million gallons (15,000,000) a day. The existing supply is little more than ten million (10,000,000) and insufficient for even present demand, and yet the parties responsible for the law of 1885, only provide for the duplication of any parts of the old engine liable to break, a provision useless and impracticable, as is evident to any intelligent person, such contingency in properly cared machinery, being an unknown quantity.

The attention of the public, the board of underwriters, and of manufacturers, is particularly called to this condition of affairs. In the event of an accident to the present pumping engine, an inadequate engine at the best, for the work required of it, from one to two weeks water supply is all that can be depended on. An early discovery of a flaw in one of the connecting rods, almost a year ago, probably saved the engine from being converted into scrap iron, and the city from a water famine.

The amount of money asked for by the new Water Commission, in the proposed confirmatory law of 1886, will not insure a complete and efficient service, and the public should not be deceived in the matter. That Commission, even if successful in finding a sufficient supply of water, and such supply is lasting and potable, make no provision in the law for enlarging the pumping service, or for preventing the water from becoming stagnant where they deliver it. I will add they had knowledge of these facts before their bill was introduced.

As the law of 1885, creating the new Water Commission, suspended indefinitely, the improvement of the property purchased, and the construction of an engine then being built by order of the old Water Commission, by authority of the law of 1884, and as the

new Water Commission appear to consider their duty under the law of 1885 ended, if they deliver a supply of water to the old Commissioners, unless some further action is taken, how will the interests of the public be subserved? and on whom will be the responsibility for trouble in the future?

It is unnecessary and not intended now, to express any opinion as to the relative merits of any waters, or the judiciousness of any experiments. The question is simply one of additional pumping facilities, equally necessary for any supply of water, whether taken from the river, or elsewhere.

In view of the danger of a water famine, liable to occur at any time, and the vast injury to be apprehended, not only to the public health, but to manufacturing and business interests, and the risk also to property resulting from a scarcity of water, it is surely proper to try to arouse public attention and to make an effort to have adequate legislation.

A law is herewith submitted, enabling the Water Commissioners, under the law of 1884, to proceed with the improvements contemplated under that law. This can be incorporated in the law proposed by the new Water Commissioners, if deemed best by the Common Council.

The Water Commissioners respectfully recommend what is deemed for the interest and safety of the city, and ask such action by the Common Council, in its recommendations to the Legislature, as will result in unanimous and concerted action with the two Water Commissions; all acting only for the interests of the city may well work together. Yet the Legislature should be petitioned on the subject by the Board of Common Council. The Water Commissioners, being at all times an advisory board, when the results of experience or information is wanted, should not be placed in the position of being at variance with the authorities of the city, where all should only have one interest.

An estimate is herewith submitted. The engine was contracted for and property purchased for houses and coal sheds, before the law of 1885 was passed, and are claims against the city.

All of which is respectfully submitted,

ROBERT LENOX BANKS,

President Board of Water Commissioners.

Whether the experiment of the Driven Well System, authorized by the law of 1885, be a successful one, or not ; and if it is as successful both in quantity and quality, as can be claimed for it, an unnecessary provision in that law restrains the Water Commissioners from taking any steps under the law of 1884 ; after an engine had been contracted for and land purchased for the perfection of the plant for a duplication of the pumping works,

Said provision of the law of 1885, has subjected and now subjects the city to fearful risks of water famine, and imperils the public health and the peoples' property in case of fire.

In this matter the public have a right to demand concerted and potent action, on the part of the city authorities and the Water Commissions, an absence of all sentiment and prejudice, and a reasonable agreement as to proper legislation.

ROBERT LENOX BANKS,

President.

JOHN M. KIMBALL,

MICHAEL DELEHANTY,

ROBERT BRYCE,

EDWARD A. MAHER.

SUPERINTENDENT'S REPORT.

WATER COMMISSIONERS' OFFICE, }
ALBANY, *February 5, 1887.* }

To the Board of Water Commissioners :

GENTLEMEN.—My report for the year 1886 is herewith submitted to your Board. It gives the extension of the pipe system, the hydrants and stop-cocks added to the works, the repairs made to the different lakes and reservoirs, and their condition upon the 31st December, 1886.

Respectfully submitted,

GEORGE W. CARPENTER,
Superintendent.

RENSSELAER LAKE.

This lake has continued to furnish a supply to Bleeker Reservoir, when the engine was necessarily stopped for repairs and for cleaning the boilers, and also when the river water was too turbid for use. The water has been of excellent quality, no unpleasant odor or taste having been discovered in it.

A barbed wire fence has been put along Washington avenue, to take the place of a board one, too much decayed to afford protection to the property. The lake itself and the lands adjoining, owned by the city, are in good condition; the keeper discharges his duties well and faithfully.

Weekly reports are made on every Saturday, of the daily height of the water in the lake, and of the amount, if any, sent through the conduit to Bleecker Reservoir. These returns, with the returns from the other reservoirs and with the time run daily by the engine, are tabulated in the office. An examination and comparison of these tables will show the sure and gradual increase in the city's consummation, and will give approximately the quantity used.

To provide against contingencies that may occur at any time, the policy has been pursued of impounding as great a quantity as possible in this lake. On October seventh, there remained in it only about three days' supply; any break in the engine at this time, requiring a week to repair, would have left the city west of Pearl street without a supply; or, if the water in the river had become roily, consumers would have been obliged to take it in that condition.

A large portion of the wood hereafter required for the engines may, as needed, be cut and teamed to the land attached to Prospect Hill Reservoir. By careful selection of the trees to be removed, this can be done without injury or reducing the value of the land; indeed, it

will be a benefit. It is necessary to keep the premises (between five hundred and six hundred acres) well fenced and carefully watched, to save the wood from being appropriated by those who eke out an existence by what they can steal.

FLOW-LINE IN RENSSELAER LAKE IN 1886.

Date.	Ft.	In.
On the thirty-first January.....	9	11 ½
“ twenty-eighth February.....	8	8 ½
“ thirty-first March.....	8	5
“ thirtieth April.....	13	6 ½
“ thirty-first May.....	14	7
“ thirtieth June.....	10	0
“ thirty-first July.....	12	1
“ thirty-first August.....	9	10
“ thirtieth September.....	10	7
“ thirty-first October.....	10	7
“ thirtieth November.....	9	4
“ thirty-first December.....	12	9 ½

For years after the construction of the works, this lake supplied that portion of the city lying west of Pearl street, and at the same time kept all the mills in Tivoli street in operation. For a long period all the water has entered into the city consumption, and even with this, supplemented by the engine, there is danger of a failure in the supply.

EXHIBIT

Of moneys paid in 1886, for keeper's salary, for repairs, cleaning shores, etc.

Keeper's salary.....	\$300 00
Fence posts.....	110 00
Materials and repairs to fence.....	264 00
Repairs to house, etc.....	84 49
Wall paper.....	16 25
	<hr/>
	\$774 74

BLEECKER AND PROSPECT HILL RESERVOIRS.

The protection rails along the walk upon the top of the embankment have been repaired in a substantial manner; new rails will be required in a few years. The pavement in Ontario street has also been repaired.

The pavement in Clinton avenue is in a bad condition. If block pavement is not laid in this avenue next year, it will be necessary to take up and repave large portions of it. The pavement on the opposite side of the avenue ought to be repaired by the owners at the same time.

Except in the cold season, one of the helpers is obliged to watch the reservoir banks to prevent fishing, which, if permitted, would be followed by swimming. A night patrol is also frequently necessary; this labor, too, is performed by one of the regular helpers. As the reservoir and garden are open for inspection on Sundays, the keeper and a helper are always on duty at such times.

Arrangements might easily be made, and at very little expense, to lay out graveled walks through the ground attached to Bleecker Reservoir. A park of this kind, although small in its dimensions, would be appreciated by the residents in this section of the city, and certainly visited and enjoyed by them.

A six-inch pipe has been laid to replace the old drain from the keeper's house and engine building at Prospect Hill Reservoir. As this drain is necessarily deep and through quicksand, the expense of the work was large.

Both the reservoirs are kept in good condition by the keeper, Mr. Richard Ryan.

FLOW-LINE IN BLEECKER RESERVOIR IN 1886.

Date.	Ft.	In.
On the thirty-first January.	13	2½
“ twenty-eighth February.	12	1
“ thirty-first March.	13	8
“ thirtieth April.	13	11¼
“ thirty-first May.	13	11
“ thirtieth June.	13	11
“ thirty-first July.	14	0¾
“ thirty-first August.	12	10½
“ thirtieth September.	13	9
“ thirty-first October.	13	4
“ thirtieth November.	14	0½
“ thirty-first December.	12	5

Every foot of head in this reservoir is necessary for the service pipes. Careful inspection is therefore required to keep the water at or near the *maximum* flow-line.

EXHIBIT

Of moneys paid in 1886, for keeper's salary, helpers and mowers, upon both Bleecker and Prospect Hill reservoirs, and for materials and work.

Keeper's salary.	\$300 00
Helpers and mowers.	799 82
Repairs to drain.	28 50
Carpenter work.	212 55
Hardware	19 87
Tools.	1 50
Repairs to pavement.	60 38
Materials.	13 79
	<hr/>
	\$1,436 41

FLOW-LINE IN PROSPECT HILL RESERVOIR IN 1886.

Date.	Ft.	In.
On the thirty-first January.....	14	1
“ twenty-eighth February.....	14	4½
“ thirty-first March.....	13	0¾
“ thirtieth April.....	13	2
“ thirty-first May.....	13	5
“ thirtieth June.....	13	6½
“ thirty-first July.....	12	11
“ thirty-first August.....	13	4
“ thirtieth September.....	13	2
“ thirty-first October.....	13	9
“ thirtieth November.....	13	3
“ thirty-first December.....	13	9½

High flow-line in this reservoir is fifteen feet; when full, it contains seven million three hundred and twelve thousand two hundred and three United States gallons.

TIVOLI LAKE.

The Patroon's Creek, east of Rensselaer Lake, with all its tributaries, has repeatedly failed to keep the lower lake full, where it must be kept to give a serviceable head upon the house pipes, dependent upon this source of supply. To meet this deficiency in the flow of the creek, recourse is had to the water stored in Rensselaer Lake.

The quantity furnished by the streams has undoubtedly diminished: this, added to the annual increase of the number of consumers proves this quantity too small for the lower service. This deficiency will grow larger, for it must be remembered that every additional consumer is liable to become an additional waster. If the present lakes are abandoned, as has been recommended, and another lake to take their place is constructed west of

West Albany, provision ought to be made for a large one, in which to store the water of the creek in floods: without this, the lower service, east of Pearl street, will remain without a full supply, and exposed to water famines.

With a large reservoir, a much greater quantity might be distributed in, and east of Pearl street, and the complaints that now exist of too small a head upon the pipes be removed.

Other cities have increased their water supplies as they have increased in population and in manufacturing establishments. It is not strange, therefore, that the creek that once furnished motive power to the factories along Tivoli street, and, at the same time supplied abundance to consumers, has failed to give the quantity now required.

These lakes and the adjacent ground have been properly cared for by the keeper, and every precaution taken to keep impurities from reaching the water. The stone protection wall along the canal, leading from the upper lake has been taken down and rebuilt; necessary repairs have also been made to the house and the fences.

FLOW-LINE IN TIVOLI LAKE IN 1886.

Date.	Ft.	In.		
On the thirty-first January.....	..	..	at high flow-line.	
“ twenty-eighth February.....	o	3	below high flow-line.	
“ thirty-first March.....	o	1	“	“
“ thirtieth April.....	..	..	at	“
“ thirty-first May.....	..	..	“	“
“ thirtieth June.....	o	3	below	“
“ thirty-first July.....	..	..	at	“

Date.	Ft.	In.			
On the thirty-first August.....	2	0	below	high	flow-line.
“ thirtieth September.....	0	8	“	“	“
“ thirty-first October.....			at	“	“
“ thirtieth November.....			“	“	“
“ thirty-first December.....			“	“	“

EXHIBIT.

Showing the moneys paid in 1886, for keeper's salary, repairs, teaming, etc.

Keeper's salary.....	\$300 00
Repairs.....	13 50
Carpenter work.....	11 50
Repairs to canal wall.....	88 22
Labor and materials.....	121 16
Mowers.....	157 89
Hardware.....	5 70
Lumber.....	2 88
Team.....	13 50
	<hr/>
	<u>\$714 35</u>

MAEZLANDT KILL.

Thorough and needed repairs have been made upon this supply. The frame conduits have been cleaned, the reservoir building repaired, and the waste conduit opened and made serviceable. This is a valuable adjunct to the works, giving a supply to North Albany west of the old Troy road, to the horse railroad stables, and to a large number of consumers in Broadway, south to Clinton avenue, and in Pearl street, south to Columbia street. The water being very cold is considered a great luxury; those who use it are unwilling to change to the new supply. With its good qualities, it is what is classed a “hard water.”

It sometimes fails during long droughts, when the deficiency is drawn from Bleecker Reservoir. The time is not distant, when the whole of Maezlandt Kill supply must be confined to consumers north of the Patroon's Creek and west of Broadway. When this becomes necessary, it can readily be done, without any expense or inconvenience to the owners.

CONDUIT.

There have been expended on the conduit, for repairs to well chamber in Washington avenue and for clearing the land enclosed by the fences, \$88.25 ; carpenter work \$47.75, and clearing the land \$40.50.

INSPECTORS.

MAEZLANDT KILL.

An Inspector is engaged to watch this source of supply : this is necessary to protect the works and maintain a head upon the mains in West Albany. The adjoining lands are a resort for the vicious and depraved, who, in addition to destroying the fences, purloining the locks and injuring the buildings, frequently shut down the gates or open the waste-pipe, and thus cut off the water from the city main. A constant daily inspection is therefore maintained, to save the property and secure the supply from interruption.

WEST ALBANY.

For years an Inspector has been kept at West Albany : his duties are to daily examine the main creek, Sand Creek and the shops, dwellings and yards, so as to detect and have removed all impurities that might otherwise reach and defile the water. If anything special requires additional help, he at once reports to the Superintendent. Great care is taken to protect the streams in passing through West Albany.

SERVICE PIPES AND FIXTURES.

Were it not for unnecessary wastes of water, Albany would have an abundant supply for a population much larger than it now has. This evil is experienced in all water supplies, but as yet, no effectual remedy to prevent it has been devised.

Two Inspectors are engaged to detect wastes, whether caused by broken fixtures or by sheer carelessness ; one is detailed to section south, and one to section north of State street. They report weekly (as do all the Inspectors), when notices, requiring all necessary repairs to be made without delay, are at once sent to the occupants. If a second examination finds the wastes still continuing, the water is turned off. From the reports, very few broken pipes remain in the out-door fixtures.

FIRE HYDRANTS.

The fire hydrants are inspected daily throughout the winter ; it is only by this constant supervision that they

are kept in a serviceable condition for fires. Each Inspector must keep his own hydrants ready for use.

MAINS LAID IN 1886.

STREET.	FROM	TO	4-inch.	6-inch.	Hydrant pipe.
Elberon place	Lake avenue.....	West, 400 feet.....	.....	420	18
Sloan street.....	Second avenue.....	Third avenue.....	789	.....	..
Warren street.....	Delaware avenue...	West	275	.....	..
Orange street.....	Lexington avenue.	Robin street.....	911	.....	..
Lark street.....	Washington avenue	Madison avenue...	1,434	.....	9
First street.....	Judson street.....	Ontario street .....	.....	2,833	50
Quail street.....	Western avenue...	South.....	.....	228	..
Warren street.....	Philip street.....	West .....	.....	225	..
Tivoli street.....	Broadway.....	West .....	.....	2,590	78
First street.....	Lark street.....	Knox street.....	.....	718	24
Alexander street....	End of old main...	West .....	.....	420	15
Hudson avenue.....	Lake avenue.....	West .....	.....	250	..
Elberon place	End of main.....	West .....	.....	200	..
Hawk street.....	Canal street.....	South.....	.....	203	..
			3,409	8,087	..

$1\frac{581}{1000}$ miles of six-inch and $\frac{6456}{10000}$ miles of four-inch main.

In First street, between Swan and Lark streets, the four-inch main has been replaced by a six-inch main; length of main, one thousand three hundred and fifty-four feet.

LEAKS AND BREAKS IN 1886.

DATE.	DIAMETER. INCHES.	LOCATION.	LEAKS.	BREAKS.
January 2.....	4	Hudson avenue, west of Broadway.....	.....	Break.
January 14.....	4 S. C.	Knox street, north of Clinton avenue.....	Leak.	
January 28.....	4	Livingston avenue, east of Watervliet avenue.....	Leak.	
February 1.....	3	Jefferson street, west of Eagle street.....	.....	Break.
February 10.....	4	Orange street, west of Hawk street.....	.....	Break.
February 15.....	4	Cherry street, at Green street.....	.....	Break.
March 4.....	HYD. PIPE.	Corner of William street and Hudson avenue.....	Leak.	
March 16.....	4	Eagle street, north of Hudson avenue.....	Leak.	
March 18.....	4	Warren street, east of Elizabeth street.....	.....	Break.
March 19.....	12 S. C.	Clinton avenue, west of Lark street.....	Leak.	
March 30.....	30	Clinton avenue, west of Robin street.....	Leak.	
March 29.....	30	Clinton avenue, near Robin street.....	Leak.	
April 3.....	4	Eagle street, south of Howard street.....	Leak.	
April 6.....	3	Van Zandt street, east of Philip street.....	.....	Break.
April 7.....	4	Intersection of Hawk street and Madison avenue.....	.....	Break.
April 9.....	3	Warren street, near Grand street.....	.....	Break.
April 10.....	4	Colonie street, east of Broadway.....	Leak.	
April 12.....	30	Opposite Chapel street.....	Leak.	
April 12.....	3	Jefferson street, west of Eagle street.....	.....	Break.
April 16.....	3	William street.....	.....	Break.
April 16.....	HYD. PIPE	Clinton avenue, at Pearl street.....	Leak.	
April 16.....	30	Clinton avenue, west of Robin street.....	Leak.	
April 16.....	30	Clinton avenue, opposite No. 512.....	Leak.	
April 20.....	3	Jefferson street, west of Eagle street.....	.....	Break.
April 22.....	12 S. C.	State street, at Peart street.....	Leak.	

May 1	4	Eagle street at Lancaster street	Leak.	Break.
May 2	3	Third street, east of Lark street	Leak.	
May 10	.....	Park avenue, west of Eagle street	Leak.	
May 20	16	Washington avenue, near Knox street	Leak.	
May 20	8 S. C.	Ferry street, at Lumber District	Leak.	
May 21	HYDRANT.	Lumber District	Leak.	Break.
May 22	HYDRANT.	Intersection Rensselaer and Dallius streets	Leak.	Break.
May 26	12	Washington avenue, west of Hawk street	Leak.	
May 29	30	Clinton avenue; east of Perry street	Leak.	
May 29	30	Clinton avenue, west of Lexington avenue	Leak.	
May 29	12	State street, opposite Lodge street	Leak.	
May 31	8	In front of the City Hall	Leak.	
June 1	HYDRANT.	Corner of Livingston avenue and Broadway	Leak.	
June 7	30	In Clinton avenue, west of Robin street	Leak.	
June 7	30	In Clinton avenue, east of Ontario street	Leak.	
June 8	HYDRANT.	Arch street, west of Broad street	Leak.	Break.
June 9	HYDRANT.	South-east corner Elm and Philip streets	Leak.	Break.
June 9	6	Lumber District (caused by drain)	Leak.	
June 14	3	Van Zandt street, near Philip street	Leak.	Break.
June 26	30	In Clinton avenue, west of Perry street	Leak.	
June 28	4	Hudson avenue and Hamilton street	Leak.	
June 29	4 S. C.	Hawk street, north of Jay street	Leak.	Break.
July 1	30	In Clinton avenue, west of Perry street	Leak.	
July 19	6	Park avenue, at High street (caused by land slide)	Leak.	
August 2	6	Quail street, near Western avenue	Leak.	Break.
August 4	3	William street, near Howard street	Leak.	Break.
August 4	4	Philip street, south of Warren street	Leak.	Break.
August 12	8 S. C.	Madison avenue, on west line of Pearl street	Leak.	
August 12	4 S. C.	Alexander street, west of Pearl street	Leak.	
August 14	3	Blecker street, east of Pearl street	Leak.	

LEAKS AND BREAKS IN 1886—(Continued).

DATE.	DIAMETER. INCHES.	LOCATION.	LEAKS.	BREAKS.
August 17.....	HYD. PIPE.	At Park entrance	Leak.	
August 25.....	4	Hawk street, south of Elm street.....	Leak.	
August 27.....	HYDRANT.	Eagle street and Maiden lane?	Leak.	
August 29.....	HYDRANT.	McCarty avenue and Cherry Hill street.....		Break.
August 30.....	4	Hudson avenue, east of Hawk street.....		Break.
August 30.....	30	Clinton avenue, west of Dove street.....	Leak.	
September 7.....	4 S. C.	Knox street, at Clinton avenue.....	Leak.	
September 9.....	4 S. C.	Elk street, west line of Perry street.....	Leak.	
September 11.....	4	Hamilton street, at Philip street		Break.
September 15.....	S. C.	Broadway, at North Ferry street.....	Leak.	
September 15.....	S. C.	Orange street, on west line Pearl street.....	Leak.	
September 23.....	30	In Clinton avenue, east of and near Judson street.....	Leak.	
September 26.....	6	Pearl street, at Gansevoort street.....		Break.
September 27.....	4	High street, at State street.....		Break.
October 6.....	HYDRANT.	Hawk street and Washington avenue.....	Leak.	
October 6.....	S. C.	Rensselaer and Green streets.....	Leak.	
October 6.....	4	Broadway, in front of No. 315.....		Break.
November 18.....	4	Broadway, north of State street (old w. w. pipe).....		Break.
November 24.....	4 SLEEVE.	Hawk street, south of Lancaster street.....	Leak.	
December 2.....	4 SLEEVE.	South Ferry street, west of Broadway.....	Leak.	

The recommendation for laying water mains only in streets that have been graded and drained, is here repeated. While changes in the surface of the streets often entail expense on the owners, in lowering their service pipes, the fire hydrants ought to be drained, if possible, to protect them against freezing, and to keep them in a servicable condition.

EXHIBIT

*Showing the cost of new mains laid in 1886, including labor,
teaming and materials.*

Elberon place, west of Lake avenue.....	\$337 05
Sloan street, from Second to Third avenue.....	491 36
Orange street, from Lexington avenue to Robin street..	486 74
Lark street, from Washington ave. to Madison ave....	1,054 09
First street, from Judson street to Ontario street.....	2,491 93
Quail street, south of Western avenue.....	216 82
Warren street, west of Delaware avenue.....	195 03
Tivoli street, west of Broadway.....	2,946 81
First street, from Lark street to Knox street....	624 18
Alexander street, west of Elizabeth street.....	395 55
Hudson avenue, west of Lake avenue.....	277 70
Elberon place, between Lake avenue and Quail street..	135 86
Hawk street, south of Canal street.....	183 37
Warren street, west of Philip street.....	216 73
Hydrant on south-east corner of Hawk and First streets.	55 80
Hydrant in Broadway, opposite Mohawk street.....	136 00
Hydrant on corner of First street and Broadway.....	68 75
Changing hydrant from south-east to north-east Swan and First streets.....	12 75
Setting, etc., stop-cocks, in West and Bradford streets, and in Washington avenue.....	64 75
Replacing the four-inch with a six-inch main, in First street, east of Lark street.....	711 77

\$11,103 04

STOP-COCKS.

The following stop-cocks have been added to the works during the year ending December 31, 1886.

In Warren street, on west line of Delaware avenue.....	1
In First street, on west line of Judson street.....	1
In First street, on east line of Ontario street.....	1
In Spring street, on west line of Lark street.....	1
In West street, on west line of Robin street.....	1
In Bradford street, on west line of Robin street.....	1
In Washington avenue, on west line of Robin street.....	1
In Tivoli street, on west line of Broadway.....	1
In State street, on west line of Broadway.....	1
In State street, on west line of Broadway.....	1
Added during the year 1886.....	10
Number December 31, 1885.....	388
Total number December 31, 1886.....	<u>398</u>

There are still a few locations where additional stop-cocks would prove serviceable, both to ordinary consumers and manufacturers.

During the past year, one large section between Central and Clinton avenues, has been divided by stop-cocks. This will lessen the labor of extending the mains, of making repairs, and will relieve a large number of consumers from annoyance caused by emptying the pipes.

I again recommend setting stop-cocks on both sides of Broadway, south of State street, for reasons heretofore given. When this is done, repairs can be made in the *day-time*, without cutting off the supply of water from the large number of manufacturing establishments, south of State street, and east of Green street.

HYDRANTS..

Additional hydrants added to the works during the
the year 1886 :

In Elberon place, 400 feet west of Lake avenue.....	I
In Lark street, near Washington avenue.....	*I
In First street, on west line of Judson street.....	I
In First street, between Judson and Perry streets.....	I
In First street, corner of Perry street.....	I
In First street, between Perry and Quail streets.....	I
In First street, between Quail and Ontario streets.....	I
On south-east corner of Hawk and First streets.....	I
On west end of Alexander street main.....	I
In First street, on west line of Lark street.....	*I
In First street, between Lark and Knox streets.....	I
In North First street, on west line of Broadway.....	I
East of Broadway, opposite Mohawk street.....	I
In Tivoli street, about 400 feet west of Broadway.....	I
In Tivoli street, about 800 feet west of Broadway.....	I
In Tivoli street, about 1,200 feet west of Broadway.....	I
In Tivoli street, about 1,600 feet west of Broadway.....	I
In Tivoli street, about 2,000 feet west of Broadway....	I
In Tivoli street, about 2,400 feet west of Broadway.....	I
Added to the works during the year 1886.....	19
Number on the 31st December, 1885.....	535
Total number December 31, 1886.....	<u>554</u>

SPECIAL RATES.

Amount of special rates paid in 1886.

By meters.....	\$13,795 08
12 Brewers	3,884 44
17 Maltsters	1,960 14
19 Livery stables.....	423 66
19 Country taverns.....	238 75
14 Fountains	128 44

* To clean the dead end of the mains.

53 Bakers		\$305 91
104 No street mains		1,191 82
Baths, for whole year (325).....	\$975 00	
Baths, for part year (20).....	39 25	
	<hr/>	1,014 25
82 Buildings erected since last assessment.....		318 28
51 Horses and cows.....		701 50
21 Hotels and boarding houses.....		775 25
1 Public building.....		100 00
Street hose, for whole year (151).....	\$755 00	
Street hose, for part year (6).....	16 00	
	<hr/>	771 00
11 Garden hose.....		33 00
150 Steam engines		4,001 07
106 Building purposes:.....		614 85
1 Canal stable		27 00
Water closets, for whole year (3,641).....	\$7,282 00	
Water closets, for part year (103).....	124 76	
	<hr/>	7,406 76
3 Soap factories		46 00
Miscellaneous		7,552 92
Permits of 1885, paid in 1886.....		2,732 60
		<hr/>
		<u>\$48,022 72</u>

SPECIAL RATES.

EXHIBIT.

Amount of special permits from 1852 to 1886, inclusive.

Year.	Amount.
1852.....	\$5,440 07
1853.....	7,665 33
1854.....	12,070 06
1855.....	11,526 00
1856.....	11,748 72
1857.....	11,795 45
1858.....	12,661 18
1859.....	12,371 88
1860.....	12,736 09
1861.....	11,504 78
1862.....	12,613 67
1863.....	12,243 85

Year.	Amount.
1864.....	\$13,492 17
1865.....	13,198 37
1866.....	15,583 50
1867.....	17,383 96
1868.....	22,017 25
1869.....	22,551 71
1870.....	24,092 26
1871.....	25,415 91
1872.....	24,852 57
1873.....	26,102 06
1874.....	26,442 27
1875.....	25,698 96
1876.....	26,876 61
1877.....	24,597 27
1878.....	25,039 30
1879.....	31,235 37
1880.....	32,942 86
1881.....	39,830 81
1882.....	40,821 04
1883.....	40,534 82
1884.....	41,885 69
1885.....	62,380 75
1886.....	48,022 72

While the ordinary water rents upon buildings and vacant lots are paid to the Receiver of Taxes, the special water rates, for the use of water for special purposes, are paid to the Chamberlain.

EXHIBIT.

Showing the moneys paid in 1886, for pipe castings, stop and service-cocks, lead, etc.

Pipe castings.....	\$1,249 64
Hydrants, including casings and boxes.....	223 45
Stop-cocks, including covers.....	687 34
Service-cocks.....	369 84
Lead.....	560 38
Sand.....	33 40

Plugs.....	85 50
Coke.....	18 44
Packing.....	59 51

\$3,207 50

EXHIBIT.

Showing the moneys paid in 1886, for labor and teaming in repairs made to mains, hydrants, and stop-cocks.

Repairs to mains.....	\$852 86
Repairs to hydrants.....	318 05
Repairs to stop-cocks.....	387 48

\$1,538 39

EXHIBIT

Of payments made on account of the Albany City Water-Works in 1886.

New pumping engine, river.....	\$38,355 50
Prospect Hill reservoir.....	9,482 99
Refunded water rents.....	241 62
Bleecker reservoir, including keeper.....	1,436 41
Rensselaer lake, including keeper.....	774 74
Tivoli lake, including keeper.....	714 35
Conduit.....	88 25
Maezlandt Kill.....	368 22
Office expenses, including Superintendent's salary.....	6,476 71
Printing and advertising.....	599 71
Watchman at West Albany.....	460 50
Inspectors of water fixtures.....	939 00
Inspectors of fire hydrants, in winter.....	1,350 00
Regular employes.....	8,808 30
Tapper boy.....	234 75
Incidental expenses.....	3,367 13
Insurance and taxes.....	482 58
Mains, stop-cocks and hydrants.....	2,161 03
Laying mains.....	5,507 77
Repairing mains, hydrants and stop-cocks.....	1,558 39
Stable and tool house.....	1,868 05
Preparing assessment, water rent rolls.....	645 25
Lead, coke, packing, etc.....	369 84

\$86,291 09

The following schedule shows the amounts of the "water rents" in the different wards for the year 1887.

First ward.....	\$6,050 70
Second ward.....	5,449 87
Third ward.....	5,783 62
Fourth ward.....	8,069 58
Fifth ward.....	6,564 76
Sixth ward.....	10,140 00
Seventh ward.....	6,424 04
Eighth ward.....	4,758 74
Ninth ward.....	5,968 56
Tenth ward.....	9,378 29
Eleventh ward.....	8,060 04
Twelfth ward.....	6,802 69
Thirteenth ward.....	7,104 83
Fourteenth ward.....	9,107 49
Fifteenth ward.....	5,446 56
Sixteenth ward.....	10,144 57
Seventeenth ward.....	7,638 98
	<hr/>
	\$122,893 32
	<hr/>

REPORT
OF THE
ENGINEER-IN-CHIEF OF STEAM POWER.

ALBANY, January 28, 1887.

To the Board of Water Commissioners of the City of Albany :

GENTLEMEN. — I have the honor to submit herewith, the eleventh annual report of the operation of the river pumping engines, supplying Bleecker Distributing Reservoir; and the ninth annual report of the high service pumping engines, supplying Prospect Hill Distributing Reservoir.

RIVER PUMPING ENGINES.

These were in operation during the past year, two hundred and ninety-eight (298) days, with an average pumping of twenty-one hours and forty minutes per day, and pumped from the river into Bleecker Distributing Reservoir two billions six hundred and seventy-five millions, five hundred and seventy thousand, one hundred and fifty (2,675,570,150) gallons, nearly ninety-eight (98) millions more than the previous year.

In addition to the above, there was drawn from Rensselaer Lake during the stoppages of the pumps, about six hundred and one million, five hundred thousand (601,500,000) gallons, making a total of upwards of three billions, two hundred and seventy-seven millions (3,277,000,000), exclusive of the quantity drawn from Rensselaer Lake during the cold weather to supplement the shortage of the river pumping engines when they were working up to and somewhat beyond the quantity they were contracted to supply. This supplement I computed in last year's annual report, to be on some occasions, two millions, six hundred and ninety-three thousand, one hundred and thirty (2,693,130) gallons per twenty-four hours; making the total supply on those occasions twelve millions, six hundred and odd thousand (12,600,000) gallons per twenty-four hours.

Gallons of Water delivered through Bleeker Distributing Reservoir.

YEAR.	No. of days pumping.	Average No. of gallons pumped per day.	No. of gallons pumped per year.	Gallons from Rensselaer lake during stoppage of pumps.	Total gallons through Bleeker, exclusive of water taken from Rensselaer during operation of engines.	Per cent. from river per year.	Per cent. more than preceding year.
1876....	143	4,558,973	651,928,008	1,012,083,997	1,044,012,005	39.17	
1877....	245	4,837,309	1,185,140,853	581,477,153	1,766,618,011	67.12	
1878....	225	4,478,004	1,007,557,050	626,920,650	1,634,471,700	61.64	
1879....	262	4,731,176	1,146,933,700	433,945,540	1,580,879,240	71.92	
1880....	308	5,176,934	1,594,495,900	295,085,680	1,889,581,180	84.38	
1881....	318	6,663,136	2,128,877,300	303,167,398	2,432,044,698	87.12	
1882....	270	7,197,170	1,943,209,168	683,721,743	2,626,930,911	73.97	
1883....	302	7,328,964	2,213,347,400	448,287,677	2,669,650,636	82.91	
1884....	283	7,784,444	2,203,486,700	629,489,334	2,833,336,034	77.78	
1885....	285	8,671,508	2,577,816,725	589,662,544	3,167,439,269	81.37	16.965
1886....	298	8,978,423	2,675,570,150	601,500,000	3,277,070,150	81.645	3.762

BOILERS.

The battery of steam boilers, consisted until recently, of five boilers, of the locomotive type; each twenty feet six inches long. Shell, sixty-six inches in diameter. Fire-box seventy-six inches wide, and each containing seventy-eight (78) four-inch tubes, ten feet long.

They have been in constant use eleven and a half years, and the latter half of that time, night and day. They have received, from time to time, such repairs as a due regard to safety and efficiency required, but they begin to show the effects of age and hard work, and the repairs upon them will have to be more extensive during the present year. This was foreseen two years ago, and a new boiler was made, according to my drawings and specifications, by the firm of Skinner & Arnold, of this city.

It is of Otis homogeneous steel, cylindrical in form, eighty-seven inches inside diameter, and twenty feet long. It is double return drop tubular, and the hot gases travel fifty-four feet before leaving the boiler. It has been in regular service one month, and when required, has done the work of three of the old boilers.

The present working steam pressure required, is only thirty-five pounds, but this boiler will be quite safe with a pressure of one hundred pounds per square inch, so that if necessary, at any future time, it can be used in connection with compound engines.

FILTERS.

Heretofore, when pumping continuously for a month, and in winter, six weeks, and sometimes longer, without an opportunity to open and clean boilers, the surface and bottom blow-off valves had to be used four, and if the river was turbid, as often as six times per twenty-four hours, to prevent priming, which it did; but with an increase in the consumption of coal, ranging from one thousand to fourteen hundred pounds per twenty-four hours.

In October, the Albany Steam Trap Company erected two eighteen-inch Blessing filters and return traps in the boiler-house, and connected them to the boilers. Their operation is as follows: They take the water from the boiler, or boilers, in a continuous stream, which passes through hard packed, fine sand, in the filtering vessels, from which it is taken clear and limpid, by the return traps, and discharged into the same boilers. The direction of the current can be reversed, and the filters cleaned in a few minutes, by a very simple process, and without opening the apparatus. It is filtration by circulation from the boilers to the filters, and from these through the automatic return traps, back to the boilers.

When the filters had been in operation a month or more, on the five boilers, which had been steaming night and day, but without blowing off, as formerly (the glass water gauges showing it was unnecessary), the boilers were opened, and found to be much cleaner than usual, and the old scale considerably honeycombed and much of it so loose on the tubes, that it could be brushed off.

The boilers have been opened twice since, and each time gave unmistakable evidence of the continuation of the solvent action of the filtered water upon the scale, and its gradual detachment from the metallic surfaces by the same cause.

The pumping engines never worked better nor more smoothly than at the present time; notwithstanding which they should have a general overhauling, of not less than one week's duration, whenever Spring, and the quantity of water in Rensselaer Lake permits.

For details of operation, etc., please see Monthly Record No. 1.

THE PROSPECT HILL PUMPING ENGINES

Were in operation connected, (*i. e.*, both engines) three hundred and forty-five and a half ($345\frac{1}{2}$) days, and single (while the change of pumps was being made) nineteen and a half ($19\frac{1}{2}$) days, and pumped from Bleecker into Prospect Hill High Service Distributing Reservoir one billion, twenty million, one hundred and sixty-one thousand, three hundred and sixty ($1,020,161,360$) gallons, an increase of twenty-nine million, seven hundred and forty-three thousand, two hundred and eighty ($29,743,280$) gallons, or about three (3) per cent. more than the preceding year.

YEAR.	Gallons per year.	Gallons increase per year.	Per cent. increase per year.	Per cent. increase from 1879.
1878	364,383,760	.....	.....	.....
1879	479,188,160	114,804,400	31.50	.....
1880	588,917,600	59,729,440	12.48	12.480
1881	662,060,480	123,142,880	22.85	38.201
1882	692,437,380	30,376,900	4.58	44.502
1883	717,140,480	24,703,100	3.56	49.657
1884	793,234,080	76,093,600	10.67	67.624
1885	990,418,080	197,184,000	24.85	106.687
1886	1,020,161,360	29,743,280	3.003	112.905

The two pumps you authorized me to have made according to the designs I submitted, have been in service, one of them eight, and the other three months. Their operation fully equals what was expected of them.

The old bucket valves (hinge type), when wide open, had an extreme lift of four inches (one of the serious objections to them), which gave an outlet area of only one hundred and four inches. The new buckets and valves are of an entirely new type, and with valves the extreme lift of which is half an inch, gives an outlet area of two hundred and thirty-four inches, which is rather more than the internal area of the bucket. The buckets and plungers are packed with elastic metallic packing; there is no soft or fibrous packing in contact with any part of the buckets, pumps or plungers, thereby reducing the loss by friction to its practicable minimum.

Believing that most new devices, however seemingly perfect theoretically, may be considered experimental in some degree, and susceptible of improvement, which only the actual operation of it can demonstrate, I deemed it prudent not to make the foot-valves until after a thorough trial of the buckets. This trial having extended over a period of eight months, and proving so entirely satisfactory, I can, with the utmost confidence, recommend the adoption of foot-valves of the same type.

These (the upper service engines and boilers) are in good working order, but needing occasionally such repairs as the wear and tear of such constant use must require.

For details of operation and quantities, please see Monthly Record No. 2.

Respectfully,

JOHN H. MARS.

Chief Engineer.

NUMBER ONE PUMPING ENGINES.—MONTHLY RECORD.

1886.	Days per month.	PUMPS IN OPERATION.			REVOLUTIONS.			Lift, in feet.	Velocity in feet per second.	Friction, in feet.	POUNDS OF COAL.		POUNDS OF ASHES, ETC.		GALLS. PUMPED INTO BLEEKER RESERVOIR.			Duty.
		Hours and minutes per month.	Hours and minutes per day.	Per minute.	Per day.	Per month.	Pumping.				Heating buildings, banking fires, etc.	Total.	Per cent.	Per pound of coal.	Per day.	Per month.		
January.....	26	589.15	22.40	12.546	17,000	448,568	240.312	3.132	16.630	817,200	49,300	119,428	.....	298.534	9,383,167	243,962,400	63,973,097
February.....	28	528.12	22.58	12.616	17,388	399,829	240.842	3.147	16.775	745,900	38,760	108,206	.....	294.819	9,561,128	219,905,950	61,757,553
March.....	27	603.04	22.20	12.653	16,947	457,840	241.139	3.175	17.078	857,294	22,200	114,677	.....	293.728	9,326,970	251,812,000	63,255,387
April.....	22	451.01	20.46	12.506	15,588	342,938	240.677	3.188	16.679	637,320	22,525	90,393	.....	295.951	8,573,450	188,615,900	63,537,242
May.....	24	485.31	20.18	15.502	15,175	364,208	241.532	3.131	16.605	665,900	22,440	95,002	.....	300.652	8,341,850	200,204,400	64,761,882
June.....	16	326.22	20.24	12.521	15,324	245,195	242.202	3.142	16.712	438,400	4,200	58,488	.....	307.612	8,428,578	134,857,250	66,424,048
July.....	27	576.12	21.20	12.520	16,031	432,847	242.379	3.142	16.712	798,300	8,430	114,813	.....	298.216	8,817,253	238,065,850	64,439,082
August.....	26	560.35	21.33	12.551	16,237	422,175	242.412	3.150	16.813	798,400	8,000	111,395	.....	290.827	8,930,625	232,196,250	62,899,496
September.....	29	641.40	22.07	12.476	16,563	480,312	242.948	3.130	16.530	910,800	6,800	128,470	.....	290.061	9,109,934	264,188,100	62,770,678
October.....	25	548.29	21.56	12.513	16,511	412,794	242.571	3.140	16.699	739,200	6,400	108,608	.....	307.139	9,241,468	227,036,700	66,412,879
November.....	23	454.56	19.42	12.539	14,881	342,274	241.399	3.146	16.772	610,400	18,000	93,443	.....	308.405	8,184,813	188,250,700	66,404,205
December.....	30	688.10	22.56	12.614	17,362	520,863	240.334	3.165	16.973	917,832	56,000	141,700	.....	312.121	9,549,155	266,474,650	66,979,307
	298	6,459.27	21.40	12.352	16,325	4,864,873	241.562	3.150	16.479	8,936,946	263,055	1,284,533	13.962	299.383	8,978,423	2,675,570,150	64,481,786	

NUMBER TWO PUMPING ENGINES.—MONTHLY RECORD.

1886.	Engines in operation.		PUMPS IN OPERATION.		REVOLUTIONS.			Lift, in feet.	Friction, in feet.	POUNDS OF COAL.		POUNDS ASHES AND CLINKERS.		GALLONS WATER PUMPED INTO PROSPECT HILL RESERVOIR.			Duty.
	Days per month.	Hours and minutes per month.	Hours and minutes per day.	Per minute.	Per day.	Per month.	Pumping.			Heaters and banking fires.	Total.	Per cent.	Per pound of coal.	Average per day.	Total per month.		
January	2	31	557.17	17.58	19,942	21,511	666,862	59.279	....	86,725	8,720	13,544	....	1230.301	3,441,863	106,697,120	.....
February	2	28	518.41	18.31	20,152	22,399	627,173	59.395	....	79,550	8,750	13,100	....	1261.441	3,583,845	100,817,680	.....
March	2	31	527.16	17.00	20,756	21,182	656,653	58.856	....	79,300	9,900	11,670	....	1324.898	3,389,176	105,064,480	.....
April	2	30	395.34	13.11	20,499	16,217	486,525	59.004	....	61,675	7,525	10,500	....	1262.164	2,594,800	77,814,800	.....
May	2	26	336.23	12.56	20,499	15,913	418,738	59.414	....	51,125	7,125	11,000	....	1294.827	2,546,030	66,198,080	.....
May	1	5	119.25	23.53	21,950	31,455	157,274	56.600	....	9,300	.....	.....	....	1352.894	2,516,384	12,581,920	.....
June	2	19	241.19	12.42	20,181	15,379	292,202	59.781	....	36,975	3,600	.....	....	1264.430	2,460,648	46,752,320	.....
June	1	11	238.02	20.43	21,947	26,900	295,900	57.471	....	19,000	.....	9,500	....	1245.894	2,152,000	23,672,000	.....
July	2	31	411.33	13.16	20,373	16,231	508,161	59.873	....	66,625	4,650	10,000	....	1208.341	2,596,960	80,505,760	.....
August	2	31	388.48	12.32	20,541	15,457	479,183	59.873	....	63,400	4,650	9,800	....	1209.294	2,473,202	76,669,280	.....
September	2	30	405.34	13.80	20,191	16,374	491,342	59.700	....	64,450	4,350	12,100	....	1219.778	2,620,491	78,614,720	.....
October	2	31	397.47	12.49	20,086	15,142	479,409	59.760	....	62,100	5,000	12,600	....	1235.192	2,474,330	76,705,440	.....
November	2	26½	336.13	12.41	20,895	15,909	421,606	59.985	....	54,843	.....	.....	....	1230.001	2,545,545	67,456,960	.....
November	1	3½	70.27	20.07	21,986	26,517	92,911	59.635	....	6,100	5,450	10,500	....	1217.191	2,121,394	7,424,880	.....
December	2	31	458.43	14.48	21,043	18,976	585,162	60.495	....	75,120	10,700	14,450	....	1246.351	3,020,191	93,625,920	.....
	2	345½	4,975.08	14.24	20.445	17,664	6,103,016	59.617	8.97	781,888	80,470	138,760	15.473	1248.877	2,826,288	976,482,560	66,176,993
	1	19½	417.54	21.26	21.774	27,999	545,985	58.661	34,400	1269.732	2,239,938	43,578,800	66,267,609

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