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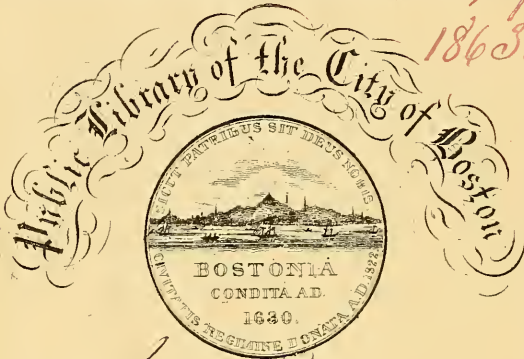
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ANNUAL REPORT
OF THE
COCHITUATE WATER BOARD
FOR
1863.

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CITY OF BOSTON.



REPORT

OF THE

COCHITUATE WATER BOARD,

TO THE

CITY COUNCIL OF BOSTON,

FOR THE YEAR

1863.

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London, October 1885

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CITY OF BOSTON.

In Board of Aldermen, January 11, 1864.

ORDERED: That the Cochituate Water Board be authorized to make their Annual Report in print.

Sent down for concurrence.

OTIS NORCROSS, *Chairman.*

In Common Council, January 14, 1864.

Concurred.

GEORGE S. HALE, *President.*

Approved, January 16, 1864.

F. W. LINCOLN, JR., *Mayor.*

REPORT.

OFFICE OF THE COCHITUATE WATER BOARD,
BOSTON, January 15, 1864.

TO THE CITY COUNCIL:—

The Cochituate Water Board, in conformity with the City Ordinance, respectfully submit their Annual Report of matters connected with the important Works entrusted to their care and management, together with the Reports of the Clerk of this Board, Superintendents, Water Registrar, and City Engineer, which contain statements of the finances and general condition of the Works.

The *Receipts and Expenditures* during the past year, it appears from the Report of the Clerk of the Board, hereto annexed, are as follows:—

There has been drawn from the Treasury during the	
year,	\$ 98,545 64
Of this amount there is charged for extension of the	
Works,	65,613 33
Making the amount of <i>Current Expenses</i> ,	\$ 32,932 31

Showing that the expenses have been about twenty-five hundred dollars more than the previous year; this increased expense has been caused chiefly by the great advance in price of all materials and labor.

The receipts and expenditures on account of the Water Works, from the commencement, to January 1, 1864, it appears, have been as follows: —

Amounts paid by the Commissioners and by the Water Boards, from the time the Works came under the control of the latter,	\$5,919,859 02
Sundry payments by the City, and discounts and interest on loans,	4,068,350 84
	<hr/>
	\$9,988,209 86
From which should be deducted	
sundry credits by the City,	\$63,797 76
Amounts received from the Commissioners and Water Boards,	167,483 98
Amounts rec'd for Water Rates,	3,848,356 49
	<hr/>
	4,079,637 23
	<hr/>
Leaving the cost of the Works, January 1, 1864, \$5,908,572 63	<hr/> <hr/>

There is charged this year to the account of the Water Works, by the City Treasurer, \$72,364.20, paid for exchange and premium on gold, which was required to pay the interest on the Water Loan.

The Annual Report of the *Water Registrar* shows that the total amount received for Water was \$394,506.25, of which \$381,509.10 was for Water used during the year 1863, being an increase over the previous year of \$20,583.37. The whole number of

Water-takers now entered for the year 1864, is 26,581, an increase of 292 over last year. The estimated income from sales of Water in 1864, is \$430,000.

There has been 93 new *Metres* connected during the year, making the whole number now in use 254; as follows: 3 4-inch, 7 3-inch, 12 2-inch, 115 1-inch, and 117 $\frac{5}{8}$ -inch.

The more general use of meters, where large quantities of Water are consumed, has proved very satisfactory, and has greatly increased the receipts; in places where a large number of hands are employed they are liable to be careless, and a great deal of water is wasted, but when the proprietors are obliged to pay for it by the gallon, they find it for their interest to do what they can to prevent this waste.

EASTERN DIVISION.

The Works in this Division are in good condition.

The number of feet of *Main Pipe* laid the past year is 12,150, exceeding that of the previous year by about 1,700 feet. The total number of feet laid from the commencement of the Works, to January 1, 1864, is 714,943 feet, being a little more than 135 miles. The Main Pipe in Chelsea Street, East Boston, between Decatur and Marion streets, has been taken up and relaid on the east side of the street, and, together with the Service Pipes, have been raised to conform to the change of grade of the street.

At the request of the Board there was appropriated, during the past year, by the City Council, the sum of \$35,000, for raising the Main Pipe on Tremont Street,

between Waltham and Springfield streets, but on account of the high price of all materials, as before stated, together with the great scarcity of men at the present time, it has been thought best by this Board to defer this work till a more favorable opportunity.

On Beacon Street, between Berkley and Dedham streets, 1109 feet of 6-inch iron pipe has been taken up, and 12-inch laid in place of it, and Hydrants of our largest patterns established at proper distances; this was rendered necessary on account of the great number of new buildings erected on that street, requiring more Water than the 6-inch pipe could deliver, and also in case of fire in that vicinity.

The 30-inch Main, on the Common, has been connected with the Main running through Boylston Street. There being no connection between these pipes except at Chester Park, it was thought best to have them all connected on the Common in case of accident or break.

The 40-inch Main has been shut off once during the year, to make the above connection. The 36-inch twice, for repairs, and the 30-inch once, to make the connection, and once, to renew a Hydrant on the Common.

The number of feet of *Service Pipe* laid during the year was 19,241, being a slight increase over last year. The whole number of Service Pipes laid, to January 1, 1864, is 24,835.

The number of new *Stop Cocks* is 46, making the whole number 1282.

The number of new *Hydrants* established is 29, making the whole number 1502.

The whole number of leaks which occurred and were repaired, in the iron pipes of 4 inches and upwards, was 97; last year 117; in those of less than 4 inches, including service pipes, 397; the previous year it was 373. The causes of these leaks are stated in the Report of the Superintendent.

Twenty-six Fire Reservoirs have been connected with Main Pipes, the expense of which is charged to the Fire Department. The whole number now connected is 81.

The several Reservoirs in this Division are in excellent condition. The repairs made last year on Beacon Hill Reservoir prove satisfactory, no leaks are to be seen, and it is believed to be in as good condition as it ever was; the iron and wood work has been painted, which has improved its appearance very much. Those at East and South Boston show no appearance of leaking; with the head of water with which we can supply them at the present time; both have been cleansed during the year, the fence around the East Boston Reservoir has been put in good repair, and the grounds around these Reservoirs are in good condition.

WESTERN DIVISION.

All the Works in charge of the Superintendent of this Division, are in their usual good condition. The slope wall on the banks of the Lake has been somewhat extended, and it is thought best to continue it in all exposed places around the Lake, and also on the banks of the roads crossing the southern portion of it, to prevent them from being washed by the Spring freshets or extreme high water.

Early in the season the water in Dug Pond was one foot above high-water mark; soon after a leak was discovered in the drain leading from the Pond to the Lake; in order to repair it the Superintendent was obliged to draw the Water from it; the drain was then thoroughly repaired, and the Pond is now full. The Board have not yet been able to effect a settlement for a perpetual right to divert the waters of a brook on the east side of this Pond, to fill it, but feel confident of doing so very soon.

Last Spring a leak was discovered in the gate-chamber at Dudley Pond, which was caused by the frost. The leak was stopped, but the masonry cannot be permanently repaired until the water is drawn down. The Pond is now full again, and wasting from the outlet.

The *Pipe-Chambers, Bridges, and Culverts* are in good order. During the year the interior of the Aqueduct has been thoroughly cleansed, and has been examined a number of times by the Board, City Engineer, and Superintendent of this Division. Some new cracks were found and repaired. One in the bottom of the Aqueduct at Ware's Valley was four hundred feet in length, through which the water had filtered and saturated the earth, causing it to settle from the brick-work and leaving quite a large cavity, in some places eighteen inches deep, and from eight to twelve inches wide. It was repaired by cutting out a number of courses of brick, and filling the cavity with concrete, replacing the brick-work, and plastering the inside with English cement. It is considered to be in good condition at the present time; but if the embankments continue to settle, it may

cause a break in the Aqueduct which might be far more disastrous than the one which occurred in 1859, and would probably cause at any rate a much greater amount of damage.

The *City Engineer* recommends to “strengthen those portions of the Aqueduct resting upon embankments by concrete foundations, and backing of the same material as high as the top of the invert.” When the Works are in condition *to do this*, it might be well to consider, in this particular case, whether it would not be better to move the pipe-chamber on the west bank of Charles River to nearly the west end of the embankment, and extend the pipes or larger ones over the bridge that crosses the road to it; then, in case the bank settled, it would start the lead in the joints only, which could be driven in very readily.

The grounds around Brookline Reservoir are in good condition, six iron screws have been taken out and replaced by composition, and the wood and iron work have been painted.

It appears by the Report of the City Engineer, that there is a difference of opinion with regard to the quantity of water actually consumed by the City for a number of years past, caused probably by taking measurements at different places, and different modes of computing it. The Board have considered the estimated consumption too high, judging from the quantity drawn from Brookline Reservoir, when the water has been shut off at the Lake. It is desirable that some method may be devised to determine the quantity correctly. The estimated daily consumption of water during the past year is less than in 1862, and the

receipts have been more ; which is gratifying to the Board. It will be seen also that 2,165,696,470 gallons have been wasted from the Lake, during the year, all of which might have been saved if we had a reservoir of sufficient capacity to store it, and would have supplied the City for a number of weeks ; and in case of a break in the Aqueduct would have given ample time to repair it. During the year the water has been shut off at the Lake eleven times, to examine and repair the Aqueduct. After it is off, it takes twelve hours to draw the water from it sufficiently to commence work ; and but once has it been off more than twenty-four hours at any one time ; then it was off thirty-seven hours to repair the leak before mentioned at Ware's Valley ; but so grave were the complaints from the high service of short supply of water, that an express was sent to the Lake to have it let on. After it was let on, it took a week to fill Brookline Reservoir, so that when the water is let on a week must elapse before it can be shut off again. By this it will be seen that, if there should be a bad break at this season of the year, the City would be entirely out of water before it could be repaired. In the Report of last year, the attention of the City Council was called to the importance of having another reservoir. During the year this subject has received the serious consideration of this Board, and a number of places within a few miles of the City have been examined, which are well adapted by nature for

this purpose; and we again respectfully call your serious attention to this very important subject.

All of which is respectfully submitted,

EBENEZER JOHNSON, *President.*
GEORGE P. FRENCH,
GEORGE DENNIE,
JABEZ FREDERICK,
L. MILES STANDISH,
GEORGE HINMAN,
NATHANIEL J. BRADLEE.

RECEIPTS AND EXPENDITURES.

*Statement of Expenditures made by the Cochituate Water Board,
from December 31, 1862, to January 1, 1864.*

Laying main pipe, for stock, &c.	\$ 2,475 82
Laying service pipe	23 87
Plumbing Shop, for stock	49 75
Blacksmith Shop, for stock, &c.	336 72
Pipe Yard, building shed and repairs	217 81
Stationery (including stationery for Water Registrar and Superintendents)	281 91
Oil	111 84
Travelling expenses	96 56
Tools	511 18
Carting	490 51
Meters	7,884 27
Fountains	185 54
Taxes	228 63
Stable	1,355 57
Proving Yard, for stock, &c.	642 81
Wages laying main pipe	3,772 93
" laying service pipe	7,127 98
" blacksmith shop	533 43
" plumbing shop	177 81
" proving yard	2,540 59
<i>Amount carried forward</i>	\$ 29,045 53

<i>Amount brought forward</i>					\$ 29,045 53
Miscellaneous Expense. Binding Reports, filling pond on the Public Garden, annual visit of the City Government to the Lake, and expenses of the Board, &c., &c.					1,048 04
Repairing hydrants					1,323 95
“ streets					2,309 85
“ service pipe					2,820 60
“ main pipe					1,191 78
“ stop-cocks					213 66
Stop-cocks					3,005 01
Salaries (including Superintendent's and Clerk's in Water Registrar's office)					8,790 08
Off and on water					2,968 09
Maintaining meters					732 04
Printing (including Water Registrar's and Superintendent's)					403 66
Postage and express					38 99
Lake					4,918 27
Aqueduct repairs					2,293 64
Office expense					1,082 72
Beacon Hill Reservoir					1,059 10
East Boston “					492 26
South Boston “					280 20
Brookline “					1,805 04
Hydrants					1,057 05
Hydrant and stop-cock boxes					1,834 74
Main pipe					19,835 44
Service pipe					9,827 17
Tolls and ferriages					168 73
<i>Amount carried forward</i>					\$ 98,545 64

Amount brought forward \$ 98,545 64

CASH PAID CITY TREASURER.

Received rent of arches under Beacon Hill Reservoir	\$ 300 00	
Received for land sold	600 00	
Received for pipe, laying, repairing, &c.	7,342 46	
Received for grass	40 00	
Received for off and on water, for repairs	\$ 1,437 00	
Received for off and on water, for waste and fines	281 00	
Received for off and on water, for non-payment	1,330 00	
	<hr/>	
	\$ 3,048 00	
Less this amount paid to the City Treasurer	1,330 00	
	<hr/>	
	1,718 00	
	<hr/>	
		10,000 46
		<hr/>
Balance		\$ 88,545 18
		<hr/> <hr/>
<i>Amount of expenditures</i>		\$ 98,545 64

EXTENSION OF THE WORKS.

Wages laying main pipe	\$ 3,772 93	
“ laying service pipe	7,127 98	
“ blacksmith shop	533 43	
“ plumbing shop	177 81	
“ proving yard	2,540 59	
	<hr/>	
<i>Amounts carried forward</i>	\$ 14,152 74	\$ 98,545 64

<i>Amounts brought forward</i>	. \$ 14,152 74	\$ 98,545 64
Main pipe	19,835 44	
Service pipe	9,827 17	
Laying main pipe, &c.	2,475 82	
Laying service pipe	23 87	
Blacksmith shop	336 72	
Plumbing shop	49 75	
Hydrant and stop-cock boxes	1,700 00	
Stable	1,100 00	
Oil	111 84	
Hydrants	1,057 05	
Stop-cocks	3,005 01	
Carting	440 00	
Tolls and ferriage	120 00	
Tools	300 00	
Proving yard for stock, &c.	600 00	
Meters	7,884 27	
Lake and Dudley Pond	2,393 65	
Pipe yard for new shed	200 00	
	<hr/>	65,613 33
		<hr/>
Amount of annual expense . . . . .	. . . . .	\$ 32,932 31
		<hr/> <hr/>

*Expenditures and Receipts on Account of the Water Works, to
January 1, 1864.*

Am't drawn by Commissioners,	\$ 4,043,718 21
Am't drawn by Water Board, 1850,	366,163 89
“ “ “ “ 1851,	141,309 23
“ “ “ “ 1852,	89,654 20
“ “ “ “ 1853,	89,854 03
“ “ “ “ 1854,	80,182 35
“ “ “ “ 1855,	63,866 33
	<hr/>
<i>Amount carried forward</i>	\$ 4,874,748 24

<i>Amount brought forward</i>		\$ 4,874,748	24
Am't drawn by Water Board, 1856,		\$ 81,429	35
“ “ “ “	1857,	96,931	25
“ “ “ “	1858,	76,006	01
“ “ “ “	1859,	385,652	47
“ “ “ “	1860,	146,304	55
“ “ “ “	1861,	73,977	29
“ “ “ “	1862,	86,264	22
“ “ “ “	1863,	98,545	64
		<hr/>	5,919,859 02

Amount paid the City Treasurer by the Commissioners . . . \$ 47,648 38

Am't paid by Water Board, 1850,		8,153	52
“ “ “ “	1851,	5,232	38
“ “ “ “	1852,	15,869	12
“ “ “ “	1853,	4,621	40
“ “ “ “	1854,	12,423	29
“ “ “ “	1855,	9,990	38
“ “ “ “	1856,	7,840	43
“ “ “ “	1857,	13,750	00
“ “ “ “	1858,	9,200	00
“ “ “ “	1859,	5,554	00
“ “ “ “	1860,	3,287	51
“ “ “ “	1861,	10,618	11
“ “ “ “	1862,	3,295	00
“ “ “ “	1863,	10,000	46
		<hr/>	167,483 98

\$ 5,752,375 04

Sundry payments by the City,	\$ 69,925	82
Discount and interest on loans,	3,998,425	02
	<hr/>	4,068,350 84

Amount carried forward . . . \$ 9,820,725 88

WATER.

19

<i>Amount brought forward</i>	.	.	\$ 9,820,725 88
Sundry credits by the City	.	\$ 63,796 76	
Amount received for water-rates (as per City Treasurer's ac- count)	.	.	3,848,356 49
			<hr/> 3,912,153 25
			<hr/> <hr/> \$ 5,908,572 63

SAMUEL N. DYER,
Clerk Cochituate Water Board.

REPORT OF THE SUPERINTENDENT OF THE EASTERN DIVISION.

Boston, *January 4, 1864.*

EBENEZER JOHNSON, ESQ., *Pres. Cochituate Water Board:* —

SIR: In compliance with the requirements of the Water Board, I here present the Annual Report of the Works under my supervision. The amount of main and service pipes laid the past year is shown in the tables hereto annexed.

The main pipe on Chelsea Street East Boston, between Decatur and Marion streets, has been taken up and relaid on the east side of the street. The relaying of this pipe has not been added to the length of main pipe laid the past year, as it adds nothing to its extent, although it took a large number of men three months to do it. I believe the whole Works in this Department to be in as good condition as heretofore. I have but little to suggest beyond what has appeared in former Reports. The increased number of water-takers, and consequently an increased waste, notwithstanding the addition of the new main, makes the supply still feeble on the high grounds, especially in East and South Boston, these latter places being connected with the low service where there is the most waste. I know of no way this can be remedied unless it be that a section of each place be set off and supplied by a separate pipe. There is now but one pipe to each of these localities, and in case of a breakage, aside from the inconvenience of being de-

prived of water for domestic use, there might be great damage done in case of a fire. I would suggest the propriety of continuing the pipe now in Federal Street, or laying a larger one over Federal Street Bridge and connecting it with the one now on Fourth Street. In case of an accident to the Works by night, or of a Sunday, a great inconvenience is felt, in getting together in suitable season a sufficient number of workmen to attend to it. The men from their limited means now reside in different parts of the City. It would be of great advantage to the City, if the Board would lease one or more buildings in the neighborhood of the pipe-yard, and rent it to the workmen, even though the income did not meet the expense. I would earnestly ask your early consideration of this matter.

Statement of Location, Size, and Number of Feet of Pipe laid in 1863,

(The 6-inch pipe in Boylston Street is taken up.)

In what Street.	Between what Streets.	Diameter of pipe in inches.	Feet of pipe.
BOSTON PROPER.			
Beacon	Berkley and Dedham.....	12	1,109
Albany	Plympton and Malden.....	12	464
Berkley.....	Boylston and Providence Railroad Bridge	12	305
	Total 12 inches in Boston.....		1,878
Marlborough.....	Berkley and Clarendon	8	150
	Total 8 inches in Boston.....		150
Avenue III.....	Dedham and Clarendon.....	6	80
Commonwealth Av.	Berkley and Clarendon.....	6	1,099
Clarendon.....	Beacon and Boylston.....	6	1,356
Concord	Washington and Harrison Avenue.....	6	155
West Canton.....	Tremont and Avenue III.....	6	40
West Newton.....	Tremont and Avenue III.....	6	220
Rutland Square....	West of Tremont.....	6	226
Avenue III.....	Dedham and Canton.....	6	246
Clarendon	Avenue III and Tremont.....	6	272
Tremont	Lenox and Kendall.....	6	66
	Total 6 inches in Boston.		3,760
Revere.....	Charles and the River.....	4	116
Stevens Place.....	East of Shawmut Avenue.....	4	244
Albany	At South City Stables.....	4	36
	For 21 Fire Reservoirs.....	4	230
	Total 4 inches in Boston.....		626

In what Street.	Between what Streets.	Diameter of pipe in inches.	Feet of pipe.
SOUTH BOSTON.			
Dorchester Avenue	Sixth and Seventh.....	12	208
	Total 12 inches in South Boston.....		208
Dorchester Avenue	Seventh and Washington Village.....	8	2,571
	Total 8 inches in South Boston.....		2,571
G.....	Sixth and Seventh.....	6	130
Linden.....	Fourth and Thomas.....	6	246
First.....	B and C.....	6	53
Broadway.....	M and N.....	6	289
B.....	Sixth and Seventh.....	6	50
Seventh.....	C and D.....	6	279
First.....	A and B.....	6	400
	Total 6 inches in South Boston.....		1,452
First.....	At Bay State Rolling Mill.....	4	502
First.....	At Aquila Adams's Wharf.....	4	345
	For 5 Fire Reservoirs.....	4	60
	Total 4 inches in South Boston.....		907
EAST BOSTON.			
Bremen.....	Marion and Putnam.....	6	429
Brooks.....	Chelsea and Bremen.....	6	24
London.....	Bennington and Porter.....	6	80
	Total 6 inches in East Boston.....		533
Border.....	McKay's Shipyard.....	4	23
	Total 4 inches in East Boston.....		23
CHARLESTOWN.			
Chelsea.....	Opposite Navy Yard.....	12	36

RECAPITULATION.

Section.	1863.	Diameter in inches.				
		36	12	8	6	4
Boston Proper... {	Total number of feet laid.....	1	1,878	156	3,760	626
	Stop-cocks in the same.....		1		9	22
South Boston... {	Total number of feet laid.....		208	2,571	1,452	907
	Stop-cocks in the same.....			1	3	6
East Boston..... {	Total number of feet laid.....				533	23
	Stop-cocks in the same.....				1	
Charlestown..... {	Total number of feet laid.....		36			
	Stop-cocks in the same.....		2			
	Sums of pipes.....		2,122	2,727	5,745	1,556
	Sums of stop-cocks.....	1	3	1	13	28

Statement of the Length of different Sizes of Pipes laid, and the Number of Stop-cocks put in, to January 1, 1864.

	Diameter of pipes in inches.										Aggregate.
	40	36	30	24	20	16	12	8	6	4	
Ft. of Pipe laid in Brookline, Roxb'y & Boston proper	23,082	19,991	29,696	5,773	.....	6,096	59,061	1,114	236,715	78,430	
Number of Stop-cocks in the same.....	4	6	8	10	1	19	114	1	482	257	
Ft. of Pipe laid in and for South Boston.....	.....	.....	.....	.....	8,155	.....	18,938	2,871	89,485	25,199	
Number of Stop-cocks in the same.....	.....	.....	.....	.....	4	.....	31	2	128	61	
Ft. of Pipe laid in and for East Boston.....	.....	.....	.....	.....	15,072	1,523	16,150	.....	69,473	3,846	
Number of Stop-cocks in the same.....	.....	.....	.....	.....	6	3	23	.....	91	28	
Ft. of Pipe laid in Newton and Needham.....	.....	1,074	2,140	.....	.....	.....	159	.....	.....	.....
Number of Stop-cocks in the same.....	.....	.....	.....	.....	.....	.....	2	.....	1	.....
TOTALS. — Length of Pipes laid.....	23,082	21,065	31,836	5,773	24,127	7,619	94,308	3,985	395,673	107,475	714,943 feet, equal to 135 mils., 2,143ft.
Number of Stop-cocks put in.....	4	6	8	10	11	22	170	3	702	346	1,282

Statement of Service Pipes laid in 1863.

Diam. in inches.	Boston Proper.		South Boston.		East Boston.		Total.	
	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.
1 $\frac{1}{4}$	3	194	.....	.....	.....	.....	3	194
1	7	427	3	105	1	87	11	619
$\frac{3}{4}$	5	277	.....	.....	1	45	6	322
$\frac{3}{8}$	287	10,861	80	2,693	69	3,336	436	16,890
$\frac{1}{2}$	7	262	25	669	7	285	39	1,216
Aggregate.....							495	19,241
Making the total number up to January 1, 1864.....							24,835	

Repairs of Pipes during the Year 1863.

Where.	DIAMETER OF PIPES IN INCHES.																Total.	
	40	36	30	24	20	16	12	8	6	4	2	1½	1¼	1	¾	½		
Boston	4	8	2	1	1	.....	8	.....	23	38	9	53	4	17	3	242	2	415
South Boston.....	.....	.....	.....	.....	1	.....	.....	.....	1	1	.....	.....	.....	4	.....	31	2	40
East Boston.....	.....	.....	.....	1	1	.....	2	.....	3	2	.....	.....	.....	3	.....	27	.....	39
Totals.....	4	8	2	2	3	.....	10	.....	27	41	9	53	4	24	3	300	4	494

Of the leaks that have occurred in pipes of 4 inches and upwards, 77 were on the joints; 9 by settling of earth; 7 by defective pipes; 1 by pile driving; 1 by defective cock; 1 by steam fire engine; 1 by frost; total (97) ninety-seven. Of the leaks in two inch and service pipes, 151 were caused by settling of earth; 5 by defective joints; 15 stiff connections; 26 stopped by rust; 2 by tenants; 53 defective pipes; 54 stopped by fish; 2 by boatmen; 26 by sewer diggers; 1 by boys; 25 defective couplings; 10 defective cocks; 6 by rats; 1 by pile driving; 8 by frost; 8 cocks pulled out; 1 by boxing; 2 by cellar diggers; 1 cock blew out. Total 397. Showing an increase of four over the past year.

Statement of the Number of Leaks, 1850–1863.

YEAR.	LEAKS IN PIPES OF A DIAMETER OF		Total.
	Four inches and upwards.	Less than four inches.	
1850.....	32	72	104
1851.....	64	173	237
1852.....	82	241	323
1853.....	85	260	345
1854.....	74	280	354
1855.....	75	219	294
1856.....	75	232	307
1857.....	85	278	363
1858.....	77	324	401
1859.....	82	449	531
1860.....	134	458	592
1861.....	109	399	508
1862.....	117	373	490
1863.....	97	397	494

Hydrants.

During the year twenty-nine new hydrants have been established as follows : fifteen in the City proper, ten in South Boston, and four in East Boston.

Total number of hydrants established up to January 1, 1864 :

In Boston proper	964
“ South Boston	317
“ East Boston	188
“ Brookline	3
“ Roxbury	12
“ Charlestown	11
“ Chelsea	7
Total	<hr/> 1,502

Fifty hydrants have been taken out and replaced by new or repaired ones, and seventy-six hydrant boxes have been renewed. The hydrants have had the usual attention this year, having been oiled twice, and other necessary repairs done to keep them in good order. Two men are detailed for each district, in cold weather, as formerly, and those hydrants most subject to frost are visited at morning and at night.

FIRE RESERVOIRS.

The following list of Fire Reservoirs have been connected with the main pipes during the year : —

Boston proper.

East Street, opposite the School House.

Chauncy Street, opposite No. 18.

High “ corner of Congress Street.

Hudson “ “ Beach “

Edinboro’ “ near Essex Street.

Fort Hill, in Belmont Street.
 Warren Street, near Eliot Street.
 Kneeland, corner of Washington Street.
 Harrison Avenue, opposite Curve Street.
 Church Street, opposite the Church.
 Essex Street, near Washington Street.
 Washington Street, opposite Boston Theatre.
 Federal “ “ Piper’s Wharf.
 Pearl “ “ Sturgis Place.
 Mt. Vernon “ “ Louisburg Square.
 Mt. Vernon “ rear of the State House.
 Myrtle “ opposite Irving Street.
 Tremont “ “ Mason “
 Pleasant “ “ Carver “
 Pleasant “ corner Washington Street.
 Anderson “ near Pinckney Street.

South Boston.

C Street, opposite Bolton Street.
 Fourth Street, near E Street.
 E Street, corner of Eighth Street.
 Dorchester Street, near Fourth Street.
 Fourth Street, near B Street.

The stock and labor for the above reservoirs, amounting to \$ 2,539.21, is charged to the Fire Department.

Stop-Cocks.

Forty-six new stop-cocks have been established during the past year, with the same number of boxes over them, and sixty-seven boxes renewed. All the stop-cocks have been oiled, and the usual attention paid them.

*Statement of Pipes and other Stock on hand, exclusive of Tools,
January 1, 1864.*

NUMBER OF	DIAMETER IN INCHES.											
	40	36	30	24	20	16	12	8	6	4	3	2
Pipes.....	15	18	91	8	62	39	135	81	22	12	3	11
Blow-off Branches.....	1	...	1	...	...	...	...	...	...	...	...	...
Y Branches.....	...	...	1	...	...	1	1	...	6	...	...	...
3-Way Branches.....	7	4	3	...	3	6	13	8	12	8	1	8
4-Way Branches.....	...	...	2	1	...	2	8	8	3	...	...	...
Flange Pipes.....	2	4	4	5	2	...	...	...	...	4	...	...
Sleeves.....	5	...	6	8	5	3	4	8	10	6	...	25
Clamp Sleeves.....	...	4	6	...	...	2	3	...	...	23	...	...
Caps.....	2	2	5	1	1	...	8	8	9	18	...	...
Reducers.....	3	2	1	2	...	3	7	6	...	13	...	...
Bevel Hubs.....	...	...	...	...	2	...	...	...	3	3	...	...
Curved Pipes.....	...	3	9	...	2	2	3	...	...	...	...	...
Quarter Turns.....	...	...	...	...	2	1	2	...	2	5	1	4
Double Hubs.....	...	...	...	...	4	9	...	...	...	...	...	...
Offset Pipes.....	...	...	...	...	...	...	...	...	8	5	...	...
Yoke Pipes.....	...	...	...	...	...	...	3	...	4	...	...	...
Man-hole Pipes.....	2	...	4	...	...	...	...	...	...	...	...	...
One-Eighth Turns.....	1	...	...	...	1	...	3	...	12	10	...	...
Pieces of Pipes.....	4	7	4	3	16	3	7	...	7	...	...	...
Stop-Cocks.....	1	2	1	2	2	2	8	7	4	6	...	2

Hydrants. 8 Lowell, new, 5 ditto, old; 14 Wilmarth, old, 3 New York pattern.

For Hydrants. 32 plungers, 18 screws, 16 valve seats, 35 stuffing-boxes, 18 nipples, 12 wharf hydrant cocks, 20 wharf hydrant nipples, 17 lbs. unfinished wharf hydrant castings, 128 lbs. unfinished composition castings, 82 lbs. iron castings, 9 bends, 40 lengtheners, 16 frames, 18 covers.

For Stop-Cocks. 3 36-inch screws, 2 30-inch ditto, 2 24-inch ditto, 1 16-inch ditto, 4 6-inch ditto, 15 6-inch iron ditto, 10 4-inch ditto, 1 unfinished composition ditto for waste-gate, 1

unfinished composition for reservoir gate, 3 12-inch flanges, 8 6-inch plungers, 15 4-inch ditto, 2 6-inch rings, 20 4-inch ditto, 1 36-inch valve, 291 lbs. 6-inch ditto, 168 lbs. 6-inch composition castings, 230 lbs. 4-inch ditto, 1,471 lbs. 4-inch iron castings, 9 ribs for 36-inch, 4 ditto for 30-inch, 8 sets of gearing for 36 and 30-inch, 7 frames, 52 covers, 3 kegs of bolts.

Meters. 1 4-inch Worthington, 3 3-inch ditto, 14 2-inch composition ditto, 117 1-inch composition ditto, 6 1-inch iron ditto, 142 $\frac{5}{8}$ -inch composition ditto, 6 $\frac{5}{8}$ -inch iron ditto, 1 2-inch composition New York, 1 1-inch Scotch, 6 $\frac{5}{8}$ -inch Scotch.

Stock for Meters. 14 1-inch nipples, 3 $\frac{5}{8}$ -inch ditto, 20 1-inch male connection couplings, 14 1-inch female ditto, 4 2-inch male ditto, 28 $\frac{5}{8}$ -inch female ditto, 7 $\frac{5}{8}$ -inch male ditto, 6 2-inch flanges, 6 3-inch reducers, 2 2-inch ditto, 1 3-inch flange, 4 2-inch connection pieces, 6 1-inch ditto, 8 $\frac{5}{8}$ -inch ditto, 9 1-inch rough stops, 9 $\frac{5}{8}$ -inch ditto, 191 lbs. unfinished composition castings, 14 clocks, 38 glasses for ditto, 5 fish boxes, 70 rubber nipples, 8 lbs. rubber packing, 15 frames and covers.

For Service Pipes. 7 1-inch union cocks, 38 $\frac{3}{4}$ -inch ditto, 36 $\frac{5}{8}$ -inch ditto, 15 $\frac{1}{2}$ -inch ditto, 10 air cocks, 10 1-inch T cocks, 14 $\frac{3}{4}$ -inch ditto, 8 $\frac{5}{8}$ -inch ditto, 14 $\frac{5}{8}$ -inch Y cocks, 47 $\frac{5}{8}$ -inch straight cocks, 35 $\frac{3}{4}$ -inch cock couplings, 138 $\frac{5}{8}$ -inch ditto, 272 $\frac{1}{2}$ -inch ditto, 6 2 $\frac{1}{4}$ -inch connection couplings, 251 $\frac{1}{4}$ -inch ditto, 6 1-inch ditto, 6 $\frac{3}{4}$ -inch ditto, 25 $\frac{5}{8}$ -inch ditto, 17 1 $\frac{1}{4}$ -inch connection nipple, 80 1-inch union tubes, 13 $\frac{5}{8}$ -flanges, 132 $\frac{5}{8}$ -inch unfinished cocks, 248 $\frac{1}{2}$ -inch ditto, 343 lbs. unfinished cock castings, various sizes, 162 lbs. unfinished coupling castings, various sizes, 21 upright tubes, caps, and flanges, for 1-inch cocks, 79 upright tubes, 135 caps, 49 long boxes, 26 T boxes, 18 Y boxes, for $\frac{5}{8}$ -inch cocks.

Lead Pipe. 616 lbs. 2 $\frac{1}{2}$ -inch, 735 lbs. 2-inch, 1,940 lbs. 1 $\frac{1}{2}$ -inch, 637 lbs. 1-inch, 1,130 lbs. $\frac{3}{4}$ -inch, 1,176 lbs. $\frac{5}{8}$ -inch, 2,257 lbs. $\frac{1}{2}$ -inch, 102 lbs. $\frac{5}{8}$ block tin, 730 lbs. sheet lead, 4458 lbs. pig lead.

Blacksmith's Shop. 1,447 lbs. bar iron, 2,571 lbs. working pieces, 249 lbs. cast steel, 1340 lbs. scrap iron.

Carpenter's Shop. 1000 feet pine plank, 200 feet oak ditto, 50 lbs. spikes and nails, 3 hydrant boxes, 4 stop-cock ditto, 3 meters ditto, 1 dozen top pieces.

Stable. 4 sets of harness, 3 horses, 1 buggy, 1 chaise, 3 wagons, 2 pungs, 1 sleigh, 1,300 lbs. English hay, 700 lbs. salt ditto, 20 bushels grain, stable utensils.

Tools. 1 steam-engine, 1 large hoisting crane, 1 boom derrick, 4 geared hand derricks, 2 sets of shears, and all the rigging for the same, tools for lying main and service pipes, and for repairs of the same, 1 steam-engine, 2 engine laths, 1 fox ditto, 1 hand ditto, 1 upright drilling machine, 3 grindstones, and the necessary tools for carrying on the machine, blacksmith's, carpenter's, and plumbers shops, 3 large tool houses, 2 small ditto, 1 40-inch proving press, 1 36-inch ditto, 2 small ditto, also office furniture.

At Beacon Hill Reservoir. 5 swivel pipe patterns, 1 swing stage, capstan frame and levers, 1 composition cylinder, 1 6-inch ditto, 4 jets, 1 reducer, and 2 sets of 12-inch plates, and 2 4-inch plates, 3 composition reel jets, 6 cast-iron jets, 1 drinking fountain, also a large lot of patterns stored at the pipe yard and at the founderies where we obtain castings.

Miscellaneous. 5 man-holes, 6 plates, large lot of old lumber, 4 large flagging-stones, lot of machinery from Marlboro', 30 tons paving gravel, 850 bricks, $\frac{1}{2}$ barrel rosin, 715 lbs. of gasket, 5 kegs, old bolts, various sizes, 4,700 lbs. old cast-iron, 30 lbs. rubber packing, 14 proving heads, 375 feet of hose.

Respectfully submitted,

EZEKIEL R. JONES,

Superintendent Eastern Division B. W. W.

REPORT OF THE SUPERINTENDENT OF THE WESTERN DIVISION.

NATICK, January 5, 1864.

EBENEZER JOHNSON, ESQ., *President Cochituate Water Board :*

SIR: The Annual Report of the condition of the Western Division of the Water Works, is herewith submitted.

The grounds, walks, and structures around the Lake have been kept in good condition and repair during the year. The roads which cross the Lake require constant watching in the Spring of the year, on account of the freshets; the City being liable for all damage occurring from any defect in the road from such cause. To avoid this expense, I would recommend the laying of slope walls at those places.

Last Spring the pressure of water on Mr. Knight's old drain, leading from Dug Pond to the Lake, was so great that it broke through the road. I was immediately notified by Mr. Messenger, of Natick, and arrived in season to prevent a large breach being made in the road.

The Gate Chamber at Dudley Pond was moved by the ice last winter, making a leak in the masonry; the leak was stopped, but cannot be permanently repaired until the water is drawn down, which it would not be advisable to do till the water is needed.

The Water has been shut off from the Conduit a number of times, to make examinations and repairs; at the large puddled

bank in Ware's Valley, about 400 feet of the Conduit has been repaired by cutting out four or five courses of the inverted arch, and filling the cavity under it with concrete.

The usual attention has been given to the grounds and walks around the Brookline Reservoir. The leak through the masonry at the Gate House has been stopped, and the exterior joints newly pointed, the stairway where the plastering was stained has been sealed with chestnut boards, and the walls, roof, and all the wood work at the Gate House have been repainted.

Annexed is a schedule of tools, &c. belonging to the City, and used in this Department.

Respectfully submitted,

E. F. KNOWLTON,

Superintendent Western Division.

The following property is in charge of and used by the Superintendent of the Western Division:—

- 1 Horse Cart and Harness.
- 1 Express Wagon.
- 1 Express Harness.
- 2 Boats and 4 Oars.
- 26 Wheelbarrows and 1 Handcart.
- 62 Shovels and 10 Picks.
- 4 Crowbars, 4 Rammers.
- 2 Grindstones, 10 Water Pails.
- 4 Pairs Rubber Boots.
- 6 Lanterns, 2 Hammers.
- 1 Level, 2 Handsaws.
- 2 Grass Hooks.
- 2 Iron Wrenches at Gate House.
- 2 “ “ at Brookline Reservoir.
- 4 Trowels, 2 Hoes, 2 Axes.

- 1 Fluid Can and Oil Filler.
- 1 Pair of Hedge Shears.
- 1 Stove, 1 Desk.
- 1 Gravel Scow.
- 1 Rain Gauge.

WATER REGISTRAR'S REPORT.

OFFICE OF WATER REGISTRAR, CITY HALL,
BOSTON, January 1, 1864.

E. JOHNSON, ESQ., *President of the Cochituate Water Board*:—

SIR: The Annual Report of the Water Registrar, for the year ending December 31, 1863, is hereby submitted in conformity to the 16th section of the ordinance.

The total number of water-takers now entered for the year 1864, is 26,581, being an increase since January 1, 1863, of 292.

During the year there has been 727 cases where the water has been shut off, all of which were for non-payment of water-rates.

The total number of cases where the water has been turned on, is 1,182; of these, 665 were cases which had been shut off for non-payment of water-rates, and 517 were turned on for the first time.

The total amount received from December 31, 1862, to January 1, 1864, is \$394,506 25

Of the above, there was received for water used in previous years, the sum of \$12,997 15

Leaving the receipts for water used during the year 1863, the sum of \$381,509 10

Amount carried forward, \$394,506 25

<i>Amount brought forward,</i>	\$ 394,506 25
In addition to the above, there has been received for letting on water in cases where it had been turned off for non-payment of rates, the sum of	1,330 00
Total amount	<u>\$ 395,836 25</u>

The increased amount of income in 1863 over the previous year, is	\$ 20,583 37
The amount of assessments now made for the present year, is	310,945 96
The estimated amount of income from the sales of water during the year, 1864, is	430,000 00
The expenditures of my office during the year 1863, have been	3,930 51

The items of this expenditure are as follows :—

Paid Chas. L. Bancroft for services as clerk	\$ 900 00
“ Stephen Badlam “ “ “ “	900 00
“ Edwin Jennings “ “ “ inspector	782 50
“ Chas. C. Badlam “ “ “ “	782 50
“ J. L. Fairbanks “ stationery . . .	179 46
“ R. D. Childs “ distributing bills . . .	28 00
“ G. E. Richardson “ “ “ . . .	28 00
“ William Souther “ “ “ . . .	26 00
“ L. H. Russell “ “ “ . . .	26 00
“ J. T. Buswell “ “ “ . . .	16 00
J. E. Farwell “ printing . . .	262 05
Amount	<u>\$ 3,930 51</u>

Statement showing the number of houses, stores, steam engines, &c. in the City of Boston, supplied with Cochituate Water to the 1st of January, 1864, with the amount of water-rates paid for 1863 :—

19,069	Dwelling-houses	.	.	.	.	.	\$ 223,488	97
18	Boarding	"	.	.	.	.	1,047	00
102	Model	"	.	.	.	.	4,366	00
11	Lodging	"	.	.	.	.	266	00
23	Hotels	.	.	.	.	.	1,979	00
4,095	Stores and shops	.	.	.	.	.	35,275	78
202	Buildings	.	.	.	.	.	8,109	84
346	Offices	.	.	.	.	.	2,464	32
50	Printing offices	.	.	.	.	.	694	95
21	Banks	.	.	.	.	.	251	50
26	Halls	.	.	.	.	.	348	43
4	Theatres	.	.	.	.	.	155	00
22	Private schools	.	.	.	.	.	212	00
10	Asylums	.	.	.	.	.	335	96
4	Greenhouses	.	.	.	.	.	27	00
1	Catholic college	.	.	.	.	.	197	50
1	Medical college	.	.	.	.	.	30	00
67	Churches	.	.	.	.	.	625	38
7	Markets	.	.	.	.	.	829	50
118	Cellars	.	.	.	.	.	767	50
410	Restaurants and saloons	.	.	.	.	.	5,091	12
10	Club houses	.	.	.	.	.	231	00
6	Bath houses	.	.	.	.	.	305	00
16	Packing houses	.	.	.	.	.	281	00
949	Stables	.	.	.	.	.	10,152	41
19	Factories	.	.	.	.	.	402	33
1	Brewery	.	.	.	.	.	10	00
4	Beer factories	.	.	.	.	.	55	75
6	Bleacheries	.	.	.	.	.	73	50
<i>Amount carried forward,</i>							\$ 298,073	74

<i>Amount brought forward,</i>		\$ 298,073 74
64 Bakeries		503 75
4 Shipyards		78 00
4 Dry docks and engines		192 03
56 Shops and do.		3,157 17
14 Stores and do.		971 56
2 Mills and do.		281 64
7 Foundries and do.		336 85
10 Factories and do.		674 56
10 Printing and do.		687 97
1 Bakery and do.		33 00
4 Shipyards and do.		221 30
4 Binderies and do.		316 91
4 Buildings and do.		520 25
1 Potteries and do.		35 00
42 Stationary engine		1,433 73
6 Armories		61 25
5 Gymnasiums		77 25
779 Hose		2,343 00
26 Fountains		130 00
2 Gaslight companies		922 39
1 Milldam company		104 25
1 Postoffice		61 50
1 Statehouse		134 50
23 Steamboats		4,312 34
3 Railroad companies		847 00
3 Offices, Niles Block		36 00
1 Office, City Scales		9 00
1 Office, Harbor Master		6 00
1 Old State House		27 00
6 Fire-alarm moters		65 00
22 Engines, hose and hook and ladder houses.		397 00
270 Public schools		1,840 00
<i>Amounts carried forward,</i>		<u>\$ 318,890 94</u>

<i>Amount brought forward,</i>	\$318,890 94
8 Police stations	625 00
2 City stables	108 75
1 Offal station	150 00
1 Steamer, Henry Morrison	192 56
1 Court house	262 50
1 Probate building	47 50
1 Dead house	10 00
1 House of Correction	462 00
1 Jail for Suffolk County	243 00
1 Lunatic hospital	225 00
1 Public library	50 00
1 Faneuil Hall	40 00
1 City Hall	50 00
1 City building	37 50
Common Sewer Department, making mortar,	75 00
Urinals, &c. F. H. Market	70 00
Contractors for supplying shipping	4,144 93
Street sprinkling	558 32
Building purposes	1,710 88
Custom House	156 00
U. S. Court House	102 00
Measured water	53,230 05
Water Power Company	67 17
	<hr/>
	\$ 381,509 10

Statement showing the number and sizes of Water Meters now in use, and where applied, to January 1, 1864.

	SIZE OF METERS.				
	4 inch.	3 inch.	2 inch.	1 inch.	$\frac{3}{4}$ inch.
Revere House				3	
Parker House				4	
American House			1	2	
Adams House				1	2
Coolidge House				4	
Marlboro House				1	
Tremont House				4	
United States Hotel				3	
Winthrop House				2	
Bromfield House					1
City Hotel					2
Sailors' Home					1
Mariners' House					1
Boston Hotel					1
Young's Hotel				2	
New England House				1	
Hotel Pelham				1	2
Merrimac House					1
Wildes' Hotel					1
Massachusetts Hotel					1
Montgomery House				1	
Quincy House				2	2
Elm Street House				1	
National House				1	1
Central House					2
Webster House				2	
Hancock House				2	
J. Adams (Boarding House)					1
Evans House				2	1
Dooley's Hotel					1
Berkley Hotel					1
Pavilion Hotel				2	
Boston Sugar Refinery		1			
Boston and Worcester Railroad Co.				2	5
Boston and Maine Railroad Company			1	1	2
Old Colony Railroad Company				3	4
Fitchburg Railroad Company				2	
Eastern Railroad Company			1	5	1
Navy Yard	2		1		
United States Marine Hospital			2		
Massachusetts General Hospital				4	1
McLean Asylum			2		
State Prison	1				
Bay State Rolling Mill				2	
Norway Iron Company				2	
<i>Amounts carried forward,</i>	3	1	7	62	35

	4 inch.	3 inch.	2 inch.	1 inch.	½ inch.
<i>Amounts brought forward</i>	3	1	7	62	35
Pembroke Forge Company				1	
D. Dyer (Rice Mill)				1	
Farrar, Follett, & Co. (Rolling Mill)					1
Boston Gaslight Co. (Gasometer)				1	
South Boston Gas Company					1
East Boston Gas Company				1	
Cunard Steamship Company		1			
East Boston Ferry Company			1		
People's Ferry Company			1		
Chelsea Ferry Company		1			
J. Trull (Distillery)				1	
J. M. Barnard (Distillery)				1	
S. Bowman "				2	
Felton & Waters "				1	1
F. H. Jenney "				1	1
W. E. French "				2	
Henry Howland "				1	
John Felton "				1	
Graves & Hoyt "				1	
Torreys & Co. (Marble Works)				1	1
Bowker, Torrey, & Co. "					2
E. L. Gowan "					1
J. Foote "					1
M. Grant "					1
Cushing & Beach "					1
A. Wentworth "					4
Houston & Pierce (Saw Mill)					1
Chauncy Page "				1	
Benjamin Pope "				1	
J. A. Robertson "					1
Bennett & Bro. "					1
Manson, Peterson, & Co. "					1
J. F. Keating "					1
J. J. McNutt "					1
J. R. Cooledge "					1
J. F. Paul "					2
H. N. Hooper & Co. (Foundry)				1	
William Carleton "					3
Cyrus Alger (New Foundry)		2	1		
do. (Old ")		1			
do. (Powder Mill)					1
Hinckley, Williams, & Co. (Foundry)					1
Downer's Kerosene Oil Works		1			1
Fulton Iron Foundry				1	
Shawmut Oil Company					1
Oriental Oil Company				1	
H. Richardson (Oil Mill)					1
Lee, Crocker, & Co. "				1	1
Hodges & Silsbee, (Chemicals)					2
W. D. Philbrick "					1
A. Lovis "					1
<i>Amounts carried forward</i>	3	7	10	85	72

	4 inch.	3 inch.	2 inch.	1 inch.	$\frac{1}{2}$ inch.
<i>Amounts brought forward.</i>	3	7	10	85	72
W. D. Philbrick (E. B.) (Chemicals)					1
Loring, Bangs, & Co. "					1
Henry Souther (Brewery)				1	
W. T. Van Nostrand "				1	
William Rutledge "					1
E. H. Maxwell "				1	
Fairbanks & Beard (Beer Manf.)				1	
Mt. Washington Glass Works				1	
Boston Crystal Glass Company					2
W. K. Lewis' (Pickle Manf.)					1
W. H. Davis' "					1
J. B. Hamblin's "					1
H. M. Richards (Jewelry Manf.)					1
Chickering & Sons (Piano Manf.)				3	1
J. L. Ross (School Furniture)				1	2
Dexter, Lambert, & Co. (Tassel Manf.)				1	
Sanborn, Richardson, & Co. (Pipe Manf.)					1
Grover, Baker, & Co. (Sewing Machines)				2	
E. G. Evans (Sngar Mill)				1	
Thomas Oxnard "				1	
Hazelton & Bailey (Paper Manf.)				1	
Globe Locomotive Works				1	
H. A. Breed & Co (Milk)					1
Hill, Dwinell, & Co. (Spice Mill)				1	
S. C. Taylor (Hat Manufacturer)					1
Warren, Color, & Co.					1
S. C. Davis (Building)					1
Aerated Bread Co.					1
J. B. Fowle & Co. (Bakery)					1
Kittredge & Co. (Turpentine Works)				1	
Aquila Adams (Machine Shop)				1	
William Evans "				1	
Atlantic Works "				2	
R. Hoe & Co. "				1	
George McLaughlin "				1	1
J. J. Walworth "				1	
Edwards & Kershaw "					4
Denio & Roberts "				1	
Briggs & Robinson (Engine)					1
Schenkl & Dana "					1
Banker, Carpenter, & Co. "					1
Stimson, Valentine, & Co. "					1
Jarvis & Hall "					1
Albion Building				1	
Hart, Baldwin, & Co. (Packing House)				1	
Aquila Adams (Shipyards)				1	
Donald McKay "					1
T. R. Birnham (Photographer)					1
Suffolk Salt Works					1
Boston Music Hall (Power for Organ)			2		
Second Church Society " "				1	
<i>Amounts carried forward.</i>	3	7	12	115	104

	4 inch.	3 inch.	2 inch.	1 inch.	$\frac{1}{2}$ inch.
<i>Amounts brought forward</i>	3	7	12	115	104
R. B. Brigham (Restaurant)					1
E. W. Johnson "					2
Peter Brigham "					1
Charles Copeland "					4
B. S. Wright & Co. "					2
W. F. White "					1
Buckley's Minstrels (Aquarium, &c.)					2
Total	3	7	12	115	117

The following table exhibits the yearly revenue received from the sales of Cochituate water, since its introduction into the City, October 25, 1848 : —

From October 25, 1848, to January 1, 1850,		\$ 72,043 20
“ January 1, 1850, “ 1851,		98,367 90
“ “ 1851, “ 1852,		161,299 72
“ “ 1852, “ 1853,		179,486 25
“ “ 1853, “ 1854,		196,352 32
“ “ 1854, “ 1855,		217,007 51
“ “ 1855, “ 1856,		266,302 77
“ “ 1856, “ 1857,		282,651 84
“ “ 1857, “ 1858,		289,328 83
“ “ 1858, “ 1859,		302,409 73
“ “ 1859, “ 1860,		314,808 97
“ “ 1860, “ 1861,		334,544 86
“ “ 1861, “ 1862,		365,323 46
“ “ 1862, “ 1863,		373,922 88
“ “ 1863, “ 1864,		394,506 25
Total		\$ 3,848,356 49

Statement showing the number and kind of Water Fixtures contained within the premises of water-takers in the City of Boston, to January 1, 1864, as compared with 1862.

1862	1863	REMARKS.
4,766	4,789	Taps. These have no connection with any drain or sewer.
36,255	37,289	Sinks.
13,127	14,100	Wash-hand basins.
4,660	4,921	Bathing-tubs.
5,216	5,788	Pan water-closets.
6,252	6,529	Hopper water-closets.
816	846	Self-acting water-closets.
1,408	1,548	Urinals.
4,390	4,967	Wash-tubs. These are permanently attached to the building.
16	17	Shower-baths. These are in houses where there are no tubs.
12	12	Hydraulic rams.
714	729	Private hydrants.
211	216	Slop-hoppers.
77,843	81,726	Total.

Respectfully submitted,

WILLIAM F. DAVIS,

Water Registrar.

REPORT OF THE CITY ENGINEER.

OFFICE OF CITY ENGINEER, BOSTON, January, 1864.

EBENEZER JOHNSON, ESQ., *President of the Cochituate Water Board*:—

SIR: In compliance with the 13th Section of the Water Ordinance, of October 31, 1850, the following Report is respectfully submitted:—

LAKE COCHITUATE.

The Gate House and other structures, as well as the grounds around the Lake, have been kept in excellent condition by the efficient Superintendent of the Western Division.

The Water in the Lake, during the past year, has stood at a higher average level than it has since 1859. On the 1st of January, 1863, the surface of the Lake was 11 feet above the bottom of the Conduit, or about three feet below high-water mark. On the second of March it had reached high-water mark, and remained at about that level till May 24. It then began to lower, and on the twelfth of July had fallen two feet, three inches. July 25, the Lake was again full, and remained so till August 5, when it began to lower, and fell one foot four inches in about two months. On the twentieth of November it stood at high-water mark again, and has remained full to the present time. It will thus be seen that at no time during the

year has the water in the Lake been more than three feet below high-water mark, and that for about one third of the year it has been at its maximum level.

Water has been wasted from the Lake, during the past year, as follows, viz:—

In March, for 23 days,	678,960,997 gallons.
“ April, “ 10 “	936,245,503 “
“ May, “ 5 “	82,187,674 “
“ July, “ 2 “	117,791,194 “
“ August, “ 1½ “	64,381,357 “
“ Nov'r, “ 9 “	73,169,814 “
“ Dec'r, “ 17 “	212,959,931 “
Total, “ <u>67½</u> “	<u>2,165,696,470</u> “

Thus it appears that Water has been wasted to an amount equal to nearly 6,000,000 gallons for each day in the year, or more than one third of the daily consumption.

CONSUMPTION.

By the tables of consumption herewith submitted, it appears that the daily average amount consumed for the past year is somewhat less than for the year 1862; about 2,000,000 gallons per day less than for 1861, and about 1,000,000 gallons per day less than for 1860. But, had the methods employed for a few years past, for estimating the consumption, been used this year, the daily average would have been 18,625,000 gallons, instead of 16,238,500, and this year's consumption would have been the greatest of any year. The estimates for a number of years past have been made from calculations of the discharge through the three pipes crossing Charles River, and it must be evident that tables of discharge computed years ago, whether based upon actual observations and measurements, or calculated by the usual formula, must give an error of excess now, when

the accretions in the pipes have increased so much. And again, this method to be reliable, requires great nicety in the observations at the two pipe-chambers; for the average head is only about six inches, and an error in observation of a quarter of an inch would make a difference of over 360,000 gallons in twenty-four hours. These observations, as kept and returned, are made to the nearest inch, and, in fact, from the eddying motion of the Water, it is hardly practicable to attain greater accuracy with the present appliances.

The method which I have employed this year is the same used by Mr. Chesbrough, and is based upon actual observations which determined the mean velocity of the water in the conduit for different declivities of surface.

The observations at the East Pipe Chamber and at the Brookline Reservoir furnish the declivity of surface and depth of water in the Conduit, and from these data the calculations are made.

I have employed this method because I consider it more reliable than the one based on the discharge through the pipes over Charles River; but even this method, in my opinion, gives too large an estimate. For the velocities obtained by experiment were those due to a flow of water when the Aqueduct was used as a canal, whereas for the past few years it has been used as a pipe. And, in fact, if the usual formula for the flow of water through pipes where the velocity is less than two feet per second be applied to the Aqueduct, the result will be considerably less than that derived from the method which I have used. The only true measurement of the consumption is obtained by the lowering of the water in the Brookline and City Reservoirs when the flow from the Lake is cut off.

During the past year the water has been shut off from the Aqueduct a number of times, and the amount consumed on those days is invariably less by nearly 2,000,000 gallons than the estimates for the day previous. For instance; on the 23d of June, the estimated consumption by the method used for the

past few years would be . . . 18,600,000 gallons.
By Mr. Chesbrough's method it would be 16,500,000 “
The water was shut off on the 24th, and the amount drawn from the reservoirs during the day was 14,450,000 gallons.

I think it must be apparent that the estimates of the past few years are much too large, and that even the estimate as made for the last year (1863) is greater than it should be, by nearly 1,000,000 gallons per day.

It is hoped that before the close of the present year a more satisfactory method may be found of determining the consumption of water.

The largest estimated amount consumed in any one day during the year was nearly 23,000,000 of gallons, on the 4th of February, when the temperature was from six to ten degrees below zero during the whole twenty-four hours.

THE LAKE AS A SOURCE OF SUPPLY.

It has been estimated that the available supply of Lake Couchituate is equal to four tenths of the annual rain-fall upon its water-shed, and that in case of a year of great drought, like that of 1837, when the total rain-fall was only about thirty inches, the supply would amount to a little over 10,000,000 gallons per day. The results of twelve years' experience and observation have been compiled, and are herewith submitted in a tabular form, showing the annual rain-fall, amount of water consumed, amount wasted, total available amount received into the Lake, available percentage of rain-fall received into the Lake, &c.

From this statement it will appear that the average percentage of rain-fall available is about five tenths, and that, could all the water received into the Lake be retained there or elsewhere, the average daily supply would be equal to about 23,700,000 gallons. But during ten years of the twelve there was an average daily waste of 10,153,500; so that, for want of ade-

quate storage, the actual available supply amounts to about 14,000,000 gallons daily. The effect of increasing the storage capacity of the Lake is shown by the fact that, while the average daily waste for six years previous to 1859 (the year following the raising of the Lake two feet) was 14,378,876 gallons, the daily average for the last four years is only about 3,800,000; thus increasing the available supply from 11,000,000, the daily average for six years previous to 1860, (not including 1855 and 1856,) to 17,600,000, the daily average for the past four years, or since the raising of the Lake. The importance, therefore, of providing additional storage room to meet the future requirements of the City, must be apparent, and its desirability furnishes an additional reason to those urged elsewhere in this Report in favor of a large receiving reservoir at this end of the Aqueduct.

CONDUIT.

The Conduit between the Lake and Charles River was thoroughly examined, in company with the Superintendent, in July, and was found to be quite clean, with the exception of a small section between the Lake and Station 100, where there was a considerable accumulation of the peculiar vegetable spongy matter referred to in previous reports. This matter has been entirely removed, and the whole line thoroughly cleansed. At the examination above referred to, two new cracks in the Aqueduct were discovered; one near the end of the first division, about station 275, — not a very serious one, — and one about four hundred feet in length, between Station 100, second division, and the West Pipe Chamber at Charles River. This last occurring in that part of the Aqueduct crossing Ware's Valley, was a most serious one, both as to locality and size; and had it not been discovered as it was, and immediately repaired, the results would have been most disastrous.

The difficulty resulting from cracks in the brick Aqueduct is

a serious one, and, from the additional duty imposed upon the Aqueduct, by using it as a pipe, under a head, is liable to increase with the increase in the consumption of water, unless measures be taken to strengthen those portions of the Aqueduct resting upon embankments by concrete foundations, and backing of the same material as high as the top of the invert.

This would be attended with considerable expense, but would be the most economical way of remedying an original error of construction, — an error which would not have been made had the designs of the Chief Engineer been carried out, or had the Commissioners foreseen that the Conduit, which was designed to be used as a covered canal, was to be run full and tasked as a pipe, under a head of from one foot to two feet eight inches during the greater part of the year, in order to furnish an adequate supply.

The question of strengthening the Aqueduct in all places where it rests upon embankments, is one that should receive the early attention of your Board, as breaks are liable to occur which would require more time to repair than could be well afforded with our limited storage room at this end of the line.

The water has been shut off from the Aqueduct for examinations, cleansing, and repairs ten days in all during the year, and the repairs which have been made, it is believed, have put the Conduit in as good condition as possible, considering the limited time available.

PIPES ACROSS CHARLES RIVER.

The accretions on the interior of these pipes are undoubtedly as large as in 1853, when the pipes were thoroughly scraped and cleaned; the effect of which, as determined by careful observations, was to increase the discharge under the common head of six inches upwards of twenty per cent.

The effect of these accretions is obvious from the gradual increase of head required to deliver an equal amount of water;

for since 1858, this increase is found to be nearly thirty per cent.

The cost of cleaning out these pipes would be small, probably not over \$ 300, and it would be well to have the work done the coming season. The effect of these accretions in all our City pipes in producing a loss of head must be very great, and the importance of preventing such formations in any pipes laid in future by some kind of coating, is sufficient to warrant experiments looking to that result.

BROOKLINE RESERVOIR.

The Gate Houses and Grounds about the Reservoir have received the usual attention of the Superintendent, and are in good condition.

The storage capacity of this Reservoir at the present rate of consumption is much too small. Its area is about twenty-three acres at its maximum water level, and its capacity above the bottom of the Conduit is 119,496,000 gallons.

Although this amount seems large and sufficient for several days' supply in case of accident, yet great inconvenience is experienced in the high service of the City if one quarter part of this amount be drawn from the Reservoir. During the past year the water was shut off at the Lake for thirty-seven hours, to make repairs, during which time only 24,000,000 gallons were drawn from the Brookline Reservoir, and yet the complaints were so numerous that special word was sent to the Lake to let on the water. The importance, therefore, of additional storage room in the neighborhood of this Reservoir is obvious, considering the immense consumption of water and the liability of accident to the Conduit, requiring a week or more to repair. What is needed is a reservoir of one hundred acres, if such can be obtained, and then the water could be shut off at the Lake for ten days without reducing the level of the water so as to cause any sensible inconvenience to any of our citizens.

CITY RESERVOIRS AND WORKS.

These have received the usual attention of the Superintendent, and are in good condition generally.

The usual table of the average monthly heights of water in the Reservoirs at Brookline, Beacon Hill, South and East Boston, has been prepared, and is herewith submitted; but it is of little or no use as indicating the loss of head during the year, as the several City Reservoirs have been more or less disconnected from the general circulation, — the Beacon Hill having been shut off for nearly one third of the year, and the South Boston and East Boston nearly all the year. For this reason the usual table exhibiting the loss of head from Brookline to the several City Reservoirs has been omitted.

It is certainly desirable to know each year what the actual loss of head is from Brookline to different parts of the City; and if in future it is found necessary to disconnect the reservoirs from the general circulation so much as they have been during the past year, a more reliable method of observation than the present would be to place either stand-pipes or gauges at different points in the several parts of the City, the same to be connected directly with the principal mains. The cost would be little, the trouble of observation a trifle more than at present, and the result, it is believed, much more reliable.

The fact of increased consumption, together with the filling up by accretions of the mains to South and East Boston, producing a great loss of head, will before long necessitate an additional line of mains to both of these places; and it is hoped that some simple and effectual means of preventing the formation of these accretions, which have so seriously affected the capacity of our whole system of distribution, will be found before the laying of these mains.

CONSUMPTION OF WATER.

Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.

MONTH.	1849	1850	1851	1852	1853	1854	1855	1856
January.....	1,700,000	5,181,700	7,233,700	8,280,900	8,050,500	10,695,200	9,702,700	12,669,000
February.....	.....	5,214,000	7,221,100	8,790,300	8,643,600	10,654,200	10,349,800	12,791,000
March.....	1,550,009	4,841,200	6,137,900	8,521,100	8,202,200	9,582,100	10,125,600	12,504,000
April.....	.....	4,961,000	5,365,200	8,048,700	7,903,600	8,738,500	8,540,000	10,800,000
May.....	3,600,000	5,346,100	6,238,400	8,350,000	8,123,400	9,685,300	9,103,800	10,378,000
June.....	4,300,000	6,906,500	7,925,000	8,033,100	8,945,900	11,745,200	9,984,400	11,223,000
July.....	4,800,000	8,514,200	7,180,200	9,608,000	8,809,200	10,613,800	11,056,600	13,167,000
August.....	4,100,000	8,004,600	7,235,000	9,709,300	8,401,900	10,028,100	11,120,800	12,664,000
September.....	4,800,000	6,585,500	7,220,600	7,920,000	8,640,700	9,712,400	11,710,800	11,522,000
October.....	4,550,000	4,504,300	6,716,600	6,930,000	8,871,100	8,769,800	10,771,200	11,891,000
November.....	3,800,000	4,960,500	6,473,500	6,637,900	8,624,700	8,030,200	10,383,200	11,691,000
December.....	3,600,000	5,037,000	7,663,400	7,195,800	9,228,400	10,597,600	11,307,200	13,284,000
Average for year,	3,680,000	5,837,900	6,883,800	8,125,800	8,542,300	9,902,000	10,346,300	12,048,600

Consumption of Water. Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.

MONTHS.	1857	1858	1859	1860	1861	1862	1863	1864
January.....	15,089,000	12,160,000	14,512,000	17,862,000	21,106,769	17,000,000	16,112,000	
February.....	14,175,000	14,399,000	14,769,000	18,901,000	20,804,131	17,000,000	17,328,000	
March.....	13,941,000	14,154,000	14,480,000	15,409,000	19,453,344	17,300,000	16,681,000	
April.....	12,454,000	13,465,000	13,760,000	14,621,000	17,151,593	15,300,000	15,125,000	
May.....	12,414,000	11,423,000	11,302,000	14,790,000	16,687,832	14,300,000	15,407,000	
June.....	12,504,000	10,867,000	11,639,000	17,838,000	17,231,984	16,600,000	16,138,000	
July.....	13,551,000	13,621,000	13,219,000	17,239,000	18,897,809	16,400,000	15,954,000	
August.....	13,077,000	13,141,000	12,704,000	19,297,000	18,272,365	17,000,000	16,980,000	
September.....	12,030,000	12,745,000	12,389,000	17,957,000	18,098,259	17,000,000	17,035,000	
October.....	10,804,000	12,969,000	12,026,000	16,938,000	17,987,128	17,300,000	15,779,000	
November.....	11,372,000	12,143,000	12,715,000	16,862,000	16,604,076	17,100,000	16,028,000	
December.....	11,241,000	13,075,000	14,586,000	19,151,000	15,976,362	17,000,000	16,295,000	
Average for year,	12,726,000	12,847,000	13,175,000	17,238,000	18,189,304	16,600,000	16,238,500	

Average Monthly Heights of Water in Reservoirs at Brookline, Beacon Hill, South and East Boston, 1859 - 63 inclusive.

MONTH.	BROOKLINE.				BEACON HILL.				SOUTH BOSTON.				EAST BOSTON.							
	1859	1860	1861	1862	1863	1859	1860	1861	1862	1863	1859	1860	1861	1862	1863	1859	1860	1861	1862	1863
January.....	124.48	123.27	122.81	122.46	123.64	114.02	118.25	116.61	117.46	118.36	114.11	107.48	115.03	113.06	115.73	93.51	93.26	95.37	96.26	96.64
February.....	124.68	122.45	122.08	122.85	123.23	115.36	117.94	118.93	119.46	118.48	114.43	109.30	115.07	114.08	115.54	93.47	95.29	93.05	94.94	93.86
March.....	124.48	123.88	123.32	123.52	123.23	116.61	119.89	119.05	119.18	118.03	114.00	109.40	115.12	114.12	115.36	93.88	94.80	94.00	95.75	94.29
April.....	122.52	123.77	124.01	124.18	123.85	116.99	119.83	118.91	117.91	117.27	114.09	109.34	115.32	114.93	114.73	98.97	93.84	96.07	96.71	95.05
May.....	124.43	123.13	124.04	124.00	123.52	117.01	117.70	119.06	117.59	116.33	114.35	111.90	113.83	115.74	112.71	94.79	96.06	97.55	93.99	93.07
June.....	124.22	123.26	123.08	123.25	123.17	115.05	116.09	117.32	116.39	115.40	113.88	113.17	112.53	114.22	111.39	93.98	96.29	96.22	95.09	91.10
July.....	124.05	122.99	122.68	123.73	122.75	115.30	116.13	116.48	116.46	116.34	113.02	113.26	110.91	114.23	109.75	93.48	95.53	95.00	95.13	90.43
August.....	124.13	122.78	123.71	123.70	123.11	114.82	115.70	114.18	116.22	116.05	112.38	110.97	112.92	114.03	109.80	93.41	96.99	97.34	93.96	91.23
September.....	124.37	123.33	123.76	123.64	123.36	113.82	117.15	113.14	116.22	116.12	111.88	114.66	112.96	114.04	109.64	93.61	95.97	95.76	95.57	91.96
October.....	124.29	123.59	123.79	123.85	122.26	114.76	115.34	115.91	* * *	115.87	111.38	113.49	114.68	114.24	109.90	93.97	96.97	95.56	91.80	95.02
November.....	123.55	123.02	123.80	124.07	123.63	114.00	116.23	116.74	117.29	116.85	110.85	114.48	114.14	115.94	111.25	93.79	97.00	96.40	93.57	93.36
December.....	123.00	122.98	124.00	123.46	122.53	113.61	114.67	117.45	115.23	118.30	109.75	114.91	113.79	116.35	109.90	91.77	98.89	97.37	95.77	89.79
Average.....	124.07	123.29	123.52	123.56	123.19	115.24	117.13	116.98	117.21	116.92	112.98	111.86	113.86	114.63	112.14	94.05	96.01	96.05	95.29	92.95

NOTE.—The above average heights are given in feet and parts, above marsh level. Maximum high water in the Brookline Reservoir is 124.6 feet above marsh level. By deducting the heights in the City Reservoirs from the heights in the Brookline Reservoir, in each month, we find the LOSS OF HEAD in the different sections of the City at that time.
 * Beacon Hill Reservoir was shut off for repairs two days in September, and twenty-nine days in October, 1862. Its average height of water is, therefore, the average for eleven months only.

Conduit.

The following Table shows the different heights at which the water has been running, and the number of days in each month at the different heights.

The height of the Conduit is six feet four inches.

	HEIGHTS IN FEET AND INCHES.									
	These heights show a head on the Conduit.									
	0.0	6.0	6.4	6.6	7.0	7.4	7.6	7.8	8.0	9.0
	NUMBER OF DAYS IN EACH MONTH.									
January			9		17		3	2		
February			2		23		1			2
March					24	7				
April		4	3	2	21					
May				23	8					
June.....	1				6		3	20		
July.....	3						10	16	2	
August.....							16	15		
September							28	2		
October.....	4					3	8	3	13	
November	1				8		6		15	
December.....	1						8	8	14	
Total.....	10	4	14	25	107	10	83	66	44	2

From this Table it appears that the Conduit has been empty ten days ; partly full only four days ; and for the rest of the year — three hundred and fifty-one days — it has been run full, and with a head varying from nothing to two feet eight inches.

Monthly Fall of Rain in Inches, in 1863.

MONTHS.	PLACES AND OBSERVERS.					
	Lake Cochituate, by E. F. Knowlton.	Boston, by J. P. Hall.	Lowell, by Merrimac Manufacturing Company, J. B. Francis.	Lowell, by Locks and Canals Company, J. B. Francis.	Cambridge, by G. P. Bond.	Waltham, by Boston Manufacturing Co. J. R. Scott, Agent.
January	4.10	4.51	3.93	4.03	4.43	2.34
February	4.38	4.54	2.91	3.20	1.63	4.06
March.....	3.57	6.42	4.69	4.96	2.46	2.64
April.....	11.34	9.08	4.37	6.75	7.39	7.82
May.....	2.66	2.82	1.91	1.96	1.67	2.23
June.....	1.98	2.56	1.59	1.61	2.47	2.40
July.....	14.12	12.38	9.77	10.23	12.43	11.66
August.....	5.61	5.64	6.07	6.66	5.57	4.39
September.....	3.39	3.12	3.07	2.90	2.98	2.16
October.....	4.56	3.83	3.66	3.98	3.40	3.04
November.....	8.54	6.48	6.02	6.31	6.53	5.92
December.....	5.05	6.34	4.38	5.22	5.46	5.00
Totals.....	69.30	67.72	52.37	57.81	56.42	53.66

NOTE. — Melted snow is, as usual, included in the above amounts of rain-fall.

Mr. J. P. Hall, who has kept a record of the Rain-fall for forty-one years, reports the amount according to his record for this year (67.72) as the largest which has fallen in any year during that period; and that the amount which fell in July of this year (12.38 inches) as the largest monthly fall during the same period.

*Annual Amount of Rain-Fall, in Inches, in Lake Cochituate, Boston,
and vicinity, 1849 to 1863, inclusive.*

YEAR.	PLACES AND OBSERVERS.						
	Lake Cochituate, by E. F. Knowlton.	Boston, by J. P. Hall.	Cambridge, by W. C. Bond and George P. Bond.	Waltham, by E. Hobbs and J. R. Scott, Agent, Boston Manufacturing Company.	Lowell, by Merrimac Manufacturing Company, J. L. Francis.	Lowell, by Locks and Canals Co., J. B. Francis.	Providence, by A. Caswell.
1849	....	40.30	40.97	40.74	41.90	....	34.69
1850	....	53.98	54.07	62.13	51.09	....	51.48
1851	....	44.31	41.97	41.00	45.68	....	43.30
1852	* 47.93	47.94	40.51	42.24	42.78	....	38.58
1853	* 53.86	48.86	53.83	45.04	43.92	....	53.27
1854	43.15	45.71	45.17	41.29	42.08	....	46.25
1855	34.96	44.19	47.59	40.63	44.89	48.41	39.05
1856	40.80	52.16	53.79	42.33	42.49	45.97	40.97
1857	63.10	56.87	57.92	44.04	49.38	52.02	44.74
1858	48.66	52.67	45.46	37.40	37.73	35.80	44.51
1859	49.02	56.70	....	48.49	47.51	48.41	45.29
1860	55.44	51.46	46.95	....	46.91	46.67	38.24
1861	46.44	50.07	50.14	....	43.32	42.95	....
1862	49.69	61.06	57.21	....	44.26	44.61	....
1863	69.30	67.72	56.42	53.66	52.37	57.81	....

* By J. Vannevar.

WATER.

Statement showing Amount of Rain-Fall on Water-shed of Lake Cochituate, Amount of Water consumed and wasted, available Amount received into Lake, available percentage of Rain-Fall, &c. from 1852 to 1863, inclusive.

YEAR.	INCHES.	Amount of Rain-Fall on Water-shed of Lake Cochituate.	Amount of water consumed.	Amount of water wasted from Lake.	Total amount consumed and wasted.	Rise of Lake during the year.	Fall of Lake during the year.	Total available amount of Rain-Fall received into Lake.	Available daily average amount of Rain-Fall received into Lake.	Available percentage of Rain-Fall received into Lake.
		GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.
1852 *	47.93	15,759,907,000	2,974,042,800	4,020,566,885	6,994,609,685	.....	261,300,000	6,733,249,685	18,306,857	43 per cent.
1853	55.86	18,366,561,000	3,117,039,500	3,405,417,500	6,524,357,000	239,580,000	.....	6,523,937,000	17,873,800	35 per cent.
1854	43.15	14,187,502,000	3,614,230,000	4,187,733,030	7,801,963,020	.....	217,800,000	7,584,163,020	20,778,529	53 per cent.
1855	34.96	11,494,710,000	3,776,399,500	No acct. kept.	.....	.....	326,700,000	.....	.....	.....
1856	40.80	13,414,893,000	4,409,787,660	"	.....	598,950,000	.....	.....	.....	.....
1857	63.10	20,747,657,000	4,644,990,000	10,025,900,000	15,276,890,000	32,670,000	.....	15,303,560,000	41,927,562	74 per cent.
1858	48.63	15,999,232,000	4,689,155,000	1,934,500,000	6,623,655,000	.....	141,370,000	6,482,025,000	17,759,013	49 per cent.
1859 †	49.02	10,117,007,000	4,808,875,000	7,569,600,000	12,377,875,000	283,140,000	.....	12,061,015,000	34,687,712	78 per cent.
1860	55.44	18,228,471,000	6,309,108,000	None.	6,309,108,000	174,240,000	.....	6,483,348,000	17,714,965	35 per cent.
1861	46.44	15,269,363,000	6,639,005,900	3,377,558,900	10,016,654,800	.....	1,459,290,000	8,557,364,800	23,444,917	55 per cent.
1862	49.69	10,337,890,000	6,053,000,000	33,200,000	6,092,200,000	1,366,800,000	.....	7,399,000,000	20,271,233	45 per cent.
1863	69.30	22,783,586,000	5,927,032,500	2,465,696,470	8,092,748,970	762,300,000	.....	8,855,048,970	24,300,408	39 per cent.
Aver. 50.30		Aver. daily waste for 10 years,	10,153,500	Average daily capacity of Lake as a source of supply for 10 years,	23,711,400					50 per cent. aver.
		" " " "	752,509	14,378,900						
		" " " "	last 4 "	about 3,800,000						

* Observations of Rain Fall at Lake Cochituate commenced 1852, and these observations are assumed as correct for the whole district. † Lake raised 2 feet.

To Messrs. J. P. Hall, Esq. of Boston, J. B. Francis, Esq. of Lowell, Prof. George P. Bond, of Cambridge, and J. R. Scott, Esq. of Waltham, I desire to express my acknowledgments of indebtedness for the favor of their respective records of the Rain-Fall during the past year.

Respectfully submitted,

N. HENRY CRAFTS,

City Engineer.

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