FIFTEENTH ANNUAL REPORT

OF THE

BOSTON WATER BOARD.

1890.

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BOSTON WATER BOARD,

FOR THE

YEAR ENDING DECEMBER 31, 1890.

BOSTON:
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1891.

Office of the Boston Water Board,
City Hall, Boston, Jan. 1, 1891.

Hon. Nathan Matthews, Jr.,
Mayor of the City of Boston: —

Sir, — The Boston Water Board or Water Supply Department present their report for the year ending Dec. 31, 1890, including a statement showing the financial condition of the department, and also the Reports of the City Engineer, and the Superintendents of the Eastern, Western, and Mystic Divisions. During the year the Water Registrar's Department has been made a separate department by ordinance, so that the Water Registrar's report is not included herewith as formerly, nor do the accounts of his department appear subsequent to May 1, 1890, the beginning of the financial year.

The following is a comprehensive summary of the disbursements by the Boston Water Board for the calendar year: —

Money expenditures Cochituate Water Works (see page 10)		$936,633 77
Money expenditures Mystic Water Works (see page 11)		141,950 85
		$1,078,584 62
Less increase in stock during year (see page 12)		2,800 00
		$1,075,784 62
Current expenses, Cochituate Water Works	$352,628 61	
Current expenses, Mystic Water Works	137,751 87	
Extension of mains, etc.	277,243 42	
Additional supply of water	204,646 12	
High service	24,184 51	
Introduction of meters and inspection, Cochituate	7,859 36	
Carried forward,	$1,004,313 89	

Brought forward,	$1,004,313 89	
Introduction of meters and inspection, Mystic . .	594 14	
Improvement of Lake Cochituate	15,364 06	
Shops, Albany street . .	55,512 53	
		$1,075,784 62

REBATE OF WATER-RATES.

The total receipts of the Cochituate works for the calendar year ending Dec. 31, 1890, have been $1,382,422.53, after deducting a rebate of seven per cent. on the bills for schedule water-rates, issued Jan. 1, 1890, equivalent to about $62,000, and the total receipts of the Mystic works have been $332,-634.02, after a similar reduction on the bills for schedule water-rates issued Jan. 1, 1890, equivalent to about $18,000. The Water Board have made another rebate of 10 per cent. on the amount of the bills for schedule water-rates, issued Jan. 1, 1891, believing that the financial condition of the department will justify such a reduction.

MYSTIC DEBT.

On Dec. 31, 1890, the Sinking-Fund for the payment of the Mystic debt was but $20,000 less than the amount of the debt, and before the end of another year the Sinking-Fund requirements for the payment of the entire Mystic debt will have been satisfied, and action will be required by the City Council to decide what disposition shall be made of the surplus revenue.

NEW WORKSHOPS IN THE EASTERN DIVISION.

The office of the Superintendent of the Eastern Division and the shops of the department in the city were removed from 221 Federal street, which has been the headquarters of the Eastern Division since 1853, to the pipe-yard on Albany street, in which a new, commodious, and substantial building has been built by the Board. A new stable, with accommodations for twenty-eight horses, has also been erected and occupied at the same place.

EXTENSION OF MAINS, ETC.

Twenty miles of pipe-mains have been laid during the year, and the total length now connected with the works is 498.73 miles; 2,118 service-pipes have been laid; and 255 hydrants have been put in service, making the present total number 5,459.

At the request of the Fire Department all Post hydrants are now provided with three steamer connections, two $2\frac{1}{2}$ and one $4\frac{1}{2}$ inches in diameter. A system of pipes to furnish a high-service supply, with a pressure of from 70 to 90 lbs. per square inch, is being laid through the mercantile section of the city as a protection against fire and only for the supply of fire pipes and sprinkler systems in the buildings of the district. Mains have already been laid for this purpose in Kingston, Essex, Bedford, and Summer streets; Franklin street between Washington and Oliver streets, Pearl street between Franklin street and Atlantic avenue, Atlantic avenue between Pearl and Federal streets, Federal street between Summer and Essex streets, South and Lincoln streets between Essex and Summer streets, and Oliver street between Franklin and Milk streets, at a cost to the department of $25,137.67.

CONSUMPTION OF WATER.

The daily average consumption per head of population on the Sudbury and Cochituate supply the past year has been 82.5 gallons, and on the Mystic supply 70.6 as against 82.7 and 70.4, respectively, the previous year. The yearly daily average total consumption has been 33,871,700 on the Cochituate and Sudbury, and 8,301,400 gallons on the Mystic, as against 32,070,000 and 7,830,500, respectively, in 1889.

Although the present consumption of water in the city shows but a small increase over that of the year 1883, notwithstanding an increase of nearly 20 per cent. in population, yet there remains a considerable amount of waste, which appears from the reports of the work of the inspectors during the past few years to be largely due to the inferior class of water-fixtures used in many buildings, especially in cheap tenement or model houses. It seems desirable that an ordinance should be passed prohibiting the use of certain kinds of fixtures.

ADDITIONAL SUPPLY.—BASIN 5.—WHITEHALL POND.

Active work has been carried on during the past year at Basin 5, in Ashland and Hopkinton. As the result of diamond drill borings during the winter months, the old site for the dam was abandoned in favor of one 300 feet further up stream. From April 15 until early in December a considerable force of men, under Superintendent John J. Arthur, has been engaged in the work of stripping the site

for the dam, excavating for the core-wall, and building the core-wall. The trench is now practically completed and the core-wall built across the valley to the surface of the ground. Specifications have been prepared for delivering filling upon the dam by contract in the spring. The roads around the basin have been altered and built by contract.

A taking by eminent domain has been made of the land, dam, and waters of Whitehall pond in Woodville, a village of the town of Hopkinton, near the source of the Sudbury river. Although the waters of this pond have been a valuable source of water supply to the city, it was possible for the owners to deprive the city of them at any time by raising or closing the dam. Moreover, by its purchase we shall be enabled to deepen the pond, and to clear it from stumps and shallow flowage, which contribute to deteriorate the water in the Sudbury river below; and we shall be able, by raising the dam, to increase its yielding capacity from 1,800,000 gallons daily, to 3,000,000 gallons daily, in a dry year. Whitehall pond covers about 600 acres. Surveys have also been made of the Cedar swamp district, so called, at the head-waters of the Sudbury river, with a view to seizing this swamp, or a portion of it, by eminent domain during the coming year, in order to obviate, if possible, the disadvantages to the supply which result from the stagnation of the river at this point. The Board is of the opinion that the Sudbury-river water acquires much of its discoloration and fecundancy in vegetable matter as a consequence of being spread out over Cedar swamp, which, with the adjacent swamp, covers nearly 1,500 acres.

LAKE COCHITUATE.

The work of building the new dam at the outlet of Lake Cochituate was resumed, and is practically completed. The work of lining the Beacon-street tunnel was continued until April 18th, when it was stopped on account of a lack of funds, but will be prosecuted during the ensuing year.

QUALITY OF THE WATER. — MEASURES TO PROTECT THE SUPPLY. — WESTERN DIVISION.

The rainfall during the year on the Cochituate and Sudbury has been about 3 inches more than the average, and the quantity of the water has been abundant. The quality of the water, as shown by the analyses of well-known chemical experts, has been better than ever before, and the Board has been able to perceive already, from the analyses sub-

mitted, direct results of the efforts which we have made to improve the water for drinking purposes.

One of the most important measures in connection with the improvement of the supply is the contract made during the year with the town of Marlborough, whereby the sewage of its 13,000 inhabitants is to be diverted from the brooks which feed Basin 3. A sewerage system, similar in character to that adopted by Framingham, is now being constructed by the town of Marlborough, and the Boston Water Board have agreed to contribute $62,000 to cover the additional expense of removing the sewage completely outside of the Sudbury water-shed. This sewerage system is to be completed Jan. 1, 1892. As a consequence of negotiations between this Board and the town of Westborough, plans have been made under the direction of the town of Westborough for a sewerage system for that town, and surveys are now being made to determine what sum should be paid by the city of Boston to defray the extra expense of conveying the sewage outside of the city's water supply. Westborough is situated near the head-waters of the Sudbury, and by the proposed system of sewerage the sewage of nearly 5,000 people will be treated so that no portion of it can find its way into the feeders of that river.

By means of the Framingham sewerage systems, upon which these others are modelled, the sewage of the town of Framingham is diverted from one of the two principal feeders of Lake Cochituate. The system is in active operation, and connections have been made with it by a large number of manufacturing and other establishments which formerly drained into Beaver dam brook; but although the system is working satisfactorily in other respects, the existence of an under-drain beneath the main sewer, the effluent from which empties into our supply, is in the opinion of our engineers a source of danger. Accordingly this Board has declined to pay to the town of Framingham the sum of $25,000, specified in the contract with that town, until this under-drain is stopped up or some means adopted for pumping the water which now runs by means of the under-drain into the feeders of Beaver dam brook. This under-drain was not a part of the plans referred to in the contract between Framingham and Boston; and although the effluent from this under-drain may be harmless so long as the main sewer and connections are tight, the Water Board does not feel that it is justified in sanctioning a condition of affairs which may render it still possible for any portion of the sewage of Framingham to empty into our supply. By the removal of the sewage of the communities of Framingham, Marlborough and West-

borough, aggregating 28,239 inhabitants, from the waters and feeders of the Sudbury, we believe that substantial improvement will necessarily appear in the future analyses of the Sudbury and Cochituate water. If sewerage systems were also established by the town of Southborough and the town of Natick, the grosser evils which affect the supply would be largely eradicated. It is especially desirable that the town of Natick should adopt a sewerage system in order that Pegan brook, the other principal feeder of Lake Cochituate, should be wholly freed from sewage matter. Vastly improved as is the condition of that brook as compared with what it once was, it is still more or less impure. It flows through the heart of the town of Natick in a covered channel difficult of access, and although the city of Boston has by repeated injunctions from the courts sought to restrain the people of that town from draining directly or indirectly into the brook, it is apparent from the condition of the brook that a certain number of them still do so secretly. Moreover we regret to state that the authorities of Natick have hampered our efforts to cut off the drains, which we have reason to believe discharge sewage into the brook, by declining to allow us to excavate the street along the line of the brook, except under conditions which would defeat our purpose. The Board are proceeding and intend to proceed vigorously against offenders in this town, but we do not believe that Pegan brook can be made a desirable source of drinking water until a sewerage system is adopted by the town of Natick. Boston is willing to contribute its share as in the case of the other towns, and we trust that it will not be long before the people of Natick become conscious of their own necessities.

In addition to the steps taken in pursuance of the policy of removing the sewage of entire communities outside of our water-shed by coöperation with the local authorities, the Water Board has been active in checking individual cases of pollution. On the Cochituate and Sudbury water-shed eighty cases have been pressed by the City Solicitor at the instance of the Board. In the case of thirty-nine of these, injunctions have been granted against the parties complained of. In the case of many others, legal proceedings have been suspended because the parties consented to make necessary changes and improvements, so that the drainage from their premises should no longer empty into the supply. Very nearly five hundred cases of old or new pollutions have been investigated, and either remedied or reported to the Law Department. Among the important cases in which legal proceedings are pending, are those of the town of Westborough

and Bernard's straw factory at Westborough, which collectively drain a large mass of foul matter directly into a swamp feeding the Sudbury. Much care has been spent in obtaining the necessary evidence to show direct connection between this swamp and our supply, and the matter is now pending in the courts. The projected Westborough sewerage system if adopted will remedy this abuse, but it is desirable that the Law Department should press these cases for immediate trial.

The examinations continuously being made at the Biological Laboratory established a year ago are throwing much light upon the condition of the water in the different basins. The filtration experiments have been carried on assiduously, and much valuable information has been obtained from them; but the problems presented are so novel and difficult that considerable time must elapse before we shall be able to make definite recommendations in this regard.

The Water Board coöperated during the year in obtaining the passage by the Legislature of Chapter 441 of the Acts of 1890, whereby the State Board of Health is given authority to prohibit the depositing of manure, excrement, garbage, and sewage, or any other polluting matter within one hundred feet of the high-water mark of any stream or other body of water used as a source of water supply. The Board also coöperated in obtaining the passage of an act, whereby the Prison Commissioners were authorized to make the necessary outlays, at the expense of the Commonwealth, to connect the Sherborn Reformatory Prison for Women with the Framingham sewerage system. Work has been begun by the State authorities, and within a very short time this serious source of pollution will have been diverted from the supply.

THE MYSTIC SYSTEM.

On the Mystic supply equally determined efforts have been employed to check pollution. One hundred and thirty-eight improvements in premises have been accomplished, and 14 cases reported to the Law Department for action. Among other injunctions granted was one against the Woburn Steam Laundry, which discharged about 1,200 gallons of refuse daily into the Mystic supply. Subsequently this establishment and 15 adjacent buildings in Woburn were connected with the Mystic-valley sewer by means of an 8-inch drain.

One of the difficulties in dealing with the Mystic system at present is the fact that the town of Medford claims, by virtue of an injunction granted to that town against the city of Boston in 1882, the right to prevent any increase in the

output of the Mystic-valley sewer, the effluent from which empties into the lower Mystic lake. With a view to bridging over the situation until the Metropolitan Main Drainage Commission shall have established a sewerage system in the towns adjacent to the Mystic supply, we have mooted from time to time the advisability of allowing these towns and individual establishments to make connections with the Mystic-valley sewer; but in the face of the unwillingness of the Medford authorities, we have felt that our hands were tied. As the result of a recent conference with the legal representative of the town of Medford, the Board have directed the Superintendent to run the Mystic-valley sewer continuously, night and day, in order that the refuse from the tanneries connected with it may be treated without intermission, and thus avoid the suspicion of creating any nuisance in the Mystic river.

It is an open question whether it would not be advisable for the city of Boston to dispose of the Mystic system, if at any time the communities outside of Boston, which now use it as a water supply, are willing and have authority to purchase it. The Mystic system can be depended upon to yield only 7,000,000 gallons daily in a dry year, and Charlestown, Somerville, Everett, and Chelsea, all of which are supplied with Mystic water, now often use over 9,000,000 gallons daily. Although under our contract with Somerville, Everett, and Chelsea, Charlestown is entitled to be supplied first, it would practically be a difficult matter in case of a drought to cut off the other communities. The only citizens of Boston who drink the Mystic water are the people of Charlestown, who use less than 3,000,000 gallons daily. Although familiar with the fact that the analyses of the Mystic supply compare very unfavorably with those of the Cochituate and Sudbury water, the people of Charlestown are said to prefer the Mystic water. The fact that the Mystic water is more white and sparkling than the Cochituate and Sudbury is a very deceptive argument. The future of the Mystic system will depend largely on the effect which the establishment of the Metropolitan drainage system may have upon the analyses of the Mystic-river water. It is very possible that this supply can be made wholesome in the future; but it is equally true that the city of Boston, though actively seeking to protect the Mystic supply, has but a comparatively small interest in maintaining it, except as a source of revenue. From the point of view of dollars and cents, it is a valuable piece of property. On the other hand, it must not be forgotten that the city of Boston may have to pay a large sum by way of betterments imposed by the Metropolitan Main Drainage

Commission in case the city retains control of the Mystic system. In view of the present condition of affairs, the Water Board desires to call attention to the fact that the connections to unite Charlestown with the Cochituate and Sudbury system are complete, and that the Cochituate and Sudbury water can be turned on at any time that the people in that section of the city so desire.

Respectfully submitted,

ROBERT GRANT,
PHILIP J. DOHERTY,
JOHN W. LEIGHTON,
Boston Water Board.

GENERAL STATISTICS.

SUDBURY AND COCHITUATE WORKS.	1888.	1889.	1890.
Daily average consumption in gallons . .	33,310,700	32,070,000	33,871,700
Daily average consumption in gallons per inhabitant	86	80.3	82.5
Daily average amount used through meters, gallons	7,844,900	8,118,800	9,034,800
Percentage of total consumption metered,	23.6	25.3	26.7
Number of services	56,947	58,810	60,718
Number of meters and motors	3,532	3,882	4,078
Leugth of supply and distributing mains, in miles	456.68	479.72	498.73
Number of fire-hydrants in use	5,008	5,225	5,398
Yearly revenue from water-rates	$1,317,385 92	$1,357,738 30	$1,382,422 53
Yearly revenue from metered water . . .	$465,653 49	$493,239 58	$554,047 36
Percentage of total revenue from metered water	35.3	36.3	40.1
Cost of works on Jan. 1, 1888, 1889, and 1890	$20,049,614 53	$20,432,974 43	$20,994,561 01
Yearly expense of maintenance	$383,638 16	$345,986 88	$381,147 10
MYSTIC WORKS.			
Daily average consumption in gallons . .	8,258,400	7,830,500	8,301,400
Daily average consumption in gallons per inhabitant	74.9	68.7	70.6
Daily average amount used through meters, gallons	1,272,600	1,341,700	1,537,400
Percentage of total consumption metered,	15.4	17.1	18.5
Number of services	17,607	18,527	19,520
Number of meters and motors	395	413	414
Length of supply and distributing mains, in miles	142.2	147.7	152.3
Number of fire-hydrants in use	956	998	1,073
Yearly revenue from water-rates	$306,637 22	$317,197 29	$332,634 02
Yearly revenue from metered water . . .	$75,880 78	$80,313 19	$89,526 42
Percentage of total revenue from metered water	24.7	24.1	26.9
Cost of works on Jan. 1, 1888, 1889, and 1890	$1,690,757 30	$1,696,280 76	$1,708,781 59
Yearly expense of maintenance	$162,086 42	$125,660 21	$144,184 44

EARNINGS AND EXPENDITURES.

The total receipts of the Cochituate Water-Works, from all sources, for the year ending Dec. 31, 1890, were as follows, viz. : —

Income from sales of water	$1,356.501 19
Income from shutting off and letting on water, and fees	4,896 69
Elevator, fire and service pipes, sale of old materials, etc.	21,024 65
	$1,382,422 53

The total expenditures of the Cochituate Water-Works from revenue, for the year ending Dec. 31, 1890, were as follows, viz. : —

Current expenses, viz. : —		
Water Supply Dept.	$352,628 61	
Water Income Dept. (8 mos.)	28,518 49	
	$381,147 10	
Refunded water-rates	1,293 24	
Interest on funded debt	765,079 10	
		1,147,519 44
Balance, Dec. 31, 1890		$234,903 09

From this apparent balance about $220,000 is required for the Sinking Fund.

The total receipts of the Mystic Water-Works, from all sources, for the year ending Dec. 31, 1890, were as follows, viz. : —

Income from sales of water	$331,109 44
Income from shutting off and letting on water, and fees,	428 25
Service-pipes, repairs, etc.	1,096 33
	$332,634 02

The total expenditures of the Mystic Water-Works from revenue, for the year ending Dec. 31, 1890, were as follows, viz. : —

Current Expenses, viz. : —		
Water Supply Dept.	$137,751 87	
Water Income Dept. (8 mos.)	6,432 57	
	$144,184 44	
Interest on funded debt	42,357 50	
Refunded water-rates	165 75	
Amount paid Chelsea, Somerville, and Everett, under contract	101,820 09	
		288,527 78
Balance, over and above all requirements, Dec. 31, 1890		$44,106 24

MAINTENANCE ACCOUNTS, COCHITUATE WATER-WORKS.

(FROM REVENUE.)

JANUARY DRAFT, 1890, TO JANUARY DRAFT, 1891.

Boston Water Board: —		
Salaries of two Commissioners, two Clerks, Purchasing Agent, and Messenger	$12,898 82	
Travelling expenses	729 48	
Printing and stationery	562 87	
Advertising, postage, and miscellaneous,	891 85	
		$15,083 02
Water Registrar's Department (4 mos.): —		
Salaries of Registrar, Clerks, Inspectors, Foreman, Marine Agent, Messenger, and laborers in Service Division	$13,988 82	
Travelling expenses, etc.	373 68	
Printing and stationery	243 17	
Miscellaneous	37 75	
		14,643 42
Eastern Division: —		
Salaries of Superintendents, Clerks, and Foreman	$15,702 20	
Travelling expenses and transportation of men	574 74	
Printing and stationery	560 47	
Miscellaneous	365 56	
		17,202 97
Western Division: —		
Salaries of Superintendent, Assistant Superintendent, and Clerks	$8,871 00	
Travelling expenses	1,033 24	
Printing and stationery	586 21	
Miscellaneous	469 86	
		10,960 31
Meters, setting and repairing		10,338 46
Workshop, blacksmith shop, etc., Federal st.		7,853 51
Pipe-yard, machine shop, stable, etc., Albany st.		13,414 37
Maverick Wharf (depot for furnishing water to shipping), rent, and salary of agent (abolished July 1)		1,026 62
Telephones		1,434 91
Amount carried forward,		$91,957 59

Amount brought forward,	$91,957 59
Special agents (3), salaries, travelling expenses, etc.,	3,791 25
Cochituate Aqueduct	2,148 42
Sudbury Aqueduct (including $12,605.79 for lining tunnel)	19,220 04
Main pipe relaying (including stock and labor)	13,572 35
" repairing " " " "	6,638 67
Hydrants " " " " "	13,799 25
Stopcocks " " " " "	2,175 04
Hydrant and stopcock boxes, and repairing (including stock and labor)	4,209 46
Tools and repairing (including stock and labor)	11,748 01
Streets, " " " " "	11,388 42
Fountains, " " " " "	2,634 59
Stables, " " " " "	10,738 10
Waste detection " " " "	19,030 72
Basins, Framingham and Ashland (including stock and labor)	5,764 80
Service-pipe repairing (including stock and labor)	11,995 94
Improvement of Sudbury and Cochituate supply	14,655 97
Inspection of Water Sources	3,669 11
High service, Chestnut Hill (including fuel, salaries, repairs, etc.)	21,248 81
High service, East Boston (including fuel, salaries, repairs, etc.)	2,455 59
High service, West Roxbury (including fuel, salaries, repairs, etc.)	2,133 04
New stable at Albany-street yard (total cost $23,967.60)	23,677 47
Chestnut-Hill Reservoir (including stable, care of grounds, etc.)	15,493 30
Parker-Hill Reservoir	3,015 46
Brookline Reservoir	1,275 79
East Boston and South Boston Reservoirs	584 14
Fisher-Hill Reservoir	796 69
Lake Cochituate	3,428 24
Chestnut-Hill driveway	3,931 57
Collector of Water-rates, salary (discontinued from June 1)	1,517 83
Taxes (none paid for year 1890)	21 31
Damages	3,458 29
Analyses of water, etc.	750 00
Merchandise sold (pipes and castings, in cases of emergency)	311 20
Filtration	5,647 30
Biological Laboratory	2,259 53
New dam at Lake Cochituate (on account)	11,485 32
	$352,628 61

MAINTENANCE ACCOUNTS, MYSTIC WATER-WORKS.

(FROM REVENUE.)

JANUARY DRAFT, 1890, TO JANUARY DRAFT, 1891.

Boston Water Board: —		
Salaries of one Commissioner and one Assistant Clerk	$4,663 56	
Printing and stationery	100 56	
Travelling expenses and miscellaneous,	553 24	
		5,317 36
Water Registrar's Department (4 mos.): —		
Salaries of Deputy Collector, two Clerks, and three Inspectors	$2,499 00	
Printing and stationery	120 60	
Travelling expenses	265 00	
Advertising, postage, and miscellaneous	101 59	
		2,986 19
Superintendent's Department: —		
Salaries of Superintendent, Assistant Superintendent, and Clerk	$5,679 16	
Printing and stationery	157 88	
Travelling expenses	20 00	
Miscellaneous	25 70	
		5,882 74
Meters, setting and repairing		2,604 42
Off and on water (labor)		2,817 10
Main-pipe laying (including stock and labor),		386 04
" relaying " " "		8,932 55
" repairing " " "		704 63
Service-pipe laying " " "		1,077 61
" repairing " " "		2,237 61
Hydrants and gates, repairing (including stock and labor)		4,603 85
Streets, repairing (including stock and labor)		607 46
Lake		9,194 05
Conduit		939 81
Engine-house (4 mos. merged in pumping service account, from May 1, 1890)		2,117 40
Stables		4,413 61
Reservoir		3,875 44
Pumping service (salaries, wages, fuel, repairs, etc.),		29,560 18
Repair-shop		2,589 67
Fountains		630 28
Tools and repairing		372 79
Taxes		30 80
Mystic Sewer (repairs, and pumping and treatment of sewage)		21,833 36
Amount carried forward,		$113,714 95

Amount brought forward,	$113,714 95
Waste-Detection Service	5,450 60
Connections with Cochituate Service	12,114 79
Protection of Water Sources (including salaries of 3 Special Agents on Pollution)	4,417 65
Analyses of Water	165 00
Filtration	755 92
Damages	1,046 01
Merchandise sold	86 95
	$137,751 87

DETAILED EXPENDITURES UNDER THE SEVERAL APPROPRIATIONS.

(From Loans.)

January Draft, 1890, to January Draft, 1891

Extension of Mains:—

Labor	$99,298 41	
Teaming	6,384 64	
Blasting	11,053 62	
Water-pipes, Contracts	94,179 94	
Miscellaneous	10,201 64	
Stock	44,205 67	
	$265,323 92	
Stock paid for in previous years (additional)	11,919 50	
		$277,243 42

Additional Supply of Water:—

(Account of Basin No. 5, Whitehall Pond and Cedar Swamp.)		
Salaries and Labor	$84,854 52	
Materials	53,015 01	
Contract, 3 Roads in Ashland and Hopkinton (on account)	21,575 67	
Contract, Water Plant at Dam	1,640 00	
" Building office	1,344 00	
Engineering	17,208 63	
" supplies	1,216 83	
Rent of Diamond Drills, Derricks, etc.	3,560 61	
Teaming	15,409 20	
Freights and Express	1,823 63	
Travelling Expenses	711 93	
Printing, Stationery, and Advertising,	778 16	
Miscellaneous	1,507 93	
		$204,646 12

High Service: —		
Labor, account Extension of Fire Service	$2,559 04	
Water Pipes, account Extension of Fire service	17,690 76	
Stock, account Extension of Fire Service	2,091 76	
Teaming, account Extension of Fire Service	142 50	
Miscellaneous, account Extension of Fire Service	316 60	
Water Tower Breed's Island, Contract (balance)	2,120 00	
Design and Drawings for additional Pumping Engine (on account)	3,871 72	
Copper-work, New Pumping-Station, Chestnut Hill, Contract (balance),	2,000 00	
Miscellaneous contracts on account of Extension to East Boston	343 70	
	$31,136 08	
Less Stock not used	6,951 57	
		$24,184 51
Introduction of Meters and Inspection, Cochituate Water-Works: —		
New Meters	$7,211 97	
Stock for Meters and setting	87 28	
	$7,299 25	
Stock paid for in previous years (additional)	560 11	
		$7,859 36
Introduction of Meters and Inspection, Mystic Water-Works: —		
New Meters	$742 81	
	$742 81	
Less Stock not used	148 67	
		$594 14
Improvement of Lake Cochituate: —		
Contract for building New Dam (balance)	$14,065 40	
Miscellaneous, account of New Dam	1,298 66	
		$15,364 06
Shops, Albany Street: —		
Contract for Building	$51,709 96	
" for Elevators	1,486 00	
" for Electric Bells and Watch-clock	250 00	
Misc. Items, Inspection, etc.	2,066 57	
		$55,512 53

COST OF CONSTRUCTION, AND CONDITION OF THE WATER DEBTS.

Cost of construction of Cochituate Works to Jan. 1, 1890		$20,432,974 43
Expended in 1890, as follows, viz. : —		
Additional Supply of Water	$204,646 12	
Extension of Mains, etc.	277,243 42	
High-Service	24,184 51	
Shops, Albany street	55,512 53	
		561,586 58
Cost of construction of Cochituate Water-Works to Jan. 1, 1891		$20,994,561 01
The outstanding Cochituate Water Loans, Jan. 1, 1890, were		$15,476,273 98
Issued during year 1890, as follows : —		
Appropriation, Additional Supply of Water, 4% Loans,	$300,000 00	
" Extension of Mains, etc., 3½% Loans,	20,000 00	
" 4% "	250,000 00	
" High Service, 3½% Loans,	100,000 00	
" 4% "	100,000 00	
		770,000 00
Total Cochituate Debt, Jan. 1, 1891		$16,246,273 98
Cochituate Water Sinking-Fund, Jan. 1, 1890		$5,285,456 37
Cochituate Water Sinking-Fund, Jan. 1, 1891		5,854,530 21
Net Cochituate Water Debt, Jan. 1, 1890		10,190,817 61
" " " " " 1, 1891		10,391,743 77

Cost of construction of Mystic Works to Jan. 1, 1890	$1,696,280 76
Cost of construction of Mystic Works to Jan. 1, 1891	1,708,781 59
The outstanding Mystic Water Loans, Jan. 1, 1890, were	$839,000 00
Paid during year 1890	100,000 00
Total Mystic Debt, Jan. 1, 1891	739,000 00
Mystic Water Sinking-Fund, Jan. 1, 1890	$754,926 05
" " " " 1, 1891	719,722 81
Net Mystic Water Debt, Jan. 1, 1890	$84,073 95
" " " " " 1, 1891	19,277 19

TOTAL MONEY EXPENDITURES, COCHITUATE WATER-WORKS, FOR YEAR 1890.

Stock	$142,624 97
Labor	338,713 07
Salaries	58,649 26
Travelling expenses	8,337 04
Printing	3,649 69
Stationery	609 78
Advertising	753 16
Postage	239 41
Freights and express	2,141 04
Rents	6,248 42
Gas	318 92
Teaming	23,272 14
Repairs	11,904 54
Taxes	21 31
Miscellaneous	14,592 34
Inspection of pipes	2,041 66
Blasting	11,053 62
Water pipe contracts	127,080 14
Coal and wood	3,797 90
Pumping Service, salaries	8,883 75
" " fuel	7,045 72
" " repairs	2,212 36
" " oils, etc.	765 87
" " small supplies	358 94
Miscellaneous contracts	140,502 06
Engineering	17,208 63
Engineering supplies	1,216 83
Hay and grain (from May 1)	2,391 20
	$936,633 77

TOTAL MONEY EXPENDITURES, MYSTIC WATER-WORKS, FOR YEAR 1890.

Stock	$12,144 24
Labor	42,873 67
Salaries	24,050 14
Advertising	37 76
Printing	1,317 28
Stationery	100 66
Taxes	30 80
Gas	109 92
Postage	38 00
Travelling expenses	2,932 20
Coal and wood	824 12
Freights and express	182 77
Teaming	20 00
Hay and grain	693 09
Damages	1,067 44
Repairs	2,722 51
Miscellaneous	2,442 31
Water pipe contract	8,705 15
Telephones	396 51
Pumping Service, salaries	10,273 79
" " fuel	13,130 01
" " repairs	378 86
" " oils, etc.	676 14
" " small supplies	339 98
" " new machinery	3,567 00
Engineering	645 00
Miscellaneous contracts	6,700 00
Mystic Sewerage Station, viz.: —	
Salaries and wages	4,879 06
Chemicals	52 76
Repairs	130 85
Small supplies	488 83
	$141,950 85

STATEMENT OF STOCK ACCOUNTS.

		Increase.	Decrease.
Cochituate Water-Works, viz. : —			
Stock on hand, Dec. 1, 1889 . .	$10,112 37		
" " " Dec. 1, 1890 . .	14,835 57		
Increase during year . . .	$4,723 20	$4,723 20	
Mystic Water-Works, viz. : —			
Stock on hand, Dec. 1, 1889 . .	$3,829 55		
" " " Dec. 1, 1890 . .	7,285 72		
Increase during year . . .	$3,456 17	3,456 17	
Extension of Mains, etc., viz. : —			
Stock on hand, Dec. 1, 1889 . .	$47,677 67		
" " " Dec. 1, 1890 . .	35,758 17		
Decrease during year . . .	$11,919 50		$11,919 50
High Service, viz. : —			
Stock on hand, Dec. 1, 1889 . .	$0,000 00		
" " " Dec. 1, 1890 . .	6,951 57		
Increase during year . . .	$6,951 57	6,951 57	
Introduction of Meters and Inspection, Cochituate Water-Works, viz. : —			
Stock on hand, Dec. 1, 1889 . .	$3,767 25		
" " " Dec. 1, 1890 . .	3,207 14		
Decrease during year . . .	$560 11		560 11
Introduction of Meters and Inspection, Mystic Water-Works, viz. : —			
Stock on hand, Dec. 1, 1889 . .	$358 82		
" " " Dec. 1, 1890 . .	507 49		
Increase during year . . .	$148 67	148 67	
		$15,279 61	$12,479 61
Total increase in Stock during year . . .		$2,800 00	

Contracts Made and Pending during 1890.

DATE.	CONTRACTORS.	WORK.	AMOUNT.	PAID ON CONTRACT.		
				Previous Years.	Year 1890.	Total.
1887. Nov. 16,	Edward Marley & Bros. .	Copper-work, Chestnut-Hill Pumping-Station	$1,393.00	$1,100 00	. . . . .	. . . . .
1889. *Mar. 26,	Samuel B. Locke & Co. . .	Iron and service-box castings	2 cents per pound	9,056 88	$4,440 02	$13,496 90
* " 27,	Boston Standard Metal Co.,	Brass and composition castings	Brass, 12¾ cents per pound . . ; Composition 14¾ c. per lb. ; 13¾ c. per lb.	2,536 05	2,712 04	5,248 09
*April 26,	Gloucester Iron Works . .	Water-pipes and specials (estimated $96,135.05) . .	4-inch, $28.43 per ton. 6 and 8 inch, $28.31 per ton. 12 and 16 inch, $27.55 per ton. 20-inch, $27.45 per ton. Specials, $53.20 per ton.	80,694 77	8,153 02	88,847 79
*May 10,	Patrick W. Hayes	Blasting, Seaver street, Roxbury	$4.44 per cubic yard	. . . . .	598 06	598 06
* " 28,	H. G. Jordan and Co. . . .	2,800 tons Cumberland coal (Mystic Dept.)	$3.92 per ton, 2,240 lbs.	5,223 79	390 43	5,614 22
*June 12,	C. F. Dacey	Blasting, Seaver street, Roxbury	$3.75 per cubic yard	. . . . .	332 00	332 00
*July 24,	John McLaren	Water-tower, Breed's Island, East Boston	$4,700.00	2,500 00	2,120 00	4,620 00
* " 26,	H. R. Worthington	Two jacket drain tanks and pumps	$438.00	. . . . .	438 00	438 00
*Aug. 14,	Thomas A. Rowe	New dam at Lake Cochituate	$26,676.00	2,032 90	24,261 07	26,293 97
*Sept. 6,	Keening & Strout Bros. . .	New stable, Albany-street yard	$22,486.00	. . . . .	22,744 09	22,744 09
* " 27,	Robinson Boiler Works .	Wrought-iron pipes for Huntington-ave. bridge . . .	$1,185.00	. . . . .	1,203 16	1,203 16
* " 27,	John Cavanagh & Co. . .	Two siphons at Warren bridge	$14,700.00	8,000 00	6,700 00	14,700 00
*Oct. 5,	J. N. Hayes & Co.	Pipe-box at Warren bridge, north side	$5,400.00	2,500 00	2,900 00	5,400 00

Contracts Made and Pending during 1890. — *Continued.*

Date.	Contractors.	Work.	Amount.	Paid on Contract.		
				Previous Years.	Year 1890.	Total.
*Oct. 5,	J. N. Hayes & Co.	Pipe-box at Warren bridge, south side	$2,898.00	$1,500 00	$1,398 00	$2,898 00
* " 16,	J. C. Coleman	Blasting, Dunreath street, Roxbury	$4.25 per cubic yard	425 00	348 13	773 13
*Nov. 8,	Augustine Judge	Blasting, Townsend street, Roxbury	$4.75 per cubic yard		392 83	392 83
* " 13,	James McLaughlin & Son	Blasting, street off River street, Dorchester	$5.00 per cubic yard		63 00	63 00
* " 15,	Henry R. Worthington	Independent condenser, Mystic Dept.	$1,250.00		1,250 00	1,250 00
* " 20,	J. N. Hayes & Co.	Change in work at Warren bridge	$800.00		800 00	800 00
* " 21,	J. C. Coleman	Blasting, Sutherland road, Brighton	$3.56 per cubic yard		441 00	441 00
* " 22,	B. Mulvey	Blasting, Elmore street, Roxbury	$2.70 per cubic yard		83 43	83 43
* " 23,	B. Mulvey	Blasting, Englewood street, Dorchester	$2.70 per cubic yard		191 36	191 36
* " 27,	American Diamond Rock-Boring Co.	Rental of drill, etc., Basin No. 5	$250 per month; $14 per karat for extra diamonds.		3,823 64	3,823 64
*Dec. 31,	Gifford & Lawrence	Machine-shop, Albany-street yard	$51,913.00		51,465 96	51,465 96
1890. Jan. 11,	R. D. Wood & Co.	Water-pipes and special castings	$30.34 per ton, 2,240 pounds		77,330 59	
*Feb. 14,	A. Fales & Son	Office building, Basin No. 5, Ashland	$1,344.00		1,344 00	1,344 00
* " 14,	Standard Thermometer Co.	Electric recording-gauge, Fisher-Hill reservoir	$485.00		494 81	494 81
* " 19,	J. C. Coleman	Blasting, Maywood street, Roxbury	$2.17 per cubic yard		98 95	98 95
*March 1,	Thomas & Co.	600 tons Cumberland coal, Chestnut-Hill Pumping-Station	$4.97 per ton, 2,240 lbs., in bins		3,464 31	3,464 31

March 10,	Osgood & Hart	Iron and service-box castings, year ending Mar. 15, '91,	2 cents per pound, iron. 2¼ cents per lb., service-boxes.	. . . . .	7,209 70	. . . . .
" 15,	Boston Standard Metal Co.	Brass castings for year ending Mar. 15, '91	Composition, No. 1, 21 c. per lb. Composition, No. 2, 19 c. per lb. Composition, No. 3, 17½ c. per lb.	. . . . .	5,718 64	. . . . .
* " 15,	Blodgett Bros. & Co. . . .	Electric-light plant at Mystic Pumping-Station . . .	$360.00	. . . . .	387 42	387 42
" 19,	R. D. Wood & Co.	Water-pipes and specials	$31.40 per ton, 2,240 pounds . . .	. . . . .	41,090 04	. . . . .
*Mar. 21,	Martin F. Kelley	Blasting, Payson avenue, Dorchester	$3.90 per cubic yard	. . . . .	$83 85	$83 85
* " 26,	Martin F. Kelley	Blasting, Juniper street, Roxbury	$3.49 per cubic yard	. . . . .	112 38	112 38
* " 28,	C. H. Brown & Co.	Engine for machine-shop, Albany street	$1,350.00	. . . . .	1,438 97	1,438 97
*Mar. 28,	Whittier Machine Co. . .	Two freight elevators, machine-shop, Albany street .	$1,390.00	. . . . .	1,486 00	1,486 00
*Apr. 4,	John B. Murphy	Blasting, Cohasset street, West Roxbury	$3.50 per cubic yard	. . . . .	64 75	64 75
* " 7,	Holtzer-Cabot Electric Co.,	Installation of accumulator plant at Chestnut-Hill Pumping-Station	$425.00	. . . . .	425 00	425 00
* " 9,	Martin F. Kelley	Blasting, Mills street, Roxbury	$3.45 per cubic yard	. . . . .	112 82	112 82
* " 21,	John B. Gunning	Blasting, Vaughn court, Dorchester	$4.75 per cubic yard	. . . . .	21 85	21 85
" 22,	Roberts Iron Works Co. .	Three boilers, Mystic Pumping-Station	$8,465.00	. . . . .	. . . . .	. . . . .
* " 24,	Thomas W. Mulvey . . .	Blasting, Magnolia street, Dorchester	$3.70 per cubic yard	. . . . .	41 81	41 81
" 26,	D. H. Cram	Rental of derricks for use at Basin 5	$200. each 1st year, $100. each after,	. . . . .	1,600 00	. . . . .
* " 30,	Martin F. Kelley	Blasting, Columbia street, Dorchester	$3.60 per cubic yard	. . . . .	98 64	98 64
* " 30,	Jas. McLaughlin & Son . .	Blasting, Evans street, Dorchester	$4.00 per cubic yard	. . . . .	30 80	30 80
*May 2,	Martin F. Kelley	Blasting, Selkirk and Chiswick roads	$3.84 per cubic yard	. . . . .	266 88	266 88
" 2,	Newell & Snawling	Three roads, Ashland and Hopkinton	(estimated) $21,285	. . . . .	21,575 67	. . . . .
* " 6,	Davis & Farnum Mfg. Co. .	Connections for Independent Condenser, Mystic Dept.,	$165.36	. . . . .	165 36	165 36
* " 10,	Martin F. Kelley	Blasting, Lanark road, Brighton	$3.83 per cubic yard	. . . . .	94 22	94 22
" 10,	E. Hodge and Co.	Two boilers, machine-shop, Albany street	$1,730.00	. . . . .	. . . . .	. . . . .

Contracts Made and Pending during 1890. – *Concluded.*

Date.	Contractor.	Work.	Amount.	Paid on Contract.		
				Previous Years.	Year 1890.	Year.
*May. 12,	Martin F. Kelley	Blasting, Lake street, Brighton	$4.60 per cubic yard		$146 28	$146 28
* " 15,	John B. Gunning	Blasting, Paul Gore street, West Roxbury	$4.75 per cubic yard		58 90	58 90
* " 19,	Martin F. Kelley	Blasting, Bellevue street, Dorchester	$3.59 per cubic yard		103 83	103 83
* " 21,	Ingalls & Kendricken	Water plant at Basin 5	$1,640.00		1,640 00	1,640 00
* " 26,	W. J. Boland	Blasting, Whitney place	$4.38 per cubic yard		32 41	32 41
" 28,	Darrow, Mann, & Co.	2,400 tons Cumberland coal, Mystic Pumping-Station,	$3.80 per ton, 2,240 lbs. delivered		5,563 58	
* " 31,	W. J. Boland	Blasting, Folsom street, Dorchester	$4.25 per cubic yard		48 03	48 03
*June 11,	James Donovan	Blasting, Fairview street, West Roxbury	$3.25 per cubic yard		135 20	135 20
* " 25,	Electric Construction and Supply Co.	Two Ward arc lamps, engine-room, Chestnut-Hill Pumping-Station	$65.00 each		132 10	132 10
*July 2,	Waldo Bros.	5,000 barrels cement, Dam 5	$1.14½ per bbl. del'd at Ashland		5,753 63	5,753 63
* " 3.	Martin F. Kelley	Blasting, Leyland street, Dorchester	$3.00 per cubic yard		39 00	39 00
* " 14,	Martin F. Kelley	Blasting, Vaughn avenue, Dorchester	$5.00 per cubic yard		28 00	28 00
* " 30,	Coffin Valve Co.	Sluice gate, dam at lake	$850.00		850 00	850 00
* " 31,	J. C. Coleman	Blasting, Ashland street, West Roxbury	$4.99 per cubic yard		54 89	54 89
*Aug. 6,	Samuel Gist	Blasting, Harriswood Crescent	$3.50 per cubic yard		78 05	78 05
* " 19,	Martin F. Kelley	Blasting, place off Wales place, Dorchester	$2.84 per cubic yard		262 42	262 42
* " 30,	Edward C. Leonard	Blasting, Kenney street, Roxbury	$4.50 per cubic yard		162 90	162 90
*Sept. 5,	James F. Davern	Blasting, Townsend street, Roxbury	$3.50 per cubic yard		215 25	215 25

*Sept.	8,	Martin F. Kelley	Blasting, street off Lawrence avenue, Dorchester	$2.94 per cubic yard		$189 63	$189 63
"	12,	B. F. Sturtevant & Co.	Heating apparatus, shop, Albany street	$1,200.00			
* "	12,	Blodgett Bros. & Co.	Watchman's clock, etc., shop, Albany street	$230.00		250 00	250 00
* "	15,	O. D. Witherell	800 tons Cumberland coal, Chestnut-Hill Pumping-Station	$4.50 per ton of 2,240 lbs. in bins		3,581 41	3,581 41
* "	20,	Edward C. Leonard	Blasting, Harrishoff street, Roxbury	$4.75 per cubic yard		101 18	101 18
* "	24,	Martin F. Kelley	Blasting, Blakeville street, Dorchester	$2.59 per cubic yard		115 00	115 00
"	26,	Waldo Bros.	2,500 barrels cement, Dam 5	$1.14 per bbl. del'd at Ashland		1,140 00	
* "	26,	Fiske, Coleman, & Co.	2,500 barrels cement, Dam 5	$1.14 per bbl. del'd at Ashland		2,850 00	2,850 00
* "	27,	Thomas Burke	Blasting, Elmore street, Roxbury	$2.68 per cubic yard		133 20	133 20
*Oct.	1,	J. C. Coleman	Blasting, Morton street, Dorchester	$4.94 per cubic yard		41 50	41 50
* "	3,	Martin F. Kelley	Blasting, Hazel park, Roxbury	$3.10 per cubic yard		117 49	117 49
* "	10,	Edward C. Leonard	Blasting, Hutchins avenue, Roxbury	$6.45 per cubic yard		32 25	32 25
"	16,	Mellert Foundry and Machine Co.	Twenty 6 x 6 3-way branches	2 6-10 cents per pound, delivered			
* "	18,	F. A. Jones	"Jones Economic Furnace" for 3 new Mystic boilers,	$150.00 each		450 00	450 00
* "	29,	J. C. Coleman	Blasting, Kilsyth road, Brighton	$4.95 per cubic yard		122 76	122 76
* "	29,	J. C. Coleman	Blasting, Weld and Centre sts., West Roxbury	$3.85 per cubic yard		589 05	589 05
"	31,	Wm. T. Davern	Blasting Dean avenue, Dorchester	$2.75 per cubic yard			
"	31,	James McLaughlin & Son	Blasting, court off Dorchester avenue	$3.95 per cubic yard			
Nov.	3,	James F. Davern	Blasting, Grainger street, Roxbury	$3.10 per cubic yard			
"	3,	Martin F. Kelley	Blasting, Holborn place, Roxbury	$2.64 per cubic yard			
"	21,	Martin F. Kelley	Blasting, Hartford terrace, Dorchester	$4.50 per cubic yard			
Dec.	1,	Thomas Burke	Blasting, Dean avenue, Dorchester	$4.00 per cubic yard			

Contracts marked with star (*) are completed.

REPORT OF THE ENGINEER.

CITY OF BOSTON,
ENGINEERING DEPARTMENT, January 1, 1891.

MR. ROBERT GRANT, *Chairman Boston Water Board:* —

SIR, — In accordance with the requirements of the Revised Ordinances, I respectfully submit the following report on the condition of the Water-Works: —

SOURCES OF SUPPLY.

The rainfall during the past year has been more than the average amount, but has been unequally distributed.

During June, July, and August the rainfall was small, and the yield of the water-sheds was reduced to so small an amount as to cause fears of a drought.

The rainfall in September and October was large, — that of October being greater than in any one month since July, 1867, and the supply of water has been abundant during the latter part of the year.

The rainfall and quantities collected on the several water-sheds are as follows: —

	Sudbury.	Cochituate.	Mystic.
Rainfall, inches .	53.00	51.23	49.37
Rainfall collected . inches . .	26.998	24.51	26.04
Daily average yield in gallons . .	96,658,100	22,023,100	33,323,300

The quality of the Sudbury and Cochituate waters has been good, and the quality of the Mystic water has been equal to the usual average from that supply.

The fluctuations in the amount of water in the different lakes and reservoirs is shown graphically by an appended diagram.

The condition of the different reservoirs during the year is given below: —

Sudbury-River Reservoirs and Lake Cochituate.

Reservoir No. 1. — Water was wasting at the outlet dam from January 1 to July 6, with the exception of two days in June, after the stop-planks were placed on the dam. Water was also wasting from September 12 to September 21; from September 24 to September 25; and from October 4 to the present time.

The dam at Reservoir No. 1 is in good condition.

Reservoir No. 2. — This reservoir was full until the latter part of June, with the exception of a short time in March, when the reservoirs were drawn down in anticipation of the usual large spring flow in the river.

During July the storage was reduced until the 25th, when the surface was at grade 160.30, or 5.57 feet below the crest of the dam. In the latter part of August the reservoir began to fill, and from October 7 till the present time, water has been running over the dam.

The dam at Reservoir No. 2 is in good condition.

Reservoir No. 3. — This reservoir was drawn down 3.75 feet in the early part of March, but soon refilled, and water was running over the crest of the dam until July 9. The lowest point reached during the summer was on August 17 when the surface was 1.25 feet below the crest of the dam. Water has been flowing over the dam since September 13.

The dam at Reservoir No. 3 is in good condition.

Reservoir No. 4. — This reservoir was drawn down about 3 feet in March, but had refilled on March 25, and remained full until July 9.

From that date the surface fell until September 13, when it was 13.07 feet below the crest of the dam. From the latter date the reservoir began to fill, and had risen to the crest of the dam on December 18.

The dam at Reservoir No. 4 is in good condition.

Farm Pond. — The surface of the pond has been kept at an average height of 149.33 feet above tide marsh level.

The conduit through the pond has been used all the year, excepting from March 21 to April 5, and from November 5 to December 14, when the water sent to Chestnut Hill was drawn through the pond.

The Framingham Water Co. have pumped 74,500,000 from the pond, or an average of 204,000 gallons per day.

Lake Cochituate. — Water was wasting at the outlet dam during January, February, and March, and a part of April and May. On June 1 the surface was 0.39 feet below high-

water mark, when the supply for the city began to gradually lower the water until September 12, when the surface was 5.19 feet below high-water mark.

During the latter part of October the lake filled rapidly, and water was allowed to waste at the outlet dam from Dec. 18 to Dec. 26.

The dam at Lake Cochituate is in good condition.

The heights of water in the various storage reservoirs on the first day of each month are given below.

	Reservoirs.				Farm Pond.	Lake Cochituate.
	No. 1.	No. 2.	No. 3.	No. 4.		
	Top of flash-boards.	Top of flash-boards.	Crest of Dam.	Top of flash-boards.	High Water.	Top of flash-boards.
	159.29	167.12	175.24	215.21	149.25	134.36
January 1, 1890	157.95	166.14	175.52	214.56	149.60	132.77
February 1, "	157.88	166.04	175.48	214.51	149.10	132.30
March 1, "	158.18	166.30	175.70	214.68	149.48	132.60
April 1, "	158.34	166.11	175.60	214.76	149.09	132.75
May 1, "	157.95	166.14	175.51	214.53	149.41	133.38
June 1, "	157.89	167.26	175.54	214.49	149.69	133.97
July 1, "	159.31	166.43	175.31	214.93	149.40	132.92
August 1, "	158.92	160.90	174.74	211.79	149.01	131.19
September 1, "	158.57	161.66	174.48	204.51	148.81	129.57
October 1, "	156.98	164.07	175.35	202.58	149.17	129.46
November 1, "	158.19	166.23	175.37	210.75	149.12	132.37
December 1, "	157.76	166.04	175.49	213.86	149.34	132.45
January 1, 1891	157.66	165.96	175.32	214.41	149.36	132.49

Water has been drawn from the different reservoirs on the Sudbury river to supply the city, as follows: —

Reservoir No. 1, and Farm Pond.

Nov. 5 to Dec. 14.

Reservoir No. 2.

Jan. 3 to Jan. 10.
May 14 to June 8.
June 11 to July 27.
Aug. 7 to Sept. 24.
Sept. 26 to Nov. 4.

RESERVOIRS NOS. 2 AND 3.

Jan. 1 to Jan. 2.
Jan. 11 to Jan. 13.
Jan. 17 to Jan. 20.
Jan. 24 to Jan. 27.
Jan. 31 to Feb. 3.
Feb. 7 to Feb. 10.
Feb. 14 to Feb. 17.
Feb. 21 to Feb. 24.
Feb. 28 to Mar. 3.
Mar. 7 to Mar. 10.
Mar. 14 to Mar. 17.
Mar. 21 to Mar. 24.
Mar. 28 to Mar. 31.
April 4 to April 7.
April 11 to April 14.
April 18 to April 21.
April 25 to May 13.
July 28 to Aug. 6.
Dec. 17 to Dec. 21.
Dec. 23 to Dec. 28.
Dec. 31.

AQUEDUCTS AND DISTRIBUTING RESERVOIRS.

The Sudbury-river aqueduct has been used 311 days, and the Cochituate has been used 355 days.

The Sudbury conduit has delivered 6,596,000,000 gallons into Chestnut-hill and Brookline reservoirs, equal to a daily supply of 18,071,200 gallons; the Cochituate aqueduct has delivered 5,722,170,800 gallons, or 15,677,200 gallons per day.

In the Cochituate aqueduct a flow $6\frac{1}{2}$ feet in depth was maintained during the year. The rate of flow in the Sudbury conduit was varied from day to day as was necessary to keep the distributing reservoirs at the proper height.

Both aqueducts have been cleaned as usual during the year.

The Chestnut-hill, Brookline, Fisher-hill, Parker-hill, and East Boston reservoirs, and the Bellevue and Breed's Island water-towers, are in good condition.

HIGH-SERVICE PUMPING-STATIONS.

At the Chestnut-hill station the pumping-engines and boilers are in good condition.

The feed-water heater was thrown out of service from April 15 to October 17 on account of the brass tubes in the heater having been destroyed by the gases in the smoke flue.

The heater was repaired by substituting galvanized wrought-iron tubes for the old brass tubes.

The duty of the boilers was reduced about 5 per cent. when the heater was not in use.

A storage battery has been connected with the electric-lighting plant to furnish lights for the station and biological

laboratory during the daytime, or when the dynamo is not running. Two arc lights have been connected with the incandescent circuits, one being hung over each engine.

One of the Standard Thermometer Co.'s electric gauges was placed in the engine-room in June to indicate and register the heights of water in Fisher-hill reservoir.

A boiler trial was made on December 4 and 5 to verify the results indicated by the daily records and to check the feed-water meters.

The trial was conducted under the same conditions as are met with during the daily runs, with the exception of carefully weighing the water before it was pumped into the boiler. To do this it was necessary to convey the feed-water, including that from the steam jackets and radiators, to a weighing barrel, instead of passing it directly into the boiler.

On December 4 the pumping-engine was run till 7 A.M., when the steam in the boiler had fallen from 70 to 42.5 lbs., no coal having been fed to the furnaces during the previous half-hour. The fires were then cleaned and lightly banked with 250 lbs. of coal.

The connections in the feed-water pipes were then changed so the water fed to the boiler could be weighed, and at 9 A.M. the engine again started, the steam pressure having been raised to seventy pounds.

The height of the water in the boiler was carefully marked at 7 A.M., and was left at the same point at the end of the trial.

Duration of trial, including two hours banking,	24 hours
Average steam pressure	70.18 lbs.
" temperature feed-water before heating,	75.6°
" " " after "	114.2°
" " of flue front of heater	358°
" " " " back " "	198°
Total coal used	8,716.5 lbs.
" ashes removed	620.5 "
" combustible	8,096. "
" weight of water fed to boiler	90,015 "
Water evaporated per lb. of coal, actual	10.33 "
" " " " " combustible	11.12 "
Equivalent evaporation per lb. coal, from and at 212°, including feed-water heater	12.14 "
Equivalent evaporation excluding feed-water heater	11.42 "
Equivalent evaporation per lb. combustible, from and at 212°, including feed-water heater,	13.07 "
Equivalent evaporation per lb. combustible, from and at 212°, excluding feed-water heater,	12.30 "

Coal burnt per sq. foot, grate surface, during pumping	10.00 lbs.
Per cent. ashes and clinkers	7.12 "

The table on page 40 shows the work done by the pumping-engines and boilers during the year.

Engine No. 1 was used 3,466 hours, pumping	1,208,902,600 gals.
Engine No. 2 was used 3,344 hours, pumping	1,160,729,100 "
Total amount pumped	2,369,631,700 "
" " coal consumed	2,677,281 lbs.
Per cent. ashes and clinkers	8.2
Average lift in feet	123.16 ft.
Quantity pumped per lb. of coal	885.1 gals.
Daily average amount pumped	6,492,100 "

The amount pumped is an increase of 10.5 per cent. over that of 1889.

The same boiler supplied the steam for pumping, and for heating and lighting the pumping-station and other buildings near the station.

COST OF PUMPING.

Salaries	$9,000 75
Fuel	5,845 08
Repairs	2,013 24
Oil, waste, and packing	741 80
Small supplies	424 08
Total	$18,024 95

Cost per million gallons raised one foot high	$0.0618
" " " pumped to reservoir	$7.61

At the West Roxbury pumping-station 14,313,800 gallons have been pumped, equivalent to a daily average of 39,200 gallons, or an increase of 10.9 per cent. over 1889.

At the East Boston pumping-station an average of 8,000 gallons per day have been pumped to the Breed's Island water-tower.

Water has been pumped into the East Boston reservoir only on one day in January, one day in February, one day in March, and two days in December, as the reservoir was filled during the night from the low-service main during the balance of the year.

This favorable showing is owing to the mild weather during last winter.

MYSTIC LAKE.

Water was wasting over the dam during the first half of the year with the exception of six days in June. On July 1 the surface of the lake began to fall, and on September 10 was at grade 3.02, or 3.98 feet below high-water mark, the lowest point reached during the year. From this date the lake began to fill, and water has been running over the dam from October 20 to the present time.

MYSTIC VALLEY SEWER.

The pump has been run on 335 days, working 5,147 hours, and has pumped 119,119,670 gallons of sewage, or an average of 355,500 gallons per day of pumping.

The total amount pumped is 19 per cent. more than during 1889; the increase being due to the increased time of running the pumps.

The total amount of sulphate of alumina used during the year was 323,650 pounds, and 191 tons of coal were used in pumping.

MYSTIC CONDUIT AND RESERVOIR.

The conduit was cleaned during the year, and is in good condition.

The reservoir has not been cleaned during the year, but has received the usual care.

MYSTIC PUMPING-STATION.

Three new boilers have been placed in the boiler-room, and the four old boilers that have been in use since 1872 were taken out.

The new boilers were built by the Roberts Iron Company, of Cambridgeport, from designs made in this office. They are similar in size and design to the three other boilers that were built six years ago. They are 78 inches in diameter, 17 feet in length, and each boiler contains 151 tubes of 3 inches outside diameter. The boiler shells are of $\frac{7}{16}$ inch steel, and the tube-sheets of $\frac{1}{2}$ inch steel.

The "Jones Economic Furnace" was connected with the three older boilers in April, and the same attachment has been placed under the new boilers.

The new boilers were first used on November 6.

An independent air-pump and condenser has been con-

nected with the two 5,000,000 pumps, and the old condensers and air-pumps, which had become badly worn, were abandoned.

A combined dynamo and water motor, furnished by the Belknap Water Motor Co., of Portland, has been placed in the engine-room, and the buildings have been wired for sixty-six incandescent lights. The dynamo has a nominal capacity of only thirty lights, but the pipe connections to the motor were made large enough to supply power for a larger plant, if the plant should prove to be a success.

The table on page 41 shows the work done by the pumping-engines during the year.

Engine No. 1 was in use 430 hours, pumping	77,644,200	gallons
Engine No. 2 was in use 1,426 hours, 15 minutes, pumping	270,667,500	"
Engine No. 3 was in use 8,355 hours, 45 minutes, pumping	2,681,804,800	"
Total amount pumped	3,030,116,500	"
Total amount of coal consumed	6,506,000	lbs.
Percentage ashes and clinkers	9.8	
Average lift in feet	147.11	
Quantity pumped per lb. of coal	465.7	gallons
Average duty of engines per 100 lbs. of coal, no deductions	57,141,800	ft.-lbs.
Daily average amount pumped	8,301,700	gallons

COST OF PUMPING.

Salaries	$9,544.50
Fuel	12,686.25
Repairs (not including new air-pump and boilers)	403.52
Oil, waste, and packing	532.28
Small supplies	340.53
Total	$23,507.08
Cost per million gallons raised one foot high,	$0.0528
Cost per million gallons pumped to reservoir	$7.76

CONSUMPTION.

The daily average consumption from the combined works, and the consumption compared with that of 1889, has been as follows: —

1890.	Cochituate Water.		Mystic Works.		Combined Supply.	
	Consumption in Gallons.	Percentage of Consumption of 1889.	Consumption in Gallons.	Percentage of Consumption of 1889.	Consumption in Gallons.	Percentage of Consumption of 1889.
January	33,680,000	111.6	8,187,900	105.4	41,867,900	110.3
February	33,030,700	92.1	8,299,700	91.5	41,330,400	92.0
March	30,844,400	95.8	8,055,800	106.9	38,900,200	97.9
April	30,466,600	98.9	7,481,600	104.1	37,948,200	99.9
May	31,381,200	95.9	7,488,400	97.7	38,869,600	96.3
June	33,022,700	98.9	8,396,000	104.7	41,418,700	100.1
July	36,701,100	115.2	9,463,300	113.8	46,164,400	114.9
August	36,316,000	115.6	8,932,200	110.1	45,248,200	114.5
September	36,165,800	114.0	8,436,700	105.9	44,602,500	112.4
October	33,388,900	105.5	7,784,100	102.1	41,173,000	104.7
November	32,955,100	104.5	7,601,300	103.9	40,556,400	104.4
December	38,334,100	120.4	9,448,300	126.4	47,782,400	121.6
Average	33,871,700	105.6	8,301,400	106.0	42,173,100	105.7

The daily average consumption per head of population has been as follows: —

Sudbury and Cochituate supply	82.5 gallons
Mystic supply	70.6 "
Combined supplies	79.8 "

The above figures show an increase of 5.6 per cent. in the consumption from the Sudbury and Cochituate works from that of the previous year, of 6 per cent. in the consumption from the Mystic works, and of 5.7 per cent. increase in the consumption from the combined supplies.

Distribution.

The following changes were made in the distribution system during the year: —

SIZE.	SUDBURY AND COCHITUATE WORKS.		MYSTIC WORKS IN CHARLESTOWN.	
	Total length laid and relaid.	Length abandoned.	Total length laid and relaid.	Length abandoned.
3"	. . . . .	. . . . .	. . . . .	988
4"	1,516	1,145	1,416	2,489
6	41,416	4,121	4,693	421
8"	11,561	261	98	
10"	5,791	. . . . .	799	
12"	36,349			
16"	823	198		
20"	221			
24"	8,158			
Total length.	105,835	5,725	7,006	3,898

The total length of pipe laid on the Sudbury and Cochituate division was twenty miles, and a little over one mile has been abandoned, making a net increase of nineteen miles in the total length in use.

On the Mystic works in Charlestown the mains were extended 1,792 feet; 1,316 feet of 1-inch and 2-inch service-pipes were relaid with 4 and 6-inch main pipes, and 3,898 feet of 3, 4, and 6-inch wrought-iron and cement pipes were replaced with cast-iron pipes.

On the Cochituate division a new high-service main, 24 inches in diameter, was laid from the 30-inch main in Perkins street to Forest hills.

This pipe is 8,150 feet in length, and should soon be extended to the vicinity of Roslindale.

The high service has been extended to supply a portion of Savin Hill, and over two miles of high-service pipes have been laid in the City proper, to supply fire-pipes and sprinklers inside of buildings.

The Bellevue high-service pipes have been extended to connect with the pipe in Pond street, west of May street, in Jamaica Plain, as there were several houses in that district that could not be supplied from Fisher-hill reservoir.

About one mile of main pipes have been relaid with larger pipes to improve the fire service in the City proper.

ADDITIONAL SUPPLY.

The borings, which were commenced last year to determine the location and character of the proposed dam, were completed early in the year, and a site for the dam was chosen about 300 feet up-stream from the preliminary location.

Plans were made and surveys continued so that work was commenced in April, and has been continued through the season.

In accordance with your vote of July 8, 1890, "That the Engineer be authorized to engage the services of Mr. Jos. P. Davis as consulting engineer for the new dam and reservoir No. 5 and Cedar Swamp," Mr. Davis was engaged as consulting engineer, and the following is his report on the new dam: —

NEW YORK, Aug. 21, 1890.

MR. WILLIAM JACKSON, *City Engineer, Boston, Mass.*: —

At your request I have visited the site and examined the plans of Dam No. 5, of the Sudbury River Water-Works, and now present my views on the points to which you have called my attention.

The location of the dam appears to have been well selected, as the core-wall can be founded upon ledge rock throughout its whole length without excessive excavation.

This rock, where uncovered, though in general sound and firm, is somewhat broken up by shrinkage cracks that probably will permit some water to flow under the dam unless by puddling or other device it can be prevented from reaching the base of the core-wall.

From the trials that have been made, and from the general appearance of the surface, it is not probable that rock much freer from fissures would be found by excavating a few feet into the ledge. I would therefore advise that it be removed only where found decayed or unfit to support the wall.

Of course you will take great care to select the best materials for filling the trench in front of the wall, and to have them thoroughly puddled and rammed, and the puddle firmly bonded to the side of the trench, that access of water to the bed rock at this point may be prevented as far as possible.

With this precaution, and the closing of wide cracks with cement grout, I am of opinion that there will be no troublesome leakage, certainly none that can endanger the dam.

I approve the form and dimensions of the cross-section of the dam and its core-wall, but would recommend that the

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DAM NO. 5—VIEW OF SITE OF DAM.

HELIOTYPE PRINTING CO. BOSTON MASS.

DAM NO. 5.—VIEW OF BOTTOM OF TRENCH OF CORE WALL.

latter be built at least one foot higher than shown on the plan, or fully to elevation 298.

I also approve the proposed method of protecting the slopes of the dam and the location and dimensions of the wasteway, and of the tail-race, as the latter are outlined in the letter of Mr. FitzGerald which you forwarded to me with the plans.

Yours respectfully,

(Signed) Jos. P. Davis.

When the trench for the core-wall was excavated, it was found, at the southerly end, to be in a very compact material, practically water-tight, and it was deemed useless to carry the excavation to solid rock. Consequently, after consulting with Mr. Davis, the plan of the core-wall at this point was modified.

The accompanying plates are views of the work of construction at Dam No. 5.

A survey for the improvement of Cedar swamp was commenced, and will be continued during the winter, as much of the work can only be done when the swamp is frozen.

The survey of Whitehall pond and its vicinity has been completed.

For particulars see the following report of Desmond FitzGerald, Resident Engineer: —

Office of Additional Supply,
South Framingham, Mass., Jan. 1, 1891.

William Jackson, Esq., *City Engineer, etc.*: —

Sir, — I submit herewith a brief report of engineering work accomplished during the past year by the "Additional Supply" force.

In January, 1890, a filtration field for the disposition of the Marlboro' sewage was found, lines run, and estimates made on the increased cost resulting to the town from carrying its sewage entirely outside of the drainage area feeding the Boston Water Supply system. The South Framingham filtration field, for the disposal of the sewage which formerly found its way into Farm pond and Lake Cochituate, has been in successful operation during the year.

Active operations have been carried on at Basin 5 during the past season. During the months of January, February, and March, diamond drill borings were put down on three lines for the dam, and as a result, the old site was abandoned for a situation about 300 feet farther up-stream. On April 15 stripping on the site of the dam was started,

and on the first of June the excavating for the core-wall was begun. On June 24 the bed rock was reached in the first section. On August 7 the concrete wall was begun. In May a water-works system was devised for delivering water under pressure at any point of the dam during its construction. The work was pushed during the remainder of the season until stopped by frost.

The trench is practically completed and the core-wall built across the valley to the surface of the ground. The following table shows the quantities of materials moved during the year: —

Soil stripping	27,037 cu. yds.
Rock	2,125 "
Trench excavations	20,464 "
Concrete	7,178 "
Embankment	5,370 "
Stripping in basin	18,700 "

The roads around the basin have been built by Newell & Snawling, under their contract of May, 1890. Specifications have been prepared for delivering filling upon the dam. Gaugings of the flow of Indian brook and from Whitehall pond have been observed during the year.

Plans have been prepared for the "taking" of the necessary lands around Whitehall pond, and whenever the engineering force could be spared from Basin 5, surveys have been made of the Cedar swamp district.

The experiments on filtration, begun early in the year, have been unremittingly continued at Chestnut-hill Reservoir. Continuous and intermittent filtration have been carried on side by side, and the results closely examined in the biological laboratory and chemically by Dr. T. M. Drown. It is too early to arrive at definite conclusions in regard to this work. Experiments of a different nature from any already made have been conducted, and as they are carried on entirely with the Boston water, we shall be able to know the exact effects of filtration under different conditions on our water supply.

The work of lining the Beacon-street tunnel with concrete was abandoned on April 18 for lack of funds. About 563 feet of lining was completed. The following table shows the cost of laying concrete in the tunnel: —

Crushing stone	$1 00	per cu. yd.	
Carting crushed stone	09	"	"
Quarrying stone	92	"	"
Screenings	25	"	"
Sand	31	"	"
Screening sand and gravel	49	"	"
Transporting materials	2 35	"	"
Preparing bottom	83	"	"
Cement	3 30	"	"
Mixing and laying	4 24	"	"
Forms	94	"	"
Holidays	30	"	"
Total	$15 02	"	"

Both Rosendale and Portland cement were used.

Very respectfully yours,

(Signed) DESMOND FITZGERALD,
Resident Engineer.

IN GENERAL.

The new dam at the outlet of Lake Cochituate has been completed, but much work remains to be done in grading the adjacent grounds and removing the old dams; this work may, however, be done from time to time as funds may be available.

Plans have been prepared for a 20,000,000-gallon high-duty pumping-engine for the high-service pumping-station at Chestnut-hill Reservoir; they will soon be completed.

The work of lining the Beacon-street tunnel, which was stopped in April, has been recommenced, and should be continued as far as means are available.

The disposal of the sewage from the several towns in the water-shed has received considerable attention. The Framingham sewer system has worked satisfactorily, excepting the discharge from an under drain used during the construction of the sewer, which empties into a feeder of Lake Cochituate.

The Marlboro' sewer system is in process of construction, and should be completed and in use during this year. Plans have been made by Charles A. Allen, civil engineer, of a sewerage system for the town of Westboro', and surveys are now being made to determine the sum it would be proper for the city to pay the town by reason of extra expense to it for conveying its sewage outside of the limits of the city's water supply.

The experiments in filtration started last year at Chestnut-

hill Reservoir have been continued. The results so far obtained indicate, as was expected, that different waters are not alike affected by filtration, and, consequently, a small filtration plant has been established on the Mystic Water-Works.

The pipe for a 30-inch main from Tremont street through East Chester park and Swett street to Dorchester avenue has been contracted for and will be laid the coming season. This main has been rendered necessary on account of the increased consumption of water in South Boston and Dorchester.

Forty contracts for rock excavation have been made during the year.

Two hundred and seventy-five petitions for main-pipe extensions have been received and reported upon in regard to grade of street, size of pipe, and cost of laying.

The pipe laid has been measured, the gates and hydrants located, and are being plotted on the plans.

Sixty-one profiles of unaccepted streets have been made, and grades given for grading the streets and laying pipes where it was necessary.

The records from the four pumping-stations, the lakes, reservoirs, the Mystic sewer, and the returns from pipe foundries, etc., have been carefully kept.

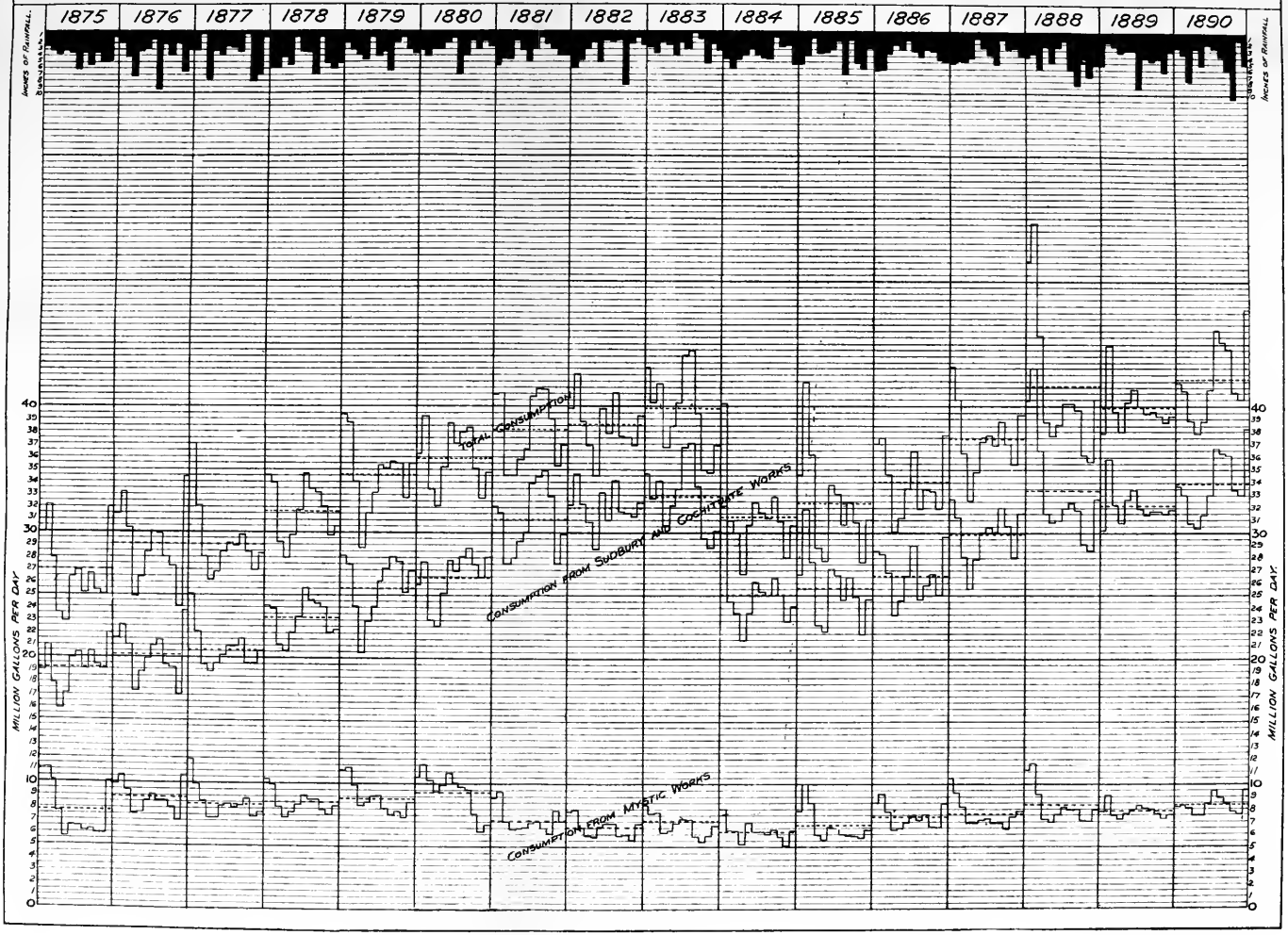
Appended to this report will be found the usual tables of rainfall, consumption, yield of water-sheds, etc.

WILLIAM JACKSON,
City Engineer and Engineer Boston Water Board.

BOSTON WATER WORKS.

Diagram showing the rainfall and daily average Consumption for each month.

Yearly Averages shown thus-----



Daily Average Consumption of Water, in Gallons, from the Cochituate and Mystic Works.

	COCHITUATE WORKS.							MYSTIC WORKS.						
MONTH.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
January	32,162,300	26,711,900	28,561,900	32,687,600	40,485,700	30,172,000	33,680,000	8,019,100	7,855,400	8,510,300	10,488,600	11,107,100	7,769,500	8,187,900
February	24,598,000	31,847,400	28,291,100	31,224,300	43,105,000	35,855,200	33,030,700	6,349,500	10,019,500	9,275,700	9,346,700	11,620,900	9,073,600	8,299,700
March	23,711,900	27,697,200	26,886,800	28,124,100	36,463,400	32,180,000	30,844,400	6,337,100	8,487,500	7,780,000	8,175,000	9,242,000	7,537,600	8,055,800
April	21,505,700	22,720,450	23,470,400	25,591,500	31,473,800	30,814,500	30,446,600	5,242,100	6,042,600	6,636,500	6,933,800	7,276,700	7,185,700	7,481,600
May	23,708,500	22,168,400	24,680,100	27,925,000	30,802,000	32,719,500	31,381,200	5,800,000	5,605,700	6,444,000	6,916,300	6,932,300	7,663,600	7,488,400
June	26,184,600	27,214,800	26,574,900	30,069,000	31,026,100	33,377,900	33,022,700	6,245,600	6,594,200	6,941,100	7,159,800	7,615,200	8,017,700	8,396,000
July	25,409,000	26,606,200	28,987,500	30,469,700	32,014,400	31,870,300	36,701,100	6,312,300	6,513,300	7,437,500	7,250,000	8,267,500	8,315,600	9,463,300
August	25,065,200	24,686,400	24,770,600	30,063,100	32,432,700	31,403,200	36,316,000	6,088,400	6,047,600	7,166,800	6,871,900	7,859,100	8,113,200	8,932,200
September . . .	26,389,500	26,493,600	25,835,600	31,946,600	31,836,500	31,722,800	36,165,800	6,411,150	5,931,900	7,585,200	6,868,600	7,266,300	7,966,000	8,436,700
October	25,022,900	24,945,500	26,713,100	30,562,700	29,110,800	31,702,200	33,429,800	5,834,200	5,914,900	6,552,000	6,436,600	7,096,400	7,627,500	7,784,100
November . . .	22,954,200	21,942,750	25,036,200	28,062,000	28,590,900	31,532,400	32,955,100	5,119,700	5,710,300	6,546,000	7,361,200	6,990,800	7,316,700	7,601,300
December	24,234,800	24,724,900	29,706,800	31,511,500	32,686,200	31,829,000	38,334,100	6,330,800	6,356,700	8,043,500	7,835,300	7,918,600	7,473,200	9,448,300
Yearly average .	25,090,500	25,607,200	26,627,900	29,852,100	33,310,700	32,070,000	33,871,700	6,209,700	6,737,350	7,399,800	7,629,000	8,258,400	7,830,500	8,301,400

Diversion of Sudbury-River Water, 1882-90.

Month.	1882.	1883.		1884.		1885.	1886.	1887.	1888.	1889.		1890.
	To Chestnut-Hill Res'r.	To Lake Cochituate.	To Chestnut-Hill Res'r.	To Lake Cochituate.	To Chestnut-Hill Res'r.	To Chestnut-Hill Res'r.	To Chestnut-Hill Res'r.	To Chestnut-Hill Res'r.	To Chestnut-Hill Res'r.	To Lake Cochituate.	To Chestnut-Hill Res'r.	To Chestnut-Hill Res'r.
	Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
January . . .	595,000,000	. . . . .	733,400,000	. . . . .	697,000,000	473,900,000	502,200,000	602,200,000	895,400,000	. . . . .	484,500,000	518,600,000
February . . .	975,700,000	. . . . .	597,800,000	1,094,300,000	265,400,000	560,400,000	380,800,000	472,000,000	906,700,000	. . . . .	564,600,000	475,000,000
March	1,002,300,000	17,200,000	634,700,000	. . . . .	312,500,000	495,900,000	467,400,000	456,700,000	691,400,000	. . . . .	584,500,000	498,600,000
April	781,200,000	967,900,000	535,700,000	. . . . .	228,800,000	350,400,000	307,000,000	385,400,000	468,800,000	. . . . .	490,500,000	417,000,000
May	502,300,000	260,000,000	613,800,000	. . . . .	268,400,000	308,500,000	344,700,000	444,200,000	566,300,000	233,400,000	615,700,000	536,300,000
June	491,800,000	. . . . .	631,600,000	168,400,000	414,500,000	768,000,000	427,100,000	463,600,000	489,000,000	. . . . .	567,600,000	513,100,000
July	646,900,000	. . . . .	754,300,000	152,000,000	430,100,000	434,600,000	534,500,000	387,500,000	528,900,000	. . . . .	534,000,000	664,100,000
August	655,800,000	. . . . .	640,900,000	1,600,000	406,100,000	401,100,000	463,100,000	352,800,000	626,600,000	. . . . .	443,700,000	625,500,000
September . .	308,900,000	. . . . .	467,100,000	. . . . .	442,200,000	386,100,000	414,700,000	577,300,000	581,600,000	. . . . .	475,500,000	606,400,000
October	570,300,000	. . . . .	483,300,000	. . . . .	432,900,000	368,300,000	474,100,000	672,300,000	435,900,000	. . . . .	414,100,000	539,900,000
November . .	572,300,000	. . . . .	580,800,000	. . . . .	363,900,000	297,600,000	381,800,000	607,100,000	410,900,000	. . . . .	454,600,000	526,000,000
December . . .	632,200,000	. . . . .	536,800,000	. . . . .	432,500,000	379,900,000	570,200,000	703,000,000	605,200,000	. . . . .	501,200,000	675,500,000
Totals . . .	7,735,200,000	1,245,100,000	7,209,900,000	1,416,300,000	4,694,300,000	5,224,700,000	5,267,600,000	6,124,100,000	7,224,700,000	233,400,000	6,130,500,000	6,596,000,000
Tot'l div'rsion from Sudbury river	7,735,200,000	8,455,000,000		6,110,600,000		5,224,700,000	5,267,600,000	6,124,100,000	7,224,700,000	6,363,900,000		6,596,000,000
Average daily diversion for whole year	21,192,300	23,164,400		16,695,600		14,314,200	14,431,800	16,778,400	19,739,600	17,435,300		18,071,200

Statement showing Amount of Water diverted from Sudbury River to Lake Cochituate and Chestnut-Hill Reservoir; Amount wasted. Amount of flow in River; Percentage of Rainfall collected, etc.. 1875 to 1890.

(Water-shed from 1875 to 1878, inclusive, = 77.764 sq. miles; in 1879 and 1880 = 78.238 sq. miles; and from 1881 to 1890, inclusive, = 75.2 sq. miles.)

YEAR.	Amount of Water diverted to Lake Cochituate and Chestnut Hill Reservior.	Amount of Water used by Framingham Water Co.	Amount of Water wasted from River.	STORAGE.		Total amount of flow in River.	Daily average amount of flow in River.	Rainfall.	Rainfall collected.	Percentage of Rainfall collected.
				Gain.	Loss.					
	Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Inches.*	*Inches.*	*Per cent.*
1875	2,555,800,000	. . . . .	24,971,600,000	66,300,000	. . . . .	27,593,700,000	75,599,200	45.490	20.418	44.88
1876	2,528,300,000	. . . . .	29,942,300,000	. . . . .	160,700,000	32,309,900,000	88,278,400	49.563	23.908	48.24
1877	1,894,350,000	. . . . .	32,438,300,000	112,100,000	. . . . .	34,444,750,000	94,369,200	44.018	25.487	57.90
1878	3,422,100,000	. . . . .	37,125,200,000	654,700,000	. . . . .	41,202,000,000	112,882,200	57.931	30.487	52.63
1879	3,749,200,000	. . . . .	20,817,500,000	962,200,000	. . . . .	25,528,900,000	69,942,200	41.419	18.775	45.33
1880	6,230,200,000	. . . . .	11,290,000,000	. . . . .	958,600,000	16,561,600,000	42,250,300	38.177	12.182	31.91
1881	8,845,300,000	. . . . .	17,279,000,000	751,700,000	. . . . .	26,876,000,000	73,633,900	44.169	20.565	46.56
1882	7,735,200,000	. . . . .	16,273,900,000	. . . . .	352,600,000	23,656,500,000	64,812,300	39,394	18.102	45.95
1883	8,455,000,000	. . . . .	7,251,900,000	. . . . .	1,086,400,000	14,620,500,000	40,056,200	32,780	11.188	34.13
1884	6,110,600,000	. . . . .	23,228,900,000	1,744,600,000	. . . . .	31,084,100,000	84,929,200	47.135	23.784	50.46
1885	5,224,700,000	61,800,000	19,878,800,000	. . . . .	446,900,000	24,718,400,000	67,721,600	43.545	18.916	43.44
1886	5,266,600,000	76,600,000	23,023,000,000	1,464,500,000	. . . . .	29,831,700,000	81,730,700	46.065	22.825	49.55
1887	6,124,100,000	87,500,000	25,334,500,000	117,400,000	. . . . .	31,663,500,000	86,749,300	42.705	24.227	56.73
1888	7,224,700,000	61,500,000	39,040,500,000	390,600,000	. . . . .	46,717,300,000	127,642,900	57.465	35.749	62.21
1889	6,363,900,000	59,500,000	31,550,400,000	. . . . .	2,800,000	37,971,000,000	104,030,100	49.95	29.056	58.17
1890	6,596,000,000	74,500,000	28,667,100,000	. . . . .	57,400,000	35,280,200,000	96,658,100	53.00	26.998	50.94
Averages .	5,520,440,600	70,233,300	24,257,056,300	. . . . .	. . . . .	30,003,753,100	81,955,400	45.80	22.667	48.69

Statement showing Amount of Water drawn from Lake Cochituate; Amount wasted; Amount of Rainfall collected in Lake; Amount received into Lake from Sudbury River; Percentage of Rainfall collected, etc., 1852 to 1890; Water-shed of Lake, 12,077 Acres.

YEAR.	Amount of Water drawn from Lake.	Amount of Water wasted from Lake.	Amount received into Lake from Sudbury River.	STORAGE.		Total amount of Rainfall collected in Lake.	Daily average amount of Rainfall collected in Lake.	Rainfall.	Rainfall collected.	Percentage of Rainfall collected.
				Gain.	Loss.					
	Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Inches.*	*Inches.*	*Per cent.*
1852[1]	2,974,042,800	4,020,566,900	. . . . .	. . . . .	261,360,000	6,733,249,700	18,396,900	47.93	20.61	43.
1853	3,117,939,500	3,166,417,500	. . . . .	239,580,000	. . . . .	6,523,937,000	17,873,800	55.73	19.51	35.
1854	3,614,230,000	4,187,733,000	. . . . .	. . . . .	217,800,000	7,584,163,000	20,778,500	43.15	22.87	53.
1855	3,776,399,500	No account kept	. . . . .	. . . . .	326,700,000	. . . . .	. . . . .	34.96	. . . .	. . . . .
1856	4,409,787,600	"	. . . . .	598,950,000	. . . . .	. . . . .	. . . . .	40.80	. . . .	. . . . .
1857	4,644,990,000	10,625,900,000	. . . . .	32,670,000	. . . . .	15,303,560,000	41,927,600	63.10	46.69	74.
1858	4,689,155,000	1,934,500,000	. . . . .	. . . . .	141,570,000	6,482,085,000	17,759,000	48.66	19.46	40.
1859[2]	4,808,875,000	7,569,000,000	. . . . .	283,140,000	. . . . .	12,661,015,000	34,687,700	49.02	38.24	78.
1860	6,309,108,000	None.	. . . . .	174,240,000	. . . . .	6,483,348,000	17,714,100	55.44	19.40	35.
1861	6,639,095,900	3,377,559,000	. . . . .	. . . . .	1,459,260,000	8,557,394,900	23,444,900	45.44	25.45	56.
1862	6,059,000,000	33,200,000	. . . . .	1,306,800,000	. . . . .	7,399,900,000	20,271,200	49.69	22.36	45.
1863	5,927,052,500	2,165,696,500	. . . . .	762,300,000	. . . . .	8,855,049,000	24,260,400	69.30	26.88	39.
1864	6,105,306,700	1,368,746,000	. . . . .	. . . . .	1,848,577,000	5,625,475,700	15,370,200	42.60	18.35	43.
1865	4,621,630,000	1,688,120,700	. . . . .	743,242,500	. . . . .	7,052,993,200	19,323,300	49.46	20.50	41.
1866	4,463,585,000	None.	. . . . .	743,242,500	. . . . .	5,206,827,500	14,265,300	62.32	16.01	26.
1867	4,951,225,000	2,482,041,000	. . . . .	. . . . .	698,811,000	6,734,455,000	18,450,600	56.25	21.80	39.
1868	5,405,515,000	2,507,684,000	. . . . .	346,371,000	. . . . .	8,259,570,000	22,567,200	49.71	24.98	50.

1869	5,503,751,000	1,635,570,000	. . . . .	480,882,000	. . . . .	7,620,203,000	20,877,300	64.34	21.99	34.
1870	5,477,810,000	4,818,971,000	. . . . .	. . . . .	1,736,085,000	8,560,696,000	23,453,900	55.89	26.08	47.
1871	5,223,500,000	None.	. . . . .	. . . . .	250,933,000	4,972,567,000	13,623,500	45.39	15.16	33.
1872	5,775,151,200	None.	1,676,666,400	1,543,995,500	. . . . .	5,642,480,300	15,416,600	48.47	17.22	35.
1873	6,511,826,900	2,917,977,000	. . . . .	. . . . .	515,132,000	8,914,671,900	24,423,800	45.43	27.13	60.
1874	6,623,972,900	1,145,851,700	. . . . .	. . . . .	1,367,715,000	6,402,109,600	17,540,000	35.93	19.52	54.
1875	7,092,955,500	None.	2,555,800,000	1,222,885,000	. . . . .	5,760,040,500	15,780,900	45.49	17.57	39.
1876	7,277,175,200	1,619,243,800	2,528,300,000	43,438,000	. . . . .	6,411,557,000	17,517,900	48.49	19.54	40.
1877	7,626,889,200	1,484,978,600	1,894,350,000	378,727,000	. . . . .	7,596,244,800	20,811,600	43.80	23.17	53.
1878	7,743,904,700	3,341,875,000	2,668,300,000	219,789,000	. . . . .	8,637,268,700	23,663,700	53.58	26.34	49.
1879	6,051,838,900	1,523,361,400	411,300,000	. . . . .	1,322,697,300	5,841,203,000	16,003,300	38.01	17.81	47.
1880	4,284,147,100	65,577,700	826,700,000	. . . . .	146,265,000	3,376,759,800	9,226,100	35.83	10.36	29.
1881	2,846,459,700	2,231,016,700	187,600,000	468,089,400	. . . . .	5,357,965,800	14,679,400	41.09	16.34	40.
1882	3,935,490,600	1,358,543,700	. . . . .	. . . . .	357,334,700	4,936,699,600	13,525,200	40.29	15.05	37.
1883	4,731,227,700	162,361,800	1,245,100,000	. . . . .	334,400,000	3,314,089,500	9,079,700	31.20	10.11	32.
1884	4,533,156,450	1,842,837,100	1,416,300,000	1,340,436,700	. . . . .	6,300,130,250	17,213,450	45.57	19.21	42.
1885	4,091,674,900	1,006,622,800	. . . . .	8,594,800	. . . . .	5,106,892,500	13,991,500	43.66	15.57	36.
1886	4,432,536,100	3,116,283,200	. . . . .	. . . . .	360,662,000	7,188,157,300	19,693,600	46 97	21.92	47.
1887	4,802,120,700	3,658,652,900	. . . . .	. . . . .	763,205,000	7,697,568,600	21,089,200	41.58	23.47	56.
1888	4,968,503,100	4,229,200,000	. . . . .	959,309,000	. . . . .	10,157,012,100	27,751,400	56.93	30.97	54.
1889	5,570,423,600	3,373,929,000	233,400,000	454,766,800	. . . . .	9,165,719,400	25,111,600	50.23	27.95	56.
1890	5,722,170,800	2,380,441,200	. . . . .	. . . . .	64,166,300	8,038,445,700	22,023,100	51.23	24.51	48.
Averages	5,213,939,100	2,352,444,800	. . . . .	. . . . .	. . . . .	7,200,163,600	19,718,600	48.02	21.89	45.

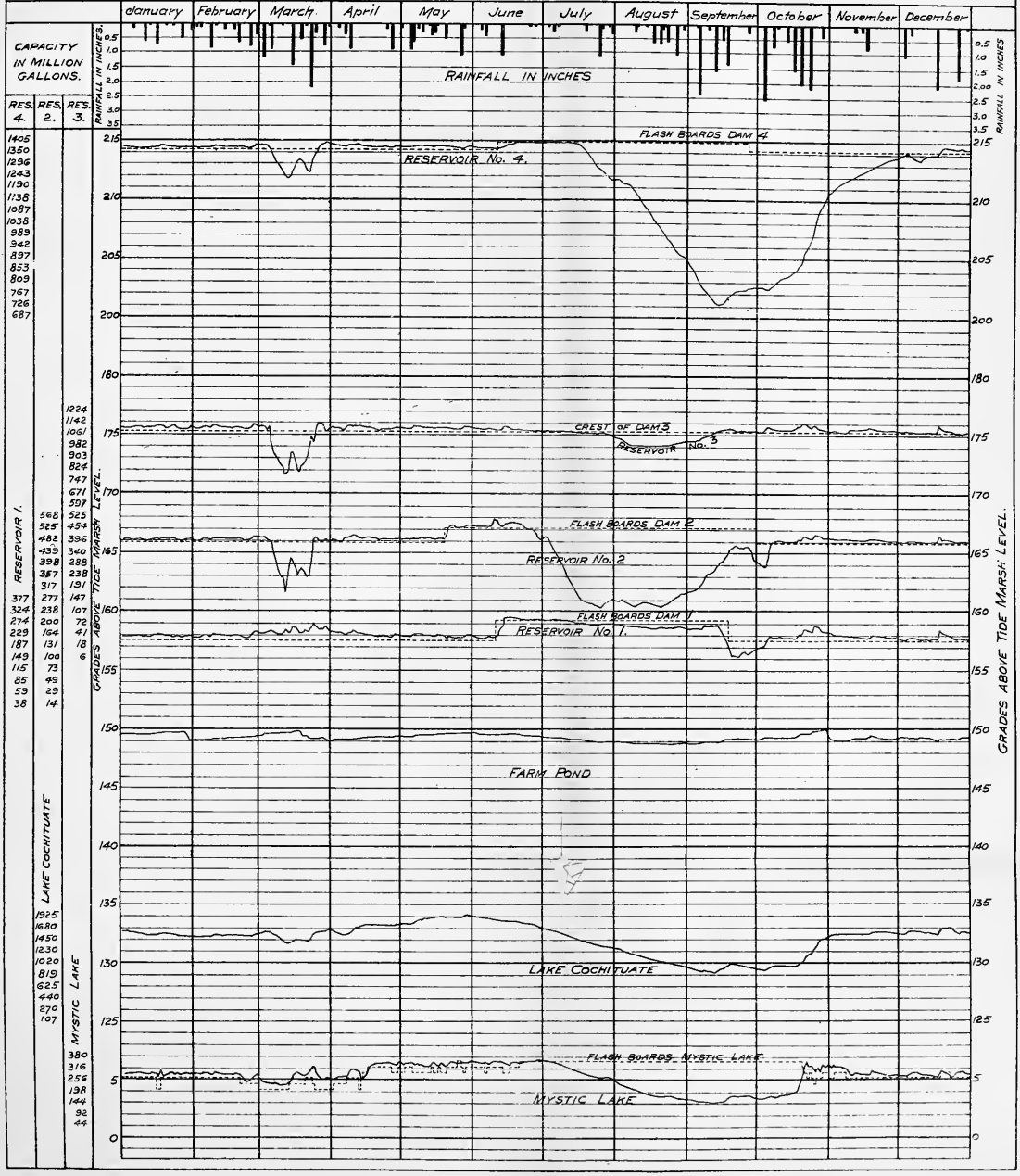
[1] Observation of rainfall at Lake Cochituate commenced 1852, and these observations are assumed as correct for the whole district.
[2] Lake raised two feet.

Table showing the Average Monthly and Yearly Heights above Tide-marsh Level of the Water in the Lakes and Reservoirs of the Boston Water Works.

MONTHS.	Reservoir No. 1. Flash boards. 159.29.		Reservoir No. 2. Flash boards. 167.12.		Reservoir No. 3. Stone crest. 175.24.		Reservoir No. 4. Flash boards. 215.21.		Farm Pond. High water. 149.25.		Lake Cochituate. High water. 134.36.		Chestnut-Hill Reservoir. High water. 124.00.		Brookline Reservoir. High water. 124.00.		Parker-Hill Reservoir. High water. 219.00.		Mystic Lake. High water. 7.00.		Mystic Reservoir. High water. 147.00.		Fisher-Hill Reservoir. High water. 241.00.	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
January .	158.24	157.95	166.35	166.12	175.62	175.55	214.69	214.53	149.43	149.64	132.31	132.49	123.66	123.45	123.46	123.02	Not in service.		. . .		5.41	5.53	146.72	146.75	239.71	239.22
February .	157.92	157.99	166.12	166.15	175.43	175.57	214.54	214.54	149.72	149.27	132.51	132.38	123.61	123.42	123.37	123.24			218.48		5.53	5.44	146.84	146.77	239.64	239.47
March . .	157.94	158.39	166.13	164.63	175.52	173.92	214.51	213.53	149.37	149.54	132.44	132.30	123.84	123.43	123.64	123.27			218.75		6.03	5.15	146.75	146.81	239.71	239.01
April . . .	157.97	158.09	166.55	166.18	175.58	175.56	214.52	214.59	149.35	149.29	133.19	133.03	123.85	123.47	123.67	123.31			218.63		6.31	5.93	146.69	146.61	239.76	239.04
May . . .	158.24	157.96	166.52	166.57	175.51	175.56	214.71	214.54	149.37	149.60	134.09	133.82	123.82	123.79	123.40	123.45			218.49		6.59	6.44	146.64	146.55	239.73	239.00
June . . .	158.88	158.80	166.01	167.18	175.47	175.45	214.76	214.71	149.45	149.59	133.71	133.56	123.75	123.79	123.56	123.61			218.36		6.58	6.55	146.56	146.43	239.44	239.48
July . . .	159.39	159.09	163.52	162.37	175.43	175.17	215.01	213.90	149.36	149.15	132.85	131.99	123.91	123.81	123.72	123.58			218.65		6.63	5.73	146.71	146.69	240.14	239.89
August . .	158.65	158.67	167.27	160.86	175.60	174.21	215.01	208.51	149.55	148.85	132.73	130.34	123.03	123.82	123.44	123.59			218.90		6.43	3.82	146.70	146.82	239.90	239.67
September,	157.81	157.63	167.04	164.02	175.34	175.14	215.09	202.33	149.41	149.07	130.75	129.55	123.56	123.77	123.35	123.54			218.76		6.32	3.31	146.59	146.70	239.65	239.59
October . .	158.00	157.99	164.50	165.85	175.41	175.62	214.77	205.15	149.50	149.54	131.23	130.38	123.54	123.86	123.35	123.53			218.96		6.31	4.68	146.60	146.58	240.41	240.05
November .	158.01	157.92	162.70	166.13	175.54	175.52	214.57	212.53	149.36	149.19	131.77	132.47	123.50	123.88	123.32	123.68			218.89		4.01	5.65	146.79	146.61	240.01	240.39
December .	158.17	157.84	166.27	166.09	175.70	175.47	214.66	214.13	149.46	149.26	132.99	132.64	123.58	123.53	123.37	123.03			218.74		5.66	5.48	146.69	146.70	240.31	239.82
Yearly averages	158.27	158.19	165.75	165.18	175.51	175.23	214.74	211.92	149.44	149.33	132.55	132.08	123.69	123.67	123.47	123.40			218.69		5.98	5.31	146.69	146.67	239.87	239.55

Boston Water Works.

Diagram showing the heights of Sudbury River Reservoirs. Farm Pond, and Conhituate and Mystic Lakes. and the Rainfall on the Sudbury River Water Shed during the year 1890.



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Statement showing Amount of Water drawn from Mystic Lake; Amount wasted; Amount of Rainfall collected in Lake; Percentage of Rainfall collected, etc., 1876 to 1890; Water-shed of Lake, 17,200 Acres.

YEAR.	Amount of Water drawn from Lake.	Amount of Water wasted from Lake.	STORAGE.		Total amount of Rainfall collected in Lake.	Daily average amount of Rainfall collected in Lake.	Rainfall.	Rainfall collected.	Percentage of Rainfall collected.
			Gain.	Loss.					
	Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Inches.*	*Inches.*	*Per cent.*
1876	3,230,101,300	6,369,774,700	. . . . .	32,583,000	9,567,293,000	26,146,100	47.00	20.49	43.6
1877	3,069,554,800	7,250,223,500	. . . . .	16,291,400	10,303,486,909	28,228,700	43.095	22.06	51.2
1878	3,367,490,400	8,718,547,600	. . . . .	26,000,000	12,060,038,000	33,041,200	54.065	25.82	47.8
1879	3,490,848,200	4,625,691,800	. . . . .	203,000,000	7,913,540,000	21,680,900	35.30	16.94	48.0
1880	3,692,195,700	2,158,761,200	. . . . .	113,500,000	5,703,756,900	15,584,000	34.42	12.21	35.5
1881	2,815,579,900	5,534,300,000	371,200,000	. . . . .	8,721,079,900	23,893,400	41.91	18.67	44.5
1882	2,570,896,700	4,444,668,000	15,000,000	. . . . .	7,030,564,700	19,261,800	39.165	15.65	38.4
1883	2,664,514,200	2,034,702,600	. . . . .	347,579,000	4,351,637,800	11,922,300	31.22	9.32	29.84
1884	2,469,761,000	6,574,003,800	380,600,000	. . . . .	9,424,364,800	25,749,600	44.39	20.18	45.46
1885	2,639,278,800	5,588,860,500	. . . . .	33,200,000	8,194,939,300	22,451,900	44.50	17.55	39.43
1886	2,862,947,500	7,743,258,900	. . . . .	28,400,000	10,577,806,400	28,980,300	45.56	22.65	49.71
1887	2,954,257,500	7,414,213,000	. . . . .	11,000,000	10,357,470,500	28,376,600	46.42	22.17	47.77
1888	3,205,121,100	11,334,593,100	. . . . .	6,000,000	14,533,714,200	39,709,600	56.745	31.12	54.84
1889	3,007,539,800	8,879,787,500	12,000,000	. . . . .	11,899,327,300	32,600,900	50.395	25.48	50.56
1890	3,212,284,500	8,953,727,900	. . . . .	3,000,000	12,163,012,400	33,323,300	49.37	26.04	52.75
Average	3,016,824,800	6,508,340,900	. . . . .	. . . . .	9,520,135,500	26,063,000	44.237	20.38	45.29

Statement of Operations at the Chestnut-Hill Pumping-station for 1890.

1890.	Engine No. 1.			Engine No. 2.			Total amount pumped.	Daily average amount pumped.	Total amount of coal consumed.	Daily average amount of coal consumed.	Total ashes and clinkers.	Per cent. ashes and clinkers.	Quantity pumped per lb. of coal. No correction for heating and lighting.	Quantity pumped per lb. of coal. Corrected for heating and lighting.	Average lift in feet.	Duty in ft. lbs. per 100 lbs. of coal.			Water evaporated in boiler per lb. of coal.	
	Total pumping time.		Amount pumped.	Total pumping time.		Amount pumped.										Without correction for heating and lighting	Corrected for heating buildings.	Corrected for heating and lighting.	Actual	From and at 21°°.
Month.	*Hrs.*	*Min.*	*Gallons.*	*Hrs.*	*Min.*	*Gallons.*	*Gallons.*	*Gallons.*	*Lbs.*	*Lbs.*	*Lbs.*	*Per Cent.*	*Gallons.*	*Gallons.*	*Feet.*	*Ft.-Lbs.*	*Ft.-Lbs.*	*Ft.-Lbs.*	*Lbs.*	*Lbs.*
January . .	363	00	128,481,350	149	00	51,496,675	179,978,025	5,805,700	209,562	6,760	19,850	9.5	858.8	938.5	123.58	88,515,900	94,003,900	96,730,000	10.16	11.97
February .	188	00	63,503,175	281	50	95,696,525	159,199,700	5,685,700	189,142	6,755	18,631	9.9	841.7	948.4	123.53	86,714,700	92,177,700	97,708,400	10.18	11.98
March . .	526	00	181,278,975	. .	.	. . . . .	181,278,975	5,847,700	210,207	6,781	20,687	9.8	862.4	960.8	123.21	88,616,000	93,755,700	98,724,800	Meters	disabled.
April . . .	. .	.	. . . . .	524	00	178,910,125	178,910,125	5,963,700	211,208	7,040	18,497	8.8	847.1	923.2	123.30	87,107,100	90,852,700	94,941,100		
May . . .	. .	.	. . . . .	555	30	194,809,150	194,809,150	6,284,200	227,000	7,323	18,018	7.9	858.2	905.1	123.34	88,278,200	89,514,000	93,094,600		
June . . .	574	00	202,176,775	. .	.	. . . . .	202,176,775	6,739,200	220,550	7,352	16,645	7.5	916.7	952.5	122.71	93,814,600	No steam used for heating buildings.	97,473,400	10.06	11.63
July . . .	672	30	231,626,625	. .	.	. . . . .	231,626,625	7,471,800	244,309	7,881	17,747	7.3	948.1	982.2	122.33	96,727,100		100,209,200	10.16	11.68
August . .	77	10	27,022,000	535	20	186,056,500	213,078,500	6,873,500	232,565	7,502	16,999	7.3	916.2	955.6	123.34	94,246,500		98,299,100	10.01	11.51
September,	. . .	.	. . . . .	601	40	210,127,025	210,127,025	7,004,200	231,971	7,732	16,648	7.2	905.8	954.0	122.49	92,537,000	92,999,700	97,463,600	9.92	11.44
October . .	464	00	162,466,825	138	05	48,350,500	210,817,325	6,800,600	236,604	7,632	18,331	7.7	891.0	971.9	123.12	91,491,100	94,510,300	99,802,900	10.24	11.91
November .	. .		. . . . .	559	00	195,282,625	195,282,625	6,509,400	224,202	7,473	17,683	7.9	871.0	961.1	123.52	89,727,900	93,406,700	99,011,100	10.23	11.98
December .	601	25	212,346,900	. .		. . . . .	212,346,900	6,849,900	239,961	7,741	19,662	8.2	884.9	1000.8	123.41	91,079,700	97,182,000	103,012,900	10.08	11.87
Totals and averages .	3466	05	1,208,902,*25	3344	25	1,160,729,125	2,369,631,750	6,492,100	2,677,281	7,335	219,398	8.2	885.1	954.8	123.16	90,912,300	93,657,900	98,069,200	10.12	11.77

Statement of Operations at the Mystic Pumping-Station for 1890.

1890.	Engine No. 1.			Engine No. 2.			Engine No. 3.			Total amount pumped.	Daily average amount pumped.	Daily average amount of coal consumed.	Daily average amount of ashes and clinkers.	Per cent. ashes and clinkers.	Quantity pumped per pound of coal.	Average lift in feet.	Duty in foot-pounds per 100 pounds of total coal.
	Total pumping time.		Amount pumped.	Total pumping time.		Amount pumped.	Total pumping time.		Amount pumped.								
Month.	*Hrs.*	*Min.*	*Gallons.*	*Hrs.*	*Min.*	*Gallons.*	*Hrs.*	*Min.*	*Gallons.*	*Gallons.*	*Gallons.*	*Lbs.*	*Lbs.*	*Per ct.*	*Gal.*	*Feet.*	*Ft.-lbs.*
January	...	...	.....	130	15	24,175,100	735	45	230,374,400	254,549,500	8,211,300	17,548	1,595	9.1	467.9	146.61	57,214,100
February	...	...	.....	101	00	19,252,500	672	00	212,761,600	232,014,100	8,286,200	17,768	1,811	10.2	466.4	146.55	56,999,800
March	...	...	.....	57	00	10,736,100	743	15	238,848,000	249,584,100	8,051,100	16,855	1,585	9.4	477.7	146.43	58,334,700
April	...	...	.....	...	...	.....	720	00	224,563,200	224,563,200	7,485,400	15,900	1,362	8.6	470.8	146.41	57,485,300
May	...	...	.....	1	00	181,200	743	00	231,116,800	231,298,000	7,461,200	15,803	1,426	9.0	472.0	146.59	57,709,600
June	...	...	.....	100	30	19,418,600	706	45	230,758,400	250,177,000	8,339,200	17,600	1,618	9.2	473.8	146.88	58,042,000
July	...	...	.....	302	15	54,269,400	742	30	241,536,000	295,805,400	9,542,100	20,177	1,940	9.6	472.9	147.82	58,301,300
August	67	00	11,340,100	236	45	43,412,500	697	30	222,566,400	277,319,000	8,945,800	19,000	1,994	10.5	470.8	148.28	58,225,500
September	261	45	46,432,500	246	30	49,090,100	486	15	156,723,200	252,245,800	8,408,200	19,100	2,004	10.5	440.2	148.29	54,443,700
October	10	15	1,902,600	...	...	.....	734	00	239,795,200	241,697,800	7,796,700	16,419	1,730	10.5	474.8	147.54	58,429,300
November	8	45	1,706,300	...	...	.....	714	00	226,739,200	228,445,500	7,614,800	16,467	1,718	10.4	462.4	146.57	56,528,400
December	82	15	16,262,700	251	00	50,132,000	660	45	226,022,400	292,417,100	9,432,800	21,177	2,076	9.8	445.4	147.34	54,732,700
Totals and Averages	430	00	77,644,200	1,426	15	270,667,500	8,355	45	2,681,804,800	3,030,116,500	8,301,700	17,825	1,738	9.8	465.7	147.11	57,141,800

Rainfall in Inches and Hundredths on the Sudbury River Water-shed for the Year 1890.

1890.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. . .	. . .	0.18	. . .	0.17	. . .	. . .	. . .	. . .	. . .	. . .	. . .
2	. . .	0.13	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
3	. . .	. . .	1.075	. . .	. . .	. . .	0.115	. . .	. . .	. . .	. . .	1.055
4	. . .	0.155	. . .	0.17	. . .	0.275	0.025	. . .	. . .	2.50	. . .	. . .
5	. . .	. . .	0.05	. . .	0.88	0.29	0.135	. . .	0.105	. . .	. . .	. . .
6	0.19	. . .	0.885	. . .	0.635	0.22	. . .	0.01	2.125	. . .	. . .	0.285
7	. . .	. . .	. . .	0.415	. . .	. . .	0.035	. . .	. . .	. . .	. . .	. . .
8	. . .	0.88	. . .	. . .	0.205	. . .	. . .	. . .	. . .	0.76	. . .	. . .
9	. . .	. . .	. . .	0.91	. . .	. . .	. . .	0.295	. . .	. . .	. . .	. . .
10	. . .	0.07	. . .	. . .	0.365	. . .	. . .	0.075	0.185	0.055	. . .	. . .
11	0.63	. . .	0.10	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
12	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.215	. . .
13	0.04	. . .	. . .	. . .	0.09	1.035	. . .	. . .	1.52	. . .	. . .	. . .
14	. . .	0.245	. . .	. . .	0.46	. . .	. . .	0.065	. . .	0.575	. . .	. . .
15	. . .	. . .	1.36	. . .	0.43	. . .	. . .	. . .	. . .	. . .	0.21	. . .
16	0.74	. . .	. . .	. . .	0.05	. . .	. . .	. . .	0.55	. . .	. . .	. . .
17	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.655	. . .	1.595	0.775	2.15
18	. . .	0.235	. . .	. . .	. . .	. . .	. . .	. . .	1.225	. . .	. . .	. . .
19	. . .	. . .	0.56	. . .	. . .	. . .	0.42	. . .	. . .	. . .	. . .	. . .
20	0.095	0.66	. . .	. . .	0.65	. . .	0.02	0.735	. . .	2.18	. . .	. . .
21	. . .	. . .	0.055	. . .	. . .	. . .	. . .	0.075	. . .	. . .	. . .	. . .
22	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
23	0.08	. . .	2.135	. . .	. . .	. . .	. . .	0.675	. . .	. . .	. . .	0.01
24	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	2.45	. . .	. . .
25	. . .	0.705	0.365	0.215	. . .	0.05	0.555	. . .	. . .	. . .	. . .	. . .
26	. . .	. . .	. . .	. . .	. . .	. . .	0.84	. . .	0.29	. . .	. . .	1.76
27	0.515	. . .	. . .	0.935	1.10	0.16	. . .	1.17	. . .	. . .	. . .	. . .
28	. . .	0.425	. . .	. . .	0.175	. . .	. . .	. . .	. . .	. . .	. . .	. . .
29	. . .	. . .	0.82	. . .	. . .	. . .	0.085	. . .	. . .	0.395	. . .	. . .
30	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.11	. . .	. . .	. . .	0.05
31	0.24	. . .	0.15	. . .	. . .	. . .	0.23	. . .	. . .	. . .	. . .	. . .
Totals . .	2.53	3.505	7.735	2.645	5.21	2.03	2.46	3.865	6.00	10.51	1.20	5.31

Total rainfall during the year, 53.00 inches.
Being an average of two gauges, located at Framingham and Ashland.

Rainfall in Inches and Hundredths at Lake Cochituate, for the Year 1890.

1890.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. . .	. . .	. . .	. . .	0.17	. . .	. . .	. . .	. . .	. . .	. . .	. . .
2	. . .	0.11	. .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
3	. . .	. . .	1.20	. . .	. . .	. . .	0.08	. . .	. . .	. . .	. . .	1.16
4	. . .	0.15	. . .	0.16	. . .	. . .	0.07	. . .	. . .	2.39	. . .	. . .
5	. . .	. . .	. . .	. . .	1.24	. . .	. . .	. . .	0.09	. . .	. . .	. . .
6	0.18	. . .	0.81	. . .	0.58	0.77	. . .	0.01	1.64	. . .	. . .	0.27
7	. . .	. . .	. . .	0.42	. . .	. . .	0.04	. . .	. . .	. . .	. . .	. . .
8	. . .	0.77	. . .	. . .	0.22	. . .	. . .	. . .	. . .	0.70	. . .	. . .
9	. . .	. . .	. . .	0.87	. . .	. . .	. . .	0.39	0.19	. . .	. . .	. . .
10	. .	0.05	. . .	. . .	0.31	. . .	. . .	0.02	. . .	0.11	. . .	. . .
11	0.49	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
12	. . .	. . .	0.11	. . .	. . .	. . .	. . .	. . .	1.00	. . .	0.23	. . .
13	0.04	. . .	. . .	. . .	0.06	0.98	. . .	. . .	. . .	. . .	. . .	. . .
14	. . .	0.22	. . .	. . .	. . .	. . .	. . .	0.12	. . .	0.50	. . .	. . .
15	. . .	. . .	1.30	. . .	0.89	. . .	. . .	. . .	. . .	. . .	0.22	. . .
16	0.74	. . .	. . .	. . .	0.02	. . .	. . .	. . .	. . .	. . .	. . .	. . .
17	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.57	. . .	1.53	0.79	1.99
18	. . .	0.24	. . .	. . .	. . .	. . .	. . .	. . .	3.24	. . .	. . .	0.01
19	. . .	. . .	0.59	. . .	. . .	. . .	0.18	. . .	. . .	. . .	. . .	. . .
20	0.06	0.62	. . .	. . .	0.63	. . .	. . .	0.65	. . .	2.23	. . .	. . .
21	. . .	. . .	0.05	. . .	. . .	. . .	. . .	0.01	. . .	. . .	. . .	. . .
22	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
23	0.07	. . .	2.08	. . .	. . .	. . .	. . .	0.42	. . .	. . .	. . .	0.02
24	. . .	. . .	. . .	. . .	. . .	0.03	. . .	. . .	. . .	2.23	. . .	. . .
25	. . .	0.70	0.29	0.16	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
26	. . .	. . .	. . .	. . .	. . .	. . .	1.22	. . .	0.31	. . .	. . .	1.81
27	0.52	. . .	. . .	0.90	1.07	. . .	. . .	1.03	. . .	. . .	. . .	. . .
28	. . .	0.35	. . .	. . .	0.12	. . .	. . .	. . .	. . .	. . .	. . .	. . .
29	. . .	. . .	0.75	. . .	. . .	. . .	0.08	. . .	. . .	0.42	. . .	. . .
30	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.12	. . .	. . .	. . .	. . .
31	0.24	. . .	0.17	. . .	. . .	. . .	0.64	. . .	. . .	. . .	. . .	. . .
Totals	2.34	3.21	7.35	2.51	5.31	1.78	2.31	3.34	6.47	10.11	1.24	5.26

Total Rainfall during the year, 51.23 inches.

Rainfall in Inches and Hundredths on the Mystic Lake Water-shed for the Year 1890.

1890.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. . .	. . .	0.20	. . .	0.20	. . .	. . .	0.025	. . .	. . .	. . .	. . .
2	. . .	0.155	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.005	. . .
3	. . .	. . .	0.80	. . .	. . .	. . .	0.02	. . .	. . .	. . .	. . .	1.135
4	. . .	0.12	. . .	0.16	. . .	0.54	0.01	. . .	. . .	1.21	. . .	. . .
5	0.35	. . .	. . .	. . .	1.18	0.43	. . .	. . .	0.01	. . .	. . .	. . .
6	0.02	. . .	0.78	. . .	0.92	0.28	. . .	0.03	0.805	. . .	. . .	0.285
7	. . .	. . .	. . .	0.44	. . .	. . .	0.01	. . .	. . .	0.17	. . .	. . .
8	. . .	0.71	. . .	. . .	0.395	. . .	. . .	. . .	. . .	0.52	. . .	. . .
9	. . .	. . .	. . .	0.81	. . .	. . .	. . .	0.37	. . .	. . .	. . .	. . .
10	0.11	0.05	. . .	. . .	0.37	. . .	. . .	0.21	0.225	0.075	0.02	. . .
11	0.445	. . .	0.10	. . .	. .	0.62	. . .	0.005	0.30	. . .	. . .	. . .
12	. . .	. . .	. . .	. . .	. . .	0.525	. .	. . .	0.53	. . .	0.23	. . .
13	0.035	. . .	0.01	. . .	. . .	0.89	. . .	. . .	0.12	. . .	. . .	. . .
14	. . .	0.255	. . .	0.005	0.375	. . .	. . .	. . .	0.075	0.315	. . .	. . .
15	0.405	. . .	1.325	. . .	0.44	. . .	. . .	. . .	0.585	. . .	0.235	. . .
16	0.215	. .	. . .	. . .	0.11	. . .	. . .	. .	0.53	. . .	. . .	. . .
17	. . .	. . .	. . .	. . .	. . .	. . .	0.01	0.435	0.19	1.87	0.895	. . .
18	. . .	0.325	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1.88
19	. . .	. . .	0.415	. . .	. . .	. . .	0.30	. . .	. . .	. . .	. . .	. . .
20	0.12	0.68	. . .	. . .	0.715	. . .	0.025	0.86	. . .	2.405	. . .	. . .
21	. . .	. . .	0.05	. . .	. . .	. . .	. . .	0.04	. . .	. . .	. . .	0.005
22	0.01	. . .	. . .	. . .	. . .	. . .	. . .	0.135	. .	. . .	. . .	. . .
23	0.11	. . .	1.78	. . .	. . .	. . .	. . .	0.195	. . .	. . .	. . .	. . .
24	. . .	0.04	. . .	. . .	. . .	. . .	0.36	0.005	. . .	1.77	. . .	. . .
25	. . .	0.65	0.28	0.135	. . .	0.05	0.305	. . .	. . .	. . .	. . .	. . .
26	. . .	. . .	. . .	. . .	. . .	. . .	0.93	. . .	0.33	. . .	. . .	1.365
27	0.55	0.04	. . .	0.855	1.48	0.045	. . .	0.975	. . .	. . .	. . .	. . .
28	. . .	0.355	0.75	. . .	0.115	. . .	. . .	. . .	. . .	. . .	. . .	. . .
29	. . .	. . .	0.08	. . .	. . .	. . .	0.025	. . .	. . .	0.505	. . .	. . .
30	0.275	. . .	. . .	. . .	. . .	. . .	. . .	0.355	. . .	. . .	. . .	. . .
31	0.08	. . .	0.11	. . .	. . .	. . .	0.27	. . .	. . .	. . .	. . .	. . .
Totals	2.725	3.38	6.68	2.405	6.30	3.38	2.265	3.64	3.70	8.84	1.385	4.67

Total rainfall during the year, 49.37 inches.
Being an average of two gauges located at Mystic Lake and Winchester.

Monthly Rainfall in Inches, during 1890, at Various Places in Eastern Massachusetts.

PLACE.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Lake Cochituate	2.34	3.21	7.35	2.51	5.31	1.78	2.31	3.34	6.47	10.11	1.24	5.26	51.23
Framingham	2.54	3.60	7.73	2.63	4.94	1.97	2.37	3.72	6.51	10.26	1.25	5.20	52.72
Dam 4, Ashland	2.52	3.41	7.74	2.66	5.48	2.09	2.55	4.01	5.49	10.76	1.15	5.42	53.28
Chestnut Hill	2.52	3.12	7.64	2.93	5.80	2.60	2.43	3.37	4.89	8.79	1.37	4.76	50.22
Mystic Station, Winchester	2.66	3.40	6.47	2.35	6.41	3.42	2.19	3.56	3.50	8.39	1.41	4.26	48.02
Mystic Lake	2.79	3.36	6.89	2.46	6.19	3.34	2.34	3.72	3.90	9.29	1.36	5.08	50.72
Mystic Engine-House	2.47	3.25	6.49	2.43	5.83	3.32	2.02	3.35	3.85	9.00	1.36	4.27	47.64
Boston Pipe Yard	2.54	3.05	6.49	2.785	5.42	2.53	1.75	2.995	6.12	7.92	1.11	3.82	46.53
Cambridge Observatory	1.97	2.85	6.53	2.03	5.06	2.80	1.42	3.15	3.70	8.09	1.15	5.15	43.90
Waltham, Boston Manufacturing Co.	2.30	3.28	7.04	2.51	5.66	2.56	2.13	3.66	4.91	10.48	1.34	5.15	51.02
Lowell, Locks and Canals Co.	2.766	2.767	6.833	1.987	5.669	3.530	3.447	4.866	4.457	7.705	1.584	4.466	50.077
Lowell-Merrimac Manufacturing Co.	2.20	4.18	6.65	2.36	5.20	3.70	2.36	4.95	4.28	6.68	1.46	3.96	48.98
Average of twelve places	2.468	3.299	6.988	2.470	5.581	2.803	2.360	3.724	4.840	8.956	1.315	4.733	49.528

Rainfall Received and Collected, 1890.

Month.	Sudbury.			Cochituate.			Mystic.		
	Rainfall.	Rainfall collected.	Per cent. collected.	Rainfall.	Rainfall collected.	Per cent. collected.	Rainfall.	Rainfall collected.	Per cent. collected.
	Inches.	Inches.	Per cent.	Inches.	Inches.	Per cent.	Inches.	Inches.	Per cent.
January . .	2.53	2.237	88.43	2.34	1.92	82.03	2.725	2.07	75.60
February .	3.505	2.464	70.29	3.21	2.04	63.43	3.38	2.23	65.98
March . . .	7.735	6.498	84.01	7.35	5.87	79.86	6.68	5.37	80.41
April . . .	2.645	3.236	122.35	2.51	2.23	88.86	2.405	2.93	121.80
May	5.21	2.437	46.78	5.31	1.85	34.90	6.30	3.00	47.59
June . . .	2.03	0.980	48.27	1.78	1.41	79.05	3.38	1.92	56.86
July	2.46	0.192	7.78	2.31	0.33	14.18	2.265	0.43	18.96
August . .	3.865	0.235	6.08	3.34	0.46	13.88	3.64	0.46	12.69
September .	6.00	0 790	13.16	6.47	1.40	21.63	3.70	0.58	15.64
October . .	10.51	4.053	38.56	10.11	3.40	33.67	8.84	2.61	29.51
November .	1.20	2.097	174.72	1.24	1.49	119.95	1.385	1.95	141.16
December .	5.31	1.779	33.49	5.26	2.11	40.19	4.67	2.49	53.48
Totals and averages	53.000	26.998	50.94	51.23	24.51	47.85	49.370	26.04	52.75

Table showing the Temperature of Air and Water at Various Stations on the Water Works.

1890.	TEMPERATURE OF AIR.						TEMPERATURE OF WATER.	
	Chestnut-Hill Reservoir.			Framingham.			Brookline Reservoir.	Mystic Engine-house.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Mean.	Mean.
January	64.0	5.5	32.0	65.0	12.0	32.3	36.0	35.5
February . . .	63.0	-2.0	31.9	62.0	-1.0	32.6	36.1	35.6
March	65.0	-1.0	33.1	64.0	-3.0	32.9	37.6	35.7
April	72.0	22.5	45.9	72.0	24.0	47.0	46.8	43.7
May	81.5	34.5	57.2	81.0	34.0	58.2	58.8	59.9
June	88.5	42.0	64.7	88.0	42.0	65.4	65.5	64.4
July	94.5	47.0	70.9	95.0	47.0	71.2	72.3	73.7
August	89.5	47.5	68.9	88.0	47.0	69.3	73.2	74.6
September . . .	84.5	35.5	63.2	82.0	30.0	62.2	68.1	68.2
October	78.0	31.0	49.8	74.0	28.0	48.6	56.6	57.5
November . . .	65.0	14.0	40.4	65.0	13.0	37.9	44.7	45.5
December . . .	54.5	1.0	25.4	50.0	-1.0	24.1	37.4	35.9

REPORT OF THE RESIDENT ENGINEER AND SUPERINTENDENT OF THE WESTERN DIVISION.

SOUTH FRAMINGHAM, Jan. 1, 1891.

ROBERT GRANT, ESQ., *Chairman Boston Water Board:* —

SIR, — The annual report for the Western Division of the Boston Water Works is submitted herewith.

SUDBURY-RIVER BASINS.

The rainfall during the past year has been about three inches more than the average, and the quantity of water has been abundant; the quality also has been excellent. Although the volumes flowing in the streams contributory to the supply were not as large as for the two previous years, still the basins have been frequently flushed, the circulation has been good and no bad water has been allowed to pass into the supply.

During the summer Basin 4 was freely drawn upon and Basin 3 kept in reserve, with a most beneficial result upon the quality of the water in the city.

A very careful record has been kept of the condition of the water in all the reservoirs, at the surface, mid-depth, and bottom. The construction of Dam 5 has been carried on during the season. As this work comes under the head of Additional Supply, a report has been made to the City Engineer on this subject. A sanitary report upon the condition of the Sudbury and Cochituate supplies was made to your Board in March. The takings of lands, etc., for Basin 5 and Whitehall pond were filed in July and August.

The above are the principal facts in regard to the Sudbury sources. A more detailed account will be found under each basin.

Basin 1.

On Jan. 1, 1890, this basin stood at elevation 157.95, and water was wasting over the stone crest and continued to waste till June 10, when both sets of flash-boards having been put in place the water rose, and on the 14th was wasting over the flash-boards and continued to waste until July 7.

The basin then gradually fell to elevation 158.50 on September 5, but rose to elevation 158.87 on the 13th, when the waste-gates were opened to facilitate some work in the river below the dam, and on the 18th the flash-boards being also removed, the basin fell to elevation 156.35 on the 26th, when the waste-gates were closed. The basin then rose, and on October 4 water was wasting over the stone crest and continued to waste until the present time.

The highest elevation reached during the year was 159.56 on June 15, and the lowest 156.14 on September 22.

Water was drawn from this source for the supply of the city between November 5 and December 15.

The effect of the freshets passing over Dam 1, during several years, has been to scour out the bed of the river, just below Winter street. This spring there was found quite a large and deep pool with a high ridge of gravel at its lower edge. The pool was in such a position that if the scouring continued it would be liable to undermine the paving at the foot of the supply-aqueduct embankment. In order to prevent this result that part of the pool nearest the supply-aqueduct was paved with heavy stones and part of the gravel ridge removed.

A daily flow of at least one and one-half millions of gallons has been passed into the river below the dam, in accordance with the law.

The usual amount of care has been given to the works around the basin. Nothing has been done towards the repair of the 48-inch main in the bed of the basin. This is in a leaky condition. I think studies should be made for the taking of the mud out of the basin and the filling-up and excavation of the shallow flowage with a view of using the basin in the future as an additional settling-basin.

Basin 2.

On Jan. 1, 1890, the surface of the water in this basin was at elevation 166.14, and water was flowing over the stone crest, and it continued to overflow until March 6, when the waste-gates having been opened it fell to elevation 161.58 on the 12th. After being kept down for a week or more, the water rose, and on the 24th was again flowing over the stone crest. This overflow continued, except for one day, until May 19, when the flash-boards being put in position the water rose, and on the 21st was running over the flash-boards, and continued to run over until June 23. The surface then fell to elevation 160.30 on July 25, and stood, on an average, just below elevation 161.00 till August

25, when it began to rise. The flash-boards were removed on September 30, and water flowed over the stone crest on October 7, and continued to overflow till the present time. The highest elevation reached was 167.59 on June 16, and the lowest 160.30 on July 25.

Water was drawn wholly from this basin for the supply of the city from January 3 to January 11, from May 14 to July 28, and from August 7 to November 5. The supply was drawn partially from this basin, and partially from Basin 3, from January 1 to January 3, from January 11 to May 14, and from July 28 to August 7, from December 15 till the present time.

The houses on the Williams and Scott places, located on the Sudbury river at the head of Basin 2, have been removed, and the grounds graded and fenced. All dangers from pollutions from these estates are now removed.

Basin 3.

On Jan. 1, 1890, this basin stood at elevation 175.52, and water was flowing over the stone crest, and so continued until March 4, when waste-gates being opened the water fell to elevation 171.50 on the 12th; on the 18th, the surface began to rise, and on the 25th was again flowing over the stone crest. It continued to overflow, with the exception of one day, until July 10. On August 17 the surface fell to 174.00, but commenced to rise again, and on September 13 was again flowing over the stone crest, and continued to overflow the remainder of the year.

The highest elevation reached was 176.07 on October 21, and the lowest was 171.50 on March 12. The whole supply of the city has at no time been drawn wholly from this basin.

At times already specified the supply was partially taken from this basin and partially from Basin 2. On July 15 the water at and near the bottom was found suddenly to have assumed a very high color. This color was much darker than the color of any of the other waters. It also contained a large amount of amorphous matter. This condition continued until about August 25, when the color suddenly disappeared. Between July 24 and August 20 the water had also a slight taste and smell.

Early in June it was noticed that the amorphous matter in the water at the bottom increased from about 200 to over 700 unit masses to the cc. At the same time the cyclotella increased at the surface. By July 28 the amorphous matter increased to 1,920 masses to the cc. As this matter gradually decreased, the color decreased. At one time the water

was of the color of gold, and doubled in depth in the course of three hours after being drawn to the surface, reaching 3.50 on our scale.

The chemists have been unable, so far, to explain this phenomenon, but it may be due to some chemical change in the iron present in the water.

A table showing the temperature and biological condition of the water throughout the year is appended.

The dam, gate-house, and other portions of this basin are in good order. No work of any importance beyond that of maintenance has been done at this point during the year.

Basin 4.

On Jan. 1, 1890, the surface of the water in this basin was, at elevation, 214.56, and water was flowing over the stone crest, and so continued till March 5, when a waste-gate being opened the water fell to 211.79 on the 13th, but on the 26th was again flowing over the stone crest. It continued to overflow till June 11, when the lower set of flash-boards being put in place the water rose, and on the 18th was running over the flash-boards, and continued to flow over till July 9, when the upper set of flash-boards was placed in position. The water now began to fall, and one of the waste-gates being opened on July 15 the water fell to 201.16 on September 13, when the gate was closed. The water then rose gradually, and on December 4 had reached elevation 214.14, and was kept a little below the stone crest till December 17, when it rose suddenly, and on December 18 water was wasting over the weir, and continued to overflow the rest of the year. Both sets of flash-boards were removed on September 27.

The highest elevation reached was 214.99 on June 19, and the lowest 201.16 on September 13.

Water was drawn from this source for the supply of the city during the greater part of the summer. The quality of the water has been excellent throughout the year. The muddy appearance of the water at the bottom, which appeared on Sept. 18, 1889, and which was fully described in my last report, reappeared again on Sept. 18, 1890. It disappeared on October 21. On September 25 the free ammonia, which was 0.0004 at the surface, was 0.0028 at the bottom; the albuminoid ammonia and the nitrites were about the same at both places, while the nitrates were 0.0060 at the surface and 0.0020 at the bottom. The amorphous matter at the bottom was about double that at the surface.

A rain gauge was established at Basin 4 early in the year.

A table is appended showing the general condition of the water during the year from the observations made in the biological laboratory.

WHITEHALL POND.

This pond having been seized by the city in July was placed under my care by vote of the Board on August 29. At that date the surface stood at elevation 323.46, or 4.45 feet below high water line. As water was drawn for the supply of the mills the surface gradually lowered to 323.11 on October 3. From October 16, at which time the water was at 323.18, the pond rose gradually to 324.94 on December 31.

No interference with the mills has yet been made. The water drawn has been daily measured by weir gauging located at the outlet of the flume. Some repairs have been made to the timbers connected with the gates, which were in a decayed condition. A float gauge has been established, and a house built over it for protection.

FARM POND.

On Jan. 1, 1890, the water in this pond stood at elevation 149.60. The surface has been kept at about high-water mark, elevation 149.25, during the entire year. Water has been drawn from this source for the supply of the city from March 21 to April 5, and from November 5 to December 14.

The Framingham Water Company has pumped from Farm pond 74,500,000 gallons, an average of 204,000 gallons daily. The total amount of water wasted from Farm pond has been 131,900,000 gallons. Almost all of this water was turned into the Sudbury river.

The highest elevation reached was 149.95 on October 30, and the lowest, 148.76, on August 17 and on September 5 and 6.

LAKE COCHITUATE.

On Jan. 1, 1890, the lake stood at grade 132.77, 1.59 feet below high water. The waste gate at this time was open and water passing over the weir. The surface of the water was kept at about 132.50 until March 4, when the gate in the lower dam was opened. This caused the lake to drop to 131.76 on March 12, but the surface afterwards rose to 132.40 on April 5, at which time both waste-gates were closed. On May 6 the water stood at grade 133.55. The upper waste-gate was then opened for a few days to prevent

the lake rising too rapidly, and the surface was kept at about 134.00 until June 1 by adjusting the gate from time to time.

As work was progressing on the new dam, it was necessary to manage the lake in a different manner from usual in order to prevent damage to the contractor.

On June 1 the gates were closed and waste ceased. The lake then fell, as it was drawn upon, to grade 129 17 on September 12, after which it began to rise, reaching elevation 132.69 on December 5. By wasting, the surface has been kept at a point about two feet below high water for the remainder of the year. 2,364,400,000 gallons have been wasted during the year.

Work was resumed on the new dam early in the season and pushed to completion, as far as the contractor's work was concerned, on August 23. Some grading was done around the site of the dam from time to time during the remainder of the year whenever the men could be spared from other duties. A road leading to the gate-house on the southerly side of the dam has been nearly completed. There still remains the erection of the bridge controlling the flash-boards, the placing of the iron weir, etc. The total amount paid the contractor, Thomas A. Rowe, was $26,293.97.

No other work of importance has been carried on. The usual care has been given to the gate-house and other structures around the lake.

A table is appended showing the changes in microscopical life during the year, at the surface, mid-depth, and bottom of one of the deep portions of the lake near the aqueduct inlet.

One of the phenomena which we have studied somewhat carefully this year is the turbid appearance of the water at the bottom of the deeper portions of the lake.

This turbidity began this year on June 11. On June 3 the temperature of the water at the surface was 67 Fahr., at mid-depth 49.5, and at the bottom (60 ft.) 45.5, while the living organisms numbered 243 at the surface, 143.5 at mid-depth, and 70 at the bottom; the amorphous matter was in terms of one mass unit 55, 51, and 61.5 at the same points and in the same order.

There had been for a long time previously a great number of tabellaria, 2,000 per cc., at the surface. On May 30 these had diminished to 1,000, and on June 3 to 243, as above. On June 11 there were but 110, and on June 19 78.5 per cc. In a short time the abnormal growth of tabellaria at the surface entirely disappeared, and at the

same time the amorphous matter at the bottom increased, accompanied by a bad smell and taste. A careful examination of the boundary line of turbid water made on June 13 showed that it was confined to the prism all over the lake below 54 feet in depth. This water remained turbid until the cooling of the surface in the autumn and the great turning over of the lake. On November 11 the temperature was the same in every point of the vertical; viz., the water was 47.9 at the surface, 47.9 at a depth of 30 feet, and 47.3 at a depth of 70 feet. After this time the water remained clear and good at the bottom.

The temperature of the water at the bottom of the deepest portions of the lake (70 feet) throughout the summer was 44.8 Fahr.

SUDBURY-RIVER AQUEDUCT.

The three portions of this aqueduct are in good order. The supply aqueduct leading from Dam 1 to Farm pond has been cleaned regularly in the same way as the main aqueduct. It accumulates dirt on its walls quicker than any other conduit we have on the work, and it is necessary to sweep it twice a year. The Farm-pond aqueduct has been in use 46 days less than the other aqueducts. The main aqueduct has been in use but 292 days, owing to work of repairs on the Beacon-street tunnel. It has carried to the city a total of 6,596,000,000 gallons, or a daily average of 18,071,200 gallons for the year. On June 9 and 10 the aqueduct was cleaned from the East Pipe Chamber to the Terminal Chamber, and from South Framingham to West Pipe Chamber by machine, July 1. At this time the aqueduct was very dirty, with muddy deposit and some spongilla. On December 15, 16, 17 the second cleaning of the aqueduct took place from the syphon to the Chestnut-Hill reservoir. Owing to difficulty of wasting water along the line without injuring the ice crops we have been unable to clean the upper end, but this will be done on the first opportunity.

The work of lining the Beacon-street tunnel has been continued this year from January 1 to April 18, when we were stopped from lack of funds. Within the last week the work has been taken up again and will be carried forward this winter. About 560 feet of tunnel has been laid between Oct. 22, 1889, and April 18, 1890, from Station 803+25 to 808+90. On examining the tunnel in December we found a large mass of rock fallen from the roof at Station 783+41, a point never before suspected of weakness. The rock was perfectly sound and good, but a seam in

wedge form was responsible for the fall of this mass weighing over ten tons. It destroyed the track and a switch at this point completely. The cost of laying concrete in this tunnel, exclusive of the track, has been $15.02 per cubic yard, which I believe is not extravagant when the difficulties under which the work is carried on are considered.

The Syphon Chambers, Course Brook, Bacon's, Fuller's, and Clark's waste weir chambers have been thoroughly repaired during the year. The joints in the stone and brick work were cut out and pointed with Portland and oil cements. The brickwork and sandstone were oiled on the outside and inside of the buildings with two coats of raw linseed oil. The sandstone was oiled to arrest disintegration.

The concrete walks on the Charles river and Waban bridges were resurfaced with two thin coatings of tar and fine sand. The concrete had become hard and cracked, letting water into the masonry. Any stonework will soon go to pieces if the water and frost gain access to the interior.

The embankments along the line have received the usual attention, the bushes and briars mowed and the sodding dressed with loam wherever found necessary. The fences have been repaired and the drains and culverts cleaned out.

COCHITUATE AQUEDUCT.

This aqueduct has been in constant service throughout the year with the exception of about nine days, when cleaning was going on. A depth of six and one-half feet of flow was maintained in the aqueduct through the entire year.

On May 26, 27, 28, and again on December 2, 3, 4, this aqueduct was cleaned from the Lake to Brookline reservoir. A new flight of steps has been built at the Newton Lower Falls embankment. The usual exterior repairs have been made.

CHESTNUT-HILL RESERVOIR.

No new work has been done at this point during the year. The grounds have been kept up to the usual high standard of maintenance. The building of the electric railway on Beacon street brought out a large number of people during the summer, and they strolled about the grounds sometimes by the thousand. An additional policeman has been furnished to maintain order. The driveway around the reservoirs, three miles in length, has been kept in good condition. A considerable amount of repairing of its surface has been done.

BROOKLINE RESERVOIR.

Everything in connection with the Brookline reservoir is in good order. About half of the water used in Boston has been sent through this reservoir during the past year. The water has been of the usual good quality. No improvements have been made.

FISHER-HILL RESERVOIR,

in Brookline, is in good condition. The grounds have been maintained as usual by the Chestnut-Hill reservoir force.

BIOLOGICAL LABORATORY.

Prof. James I. Peck, who was in charge of the biological work last year, was obliged to resign his office from ill health, and his assistant, Mr. E. C. Whipple, has carried on the work successfully since his departure. The results accomplished by the slight outlay in this department have more than met my expectations. Weekly examinations have been made of the water in all the storage basins, reservoirs, and sources of supply at the surface, mid depth, and bottom, giving a complete knowledge of the state of the water, with the exception of the chemical and bacteria analyses. These should be added to the laboratory results, as I have already urged. The color, temperature, number, and kind of organism, and the quantity of amorphous matter present in the water are recorded weekly in suitable books, and the data also plotted graphically. In addition to this work, about 90 special investigations have been made during the year on the quality of the water in the brooks feeding the supply, the effects of the swamps, etc., and the information so obtained has enabled me to get a much clearer idea of the effects of different conditions in the topography at the sources of supply on the quality of the water.

It will also affect the plans for the improvement of the water at the least expense, and in the best manner, whenever that work is seriously entered upon.

FILTRATION EXPERIMENTS.

The filtration experiments at Chestnut-Hill reservoir have been carried on continuously since they were started in the early summer. Much valuable information has already been obtained as to the effects of filtration on the Boston water, mechanical, chemical, and biological, but the conditions resulting from the different seasons are so various,

and the problems constantly met with so new and puzzling, that it will require several years of investigation to master them. For the first time continuous and intermittent filtrations have been carried on together side by side, and under several combinations of materials and methods.

Inspection of Pollutions Department.

The following is a digest of the operations of the department for the year past: —

Total number of cases prepared for the City Solicitor	80
Injunctions granted	39
Petitions for injunctions filed	41
Cases given to City Solicitor but not filed in court	31
Cases inspected (old)	380
" " (new)	112

Of the 492 cases inspected, 124 are reported as permanently remedied; 217 cases are reported as at present "all right" and "safe"; 34 "seem safe"; 35 are "suspected" only, and 82 are "unsatisfactory." There is still a large field for able, energetic, and unfaltering work in the remedying of every case that threatens the purity of the supply.

I have during the year reported the details of every case in any way connected with the Sudbury and Cochituate supplies, and these to the number of 683 are contained in the volumes on file in the office of the Water Board. Special reports have also been made in regard to a number of the cases. A great deal of time and thought has been devoted to the Westborough cases, and after many experiments the direct legal evidence which was desired by the Law Department was obtained, transmitted to your Board, and then placed in the hands of the City Solicitor.

Quality of the Water.

The quality of the water has on the whole been excellent throughout the year. I have collected all the analyses which have ever been made, so far as known, of the Boston water, and suggest the printing of these fifteen tables in a separate pamphlet for the information of those interested in the chemical quality of the water. The following tables, however, give the means of many hundred analyses by Dr. Thomas M. Drown and Dr. Edward S. Wood, both well-known experts on the subject.

Means of Monthly Analyses. Two Years, June, 1887, to May, 1889. By Dr. Thomas M. Drown.

PARTS PER 100,000.

SOURCE.	Color.	Residue on Evaporation.			Ammonia.		Chlorine.	Nitrogen as		Hardness in May, 1888.	REMARKS.
		Total.	Loss on Ignit'n.	Fixed.	Free.	Albuminoid.		Nitrates.	Nitrites.		
Sudbury River, Upper end Res. No. 2, samples collected 1 ft. beneath surface	1.09	4.95	1.80	3.15	.0016	.0283	.31	.0123	.0002	1.4	Supplement to Rep., Mass. State Board of Health, 1890. Pages 38 to 58.
Reservoir No. 2, near gate-house, samples collected 8 ft. beneath surface	1.01	4.79	1.88	2.91	.0008	.0296	.30	.0089	.0002	1.1	
Stony Brook, Upper end Res. No. 3, samples collected 1 ft. beneath surface	1.02	6.88	2.15	4.73	.0047	.0309	.57	.0274	.0005	1.8	
Reservoir No. 3, near gate-house, samples collected 8 ft. beneath surface	0.87	5.25	1.85	3.40	.0049	.0285	.40	.0218	.0003	1.7	
Reservoir No. 4, near gate-house, samples collected 1 ft. beneath surface	0.73	3.75	1.52	2.23	.0006	.0260	.23	.0056	.0001	1.3	
Reservoir No. 4, near gate-house, samples collected 20 ft. beneath surface	0.72	3.89	1.47	2.42	.0014	.0244	.23	.0057	.0002	1.3	
Reservoir No. 4, near gate-house, samples collected 40 ft. beneath surface	0.73	4.00	1.48	2.52	.0019	.0244	.23	.0066	.0002	1.4	
Farm Pond at gate-house	0.65	5.10	1.63	3.47	.0047	.0262	.40	.0158	.0003	1.6	
Dudley Pond	0.13	*2.73	*0.82	*1.91	.0059	.0209	.22	.0097	.0001	1.6	Means from March to May, 1889.
Beaver Dam Brook at point of discharge into Lake Cochituate	0.86	8.79	2.32	6.47	.0088	.0321	.53	.0295	.0007	3.0	
Lake Cochituate, in the gate-house	0.25	5.09	1.22	3.87	.0026	.0207	.44	.0148	.0003	1.8	
Chestnut-Hill Reservoir, Effluent gate-house	0.38	5.08	1.43	3.65	.0019	.0222	.40	.0200	.0002	2.1	
Brookline " " " "	0.43	5.11	1.45	3.66	.0018	.0220	.41	.0197	.0002	2.1	
Fisher-Hill " (High Service)	0.31	*4.80	*1.32	*3.48	.0008	.0214	.41	.0226	.0002	. . .	Means from June, 1888, to May, 1889.
Parker " " " "	0.30	4.84	1.47	3.37	.0017	.0232	.39	.0087	.0001	1.9	Means from June, 1888, to May, 1889. No water was run into or drawn from Res. between Dec., 1887, and July 1888.
Service-pipes, Mass. Inst. Tech., Boston	0.38	4.98	1.47	3.51	.0008	.0207	.41	.0206	.0002	1.9	

*Residue from filtered water.

Means of Quarterly Analyses. Two years, July, 1887, to April, 1889. By Dr. Edward S. Wood.

PARTS IN 100,000.

SOURCE.	AMMONIA.		Chlorine.	RESIDUE.			Hardness.	Color.	REMARKS.
	Free.	Albuminoid.		Fixed.	Vol.	Total.			
Basin No. 2, Influent	.0025	.0246	.36	2.10	2.88	4.98	1	2.05	
" " " Effluent	.0028	.0277	.42	2.04	3.87	5.91	1¼	1.86	
" " 3, Influent	.0040	.0271	.56	2.94	3.65	6.59	1½	1.95	
" " " Effluent	.0049	.0242	.52	2 56	3.41	5.97	1¾	2.11	
" " 4, "	.0021	.0222	.32	1.92	2.85	4.77	1	1.90	
Farm Pond, "	.0059	.0237	.44	2.33	3.31	5.64	1¼	2.21	
Beaver Dam Brook	.0073	.0263	.59	3.81	4.09	7.90	2½	2.06	
Lake Cochituate, Effluent	.0024	.0160	.54	2.54	3.75	6.29	1½	3.85	
Chestnut-Hill Reservoir, Effluent	.0020	.0199	.51	2.09	3.34	5.43	1½	3.36	
Service-pipes (Boston)	.0070	.0194	.50	2.20	3.40	5.60	1½	3.35	

Means of Quarterly Analyses, 7 years, 1883 to 1890. By Dr. Edward S. Wood.

PARTS IN 100,000.

SOURCE.	AMMONIA.		Chlorine.	RESIDUE.			Hardness.	Color.	REMARKS.
	Free.	Albuminoid.		Fixed.	Vol.	Total.			
Basin 2. Influent	.0033	.0251	.42	2.18	3.35	5.53	$1\frac{1}{4}$	2.05	
Basin 2. Effluent	.0047	.0262	.43	2.09	3.51	5.60	$1\frac{1}{4}$	1.93	
Basin 3. Influent	.0052	.0275	.61	2.93	3.90	6.83	$1\frac{3}{4}$	2.18	
Basin 3. Effluent	.0053	.0280	.52	2.64	3.94	6.58	$1\frac{3}{4}$	2.26	
Basin 4. Influent	.0028	.0306	.38	1.94	3.67	5.61	$1\frac{1}{4}$	1.57	Mean for 4 years, 1886 to 1890.
Basin 4. Effluent	.0028	.0256	.39	1.83	3.12	4.95	1	1.71	Mean for 4 years, 1886 to 1890.
Farm Pond Influent	.0068	.0255	.45	2.32	3.40	5.72	$1\frac{1}{4}$	2.12	
Farm Pond Effluent	.0084	.0244	.48	2.31	3.47	5.78	$1\frac{1}{4}$	2.36	
Beaver Dam Brook	.0232	.0254	.67	5.53	4.63	10.16	$3\frac{1}{2}$	2.51	
Lake Cochituate Effluent	.0031	.0163	.56	2.76	3.60	6.35	$1\frac{3}{4}$	3.97	
Chestnut-Hill Reservoir, Sudbury Influent,	.0035	.0223	.47	2.68	3.59	6.27	$1\frac{1}{2}$	2.29	
Chestnut-Hill Reservoir, Cochituate Influent	.0036	.0169	.56	2.88	3.35	6.23	$1\frac{1}{2}$	4.28	
Chestnut Hill Reservoir, Effluent	.0034	.0193	.51	2.48	3.43	5.92	$1\frac{1}{2}$	3.40	
Service (Boston)	.0011	.0191	.51	2.41	3.58	5.98	$1\frac{1}{2}$	3.35	The color scale is exactly the opposite to Dr. Drown's scale. The higher the figures the lighter the color.

The following analysis represents the average condition of the tap-water in Boston for the year 1890. The analyses were made by Dr. Drown, and were furnished through the kindness of the State Board of Health: —

Residue on Evaporation.					Nitrogen.				
Color.	Total.	Loss on Ignition, Filtered.	Fixed.	Chlorine.	Albuminoid Ammonia, Unfiltered.	Free Ammonia.	As Nitrites.	As Nitrates.	Hardness.
0.35	4.66	1.23	3.38	.42	.0169	.0003	.0001	.0240	2.23

The following is a brief statement of the condition of the water, from a biological point of view, at the different sources of supply during the past year: —

LAKE COCHITUATE.

At the beginning of the year the diatoms Asterionella, Melosira, Stephanodiscus, and Tabellaria were present, and formed the greater part of the organisms. In the spring Asterionella increased to 674 per cc. at the surface (April 8), after which they disappeared. Meanwhile the Tabellaria had been increasing, and on May 20 there were 2,300 per cc. at the surface. These imparted to the water a slight characteristic taste. During the summer, algæ, both Chlorophyceæ and Cyanophyceæ, were abundant near the surface. At the same time the water at the bottom in those places where it was more than 50 feet deep was bad. It had a very high color, a bad taste and smell, and contained immense quantities of amorphous matter. This bad condition lasted until November 11. Since October the diatoms Asterionella and Melosira have again been abundant.

Basin 2.

Basin 2 has contained comparatively few organisms. Throughout the winter and spring diatoms and desmids were present in small numbers. During the summer there was a growth of the Chlorophyceæ, and at one time, in August, Cyclotella and Synedra were somewhat abundant. Amorphous matter was also quite plenty about this time. Since October the water has contained few organisms. Some moulds have been observed since the basin froze over. They are most abundant immediately below the ice.

Basin 3.

During the first three months of the year Asterionella were present in small numbers. These increased rapidly during April, and other diatoms appeared. By July these had all disappeared, and the algæ, Chlorophyceæ and Cyanophyceæ, were abundant. During the latter part of the summer the water at the bottom of the basin was bad. From the surface down to a depth of eighteen feet the water was clear, but below that the color rapidly deepened until at the bottom it was a dark reddish brown. The taste was rank, and the odor resembled that of decaying vegetable matter on a salt marsh. This condition was confined chiefly to the old bed of the brook, where the water was over sixteen feet deep. Since October Asterionella have been quite abundant. Moulds also appeared when the basin froze over, being most numerous just below the ice.

Basin 4.

Basin 4 water contained very few organisms at any time. Diatoms were found in small numbers at all seasons, — the principal genus being Cyclotella, which were most numerous during June and July. During the summer there was a slight growth of Chlorophyceæ and Infusoria. The amorphous matter also was not abundant, though during the latter part of the summer there was quite an increase at the bottom, accompanied by a slight cloudiness of the water. This lasted, however, only a short time, and has already been alluded to in detail.

Monthly Averages, 1890.

The accompanying tables contain the averages of the results of analyses for each month from November, 1889 (when the record practically began), to Jan. 1, 1891. The results are expressed in "number per cc." at the surface, mid-depth, and bottom. A table of average temperatures is also given.

Very respectfully,

DESMOND FITZGERALD,
Res't Eng'r and Supt.

Month.	Organisms, cc.				Amorphous.				Remarks.
	Sur.	Mid.	Bot.	Ave.	Sur.	Mid.	Bot.	Ave.	
November, 1889 . .	238	216	106	186	123	108	187	139	Diatoms, chiefly. {Tabellaria, Melosira, Asterionella.} A few Cyanophyceæ and Crenothrix.
December, " . .	45	60	78	61	94	125	102	107	Diatoms. {Melosira, Tabellaria.} Little else.
January, 1890 . .	71	92	88	84	84	104	87	92	Diatoms. {Melosira, Asterionella, Stephanodiscus, Tabellaria.} Little else.
February, " . .	242	. . . .	. . . .	242	198	. . . .	. . . .	198	" " "
March, " . .	422	409	392	408	267	230	268	255	Diatoms. {Asterionella, Melosira, Tabellaria.} "
April, " . .	961	870	937	923	191	204	204	200	Diatoms. {Asterionella, Tabellaria, Melosira.} Zoospores.
May, " . .	1,750	459	251	820	71	74	98	81	Diatoms. {Tabellaria, Asterionella, Synedra.} "
June, " . .	141	38	41	77	63	45	202	103	Diatoms. {Cyclotella, Tabellaria.} Cyanophyceæ.
July, " . .	143	32	28	68	76	48	1,057	394	{Chlorophyceæ, Cyanophyceæ.} Only a few diatoms. Crenothrix at bottom.
August, " . .	148	104	80	111	180	117	2,408	902	" "
September, " . .	147	72	33	84	126	148	1,153	476	{Chlorophyceæ, Cyanophyceæ. Diatoms.} Infusoria and Crenothrix at bottom.
October, " . .	325	239	187	250	81	108	815	335	{Diatoms, Cyanophyceæ, Chlorophyceæ.} " " "
November, " . .	521	366	814	567	105	77	338	190	Diatoms. {Asterionella, Melosira, etc.}
December " . .	581	715	1,191	829	74	60	161	98	" " Cyanophyceæ.

Desmidiæ, Chlorophyceæ, Infusoria, Rotifera are found in small numbers throughout the year. In the table I have mentioned only the most prominent genera.

Basin 2—1890.

Month.	Organisms, cc.					Amorphous.					Remarks.
	Sur.	Mid.	Bot.	Ave.	Influent.	Sur.	Mid.	Bot.	Ave.	Influent.	
November, 1889 . .	22	. . . .	19	21	. . . . .	197	. . . .	185	191	. . . . .	Diatoms, Desmids.
December, " . .	8	. . . .	7	8	. . . . .	76	. . . .	83	80	. . . . .	" "
January, 1890 . .	7	. . . .	7	7	. . . . .	102	. . . .	118	110	. . . . .	" "
February, " . .	12	. . . .	9	10	. . . . .	106	. . . .	65	85	. . . . .	Diatoms, Desmids. Infusoria.
March, " . .	17	28	19	21	15	128	112	127	122	95	" "
April, " . .	38	32	26	32	27	148	131	156	145	69	Chlorophyceæ.
May, " . .	82	63	53	66	27	263	228	262	251	111	"
June, " . .	47	51	52	50	26	259	286	228	258	125	"
July, " .	112	112	106	110	25	371	330	441	381	132	Chlorophyceæ and Diatoms.
August, " . .	143	113	120	125	50	465	548	372	462	195	Chiefly Diatoms. { Cyclotella. Synedra.
September, " . .	165	167	162	165	26	346	429	376	384	177	Diatoms, Chlorophyceæ, Desmids.
October, " . .	141	140	161	147	31	255	294	297	282	118	Spores, Diatoms (Leptothrix).
November, " . .	17	16	11	15	28	96	116	145	119	61	Diatoms, chiefly.
December, " . .	34	79	40	51	31	115	101	116	111	23	Diatoms, Moulds.

Infusoria, Rotifera, etc., present at all times of the year in small numbers.

Basin 3 — 1890.

Month.	Organisms, cc.					Amorphous.					Remarks.
	Sur.	Mid.	Bot.	Mean.	Influent Brook.	Sur.	Mid.	Bot.	Mean.	Influent Brook.	
November, 1889 . .	102	. . . .	118	110	. . . . .	194	. . . .	165	179	. . . . .	Diatoms { Asterionella. Tabellaria.
December, " . .	33	. . . .	27	30	. . . . .	151	. . . .	177	164	. . . . .	Diatoms (Asterionella).
January, 1890 . .	29	. . . .	27	28	. . . . .	175	. . . .	189	182	. . . . .	" "
February, " . .	27	. . . .	21	24	. . . . .	163	. . . .	126	144	. . . . .	" "
March, " . .	14	12	13	13	6	174	222	186	194	117	" "
April, " . .	103	115	98	105	23	224	172	151	182	85	Diatoms { Asterionella. Tabellaria. Synedra. Infusoria.
May, " . .	309	319	267	298	29	174	141	261	192	172	" "
June, " . .	216	168	85	156	12	152	217	473	281	214	Diatoms (Cyclotella). Chlorophyceæ. (Cyanophyceæ appears.)
July, " . .	82	91	73	82	40	69	101	827	332	171	Chlorophyceæ, chiefly. Chlorophyceæ.
August, " . .	107	116	124	116	68	201	323	1,251	592	445	Cyanophyceæ, Diatoms.
September, " . .	111	85	75	90	79	468	380	558	469	339	Infusorio. (Cyclotella.) " "
October, " . .	325	394	326	348	28	278	315	286	293	81	Diatoms (Asterionella). Spores.
November, " . .	251	251	234	245	15	141	131	144	139	38	Diatoms (Asterionella).
December, " . .	251	272	228	250	68	75	75	89	80	51	Diatoms (Asterionella). Moulds.

Desmidiæ, Chlorophyceæ, Infusoria, Rotifera, etc., present in small numbers at all seasons.

Basin 4 — 1890.

Month.	Organisms, cc.					Amorphous.					Remarks.
	Sur.	Mid.	Bot.	Ave.	Influent Brook.	Sur.	Mid.	Bot.	Ave.	Influent Brook.	
November, 1889 . .	28	38	27	31	13	223	182	192	199	55	Desmids, diatoms.
December, " . .	47	39	50	45	. . . . .	147	128	143	140	. . . . .	Desmids (Closterium) chiefly.
January, 1890 . .	21	23	21	22	. . . . .	123	132	113	122	. . . . .	" " "
February, " . .	9	8	6	8	. . . . .	105	115	111	110	. . . . .	Desmids, diatoms.
March, " . .	7	9	10	9	6	149	155	157	154	31	" "
April, " . .	21	23	19	21	17	158	147	190	165	79	" " Infusoria.
May, " . .	46	31	25	34	35	90	97	107	98	115	" " Spores, "
June, " . .	92	61	28	60	13	56	71	112	80	65	Diatoms (Cyclotella) chiefly.
July, " . .	113	57	29	66	8	68	138	306	171	57	" " and Chlorophyceæ.
August, " . .	131	81	47	86	74	142	205	367	238	184	Diatoms, infusoria.
September, " . .	38	35	21	31	42	209	236	325	257	273	" "
October, " . .	69	68	33	57	18	342	309	257	303	56	Spores, Diatoms, Infusoria.
November, " . .	33	27	33	31	15	118	99	136	118	28	Diatoms.
December, " . .	19	32	28	26	7	39	51	43	44	15	"

Month.	Chestnut-Hill Reservoir.						Brookline Reservoir.		Taps in City.			
	Organisms, cc.			Amorphous.			Effluent G. H.		Organisms, cc.		Amorphous.	
	Effluent G. H.	Sudbury G. H.	Cochituate G. H.	Effluent G. H.	Sudbury G. H.	Cochituate G. H.	Organisms.	Amorphous.	Boston Common.	Mattapan.	Boston Common.	Mattapan.
November, 1889 . .	77	34	216	115	65	84	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	
December, " . .	25	20	71	101	104	91	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	
January, 1890 . .	53	13	109	121	87	131	63	104	. . . . .	. . . . .	. . . . .	
February, " . .	120	11	196	124	91	152	104	115	. . . . .	. . . . .	. . . . .	
March, " . .	256	125	459	159	125	175	229	147	†188	*199	†68	*48
April, " . .	517	60	904	190	132	123	706	150	467	*511	78	*52
May, " . .	471	165	1,399	136	292	154	617	103	457	159	426	30
June, " . .	132	22	213	106	514	82	161	101	129	35	200	31
July, " . .	123	70	113	181	302	105	103	140	108	40	185	66
August, " . .	145	148	146	238	650	114	148	261	107	21	115	43
September, " . .	383	90	156	184	460	130	417	165	261	45	268	44
October, " . .	114	156	307	94	409	73	228	224	91	44	71	100
November, " . .	94	42	374	41	57	87	111	80	70	29	50	14
December, " . .	181	85	476	52	69	65	259	76	‡137	62	°37	14

* Taken in South Boston. † Taken in City Hall. ‡ Taken in Providence Depot.

Mean temperatures for 1890. — (Fahrenheit.)

Month.	Lake Cochituate.			Basin 2.			Basin 3.			Basin 4.		
	Sur.	Mid.	Bot.	Sur.	Mid.	Bot.	Sur.	Mid.	Bot.	Sur.	Mid.	Bot.
November, 1889	47.6	46.8	46.7	45.8	. . . . .	45.4	46.5	. . . . .	46.2	48.6	. . . . .	48.2
December, "	40.6	40.8	40.7	37.8	. . . . .	37.6	37.3	. . . . .	37.8	40.1	40.2	39.9
January, 1890	36.4	37.4	37.7	35.3	. . . . .	35.6	35.1	. . . . .	35.7	35.9	36.6	37.3
February, "	*35.3	. . . . .	. . . . .	34.4	. . . . .	35.0	34.4	. . . . .	35.2	35.5	35.6	36.0
March, "	35.8	35.9	36.2	35.8	. . . . .	36.2	35.4	. . . . .	35.8	35.9	36.0	36.1
April, "	44.6	43.2	43.2	49.9	49.2	49.1	47.7	47.4	47.4	46.0	45.6	44.7
May, "	60.6	47.9	45.0	62.0	62.0	61.6	60.8	60.0	59.7	60.4	55.7	52.3
June, "	68.0	49.8	45.1	69.9	67.8	66.1	69.0	67.1	65.1	68.6	62.3	54.9
July, "	74.6	50.2	45.0	74.5	72.2	70.2	74.0	71.5	64.5	75.6	63.2	54.2
August, "	73.6	50.0	45.0	74.9	74.2	73.1	74.4	72.2	65.9	73.5	67.6	54.0
September, "	69.6	49.1	44.9	68.5	68.1	67.5	68.5	68.3	67.6	68.1	65.0	53.5
October, "	58.0	50.8	45.1	54.1	54.2	54.2	55.3	55.4	55.3	55.2	55.2	52.7
November, "	46.7	46.6	45.6	43.1	43.2	43.3	43.3	43.4	43.5	45.5	45.5	45.7
December, "	35.1	36.3	36.6	34.7	36.4	36.9	35.2	36.9	38.2			

* Taken in gate-house.

Table of Rainfall at Chestnut-Hill Reservoir for Year ending Dec. 31, 1890.

DATE.	Inches.	Snow or Rain.	Duration.
Jan. 5	0.13	Rain	6.45 a.m. to 9.45 a.m.
" 6	0.09	"	3.00 a.m. to 5.45 a.m.
" 10	0.17	Snow	3.00 a.m. to 11.30 a.m.
" 11	0.36	"	9.30 a.m. to 2.30 a.m.
" 12			
" 15	0.81	Rain	8.30 a.m. to 11.30 a.m.
" 16			
" 20	0.05	"	7.00 a.m. to 2.30 p.m.
" 23	0.08	Snow	3.30. p.m. to 11.00 p.m.
" 27	0.57	Snow and Rain	1.15 a.m. to 6.00 p.m.
" 30	0.23	Rain and Snow	1.30 a.m. to 8.30 p.m.
" 31	0.03	Rain	6.30 p.m. to 10.00 p.m.
Total	2.52		
Feb. 2	0.11	Rain	5.05 p.m. to 11.30 a.m.
" 3			
" 4	0.17	"	4.15 p.m. to 10.00 p.m.
" 8	0.84	"	1.00 a.m. to 10.00 p.m.
" 10	0.08	Snow	8.00 a.m. to 11.00 p.m.
" 14	0.30	Rain	6.30 a.m. to 11.30 a.m.
" 17	0.25	Rain and Snow	10.00 p.m. to 1.00 a.m.
" 18			
" 19			
" 20	0.64	Snow	3.00 a.m. to 1.00 p.m.
" 24	0.57	Rain	2.00 p.m. to 8.00 a.m.
" 25			
" 26			
" 28	0.16	"	11.00 a.m. to midnight.
Total	3.12		
Mar. 1	0.30	Rain	Midnight Feb. 28 to 1.00 p.m.
Mar. 1	0.10	Snow	11.00 p.m. to 6.00 a.m.
" 2			
" 2	1.02	"	1.00 p.m. to 11.00 a.m.
" 3			
" 6	0.70	"	4.00 a.m. to 8.00 p.m.
" 14	1.56	Rain and Snow	5.00 a.m. to 1.00 a.m.
" 15			
" 16			
" 19	0.63	"	8.30 a.m. to 10.00 p.m.
" 21	0.04	Rain	12.45 p.m. to 3.30 p.m.
" 22	1.68	Rain and Snow	10.45 a.m. to 2.30 p.m.
" 23			
" 25	0.40	Rain	10.00 p.m. to 5.00 a.m.
" 26			
" 28	1.15	Rain and Snow	5.00 a.m. to 2.00 p.m.
" 29			
" 31	0.06	"	9.00 p.m. to midnight.
Total	7.64		
April 1	0.09	Snow	Midnight, March 31, to 6.30 a.m.
" 4	0.17	Rain	12.50 p.m. to 10.00 p.m.
" 7	0.46	"	7.00 a.m. to 3.00 p.m.
" 8	0.96	"	5.05 p.m. to 10.00 p.m.
" 9			
" 25	0.15	"	5.00 a.m to 1.00 p.m.
" 26	1.10	"	7.00 p.m. to 8.00 p.m.
" 27			
Total	2.93		
May 1	0.20	Rain	5.00 p.m. to 9.45 p.m.
" 4	0.77	"	12.25 p.m. to 6.00 a.m.
" 5			
" 6	0.97	"	2.00 p.m. to 10.00 p.m.

Table of Rainfall at Chestnut-Hill Reservoir. — Continued.

DATE.	Inches.	Snow or Rain.	DURATION.
May 8	0.42	Rain	1.00 p.m. to 10.00 p.m.
" 10	0.25	"	7.00 p.m. to 8.00 p.m.
" 11			
" 14	0.43	Showers	2.00 a.m to 11.50 p.m.
" 15	0.41	Rain	11.15 a.m. to 8.00 p.m.
" 16	0.03	"	5.10 p.m. to 8.00 p.m.
" 20	0.85	"	10.20 a.m. to 8.00 p.m.
" 26	1.33	"	6.45 p.m to 9.00 p.m.
" 27			
" 28	0.14	Showers	1.00 p.m. to 10.00 p.m.
Total	5.80		
June 4	0.35	Showers	4.30 a.m. to 2.00 p.m.
" 5	0.34	Rain	8.00 p.m. to 10.20 p.m.
" 6	0.16	"	8.20 p m. to 11.00 p.m.
" 12	1.43	"	2.00 p.m. to10.00 p.m.
" 13			
" 25	0.25	"	4.00 a.m. to 5.00 a.m.
" 27	0.07	"	8.00 a.m. to 1.30 p.m.
Total	2.60		
July 7	0.03	Rain	9.50 p m. to 10.30 p.m.
" 19	0.12	Show er	3.30 p.m. to 5.15 p.m.
" 20	0.05	Rain	8.00 p.m. to 10 p.m.
" 25	0.68	Showers	4.00 a.m. to8.30 a.m.
" 26			
" 26	0.96	Rain	10.30 a.m. to 4.15 p.m.
" 29	0.12	"	7.00 a.m. to 9.45 a.m.
" 31	0.47	Show er	6.15 p.m. to 7. p.m.
Total .	2.43		

DATE.	Inches.	Snow or Rain.	DURATION.
Aug. 1	0.20	Show er	12.30 a.m. to 7.00 a.m.
" 6	0.31	Rain	8.55 a.m. to 10.15 a.m.
" 9	0.20	"	8.40 a.m. to 8.00 p.m.
" 10	0.06	Show er	5.00 p m. to 9.40 p.m.
" 17	0.49	"	9.00 p.m. to 7.00 a.m.
" 18			
" 19	0.75	Rain	5.30 p.m. to 8.20 a.m.
" 20			
" 23	0.38	"	1.00 a.m. to 11.00 p.m.
" 27	0.91	"	1.00 a.m. to 9.30 a.m.
" 30	0.07	"	1.00 p.m. to 1.30 p.m.
Total	3.37		
Sept. 6	1.57	Rain	2.30 p.m. to 3.00 a.m.
" 7			
" 9	0.13	"	12.30 p.m. to 4.30 p.m.
" 10			
" 11	0.39	"	11.00 p.m. to 5.00 a.m.
" 12			
" 12	0.18	"	9.40 a.m. to 2.00 p.m.
" 12	0.57	"	10.30 p.m. to 8.30 a.m.
" 13			
" 14	1.16	"	2.00 p.m. to 11.50 a.m.
" 15			
" 16			
" 16	0.27	Showers	7.00 p.m. to 5.00 p.m.
" 17			
" 17	0.32	Rain	8.00 p.m. to 8.00 a.m.
" 18			
" 26	0.30	Showers	3.00 p.m. to 10.30 p.m.
Total	4.89		

Table of Rainfall at Chestnut-Hill Reservoir. — Concluded.

DATE.	Inches.	Snow or Rain.	Duration.
Oct. 3	1.07	Rain.	5.20 p.m. to 8.00 a.m.
" 4			
" 7	0.72	"	2.00 a.m. to 6.00 p.m.
" 8			
" 14	0.44	"	8.00 a.m. to 11.50 p.m.
" 16	1.35	"	10.45 p.m. to 11.00 p.m.
" 17			
" 19	2.04	"	10.00 a.m to 3.30 p.m.
" 20			
" 24	2.73	"	1.00 a.m to 3.00 a.m.
" 25			
" 29	0.43	"	9.00 a.m. to 2.00 a.m.
" 30			
Total	8.78		
Nov. 11	0.27	Rain.	10.00 a.m. to 7.00 p.m.
" 12			
" 15	0.27	"	2.00 p.m. to 2.00 a.m.
" 16			
Nov. 17	0.83	Rain.	7.30 a.m. to 5.00 a.m.
" 18			
Total	1.37		
Dec. 3	1.08	Snow and Rain.	1.30 a.m. to 6.20 a.m.
" 4			
" 5	0.23	"	10.00 a.m. to 4.00 a.m.
" 6			
" 7			
" 17	1.85	Rain.	2.00 p.m. to 8.00 a.m.
" 18			
" 26	1.60	Snow and Rain.	7.50 a.m to 2.00 a.m.
" 27			
Total	4.76		

Total Rainfall for Year 50.21 inches.

REPORT OF THE SUPERINTENDENT OF THE EASTERN DIVISION.

OFFICE OF SUPERINTENDENT OF EASTERN DIVISION.
BOSTON, Jan. 1, 1891.

ROBERT GRANT, ESQ., *Chairman Boston Water Board:*—

DEAR SIR, — The annual report of the Eastern Division for the year ending Dec. 31, 1890, is respectfully submitted.

Distribution. — Twenty miles of pipe mains have been laid during the year, and 5,725 feet of pipe has been abandoned, making the net increase in the distribution system about nineteen miles, and the total length now connected with the works 498.73 miles.

For the improvement of the high service supply in West Roxbury, a 24-inch main, 8,158 feet in length, has been laid from the junction of Prince and Perkins streets, through Prince, Pond, Eliot, and South streets to the junction of Morton street.

In order to furnish a supply from the high-service tank on Mt. Bellevue to the high land in the vicinity of May and Pond streets at Jamaica Plain, a 12-inch main has been laid in Weld, Centre, and May streets, a distance of 12,680 feet.

In response to the petition of Messrs. Brown, Durrell, and Co., and other property owners in the mercantile section of the city, an order was passed by the City Council, approved March 1, authorizing the expenditure of $100,000, for the purpose of laying a system of pipes throughout the mercantile district to furnish a high-service supply with a pressure of from 70 to 90 lbs. per square inch, this supply to be used only for the supply of fire pipes and sprinkler systems in the buildings of the district.

In compliance with this order, mains have been laid in Kingston, Essex, Bedford, and Summer streets, Franklin street between Washington and Oliver streets, Pearl street between Franklin street and Atlantic avenue, Atlantic avenue between Pearl and Federal streets, Federal street between Summer and Essex streets, South and Lincoln streets between Essex and Summer streets, and Oliver street between Franklin and Milk streets. The total length laid for this service has

been 11,347 feet, at a cost of $25,137.67. Two hundred and seventy-five petitions for the extension of mains have been received, of which number 216 have been granted.

Hydrants. — Two hundred and fifty-five hydrants have been established and 81 abandoned, making a net increase of 174 for the year.

The total number now connected with the system is 5,459. Fifty-four of the old pattern Boston hydrants have been replaced by hydrants of the Post or Lowry patterns.

At the request of the Fire Department, all Post hydrants are now provided with three steamer connections, two $2\frac{1}{2}$ inches and one $4\frac{1}{2}$ inches in diameter.

Service-Pipes. — Two thousand one hundred and eighteen service-pipes have been laid, with an aggregate length of 61,838 feet, and 210 services abandoned, making a net increase of 1,908 for the year.

New sidewalk stopcocks have been set on 4,002 services, making a total of 28,950 set since this work was begun in 1885.

High-Service Works. — The buildings and machinery at the Chestnut-Hill, East Boston, and West Roxbury pumping stations are in good condition.

The feed water heater at Chestnut-Hill station has been rebuilt, using wrought-iron pipes in place of the brass pipes which were destroyed by the gases in the flue.

Pipe Yard and Buildings. — The new stable at the Albany-street yard was occupied on March 1. It is a substantial three-story brick building 40 x 110 feet. The first floor is devoted to storage of wagons and carriages, with ample facilities for washing carriages. On the second floor are stalls for twenty-eight horses, and two box stalls for use in case of sickness, also an ample harness room. The upper floor is used for storage of hay and grain, and has two rat-proof grain bins, holding 1,000 bushels of oats.

On November 1 the superintendent's office and shops of the department were moved from 221 Federal street, which had been the headquarters of this division since 1853, to the new building at the Albany-street yard.

The new building is 41 x 215 feet, three stories in height, with a flat roof. On the first floor are located the offices of the superintendent and assistants, meter-testing room, machine-shop, engine-room, blacksmith-shop, and carpenter-

shop. On the second floor is an office for clerks, a plumber-shop, and store-rooms.

The third floor is devoted to storage purposes.

The boilers and coal-shed are located in a one-story L.

The principal items of cost of the building are as follows: —

Gifford & Lawrence, building	$52,157 00
E. Hodge & Co., boilers	1,730 00
C. H. Brown & Co., engine	1,438 97
B. F. Sturtevant & Co., heating apparatus	1,200 00
Whittier Machine Co., elevators	1,486 00
Blodgett Bros., electric bells and watch clock,	250 00

The building occupied as a stable and office in the Dorchester district has been thoroughly repaired.

I recommend that the old pumping-station in East Boston be remodelled and used as a stable and headquarters for the men employed in that district. The present building on Morris street is located on land in charge of the Paving Department, and the building must be raised to the new grade of the street if retained.

Fountains. — The number of drinking-fountains remain the same as last year.

Repairs have been made to some of the fountains so that they can be used during the winter season.

Water-Posts. — Nineteen water-posts have been erected and one abandoned, making the number now in service 170, located as follows: —

Boston Proper	11
East Boston	9
South Boston	11
Roxbury	34
Dorchester	45
West Roxbury	41
Brighton	19
Total	170

Reservoirs.—At the Parker-Hill reservoir a new fence 890 feet in length has been built on two sides of the lot, and the fence, keeper's house, and gate house have been painted. This reservoir has never been cleaned since it was first filled

in 1875, and I recommend that it be done during the coming season.

The East Boston and South Boston reservoirs are in good order, but the fences surrounding both lots are out of repair. The fence on the north and east sides of the East Boston reservoir should be rebuilt.

Meters.—The total number of meters in service on Dec. 31, 1890, was 3,627 on the Cochituate supply and 391 on the Mystic works, a total of 4,018.

The following tables show in detail the work done during the year, meters in service, purchased, etc.

Meters in Service Jan. 1, 1891.

COCHITUATE.	6″	4″	3″	2″	1½″	1″	¾″	⅝″	½″	Total.
Worthington	...	8	20	99	83	532	419	123	...	1,284
B.W.W.	...	...	...	...	...	...	491	...	...	491
Crown	1	13	28	28	56	187	146	1,225	...	1,684
Hersey	...	...	2	9	14	22	59	6	...	112
Ball & Fitts	...	...	...	...	...	4	4	6	...	14
Balance Valve	...	...	...	...	...	...	4	...	...	4
Frost	...	...	...	...	1	1	1	...	1	4
Thomson	...	...	...	2	2	2	1	3	...	10
Weir	...	...	...	...	...	...	1	...	...	1
Am. Frost	...	...	...	...	...	...	3	...	...	3
Star	...	...	...	...	...	...	5	...	...	5
Desper	...	...	...	...	...	...	2	3	...	5
Metropolitan	...	...	...	...	...	...	3	4	...	7
Champion	...	...	...	...	...	...	1	...	...	1
Nash	...	...	...	...	...	...	...	2	...	2
	1	21	50	138	156	748	1,140	1,372	1	3,627

Meters Applied.

COCHITUATE DEPARTMENT.	4″	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	...	1	7	6	28	35	1	78
B.W.W.	...	...	...	...	...	19	...	19
Crown	3	2	7	17	19	13	65	126
Hersey	...	...	4	8	5	29	...	46
	3	3	18	31	52	96	66	269

Meters Discontinued.

COCHITUATE DEPARTMENT.	4″	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	2	1	1	2	16	10	1	33
B.W.W.	...	...	...	...	...	19	..	19
Crown	1	...	...	1	2	6	30	40
Hersey	...	...	1	...	...	1	...	2
Thomson	...	...	...	...	...	1	...	1
Tremont	...	...	...	...	...	2	...	2
	3	1	2	3	18	39	31	97

Meters Purchased.

	4″	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	...	3	10	8	20	6	...	47
Crown	2	2	9	12	37	...	1	63
Hersey	2	3	8	10	5	40	...	68
Thomson	...	...	2	2	...	...	...	4
	4	8	29	32	62	46	1	182

Meters in Service Jan. 1, 1891.

MYSTIC DEPARTMENT.	6″	4″	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	...	8	3	35	4	76	52	14	192
B.W.W.	...	...	...	...	...	...	3	...	3
Crown	2	6	6	10	2	29	46	84	185
Ball & Fitts	...	...	1	1	...	...	1	...	3
Hersey	...	1	...	3	...	4	...	...	8
	2	15	10	49	6	109	102	98	391

Meters Applied.

MYSTIC DEPARTMENT.	4″	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	...	...	4	...	6	6	1	17
Crown	...	...	1	...	4	2	6	13
Hersey	1	1	3	...	2	...	...	7
Ball & Fitts	...	2	...	...	...	...	...	2
	1	3	8	...	12	8	7	39

Meters Discontinued.

MYSTIC DEPARTMENT.	3″	2″	1½″	1″	¾″	⅝″	Total.
Worthington	...	1	...	4	2	4	11
B.W.W.	...	...	...	...	1	...	1
Crown	1	2	...	2	1	9	15
Hersey	1	1	...	3	...	...	5
Ball & Fitts	2	...	...	...	...	...	2
	4	4	...	9	4	13	34

Meters sent to Factory for Repairs.

	3"	2"	1½"	1"	¾"	⅝"	Total.
Worthington	...	1	2	13	...	...	16
Crown	1	2	5	8	20	69	105
Hersey	...	1	1	1	...	...	3
Thomson	...	..	...	1	...	...	1
	1	4	8	23	20	69	125

GENERAL STATEMENT FOR THE YEAR.

	COCHITUATE.		MYSTIC.	
	Meters.	Boxes.	Meters.	Boxes.
In service Jan. 1, 1891	3,627	.....	391	.....
New set	269	73	39	13
Discontinued	97	2	34	1
Changed	802	.....	107	.....
Changed location	27	.....	4	.....
Tested at shop	1,329	.....	140	.....
Repaired at shop	458	.....	57	.....
Repaired at factory	116	.....	9	.....
Repaired in service	304	37	89	38
Purchased	182	.....	.....	.....

The number of meters changed, tested, and repaired has been larger than usual. This is due to having taken out for test a large number of meters which had registered from 300,000 to 5,000,000 cubic feet. Some of these meters were found to be so worn as to necessitate their being sent to the factory for repairs, while the greater proportion required but very small repairs. This work will be continued during the coming season.

CAUSES FOR CHANGING METERS.

	Cochituate.	Mystic.
Clock broken	66	16
Ordered out for examination	233	39
" " " test	282	1
Lever broken	5	
Leak at packing	7	2
Clock defaced	7	10
Gear out of order	33	3
Injured by hot water	20	
Leak at spindle	15	1
Rust in meter	17	4
Spindle broken	5	
No force	12	1
Ratchet broken	4	
Water in piston	1	
Solder in meter	4	1
Bolts broken	1	
Enlargement of service	27	8
Frozen	4	1
Spindle stuck	3	1
Stopped by dirt	7	
Packing blown out	17	1
Valve worn out	3	
Piston " "	7	
Meter burst	1	
Piston head broken	1	
Stopped in service	16	2
" by gasket	1	
Body broken	2	1
Piston-rod broken	1	
Points broken off		2
Stopped by fish		5
Piston broken		3
Gear "		2
Block worn out		2
Lever " "		1
Total	802	107

METERS REPAIRED IN SERVICE, AS FOLLOWS: —

	Cochituate.	Mystic.
Leak at air screw	1	
" " stopcock	5	5
" " spindle	81	2
" " coupling	64	5
" " packing	10	
" " stuffing-box	2	
" " joint	10	5
Seal broken	6	1
Spindle stuck	10	4
Clock broken	70	26
" out of order	12	7
" defaced	19	27
Spindle broken	2	
Pawl stuck	2	
Cap broken	1	
Check-valve applied	2	
Stopped by fish	1	4
Meter made secure	4	
Glass broken	1	
Dirt in clock	1	1
Ratchet broken		1
Stopped in service		1
Total	304	89

WASTE DETECTION.

The work of this department has been continued throughout the year.

The force of ten inspectors has been employed continuously, but the eighteen men employed in the operation of the Deacon meter system were suspended from February 6 to April 1.

The premises of all the water takers have been examined, and more than 10,000 notices to repair defective fixtures have been issued.

The following table shows the work done by the inspectors: —

Premises examined	63,633
" notified to repair defective fixtures	10,402
" reëxamined.	10,643
Second notices to repair issued	383
" reëxaminations made	1,836

Wilful waste notices issued	178
Fines collected	5
Cases of unpaid hose reported	536
Violation of hose regulations	132
Defective services in street	104
Hopper water-closets not self-closing reported	38

The defective fixtures may be divided into the following classes : —

Ball-cocks	4,320
Water-closets	2,845
Faucets : sink, bowl, and bath-room	3,769
Stopcocks	17
Services burst inside building	684
" " outside " for owner to repair,	51
" " " " " city " "	101
Wilful wastes	167

The territory covered by the Deacon meter system is now divided into 176 sections supplied through 81 meters, and contains a population of 407,600. On the Cochituate works 356,600, out of a population of 408,650, can be supplied through the meters the system covering all the territory supplied with water, with the exception of the business portion of the city and a few takers on the outskirts of the residential district.

On the Mystic works the system has not been generally extended in Somerville, Chelsea, and Everett, owing to the fact that the distribution system of those places are not under the control of this department.

The following statement is condensed from the returns of the different sections, and shows the daily average consumption and also the rate of consumption during the hours of 1 to 4 A.M., at the close of the season of 1889, and at the beginning and end of the season of 1890 : —

	Population.	2D READINGS.		1ST READINGS.		2D READINGS.	
		Daily consumption per head.	Night rate per head, per day.	Daily consumption per head.	Night rate per head, per day.	Daily consumption per head.	Night rate per head, per day.
		Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
Cochituate Works	356,600	48.4	27.1	52.1	29.6	47.7	27.0
Mystic Works. . .	51,000	40.1	23.5	43.5	25.2	36.1	21.3

From the above it appears that the daily average consumption of the residential portion of the city is not over 50 gallons per head per day, and that of this amount nearly one-half may be classed as waste.

Although the present consumption of water in the city shows but a small increase over that of the year 1883, notwithstanding an increase of nearly 20 per cent. in population, yet there remains a large amount of waste.

The reports of the work done by the inspectors during the past few years show that a large proportion of the waste is due to the poor class of water fixtures used in many of the buildings. These fixtures, of poor material and workmanship, are almost certain to prove defective within one or two months after they are used, and repairs are made with others of same class which are found defective at the next visit of the inspector.

Owners and agents of the cheap tenement or model houses in which these causes of waste are generally found, as a rule pay little attention to notices to repair until threatened with a fine.

In tenement-houses where water-closets or other fixtures are used in common by the tenants, it is very difficult to fix the responsibility in cases of wilful waste, and where the occupants cannot or will not understand the English language the case is still more difficult.

Further reduction of the waste can, I think, be best accomplished by the rigid enforcement of ordinances prescribing the class of fixtures that may be used.

Statement of Location, Size, and Number of Feet of Pipe laid in 1890.

NOTE.—B. indicates Boston; S.B., South Boston; E.B., East Boston; Rox., Roxbury; Dor., Dorchester; W.R., West Roxbury; Brl., Brighton.

In what Street.	Between what Streets.	District.	Size.	Length.
Prince	Perkins and Pond	W.R.	24	2,466
Pond	Prince and Eliot	"	"	663
Eliot	Pond and South	"	"	1,882
South	Eliot and Morton	"	"	3,147
	Total 24-inch	...	...	8,158
Huntington ave	Irvington and Exeter	B.	20	221
	Total 20-inch			221
Huntington ave	Irvington and Exeter	B.	16	198
	Parker and Longwood ave	Rox.	"	625
	Total 16-inch	...		823
Summer	Washington and Atlantic ave	B.	12	1,678
Lincoln	Bedford and Summer	"	"	96
Oak	Albany and Washington	"	"	961
Albany	Harvard and Beach	"	"	783
Fenway	Parker and Westland ave	"	"	1,673
Atlantic ave	Pearl and Summer	"	"	847
Federal	Essex and Summer	"	"	390
Kingston	Bedford and Beach	"	"	740
Bedford	Lincoln and Washington	"	"	1,137
Franklin	Washington and Oliver	"	"	1,717
L	Eighth and the water	S.B.	"	877
Boston	Ellery and Powers	"	"	435
Beachmont	Leyden and Swan	E.B.	"	491
Parker Hill ave	Parker and Tremont	Rox.	"	345
East Chester park	Swett and Chesterfield	"	"	102
Brookline ave	Maple and Burlington ave	"	"	333
Parker	Ward and Ruggles	"	"	312
Hutchins ave	From Day	"	"	24
Glen ave	Harvard and White	Dor.	"	906
	Carried forward	...	...	13,847

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	13,847
Westville	Geneva ave and Ditson	Dor.	12	60
Geneva ave	Bowdoin and O.C. R.R	"	"	123
Topliff	Westville and Bowdoin	"	"	992
Homes ave	Draper and Topliff	"	"	44
Columbia	Stanwood and Richfield	"	"	176
Lawrence ave	John and Magnolia	"	"	65
Magnolia	Quincy and Lawrence ave	"	"	66
Codman	Carruth and Dorchester ave.	"	"	607
Morton	Norfolk and N.Y. & N.E. R.R.	"	"	105
Back	Morton and Walk Hill	"	"	665
Blue Hill ave.	Walk Hill and Tileston ave.	"	"	364
Ashmont	Washington and Ocean	"	"	946
Angell	Blue Hill ave. and Canterbury	W.R.	"	156
Prospect	Amherst and Linden	"	"	154
Vermont ave	Corey and Mt. Vernon	"	"	202
Prince	At Perkins	"	"	16
Selwyn	Hewlit and Mozart	"	"	116
Neponset ave. . . .	Jewett and Canterbury	"	"	155
Lowder's lane	From Centre	"	"	342
Pond	Prince and Orchard	"	"	14
Washington	Walk Hill and Hyde Park ave.	"	"	100
Eliot	Holbrook and South	"	"	25
Canterbury	Poplar and Ashland	"	"	116
Hyde Park ave	Ashland and Mt. Hope	"	"	786
Centre	Walter and Weld	"	"	2,254
Weld	Corey and Centre	"	"	6,583
South	At Morton	"	"	25
Pond	Rockwood and Avon	"	"	191
Centre	Green Hill and May	"	"	2,663
May	Pond and Centre	"	"	1,180
Foster	Mt. Vernon and South	Bri.	"	1,107
South	Lake and Chestnut Hill ave.	"	"	1,148
Lake	South and Kendrick	"	"	956
	Total 12-inch	. . .	. . .	36,349

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
Camden	Columbus ave. and Watson	B.	10	350
Kingston	Beach and Essex	"	"	543
Bowdoin	Allston and Derne	"	"	154
Essex	Washington and Federal	"	"	1,554
Tremont	Church and Jefferson	"	"	70
Oliver	Franklin and Milk	"	"	351
Mountfort	Beacon and St. Mary	Rox.	"	612
Tolman	Neponset ave. and Norwood	Dor.	"	822
Savin Hill ave	From Grampian Way	"	"	419
Church	Weld and Centre	W.R.	"	916
	Total 10-inch			5,791
Bay State road	Beacon and Kenmore	B.	8	346
Tufts	Kingston and Utica	"	"	414
Somerset	Allston and Ashburton place	"	"	275
Allston	Somerset and Bowdoin	"	"	362
Derne	Bowdoin and Temple	"	"	179
St. Botolph	Garrison and Irvington	"	"	543
Essex	Washington and Harrison ave.	"	"	32
South	Summer and Essex	"	"	448
Lincoln	Bedford and Essex	"	"	361
Pearl	Franklin and Atlantic ave.	"	"	884
Central wharf	North side	"	"	189
Summer	Gilbert and Atlantic ave.	"	"	580
Cowper	From Short	E.B.	"	18
Dorr	Ewer and Earl	S.B.	"	110
Fulda	Ellis and Valentine	Rox.	"	135
Minden	Walden and Day	"	"	344
Chesterfield	From East Chester park	"	"	276
Gay Head	Centre and Round Hill	"	"	77
Harrishof	Harold and Walnut ave.	"	"	320
Round Hill	Gay Head and Day	"	"	511
Calumet	Tremont and Sachem	"	"	553
Hillside	Wait and Parker Hill ave.	"	"	784
Pope's Hill	Houghton and Neponset ave.	Dor.	"	283
Draper	Robinson and Homes ave.	"	"	71
	Carried forward			8,095

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	8,095
Waldeck	Tremlett and Melville ave.	Dor.	8	226
Savin Hill Ave. . . .	Pleasant and Dorchester ave.	"	"	461
Quincy	Columbia and Mt. Everett	"	"	101
Park	Washington and Coffee court	"	"	122
Norfolk	Walk Hill and R.R bridge	"	"	66
King	Train and Neponset ave.	"	"	263
Symmes	Fairview and Bussey	W. R.	"	336
Clarendon park . . .	Poplar and Whitford	"	"	199
Willow	Weld and Dunbar	"	"	342
Ashland	Canterbury and Back	"	"	889
Walter	Symmes and Bussey	"	"	66
Kittredge	Whitford and Metropolitan ave.	"	"	120
St. John	Rockview and Centre	"	"	14
Lanark road	Englewood ave. and Kilsyth road	Bri.	"	261
	Total 8-inch	. . .	. . .	11,561
East Lenox	Fellows and Washington	B.	6	293
Essex place	Essex and Tufts	"	"	93
St. Botolph	Follen and Garrison	"	"	266
Revere	Charles and the water	"	"	288
Street	Brimmer and Otter	"	"	405
Ridgeway lane	Cambridge and Derne	"	"	633
Woodbury	Washington and Shawmut ave.	"	"	170
Chandler	Tremont and Berkeley	"	"	12
Dundee	Dalton and West Chester park	"	"	808
Kingston	Summer and Bedford	"	"	374
Belvidere	Falmouth and B. & A. R.R.	"	"	123
Gilbert	Summer and Aldine	"	"	65
Bulfinch	Allston and Howard	"	"	30
Farnsworth	Congress and N. Y. & N. E. R.R.	S.B.	"	514
Street	From Third	"	"	137
I	Fourth and Fifth	"	"	281
Fourth	H and I	"	"	20
Earl	Dorr and O.C. R.R.	"	"	420
	Carried forward	. . .	. . .	4,932

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	...	...	4,932
Loring	Seventh and Eighth	S.B.	6	105
Bennington	Wordsworth and West	E. B.	"	393
Falcon	Brook and Putnam	"	"	121
Wordsworth	Coleridge and B., R., & L. R.	"	"	132
Leyden	Bennington and Beachmont	"	"	371
Pope	Swift and Curtis	"	"	309
Meridian	Marion and W. Eagle	"	"	19
Wordsworth	Saratoga and Pope	"	"	531
West Eagle	Meridian and Brook	"	"	316
Putnam	Falcon and Eagle	"	"	24
Kent	Vernon and Roxbury	Rox.	"	213
Williams	Westminster and Shawmut ave.	"	"	360
Maywood	Warren and Blue Hill ave.	"	"	125
Juniper	Thornton and Juniper terrace	"	"	168
Sherman	Dale and Rockland	"	"	119
Mills	" " "	"	"	131
Rockland ave.	" " "	"	"	93
Thornton	Juniper and Cedar square	"	"	171
Atherton	Amory and Copley	"	"	134
Fairbury	Rand and Blue Hill ave.	"	"	174
Mansur	Day and Schiller	"	"	329
Terrace ave.	From Sheridan	"	"	152
Wayne	Maple and Blue Hill ave.	"	"	179
Sachem	Hillside and Calumet	"	"	247
Savin	Tupelo and Blue Hill ave.	"	"	174
Cherry	Quincy " " " "	"	"	46
Whitney place	From Tremont	"	"	22
Round Hill	Walden and Round Hill	"	"	432
Fellows pl.	From Fellows	"	"	197
Moreland	Dennis and Blue Hill ave.	"	"	185
Sterling	Westminster and Warwick	"	"	143
Paulding	Dale and Bainbridge	"	"	217
Cliff	Washington and Dana	"	"	295
Harold	Townsend and Munroe	"	"	357
	Carried forward	...	...	11,916

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	11,916
Judson	Cottage and Brookfield	Rox.	6	221
Townsend	Harold and Humboldt ave.	"	"	348
Kenney	From Day	"	"	476
Williams terrace . . .	Williams and Williams	"	"	296
Elmore	Washington and Mayfair	"	"	240
Aspen	Copeland and Montrose	"	"	188
Hazel park	From Maywood	"	"	164
Dromey ave.	" Brookfield	"	"	400
Grainger	Elmore and Kingsbury	"	"	243
Holborn pl.	From Holborn	"	"	154
Miner	Brookline ave. and B. & A. R.R.	"	"	435
Bower	Walnut ave. and Warren	"	"	150
Laurel	Bower and Ottawa	"	"	34
Auckland	Belfort and Thornley	Dor.	"	104
Clarence pl.	Whitfield and Washington	"	"	191
Ballou ave.	Norfolk and N.Y. & N.E. R.R.	"	"	168
Payson ave.	Hancock and Glendale	"	"	91
Vaughan ave.	From Geneva ave.	"	"	142
Grace ave.	Arcadia and Robinson	"	"	155
Middleton ave.	From Norfolk	"	"	63
Evans	Nelson and Corbett	"	"	117
Clifton park	Clifton and Dudley	"	"	109
Dracut	Wrentham and Dorchester ave.	"	"	397
Mattapan	Tileston and Blue Hill ave	"	"	524
Bellevue	Quincy and Kane	"	"	60
Leeds	Adams and Dorchester ave.	"	"	290
Cedar pl.	Bird and N.Y. & N.E. R.R.	"	"	241
Clark	Quincy and Barrington	"	"	60
Folsom	From Woodward	"	"	24
Maxwell	Morton and Milton ave.	"	"	352
Street	From New Minot	"	"	186
Beale	Carruth and Dorchester ave.	"	"	137
Van Winkle	" " " "	"	"	210
Street	From Chickatawbut	"	"	138
	Carried forward	. . .	. . .	19,024

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	19,024
Lyndhurst	Allston and Washington	Dor.	6	528
Dorchester ave.	Dracut and Wrentham	"	"	209
Leyland	Burgess and Cottage	"	"	763
Street	From Dorchester ave.	"	"	192
Salcombe	" Cushing ave.	"	"	200
Hillside terrace	" Bailey	"	"	135
Brent	Washington and Carlisle	"	"	49
Bushnell	Rowena and Beale	"	"	160
Bicknell ave.	Harvard and White	"	"	84
Frost ave.	Fairview and Boutwell	"	"	184
Wrentham	Ashmont and Dorchester avenue	"	"	100
Wales pl.	Estes and Puritan ave.	"	"	199
Estes	From Wales	"	"	246
Grampian way	Savin Hill and Savin Hill ave.	"	"	374
Laurel	From Norfolk	"	"	190
Mellen	Ocean and Ashmont	"	"	247
Street	From Lawrence ave.	"	"	240
Whitfield	Wheatland and Talbot aves.	"	"	72
Blakeville	Olney and Bowdoin	"	"	183
Savin Hill ave.	Sidney and Grampian way	"	"	130
Evelyn	Norfolk and Blue Hill ave.	"	"	306
Granville	Adams and Milton	"	"	821
Dakota	Geneva ave. and Bowdoin sq.	"	"	522
Iowa	Westville and Dakota	"	"	336
Selden	Capen and Nelson	"	"	60
Blackwell	From Neponset ave.	"	"	247
Dean ave.	" Howard ave.	"	"	270
St. Gregory court . . .	" Dorchester ave.	"	"	223
Randolph terrace . . .	" Van Winkle	"	"	123
LeRoy	Ditson and Geneva ave.	"	"	454
Queen	From King	"	"	180
Ocean	Roslin and Welles ave.	"	"	192
Tileston ave.	Walk Hill and Blue Hill ave.	"	"	214
Hartford terrace . . .	From Hartford	"	"	19
	Carried forward	. . .	. . .	27,476

Statement of Location, Size, etc. — *Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	...	...	27,476
Mt. Bowdoin terrace	From Eldon	Dor.	6	72
Holmes pl.	Mills and Tileston pl.	"	"	41
Coffey	Newhall and Neponset ave	"	"	235
Newhall	Ashmont and Pierce ave	"	"	122
Coolidge ave	From Bernard	"	"	50
Meyers	" Spruce	W. R.	"	235
Spruce	Meyers and Florence	"	"	87
Bailey	Washington and Washington	"	"	184
Cohasset	Corinth and Albano	"	"	678
Amherst	Brandon and Prospect	"	"	91
Custer	Ballard and Goldsmith	"	"	144
Yale	Wachusett and Weldon	"	"	134
Allen	From Anawan	"	"	60
Paul Gore	Danforth and Chestnut	"	"	142
Mozart	Selwyn and Walter	"	"	161
Wilkins pl.	From Sycamore	"	"	223
Arundel	Walter and Selwyn	"	"	519
Perham	Ivory and Winslow	"	"	120
Henman	Summit and Kittredge	"	"	110
South Fairview	South and Robert	"	"	398
Egleston	Boylston and School	"	"	48
Bradstreet ave	From Mt. Hope	"	"	193
Weldon	Yale and Hyde Park ave.	"	"	571
Rockview	St. John and Parley vale	"	"	187
Garden	Maple and Corey	"	"	258
Augustus ave	Whitford and Metropolitan ave	"	"	209
Carolina ave	South and Lee	"	"	100
Argyle	From Cromwall	"	"	105
Brookfield	South and So. Fairview	"	"	305
Robert	Brookfield and So. Walter	"	"	202
Maple	Weld and Garden	"	"	316
Pomfret	Maple and Corey ave	"	"	191
Ruskin	" " " "	"	"	105
Wiggins	From Beech	"	"	274
	Carried forward	...	...	34,346

Statement of Location, Size, etc.—*Continued.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	34,346
Jewitt	Mt. Hope and Neponset ave.	W. R.	6	388
Grover	From Neponset ave.	"	"	120
March ave	Park and Bellevue	"	"	251
Perkins	Canterbury and Grew	"	"	489
Johnston	From Jamaica	"	"	299
Ashland	Sherwood and Brown ave.	"	"	72
Dustin	Cambridge and No. Beacon	Bri.	"	75
Hano	From Braintree	"	"	52
Pratt	" Linden	"	"	61
Richardson	" Western ave.	"	"	238
Street	" No. Harvard	"	"	400
Mt. Vernon	" Rockland	"	"	66
Menlo	Sparhawk and Henshaw	"	"	486
Selkirk road	Sutherland and Cheswick road	"	"	314
Cheswick road	Selkirk road and Elm ave.	"	"	144
Oakland	Washington and Faneuil	"	"	111
Englewood ave.	Elm ave. and Lanark road	"	"	27
Kilsyth road	Lanark and Selkirk roads	"	"	221
Nantasket ave.	Union and Washington	"	"	198
Madison ave.	" " "	"	"	48
Pratt	Ashford and Linden	"	"	237
Saunders	No. Beacon and Pomeroy	"	"	239
Pomeroy	From Saunders	"	"	138
Henshaw	Menlo and Market	"	"	320
Cufflen	Tremont and Nonantum	"	"	217
Tremont	Washington and Cufflen	"	"	45
Webster ave.	From Cambridge	"	"	6
Street	From Webster	"	"	129
Barstow	" Saunders	"	"	204
Riverdale pl.	" Riverdale	"	"	145
Leicester	" Surry	"	"	81
Rena	Hubbard and No. Harvard	"	"	162
Wordsworth	From Pratt	"	"	142
Chamberlain	" Cambridge	"	"	480
	Carried forward	. . .	. . .	40,951

Statement of Location, Size, etc. — *Concluded.*

In what Street.	Between what Streets.	District.	Size.	Length.
	Brought forward	. . .	. . .	40,951
Street	From Raymond	Bri.	6	323
"	" Market	"	"	142
	Total 6-inch	. . .	. . .	41,416
Bumstead court	From Boylston	B.	4	65
Humboldt park	" Bower	Rox.	"	137
Minchen court	" Geneva ave.	Dor.	"	136
Franklin park	" Walnut ave.	W.R.	"	807
" "	" Scarborough	"	"	371
	Total 4-inch	. . .	. . .	1,516

Statement of Location, Size, and Number of Feet of Pipe Relaid and Abandoned in 1890.

In what Street.	Between what Streets.	District.	Size.	Length Abandoned.	Size of Pipe as Relaid.
Huntington ave.	Irvington and Exeter	B.	16	198	16
	Total 16-inch			198	
Central wharf	North side	B.	8	189	8
Central ave.	Centre and Old Colony R.R.	W.R.	"	72	
	Total 8-inch			261	
Oak	Albany and Washington	B.	6	961	12
Albany	Harvard and Beach	"	"	783	"
Camden	Watson and Columbus ave.	"	"	350	10
Kingston	Beach and Essex	"	"	543	"
Somerset	Allston and Ashburton pl.	"	"	275	8
Bulfinch	" " Bulfinch pl.	"	"	30	6
Allston	Somerset and Bowdoin	"	"	362	8
Bowdoin	Allston and Derne	"	"	139	10
Derne	Bowdoin and Temple	"	"	179	8
Revere	Charles and the water	"	"	181	6
Tremont	Church and Jefferson	"	"	70	10
Bower	Walnut and Humboldt aves.	Rox.	"	150	6
Laurel	Bower and Ottawa	"	"	34	6
Pope's Hill	Houghton and Neponset ave.	Dor.	"	19	8
Pratt	Linden and Wordsworth	Bri	"	45	6
	Total 6-inch			4,121	
Street	From Brimmer	B.	4	405	6
Ridgway lane	Cambridge and Derne	"	"	633	"
Revere	Charles and the water	"	"	107	"
	Total 4-inch			1,145	

Pipes Lowered.

In what Street.	Between what Streets.	District.	Size.	Length.
Parker	Boylston and Westland ave.	B.	6	350
Dracut	Dorchester ave. and Wrentham	Dor.	"	75
Dustin	From Cambridge	Bri.	"	150
	Total 6-inch			575
Brandon	Birch and Amherst	W.R.	8	75
	Total 8-inch			75
Munroe	Humboldt and Walnut aves.	Rox.	12	400
Commercial	Beach and Park	Dor.	"	125
	Total 12-inch			525

Pipes Raised.

In what Street.	Between what Streets.	District.	Size.	Length.
Bower	Warren and Walnut ave.	Rox.	6	415
Laurel	Bower and Ottawa	"	"	220
	Total 6-inch			635
Lawrence ave.	St. John and Blue Hill ave.	Rox.	12	200
	Total			200

Table showing the Length of Supply and Distributing Mains laid during the Year 1890, and the Length connected with the Sudbury and Cochituate Works Jan. 1, 1891.

	Diameter of Pipes in Inches.														Totals.
	60	**48**	**40**	**36**	**30**	**28**	**24**	**20**	**16**	**12**	**10**	**8**	**6**	**4**	
EASTERN DIVISION.															
Length in use Jan. 1, 1890 . . .	. . . .	25,571	23,054	20,844	53,551	244	47,683	59,263	67,413	708,549	31,661	276,915	1,068 906	126,057	2,509,711
Stopcocks in same	. . . .	1	7	12	22	. . . .	43	35	94	1,056	32	501	2,714	614	5,131
Length laid or relaid during the year	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	8,158	221	823	36,349	5,791	11,561	41,416	1,516	105,835
Stopcocks in same	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	4	1	1	67	12	38	146	14	283
Length abandoned during the year	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	198	. . . .	. . . .	261	4,121	1.145	5,725
Stopcocks in same	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	1	. . . .	. . . .	14	3	18
Length in use Jan. 1, 1891 . .	. . . .	25,571	23,054	20,844	53,551	244	55,841	59,484	68,038	744,898	37,452	288,215	1,106,201	126,428	2,609,821
Stopcocks in same	. . . .	1	7	12	22	. . . .	47	36	95	1,122	44	539	2,846	625	5,396
WESTERN DIVISION.															
Length in use Jan. 1, 1891 . . .	266	16,051	1,435	1,166	2,140	. . . .	. . . .	. . . .	20	2,043	. . . .	. . . .	360	. . . .	23,481
Stopcocks in same	. . . .	5	. . . .	3	. . . .	. . . .	. . . .	. . . .	2	4	. . . .	. . . .	2	. . . .	16
Total length connected with Works Jan. 1, 1891	266	41,622	24,489	22,010	55,691	244	55,841	59,484	68,058	746,941	37,452	288,215	1,106,561	126,428	2,633,302 498.73 miles.

Statement of Hydrant, Blow-off, and Reservoir Pipe Jan. 1, 1891.

	Diameter in Inches.						Totals.
	16	12	9	8	6	4	
Total length in use Jan. 1, 1890	272	6,900	3,078	28	12,241	11,418	33,937
Length laid or relaid during the year	.....	12	.....	.....	1,174	71	1,257
Length abandoned during the year	.....	29	22	.....	47	425	523
Total length in use Jan. 1, 1891	272	6,883	3,056	28	13,368	11,064	34,671

SIZE OF SERVICES.	BOSTON.		SOUTH BOSTON.		EAST BOSTON.		ROXBURY.		DORCHESTER.		WEST ROXBURY.		BRIGHTON.		TOTALS.	
	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.	Number of Services.	Length in feet.
6-inch laid	10	290	....	....	....	....	1	60	....	....	....	....	....	....	11	350
4 " "	23	452	1	16	....	....	3	59	1	50	1	32	1	28	30	637
4 " abandoned	....	....	....	....	....	....	1	30	....	....	....	....	....	....	1	30
3 " laid	25	796	....	....	....	....	....	....	2	55	....	....	....	....	27	851
2 " "	11	296	1	4	1	7	6	262	1	19	....	....	....	....	20	588
2 " abandoned	2	35	....	....	1	31	....	....	....	....	....	....	....	....	3	66
1½ " laid	12	297	1	19	1	33	2	59	1	53	....	....	....	....	17	461
1½ " abandoned	6	156	....	....	....	....	....	....	....	....	....	....	1	....	6	156
1¼ " laid	14	456	1	19	....	....	3	115	....	....	....	....	1	50	19	640
1 " "	50	1,433	6	209	3	114	28	980	6	164	5	139	2	51	100	3,090
1 " abandoned	4	78	1	4	....	....	4	89	3	106	....	....	....	....	12	277
¾ " laid	21	663	8	218	2	68	18	467	1	....	3	72	2	44	55	1,532
¾ " abandoned	11	197	1	41	1	30	....	....	....	....	....	....	....	....	13	268
⅝ " laid	109	4,085	108	2,927	171	5,233	465	12,314	477	14,744	326	8,637	183	5,711	1,839	53,651
⅝ " abandoned	99	2,016	14	374	5	62	15	350	14	337	5	104	5	82	157	3,325
½ " "	1	15	6	172	8	220	3	77	..	....	....	....	....	....	18	484
Total laid	275	8,768	126	3,412	178	5,455	526	14,316	489	15,085	335	8,880	189	5,884	2,118	61,800
" abandoned	123	2,497	22	591	15	343	23	546	17	443	5	104	5	82	210	4,606
Net increase	152	6,271	104	2,821	163	5,112	503	13,770	472	14,642	330	8,776	184	5,802	1,908	57,194

Two hundred and fifty-five hydrants have been established and eighty-one abandoned during the year 1890.

	Established.					Abandoned.					
	Boston Lowry.	Post.	Lowry.	Boston.	Total.	Boston Lowry.	Post.	Lowry.	Boston.	Total.	Net Increase.
Boston	3	19	30	. .	52	. . .	. .	1	35	36	16
South Boston	. . .	4	5	. .	9	. . .	1	. .	1	2	7
East Boston	2	12	3	. .	17	1	1	1	5	8	9
Roxbury	13	18	9	. .	40	5	. .	1	7	13	27
Dorchester	31	30	3	1	65	2	. .	3	4	9	56
West Roxbury	21	23	. .	. .	44	5	. .	. .	3	8	36
Brighton	14	11	2	1	28	4	1	. .	. .	5	23
	84	117	52	2	255	17	3	6	55	81	174

Hydrants taken out and repaired 74
Hydrant boxes renewed 134
Gate boxes renewed 151

Total Number of Hydrants in use Jan., 1891.

	Boston Lowry.	Boston Y.	Post.	Lowry.	Boston.	Total.
Boston	68	. . . .	203	664	533	1,468
South Boston	17	1	74	200	274	566
East Boston	24	. . . .	78	137	138	377
Roxbury	52	. . . .	118	664	106	940
Dorchester	164	. . . .	237	572	82	1,055
West Roxbury	155	. . . .	333	113	53	654
Brighton	50	. . . .	202	66	38	356
Deer Island	. . . .	. . . .	16	. . . .	. . . .	16
Brookline	. . . .	. . . .	. . . .	5	3	8
Chelsea	. . . .	. . . .	. . . .	. . . .	7	7
Quincy	. . . .	. . . .	7	. . . .	. . . .	7
Long Island	. . . .	. . . .	4	. . . .	. . . .	4
	530	1	1,272	2,421	1,234	5,458

Repairs of Pipes during the Year 1890.

	Diameter of Pipes in Inches.																		Total.
	40	36	30	24	20	16	12	10	8	6	4	3	2	1½	1¼	1	¾	⅝	½	
Boston	1	.	3	.	10	7	23	1	5	38	20	1	3	2	3	10	10	290	4	431
South Boston	.	.	.	.	.	.	2	1	1	7	3	.	1	1	.	2	.	66	3	87
East Boston	.	.	.	.	2	.	1	1	1	7	.	.	.	.	.	1	2	37	6	58
Roxbury	1	1	.	1	3	1	8	.	1	14	1	.	2	1	.	3	3	140	2	182
Dorchester	.		.	.	.	.	3	.		6	.	.	1	1	.	1	1	79	4	95
West Roxbury		.	.	1	.	.	3	.	.	4	.	.	.	.	.	.	1	26	.	35
Brighton	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	1	10
	2	1	4	2	15	8	40	3	8	76	24	1	7	5	3	16	17	646	20	898

Causes of the leaks that have occurred in pipes of 4 inches diameter and upwards: —

Settling of earth	26	
Blasting	1	
Defective joints	52	
" pipes	36	
" valves	4	
" packing	33	
" stuffing-box	22	
" stopcocks	4	
Struck by pick	2	
	—	180
Of 3-inch and in service-pipes: —		
Settling of earth	162	
Gnawed by rats	6	
Nail-hole	2	
Defective joints	20	
" packing	21	
" coupling	12	
" stopcocks	6	
" pipes	150	
Struck by pick	54	
	—	433
Carried forward,		613

Brought forward,		613
Stoppages by: —		
Fish	21	
Dirt	31	
Gasket	5	
Solder	4	
Rust	217	
Frost	7	
		285
Total		898

Statement of Leaks and Stoppages, 1850–1890.

YEAR.	DIAMETER.		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	234	311
1859	82	449	531
1860	134	458	592
1861	109	399	508
1862	117	373	490
1863	97	397	494
1864	95	594	689
1865	111	496	607
1866	139	536	675
1867	122	487	609
1868	82	449	531
1869	82	407	489
1870	157	707	864
1871	185	1,380	1,565
1872	188	1,459	1,647
1873	153	1,076	1,229
1874	434	2,120	2,554
1875	203	725	928
1876	214	734	948
1877	109	801	910
1878	213	1,024	1,237
1879	211	995	1,206
1880	135	929	1,064
1881	145	833	978
1882	170	1,248	1,418
1883	171	782	953
1884	253	1,127	1,380

Statement of Leaks and Stoppages, 1850–1890.— Concluded.

YEAR.	DIAMETER.		Total.
	Four inches and upwards.	Less than four inches.	
1885	111	638	749
1886	150	725	875
1887	172	869	1,041
1888	216	1,140	1,356
1889	183	849	1,032
1890	180	718	898

Respectfully submitted,

DEXTER BRACKETT,
Superintendent Eastern Division.

REPORT OF THE SUPERINTENDENT OF THE MYSTIC DIVISION.

MYSTIC DEPARTMENT,
BOSTON, Jan. 1, 1891.

ROBERT GRANT, ESQ., *Chairman Boston Water Board:* —

SIR, — The annual report of this department for the year 1890 is herewith submitted.

MYSTIC LAKE.

Waste has owerflowed the dam throughout the year, except from July 1 to October 19. The lowest point reached was on September 10, when it was 3.02 above tide-marsh level. During the season the usual force of men has been employed in removing the vegetable growth from Horn and Wedge ponds, and from the river above Whitney's dam. All along the supply the edges have been freed from all contaminating matter, and some of the feeders bedded with gravel. At the dam the old spruce flash-boards were replaced by hard-pine ones; slight repairs were made on the bridge, and the general surroundings kept in good condition. A watercloset and a new force-pump have been put in the gate-keeper's residence. I would call the attention of the Board to the necessity of a telephone at this station.

RESERVOIR.

The roads adjoining the reservoir have been graded; about 1,100 feet of the road leading to the pumping station have been macadamized, and 1,400 feet of wooden fence built.

The sides were top-dressed, as usual; the walks on the top and the steps leading to the same were repaired. The drain from the dry-well at the gate-house has also been repaired.

CONDUIT.

This has received the customary cleaning and flushing; new copper-screens have been put in the gate-chamber and a few slight repairs done at the waste-weir.

FORCE MAINS.

During the year a few leaks were discovered and the defects promptly remedied; so that now the mains are apparently in good order.

PUMPING STATION.

Three new boilers were built by the Roberts Iron Company of Cambridgeport, Mass., to replace the four old boilers that were erected in 1872. The new ones are similar in size and design to the three other boilers that were placed in the boiler room in 1884. They were first put in service on November 6. In April an attachment for admitting air to the furnaces at the bridge wall was placed in boilers Nos. 1, 2, and 3, by Mr. F. A. Jones, and later a similar appliance was attached to the new boilers, Nos. 4, 5, and 6. At present boilers Nos. 1, 2, and 3 are being overhauled.

The independent air-pump and condenser mentioned in the last report has been connected with engines Nos. 1 and 2, and the old air-pumps and the old condensers have been abandoned. The new machine was furnished by Henry R. Worthington, of New York. A combined dynamo and water-motor was purchased of the Belknap Water Motor Company, of Portland, Me., and the building was wired for 60 incandescent lights. The capacity of the dynamo is nominally thirty 16-candle power lights.

Sanitary improvements have been made at the engine-house, also at the engineers' residences. The coal-shed has been extended 20 feet, and a Fairbank's platform-scales erected within. The concrete walks and gutters were repaired, and the surrounding grounds restored to a good condition. Near the engine-house a filtration plant for experimental purposes has been constructed in accordance with the plans of the City Engineer. I recommend that Engine No. 1, which has a pumping capacity of but 5,000,000 gallons per day, be replaced by an engine of more than twice that pumping capacity.

MYSTIC-VALLEY SEWER.

The quantity of sewage pumped, from Jan. 1, 1890, to Jan. 1, 1891, was 119,119,670 gallons, to which was applied 323,650 pounds of crude sulphate of alumina. The quantity of sludge precipitated and removed from the works was 3,305,673 gallons, containing about 96 per cent. of moisture, or, stated on the basis of cubic yards, after the

elimination of 86 per cent. of moisture the quantity of sludge removed was 2,611 cubic yards.

The amount of coal required to furnish power for pumping the sewage was 191 tons.

Compared with the quantity of sewage pumped during the whole of last year, there was an increase during this year of 8 per cent. The rate of precipitant used, from Jan. 1, 1890, to Jan. 1, 1891, was one part of crude sulphate of alumina to 3,067 parts of sewage, or 1.36 tons per 1,000,000 gallons of sewage. The cause of this access of pumping was due to the greater quantity of surface-water taken into the sewer.

The character of the effluent discharged from the tanks during the past year has been clearer, and has contained less color than that of the previous year. The only repairs required on the plant have been the substitution of 25 new tubes in the boiler and a few improvements on the engine and pumps. A watercloset was built in the chemical room; also, an office was fitted up in the barn for the engineer in charge of the work.

POLLUTION.

Three inspectors were employed in this department most of the year patroling the streams and interviewing the property owners in regard to the disposal of their sewage with a view of making changes where such were necessary. In a few cases the property owners, after being notified, continued to defy the law relating to the pollution of streams, but, generally, they have complied with our wishes, and made important changes for the purity of the supply. The most important case remedied was that of the Woburn Steam Laundry, owned by Messrs. A. L. and H. L. Richardson.

This establishment discharged daily about 1,200 gallons of refuse into our supply.

This case was reported to the Law Department on September 4, and on the 6th an injunction was granted. In a few days thereafter an 8-inch drain was laid in Main street, connecting with Mystic-valley sewer, and the laundry sewage was diverted from the water supply. Subsequently, about fifteen adjacent buildings were connected with this drain. About fourteen cases have been submitted to the Law Department. One hundred and thirty-eight improvements have been accomplished during the past year, as follows: 46 new cesspools and 5 new vaults built, 23 cesspools and 5 vaults cleaned, to prevent overflowing; 34 drains, 3 cesspools, 4 vaults, and 3 pig-pens abandoned, and 15 manure-pipes removed.

DISTRIBUTION-PIPES.

The distribution-pipes have been extended by the addition of 799 feet of 10-inch pipe, 98 feet of 8-inch pipe, 652 feet of 6-inch pipe, and 1,559½ feet of 4-inch pipe. There have been 3,898 feet of cement-lined pipe replaced by cast-iron pipe. There was but one break in main pipe during the year. There are remaining in Charlestown about 14,500 feet of cement-lined distribution pipe, varying in size from 2 inch to 20 inch.

I recommend that, during the coming year, all the cement-lined pipe be replaced by cast-iron pipe.

HYDRANTS AND GATES.

Eighty-one street Lowry hydrants were abandoned and new ones substituted. Eight additional, 8 Lowry and 2 Boston Lowry hydrants were established. One hundred and twenty-two hydrant stems, 39 gate boxes, and 87 hydrant boxes were replaced by new ones. Five 4-inch, 15 6-inch, and 1 8-inch gate were removed.

FOUNTAINS AND STAND-PIPES.

The small drinking fountain in City square was removed and a large one erected. Five additional stand-pipes for street watering-carts have been established.

SERVICE-PIPES AND BOXES.

Forty-eight new services have been laid, and 132 repaired, for which 927 feet of lead-pipe were required. Thirty-one ½-inch tin lined service-pipes were replaced by larger ones, and 16 leaks repaired. Fifty-seven stoppages by eels, 24 by rust, and 4 by moss were blown out. One hundred and sixty-one service-boxes were renewed.

New Services.

Size	⅝"	¾"	1"	2'	Total Number.	Total ft.
Number	27	11	1	9	48	1,247½

Summary of Services connected with Works Jan. 1, 1891.

	Charlestown.	Somerville.	Chelsea.	Everett.	Total.
Number of services	5,905	6,445	5,136	20,34	19,520
Number of feet	157,751	216,304	137,710	40,268	552,033

Breaks and Leaks on Distribution Pipes.

Size of Pipes	4''	6''	8''	10''	12''	Total.
Charlestown	1	...	...	...	...	1
Somerville	12	9	11	2	3	37

Extension of Distribution Pipes.

Size of Pipes	3"	4"	6"	8"	10"	12"	16"	Total.
Pearl st.	...	376	....	98	799	...	...	1,254
Rutherford ave., B. & M. R.R.	...	...	373	...	...	...	...	336
Prospect pl.	...	122	....	...	...	...	...	122
Hoosac Tunnel, D. & E. Water st.	...	...	24	...	...	...	...	24
Tufts court	...	198	....	...	...	...	...	198
Kelley's court	...	256	....	...	...	...	...	256
Quincy court	...	75	....	...	...	...	...	75
Wellington pl.	...	50	....	...	...	...	...	50
Short-st. court	...	100	....	...	...	...	...	100
Clinton pl.	...	...	255	...	...	...	...	255
Mason place	...	81	....	...	...	...	...	81
Hamilton court	...	158	...	...	...	...	...	158
Schoolhouse court	...	...	143½	...	...	...	...	143½
Somerville	...	605	16,328	3,677	1,647	540	...	22,797
Chelsea	...	312	860	...	626	...	...	1,798
Everett	...	7,583	4,637	...	...	...	...	12,220
	...	9,916	22,620½	3,775	3,072	540	...	39,923½

Distribution Pipes Relaid.

Location.	Original Size.	4-in.	6-in.	Total.
Scott's court	3-in.		398	398
Gibbs lane	4-in.		219	219
Brighton street	4-in.		96	96
Beacham street	4-in.		423	423
West street	3-in.		286	286
Baldwin street	4-in.		1,080	1,080
Salem ave.	3-in.		304	304
Jackson street	4-in.		232	232
Decatur street	4-in.		220	220
Stone street	4-in.		219	219
Thompson street	6-in.		143½	143½
Chambers street	6-in.		277½	277½
				3,898

Hydrants Established.

	Established.			Abandoned.	Net Increase.
	Lowry.	Boston Lowry.	Post.	Flush.	
Charlestown	8	2		2	8
Somerville			49	6	43
Chelsea			9	2	7
Everett			15		15
Total	8	2	73	10	73

Total Number of Hydrants in use Jan. 1, 1891.

Charlestown	193	33	50	39	315
Somerville	2		457		459
Chelsea			184	2	186
Everett	1		102		103
Medford			2	6	8
Pumping Station			2	1	3
Total	196	33	797	48	1,074

Length of Distributing Mains connected with Works Jan. 1, 1891.

LOCATION.	DIAMETER IN INCHES.													TOTAL.
	3-in.	4-in.	6-in.	8-in.	10-in.	12-in.	14-in.	16-in.	18-in.	20-in.	24 in.	30-in.	36-in.	
Charlestown . . .	2,400	24,320	61,344	22,170	5,606	15,087	. . . . .	20,140	. . . . .	6,180	16,982	25,296	974	200,499
Somerville	7,455	89,947	156,717	45,576	10,351	9,154	8,037	. . . . .	387	. . . . .	. . . . .	. . . . .	. . . . .	327,621
Chelsea	18,313	76,885	38,850	7,787	26,653	. . . . .	. . . . .	2,348	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	170,836
Everett	914	47,005	47,591	2,681	7,128	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	105,319
Total	29,082	238,157	304,502	78,214	49,838	24,241	8,037	22,488	387	6,180	16,982	25,296	974	804,275

Number of Gates connected with Works Jan. 1, 1891.

Charlestown . . .	12	163	199	55	17	34	. . . . .	24	. . . . .	4	11	12	. . . . .	531
Somerville	5	225	314	27	22	23	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	616
Chelsea	30	175	62	22	18	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	307
Everett	4	64	46	5	2	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	121
Total	51	627	621	109	59	57	. . . . .	24	. . . . .	4	11	12	. . . . .	1,575

Yours respectfully,

EUGENE S. SULLIVAN,

Superintendent.

SUMMARY OF STATISTICS.

REPORT OF 1890.

IN ACCORDANCE WITH THE RECOMMENDATION OF THE NEW ENGLAND WATER-WORKS ASSOCIATION.

Boston Water-Works, Suffolk County, Massachusetts, supplies also the cities of Somerville and Chelsea, and the town of Everett.

Population by census of 1890 : —

Boston	448,477
Chelsea	27,909
Somerville	40,152
Everett	11,068
Total	527,606

Date of construction : —

Cochituate Works	1848
Mystic "	1864

By whom owned. — City of Boston.
Sources of supply. — Lake Cochituate, Sudbury river, and Mystic lake.

Mode of supply. — Sixty-five per cent, from gravity works.
Thirty-five " " " pumping "

PUMPING.

	COCHITUATE.	MYSTIC.
Builder of pumping machinery, —	Holly Co.	H. R. Worthington.
Description of coal used : —		
a Kind, —	Bituminous.	Bituminous.
c Size, —	Broken.	Broken.
e Price per gross ton, —	$4.70	$4.20.
f Per cent. of ash, —	8.2	9.8.

	COCHITUATE.	MYSTIC.
Coal consumed for year, in lbs.	2,677,281	6,506,000
Total pumpage for year, in galls.	2,369,631,700	3,030,116,500
Average dynamic head, in feet	123.16	147.11
Gallons pumped per lb. of coal	885.1	465.7
Duty in foot-lbs. per 100 lbs. of coal (no deductions)	98,069,200	57,141,800
Cost of pumping figured on pumping-station expenses, viz. : —	$18,024 95	$23,507 08
Cost per million gallons raised to reservoir	$7 61	$7 76
Cost per million gallons raised one foot high	$0.0618	$0.0528

CONSUMPTION.

	COCHITUATE.	MYSTIC.
Estimated population	410,600	117,700
Estimated population supplied	405,000	115,000
Total consumption, gallons,	12,363,178,400	3,030,015,000
Passed through domestic meters	318,840,000	6,978,400
Passed through business meters	2,978,872,500	554,178,300
Average daily consumption, gallons	33,871,700	8,301,400
Gallons per day, each inhabitant	82.5	70.6
Gallons per day, each consumer	84.7	72.1
Gallons per day to each tap,	558.	425.

DISTRIBUTION.

Mains.

	COCHITUATE.	MYSTIC.
Kind of pipe used	Cast-Iron.	Cast-Iron, Wrought-Iron and Cement.
Sizes	48-in. to 4-in.	30-in. to 3-in.
Extended, miles	19.00	4.6
Total now in use	498.73	152.3

	Cochituate.	Mystic.
Distribution-pipes less than 4-in., length, miles	0	5.4
Hydrants added	173	73
Hydrants now in use	5,458	1,074
Stop-gates added	265	113
Stop-gates now in use	5,412	1,575

Services.

Kind of pipe used	Lead.	Lead and Wrought-Iron.
Sizes	$\frac{5}{8}$-in. to 4-in.	$\frac{1}{2}$-in. to 2-in.
Extended, feet	57,232	20,360
Service-taps added	1,908	993
Total now in use	60,718	19,520
Meters added	172	5
Meters now in use	3,627	391
Motors and elevators in use,	451	23

SCHEDULES OF PROPERTY

OF THE

WATER-SUPPLY DEPARTMENT.

Schedule of Property on hand Jan. 1, 1891.

Statement of Pipes, Gates, Special Castings, Pig Lead, and Gasket on Hand.

	Diameter in Inches.															Total Weight. Lbs.
	60	48	40	36	30	24	20	16	12	10	9	8	6	4	3	
Pipes	2	123	38	4	28	42	168	281	779	860	2	2,398	1,071	284	85	5,749,423
Offset Pipes	...	...	...	..	..	...	...	...	...	50	...	112	148	9	32	74,210
Siphon Pipes	...	...	...	...	...	...	...	...	14	15	...	13	22	19	...	38,731
Manhole Pipes	...	...	1	...	2	...	...	...	...	...	...	...	...	...	...	12,600
Pieces Pipes	1	5	...	2	...	6	...	9	103	43	...	58	76	...	...	191,406
Flang Pipes	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	310
¼ Curves	..	...	...	2	2	3	8	2	49	16	...	31	55	26	16	69,674
⅛ Curves	..	...	...	1	7	4	5	9	71	45	...	111	76	37	22	105,192
1-16 Curves	...	...	...	...	8	5	7	2	28	36	...	74	87	22	16	96,808
1-32 Curves	...	1	...	2	3	...	...	...	...	...	...	...	..	...	...	12,834
1-64 Curves	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...	26,740
Curves, Old	...	...	...	...	10	...	...	...	..	...	...	...	...	...	...	23,800
3-Way Branches	...	1	4	4	6	4	5	26	235	130	2	173	158	83	...	332,266
4-Way Branches	...	...	1	1	1	8	1	16	56	25	...	...	49	6	...	107,931
Y Branches	...	...	1	...	1	1	4	1	...	...	...	...	...	...	...	22,043
Blow-off Branches	...	...	...	...	2	1	2	12	96	7	...	15	...	...	...	59,695
Caps	1	2	1	4	3	5	1	2	33	23	..	55	98	44	...	34,893
Sleeves	1	10	11	8	13	14	9	13	148	82	...	93	96	48	39	116,105

Branch Sleeves								2											1,040
Clamp Sleeves		3												19	7				7,225
Cleaning Sleeves								7					92						5,294
Thawing Sleeves								30				7	156	73					7,671
Reducers	3	6	2	3	9	8	5	33	43	11	101	55	32						83,649
Manhole Siphon					1														1,830
Branch Openings			3	19	4														6,080
Plugs												26							212
Gates			2	3		2	4	2			10	13	6	16					
Pipe Straps (Wrought Iron)	12	12	12	10	20	22	8												
Pig Lead																			4,999
Gasket																			1,377

Statement of Service Pipe and Fittings.

	Diameter in Inches.									
	3	2½	2	1½	1¼	1	¾	⅝	½	⅜
Pounds Lead Pipe	. .	. .	3,150	4,493	2,591	7,306	8,046	11,149	. .	. .
Pounds Tin-lined Pipe	. .	. .	. . .	. . .	. . .	. . .	234	920	. .	. .
Pounds Block Tin Pipe	. .	. .	. . .	. . .	. . .	. . .	146	100	20	. .
Stopcocks, Corp.	. .	. .	. . .	1	23	100	68	632	12	. .
Stopcocks, Sidewalk	. .	. .	. . .	. . .	. . .	52	69	1,232	. .	. .
Male Couplings	. .	. .	18	62	79	94	78	175	5	. .
Female Couplings	. .	. .	48	60	36	150	47	1,277	50	. .
Stopcocks, Angle	. .	. .	. . .	. . .	. . .	13	. . .	164	. .	. .
Stopcocks, Bib	. .	. .	. . .	. . .	. . .	. . .	. . .	. . .	1	. .
Stopcocks, T	. .	. .	. . .	. . .	41	23	3	98	. .	. .
Stopcocks, Air	. .	. .	. . .	13	. . .	15	. . .	. . .	. .	. .
Plugs	. .	. .	7	13	19	89	103	320	39	. .
Nipples, Solder	. .	. .	36	4	. . .	. . .	. . .	. . .	. .	. .
Corporation Boxes	. .	. .	. . .	. . .	. . .	5	. . .	872	. .	. .
Corporation Boxes, T	. .	. .	. . .	. . .	. . .	. . .	. . .	17	. .	. .
Corporation Boxes, Y	. .	. .	. . .	. . .	. . .	. . .	. . .	13	. .	. .
Corporation Caps	. .	. .	136	. . .	. . .	. . .	. . .	29	. .	. .
Wrought-iron Pipe, feet	361	. .	761	360	. . .	40	. . .	. . .	175	. .
Check Valves	. .	. .	. . .	1	. . .	1	. . .	. . .	. .	. .
Chapman Valves	. .	. .	4	4	. . .	. . .	. . .	. . .	. .	. .
Reducers	. .	1	3	. . .	. . .	2	1	6	. .	. .
Iron T	. .	. .	3	3	. . .	33	38	. . .	3	9
Iron Caps	. .	. .	. . .	. . .	. . .	. . .	. . .	. . .	. .	44
Iron L	. .	. .	. . .	3	. . .	20	6	. . .	6	. .
Iron Elbows	. .	. .	6	. . .	. . .	. . .	. . .	. . .	. .	. .
Church Stopcocks	. .	. .	. . .	. . .	. . .	. . .	. . .	348	. .	. .
Sidewalk Upright Tops	. .	. .	. . .	. .	. . .	. . .	. . .	161	. .	. .
Sidewalk Upright Bottoms	. .	. .	. . .	. . .	. . .	. . .	. . .	991	. .	. .

Hydrant and Gate Specials.

	Lowry Hydrants.	Post Hydrants.	B. Lowry Hydrants.	Boston Hydrants.	Boston Hydrants, old pattern.	Gates.
Barrels	28	7	7	13	65	....
Pots	226	43	4	82	51	.....
Pots with Valve	.....	12	.....	.....	....	.....
Pots with Caps	44	.....	.....	.....	.....	.....
Bottom Extensions	27	7	4	.....	39	.....
Wooden Boxes	88	50	5	5	31	33
Rubber Gaskets	136	154	191	28	24	.....
Frames	45	32	72	121	.....	512
Covers	59	26	81	318	.....	340
Bonnets	59	.....	.....	....	.....	.....
Wastes	30	.....	.....	75	.....	.....
Bolts	132	107	87	39	39	.....
Iron Boxes	.....	.....	.....	.....	.....	141
Top Extensions	2	.....	.....	.....	.....	.....
Screws	5	.....	.....	.....	.....	.....

Parts of Unfinished Hydrants and Gates.

	Lowry Hydrant.	Post Hydrant.	B Lowry Hydrant.	Boston Hydrant.	Gates.
Iron Barrels	9				
Iron Tops		87			56
Iron Bodies		10			
Iron Nuts		362		247	941
Iron Valves	128	43	57		10
Iron Washers	300	82	15		
Iron Rings		15			
Iron Guides		103		9	
Iron Stuffing Boxes					100
Iron Cap-Rings, lbs.		38			
Iron Caps		41		19	
Iron Cross-bar Caps	61				
Iron Cross-bar	34				
Iron Bolts	218				
Iron Sides					39
Composition Glands		8			
Composition Nuts and Screws	20	24	58		
Composition Rd. Head Screws		310			
Composition Nipples		3			
Composition Valve Seats			24		167
Composition Nuts	98		13		52
Composition Bolts	77				75
Composition Wastes	45				
Composition Rings					2
Composition Valves					20
Composition Screws					66
Composition Small Rings					91
Composition Small Collars					162
Composition Stuffing Boxes					21
Composition Collar Bolts	250				
Composition lbs. (unfinished)	1,218	867	71	30	4,029
Rubber Valves, lbs.	468	90	40	3	

Meters and Fittings.

COCHITUATE DEPARTMENT.	DIAMETER IN INCHES.						
	4	3	2	1½	1	¾	⅝
Worthington	...	3	9	7	17	5	3
Crown	1	2	3	...	12	2	10
Hersey	1	1	...	...	1	1	...
Nipples	...	...	9	50	105	68	...
Solder Nipples	...	...	2	2	...	...	...
Couplings, Female	...	...	4	...	...	...	250
Reducers	...	...	...	...	...	418	100
Stopcocks	...	...	...	1	7	4	...
Stopcocks for Iron Pipe	...	...	...	...	47	...	...
Check Valves	...	...	3	3	4	20	...
Connecting Pieces	...	1	7	8	...	...	...
Flanges	13	19	1	...	...	...	...
Fish Boxes	9	...	8	...	...	...	...
Worthington Clocks	1	3	19	1	14	23	...
B. W. W. Clocks	...	...	...	...	...	242	...
Crown Clocks	2	...	...	...	...	...	...
Crown Intermediate Gears	1	...	5	...	6	4	3
Tremont Clocks	...	...	...	...	...	113	...
Worthington Ratchets	...	...	...	...	4	2	...
CONDEMNED METERS.							
Tremont	...	...	...	...	28	260	...
Tremont Low Pressure	...	...	...	...	...	...	23
Worthington	...	...	...	...	...	...	77
Ball & Fitts	...	...	...	...	2	...	5
Desper	...	...	...	...	1	...	13
Thomson	...	...	...	...	2	...	3
Spooner	...	...	...	...	...	...	1

MISCELLANEOUS PROPERTY, COCHITUATE METER DEPARTMENT, ON HAND.

5 brass butts, 2 plumber's bags, 2 pairs rubber boots, 4 horse blankets, 12 lbs. sheet brass, 50 lbs. leather board, 2 pipe cutters, 1 wire cutter, 2 boxes candles, 1 crowbar, 34 meter frame covers, 24 Worthington meter caps, 16 Crown meter caps, 15 lbs copper, 2,662 lbs. old composition, 210 old couplings, 337 lbs. seal clamps, 838 lbs. old clocks, 1 pair callipers, 2 differential pulley-blocks, 1 iron crane, 1 iron derrick, 1 wood derrick, 83 iron dowells, 1 hand drill, 1 electric appliance, 2 plumber's furnaces, 22 meter frames, 1 oil feeder, 300 meter-clock glasses, 2 pressure gauges, 2 paving hammers, 2 sets harness, 2 horses, 2 iron horses, 93 feet rubber hose, 3 electric battery jars, 2 fifteen-feet ladders, 1 testing machine, 1 brass pump, 1 galvanized pump, 2 picks, 2 solder pots, 1 pung, 1 Worthington pattern, 1,425 lbs. old lead pipe, 2 wire plyers, 3 rammers, 50 lbs. rubber, 2 shovels, 1 die stock, 1 sleigh, 1 Fairbanks scales, 1 Howe scales, 1 plumber's gas stove, 1 iron saw, 88 lbs. solder, 1 four-inch chain tongs, 2 trowels, 2 water tanks, 1 vise, 1 eddy valve, 1 working wagon, 1 driving wagon, 2 monkey wrenches, 2 fork wrenches, 2 Stillson wrenches.

METERS AND FITTINGS, MYSTIC DEPARTMENT.

MYSTIC DEPARTMENT.	DIAMETER IN INCHES.							
	3	2	1½	1	¾	⅝	½	
Worthington	...	3	...	1	6	2	...	12
Crown	...	2	...	1	3	24	...	30
Hersey	1	...	...	2	...	...	...	3
Ball & Fitts	2	...	...	...	...	...	...	2
Couplings	...	18	33	...	110	206	10	377
Meter Nipples	...	22	...	...	...	50	...	72
Elbows (Iron)	...	3	8	...	...	...	...	11
Bushings	...	...	12	18	36	...	...	66
Reducers	...	...	...	...	8	8	...	16
Plugs (Iron)	...	...	...	6	...	...	...	6
Unions (Iron)	1	...	...	...	...	...	...	1
CONDEMNED METERS.								
Tremont	...	...	...	3	3	...	...	6
Worthington	...	...	...	...	1	22	...	23
Ball & Fitts	...	3	...	...	1	...	...	4

MISCELLANEOUS PROPERTY, MYSTIC METER DEPARTMENT, ON HAND.

1 pipe-cutter, 4 cold chisels, 2 crowbars, 1 clock, 1 set one to two-inch dies, 2 oil feeders, 1 plumber's furnace, 1 chain fall, 25 lantern globes, 1 hatchet, 1 set harness, 1 horse, 28 calking irons, 2 gasket irons, 4 lanterns, 4 levers, 4 diamond points, 4 picks, 1 die plate, 1 pung, 1 rammer, 1 shears, 1 steel square, 2 carpenter's saws, 1 scales, 2 shovels, 1 oil tank, 1 testing tank, 4 cutting tools, 3 monkey wrenches, 1 Stillson wrench, 2 wagons, 48 meter frames, 98 meter covers.

MISCELLANEOUS PROPERTY COCHITUATE DEPARTMENT, ON HAND.

3 lbs. oxalic acid, 2 lbs. muriatic acid, 6½ lbs. antimony, 6 anvils, 21 axes, 10 grub-axes, 2 axles, 1 axle set, 11 augurs, 1 cask albamural, 4 window-awnings, 67 bolts, 6 x $\frac{5}{16}$ 20 tire bolts, 4 x $\frac{5}{16}$; 275 bolts, 3½ x $\frac{5}{16}$; 55 bolts, 1¼ x ¼; 46 bolts, 6 x ⅜; 36 bolts, 3½ x ⅜; 405 bolts, 4 x ¾; 140 bolts, 3¼ x ¾; 212 bolts, 2 x $\frac{9}{16}$; 2,926 bolts, 3½ x ⅝; 188 bolts, 2¼ x $\frac{9}{16}$; 39 bolts, 1¼ x ⅜; 32 bolts, 5½ x 1; 105 bolts, 4¼ x ⅜; 742 bolts, 2½ x ¾; 349 bolts, 1½ x ¾; 2,717 bolts, 3¾ x ¾; 140 bolts, 1½ x ⅜; 30 bolts, 3 x ⅜; 47 bolts, 6¼ x ⅜; 72 carriage bolts, 4½ x ⅜; 36 carriage bolts, 2½ x ⅜; 90 carriage bolts, 7 x $\frac{3}{16}$; 20 carriage bolts, 3 x $\frac{5}{16}$; 92 carriage bolts, 2½ x ¼; 17 sweating bolts, 18 Lowry collar bolts, 3 two-inch stretching bolts, 2 one and one-half-inch stretching bolts, 4 one and one-quarter-inch stretching bolts, 6 one-inch stretching bolts, 10 three-quarter-inch stretching bolts, 14 five-eighth-inch stretching bolts, 6 rattan brooms, 99 corn brooms, 3 stable brooms, 11 whisk brooms, 6 pinch bars, 1 tamping bar, 50 crowbars, 3 boring bars, 166 hoisting screw bars, 8 kerosene barrels, 2 bushel baskets, 6 waste baskets, 1 charcoal basket, 2 bellows, 10 summer blankets, 40 street blankets, 36 stable blankets, 700 wooden paving blocks, 763 stone paving blocks, 8 block planes, 1 window brush, 6 dust brushes, 23 horse brushes, 20 paint brushes, 2 forty-horse-power boilers, 5 wire brushes, 23 water-trough brushes, 19 bench brushes, 4 open buggies, 4 covered buggies, 1 pair rubber boots, 1 pair stuffing boot, 4 interference boots, 189 lbs. borax, 4 "B. W. W." brands, 115 lbs. sheet brass, 3,927 old bricks, 3,146 paving bricks, 13 lbs. Bristol bricks, 102 fire bricks, 275 lbs. brimstone, 4 plumbers' bags, 2 feed bags, 40 gas burners, 94 lantern burners, 3 street roller boxes, 7 rosin boxes, 3 notice boxes, 8 Lowry collar boxes, 1 sponge box, 1 set ⅝ to 1-inch bits, 1 bit brace, 4 book-cases, 2 iron beds, 3 string bells, 1 tower bell, 3 bickern, 1 plumb bob, 6 brass butts, 30 lamp chimneys, 1 hand cart, 1 tip cart, 60 pieces carpenter's chalk, 4 lbs. red chalk, 12 one-half-gal. cans, 9 one-gal. cans, 15 five-gal. cans, 2 ten-gal. cans, 4 rope chains, 2 eight-inch iron chains, 6 six-inch iron chains, 6 twelve-inch iron chains, 6 sixteen-inch iron chains, 1 twenty-inch iron chain, 1 twenty-four-inch iron chain, 2 thirty-inch iron chains, 1 forty-eight-inch iron chain, 1 sixty-inch iron chain, 6 iron chains with hooks, 100 ft. polished chain, 2 lead cutters, 2 wire cutters, 2 bolt cutters, 11 office chairs, 2 high chairs, 7 swing office chairs, 2 counters, 1½ bundles clapboards, 8 wooden water-trough covers, 1 large pipe callipers, 5 callipers, 1 screw chest, 1 bbl. Portland cement, 1 can belting cement, 23 curry combs, 1 hay cutter, 13 hydrant chucks, 5 independent jaw chucks, 1 universal chuck, 8 small iron chucks, 3 iron chucks, 4 old chucks, 30 baskets charcoal, 11 carpenters' chisels, 136 cutting chisels, 28 lead chisels, 88 cold chisels, 1 turning chisel, 3,585 lbs. fire clay, 5 tons anthracite coal, ½ ton cumb coal, 9 float ball cocks, 1 pair centres, 20 extra lathe centres, 4 door clamps, 2 Howard clocks, 1 watchman's clock, 5 carriage canopies, 7

chair cushions, 2 sixteen-inch derricks, 1 twenty-inch derrick, 1 twenty-four-inch derrick, 1 thirty-inch derrick, 2 forty-inch derricks, 1 forty-eight-inch derrick, 1 Lowry screw dog, 1 stopcock nut dog, 29 lathe dogs, 17 clamp dogs, 1 set stone dogs, 1 radial drill, 1 two-foot eight-inch upright swing drill, 1 one-foot six-inch upright swing drill, 1 upright drill, 1 breast drill, 12 five-eighth-inch drills, 5 three-quarter-inch drills, 4 one-inch drills, 22 twist drills, 198 flat drills, 1 one-inch drill and tap, 1 one and one-quarter-inch drill and tap, 1 set dies, 4 doors, 2 x 6 x 7; 107 fountain dippers, 160 unfinished dippers, 15 long-handle dippers, 3 thawing dippers, 2 desks, 6 roll-top desks, 2 standing desks, 1 C. H. Brown & Co. 12-inch x 34-inch engine, 17 oil feeders, 12 "B. T." fullers, 6 "B. T." flatters, 1 portable furnace, 13 plumbers' furnaces, 8 lead furnaces, 3 lead furnace frames, 12 manure forks, 7 hay forks, 11 falls, 4 forges, 10 galvanized eighteen-inch funnels, 465 assorted files, 3 pressure gauges, 2 gasket gauges, 35 goose-necks, 600 tons gravel, 4 grindstones, 9 large grates, 10 small grates, 35 panes plain glass 19½ x 11, 15 panes ground glass 19 x 11, 2 brick hammers, 5 carpenter's hammers, 2 claw hammers, 16 paving hammers, 28 sledge hammers, 15 stone hammers, 14 hand hammers, 1 trip hammer, 7 hammer hooks, 6 blacksmith's hammers, 55 plumber's hammers, 31 driving hammers, 1 Pean hammer, 12 tons hay, 64 wooden horses, 24 horses, 7 axe handles, 511 pick handles, 6 sledge handles, 16 hatchets, 3 pieces suction hose, 1 hose-carriage, 6 pieces W P. hose, 299 feet ¾-inch hose, 8 feet 1-inch hose, 25 feet 1½-inch hose, 600 feet 2-inch linen hose, 64 feet 2½-inch hose, 17 hose couplings, 28 hose nozzles, 17 hose spanners, 9 hose racks, 100 feet 2½-inch leather hose, 290 chain hooks, 7 shave hooks, 1 pump hook, 2 pot hooks, 18 coat hooks, 18 team harnesses, 6 buggy harnesses, 2 tip-cart harnesses, 18 hobs for Fox lathe, 1 coal hod, 28 wooden heads, 6,752 lbs. ref. iron, 2,176 lbs. Norway iron, 6 six-inch jointers, 4 eight-inch jointers, 3 ten-inch jointers, 4 twelve-inch jointers, 1 sixteen-inch jointer, 2 twenty-inch jointers, 2 fountain jets, 1 one-horse jigger, 1 hand jigger, 23 lead kettles, 8 heating kettles, 7 paring knives, 10 chipping knives, 1 horse-shoeing kit, 3 large square lanterns, 94 lantern burners, 20 lantern burner tops, 315 white lantern globes, 24 red lantern globes, 317 lanterns, 5 forty-eight-inch pipe ladders, 23 small ladles, 15 large ladles, 2 lamps, 1 long lever, 1 short lever, 5 marking lines, 8 spirit levels, 5 lbs. black lead, 122 lbs. red lead, 30 lbs. sheet lead, 200 lbs. white lead, 2 engine lathes 18 inches x 8 feet, 1 engine lathe 18 inches x 6 feet, 1 engine lathe 24 inches x 14 feet, 1 engine lathe 27 inches x 12 feet, 1 speed lathe 16 inches x 5 feet, 1 Fox lathe 18 inches x 6 feet, 1 Fox lathe 14 inches x 5 feet, 13 lbs. sole leather, 27,682 feet kyanized lumber, 3,819 feet creosoted plank, 32,915 feet creosoted boards, 1,055 feet whitewood, 132 feet maple, 1,200 feet hard pine, 1,500 feet spruce sheeting, 400 feet 4 inch x 4 inch spruce, 150 feet 2-inch oak plank, 400 feet 3-inch oak plank, 11 eight-foot cedar posts, 60 feet hard pine, 8 five-eighth-inch thawing machines, 6 five-eighth-inch drilling machines, 2 one-inch drilling machines, 3 lawn-mowing machines, 1 tire upsetting machine, 1 bending machine, 3 six-inch pipe-cleaning machines, 2 twelve-inch pipe-cleaning machines, 1 horse-clipping machine, 1 tool-heading machine, 1 boring machine, 1 rolling machine, 1 bolt-heading machine, 3 stopcock testing machines, 4 floor mops, 2 four-quart measures, 9 bushels meal, 40 yards iron-wire netting, 285 lbs. 6d. nails, 10 lbs. 10d. nails, 100 lbs. 10d. cut nails, 390 lbs. 20d. nails, 200 lbs. 30d. nails, 725 lbs. 40d. wire nails, 200 lbs. 40d. cut nails, 25 lbs. upholstering nails, 4 pks. ¾ Clout nails, 117 lbs. horse-shoe nails, 12,400 1-hour notices, 10,000 2-hour notices, 33,250 3-hour notices, 18,655 5-hour notices, 12,500 7-hour notices, 6,000 12-hour notices, 415 bu. oats, 282 gal. kerosene oil, 75 gal. linseed oil, 22 gal. cylinder oil, 20 gal. neatsfoot oil, 2 oil-tanks, 20 Draper oilers, 35 lbs. tarred paper, 577 picks, 292 pick-eyes, 23 padlock-hasps, 24 padlocks, 1 oil-pan, 6

stable-pails, 228 water-pails, 1 (galvanized) ash-pail, 1 Edison force pump, 1 pump, 5 3-in. diaphragm pumps, 10 copper pumps, 6 force pumps, 1 Worthington feed pump, 1 Blake feed pump, 1 Harrison force pump, 2 brass pumps, 1 bbl. black paint, 175 lbs. No. 185 paint, 100 lbs. No. 158 paint, 75 lbs. No. 176 paint, 125 lbs, No. 164 paint, 25 lbs. No. 150 paint, 100 lbs. tinted Newport paint, 70 ft. drain-pipe, 45 ft. 4-in. soil-pipe, 3 pieces suction-pipe, 19 pipe-tongs, 48 lbs. ¾ block-tin pipe, 473 lbs. $\frac{7}{32}$ block-tin pipe, 29 ft. 4-in. stove-pipe, 7 ft. 5-in. stove-pipe, 4 pipe cutters, 2 sets planes, 1 shoe plane, 1 planer 5 feet x 22 inches x 16 inches, 35 diamond points, 13 bull points, 2 six-inch puddling heads, 4 eight-inch puddling heads, 1 ten-inch puddling head, 4 twelve-inch puddling heads, 1 sixteen-inch pudding head, 15 pungs, 4 pks. Horse Medicine powder, ½ gal. polish, 5 lbs. putty, 1 proving press, 2 letter presses, 11 small B. pulleys, 2 iron pulleys, 3 chain hoist pulleys, 3 belt punches, 6 surface plates, 7 four-inch wood plugs, 1 six-inch wood plug, 1 eight-inch wood plug, 1 twelve-inch plug, 1 plumb and line, 5 soldering pots, 2 water pots, 5 small lead pots, 4 large lead pots, 435 leather packings 11 lbs. potash, 6 iron rakes, 7 wooden rakes, 440 lantern rests, 55 rammers, 27 rammer heads, 1 hand roller, 2 breast rollers, 18 iron rollers, 21 wooden rollers, 7 spades, 32 surcingles, 1 sled, 3 bottles salve, 1 iron sheriff, 28 signs (No Smoking), 40 signs (No Passing), 55 hydrant signs, 6 post squeezers, 10 Lowry squeezers, 2 stopcock squeezers, 60 lbs. solder, 7 solder irons, 85 lbs. wiping solder, 3 sets iron stamps, 3 gallons shellac, 1 sink-trap, 40 window sashes, 1 swage block, 3 bush. shorts, 1 horse sling, 23 papers iron tacks, 30 lbs. tallow, 3 measuring tapes, 78 sheets tin, 130 lbs. pig tin, 4 tool boxes, 6 tool houses, 1 torch, 1 box tripoli, 13 trowels, 6 gals. turpentine, 2 large granite tablets, 6 glass tubes, ⅜ x 12 inches, 185 brass tubes, 1 ice-water tank, 3 tables, 3 gas tongs, 6 twelve-inch pipe tongs, 54 blacksmith's tongs, 2 clay tubs, 1 target, 1 wheel traveller, 6 stone troughs, 2 two-inch W. P. valves, 16 gals. black varnish, 25 vises, 21 wagons, 9 Sw. wrenches, 10 Stillson wrenches, 241 monkey wrenches, 126 post hydrant wrenches, 25 gate wrenches, 17 service wrenches, 35 Boston hydrant wrenches, 31 Lowry hydrant wrenches, 4 large service-pipe wrenches, 20 air-cock wrenches, 32 wharf-hydrant wrenches, 3 Lowry collar wrenches, 3 twenty-four-inch stopcock wrenches, 1 forty-eight-inch gate wrench, 39 large fork wrenches, 21 small fork wrenches, 13 socket wrenches, 340 lbs. 3-inch rope, 63 lbs. 2-inch rope, 1 six-inch strap rope, 1 twelve-inch strap rope, 14 rachets, 7 woollen robes, 7 fur robes, 4 scythe rifles, 3½ lbs. copper rivets, 2 lbs. round head rivets, 7 plumber's rasps, 10 lbs. sheet rubber, 29 rubber pump valves, 4 lathe rests, 27 tap reamers, 12 fluter reamers, ½ lb. rawhide lacing, 125 lbs. grinding sand, 2 tons sand, 8 cross-cut saws, 14 hand-saws, 14 wood-saws, 7 circular saws, 3 metal saws, 12 hack saws, 1 pair shears, 1 grass shears, 2 six-inch pipe shears, 9 twelve-inch pipe shears, 3 small scales, 4 platform scales, 2 gravel screens, 3 screw-drivers, 100 lbs. 5 x ½ inch spikes, 9 hand spikes, 100 one-half-inch screws, 66 five-eighths-inch screws, 6 gross ¾-inch screws, 4 gross 1-inch screws, 3 gross 1¼-inch screws, 1 gross 2-inch screws, 1 gross 2¼-inch screws, 1 gross 2½-inch screws, 3 gross 1½-inch screws, 351 lag screws, 70 hoisting screws, 8 jack screws, 4 scythes, 3 scythe snaths, 15 scythe stones, 124 lead sets, 346 round-point shovels, 9 long-handle shovels, 44 square-point shovels, 4 snow shovels, 1 coal shovel, 6 lbs. common soap, 55 lbs. castile soap, 1 spoke shave, 2 draw shaves, 2 oil stoves, 6 sleighs, 1 sickle, 7 large stoves, 6 tool-house stoves, 1 office stove, 7 squares, 6,248 lbs. steel, ½ bale straw, 36 stone chisels, 49 stone points, 37 stone drills, 10 stone wedges, 251 lbs. cotton waste, 74 iron wedges, 585 wooden wedges, 8 stone-cutter's wedges, 7 wedges, 15 gross wicking, 25 torch wicks, 281 lantern wicks, 10 wheelbarrows, 15 lbs. iron wire, 10 lbs. brass wire, 25 lbs. barbed wire, 23 cords wood, 1 pair pipe wheels, 1 sixteen-

inch hand wheel, 1 twelve-inch hand wheel, 3 emery wheels, 3 drilling-machine wheels, 3 tool-house wheels, 20 buggy washers, 4 storm windows 5 feet 10 inches x 2 feet 8 inches.

PROPERTY AT CHESTNUT-HILL PUMPING-STATION.

1 anvil, 3 brushes, 5 brooms, 1 set engine brasses, 2 sets plain grate bars, 2 iron bedsteads, 1 bureau, 2 pair blankets, 150 assorted joint bolts, 1 set bits, 1 bit stock, 1 storage battery, 1 steam blower (for flues), 1 set hoisting blocks, 500 tons Cumberland coal, 2 clocks, 5 chairs, 10 cold chisels, 1 set carpenter's chisels, 1 fifteen-inch chuck (4 jaws), 1 No. 3 Little Giant chuck, 1 set planer centres, 2 set crotches, 1 oil cabinet, 2 coal cars, 1 crane, 18 T. S. twist $\frac{1}{4}$ to $1\frac{1}{4}$-inch drills, 30 S. S. twist $\frac{1}{16}$ to 1-inch drills, 1 set $\frac{1}{4}$ to 1-inch dies, 1 twenty-four-inch upright drill, 24 lathe dogs, 1 grindstone dresser, 1 emery wheel dresser, 1 breast drill, one 300 light "Standard Vermont" dynamo, 2 desks, 2 Gaskill engines, 1 Payne 7 x 10-inch engine, 1 double 5 x 12 hoisting engine, 1 emery wheel, 150 assorted pipe fittings, 2 rope falls, 2 chain 2 falls, doz. assorted files, 1 forge, 1 set carpenters' gouges, 1 Jones' peerless recording gauge, 2 mercury gauges, 2 float gauges, 1 electric gauge, 1 grindstone, 11 eighteen-inch manhole gaskets, 24 sixteen x ten-inch manhole gaskets, 24 six x four handhole gaskets, 10 banister grates, 150 ft. woven hose, 50 feet 2-inch rubber hose, 100 feet $\frac{3}{4}$-inch rubber hose, 1 hatchet, 4 Thompson indicators, 1 Hopkinson indicator, 2 soldering irons, 1 step ladder, 1 thirty-foot ladder, 1 twenty-foot ladder, 2 sets bed linen, 2 Ward arc lamps, 225 Sawyer Man 16 C. P. lamps, 70 Sawyer Man 32 C. P. lamps, 19 square complete lamps, 6 hand lamps, 1 spirit level, 1 sixteen-inch x 8-feet engine lathe, 14 lbs. white lead, 10 lbs. red lead, 2 mattresses, 1 No. 13 Turk's water motor, 2 sets furnace mouth-pieces, 1 three-quarter-inch hose nozzle, 1 set nickel oilers, 1 one-gal. copper-feeder oiler, 2 one-quart copper-feeder oilers, 2 gal. boiled linseed oil, 10 gal. cylinder oil, 30 gal. machine oil, 8 gal. kerosene oil, 3 three x two x three Worthington pumps, 1 four and one-half x two and three-quarters x four Worthington pump, 1 eight x five x ten Knowles pump, 1 five x three x eight air pump, 4 planes, 1 twenty-two-inch x five-foot Wheeler planer, 1 die plate, 1 elevated platform, 1 watering pot, 2 two-inch hosepipes, 400 feet (various sizes) wrought-iron pipe, 30 lbs. sheet packing, 75 lbs. steam packing, 1 set parallel pieces, 2 ratchets, 20 fluted $\frac{5}{16}$ to $1\frac{1}{4}$-inch reamers, 3 scoop shovels, 2 platform scales, 1 small scale, 4 chain slings, 3 rope slings, 3 lbs. solder, 40 lbs. steel, 4 saws, 1 hack saw, 1 two-foot square, 1 black walnut table, 2 two and one-half-inch pipe tongs, 1 set $\frac{1}{8}$ to $2\frac{1}{2}$ pipe tools, 1 set lathe tools, 1 set planer tools, 1 set blacksmith's tools, 10 fire tools, 1 set $\frac{1}{8}$ to $1\frac{1}{4}$ pipe taps, 1 set $\frac{1}{4}$ to $1\frac{1}{2}$ hand taps, 1 set $\frac{1}{4}$ to 1-inch die plate taps, 1 two-inch tap, 16 assorted sizes taps, 1 kerosene oil tank, 2 Nason traps, 1 hoisting tackle, 4 hot water thermometers, 3 vises, 1 planer vise, 21 assorted sizes steam valves, 1,000 pump valves, 8 rubber air valves, 3 coils brass wire, 4 tap wrenches, 5 Stillson wrenches, 10 screw wrenches, 13 socket wrenches, 29 fork wrenches, 150 lbs. cotton waste, 4 large wheelbarrows, 1 small wheelbarrow.

PROPERTY AT EAST BOSTON PUMPING-STATION.

1 axe, 1 pick-axe, 1 iron bedstead and bedclothes, 2 twenty-five horse-power boilers and fittings, 1 extra set grate bars, 3 brooms, 1 dust-brush, 1 window-brush, 1 clock, 2 chairs, 1 clothes closet, 6 cold chisels, 1 oil cabinet, 1 pt. can, 1 qt. can, 1 one-half gal. can, 1 oiling can, 1 black walnut desk, 6 files, 2 mercury gauges, 3 water gauges, 3 steam gauges, 1 "Edison" recording gauge, 1 heater,

100 ft. ⅝. rubber hose, 1 electric indicator, 2 ladders (one 11 ft., one 16 ft.), 1 step ladder, 24 gals. cylinder oil, 30 gals. spindle oil, 20 lbs. steam packing, 2 Worthington pumps, compound H. P. and fittings; 1 Worthington H. P. pump, 12 x 7 x 10; 1 Blake feed pump, 3 x 2 x 5; 2 pails, 1 hand-saw, 1 sledge, 1 shovel, 1 set fire tools, 1 iron wheelbarrow, 2 gate wrenches, 6 fork wrenches, 2 socket wrenches, 3 Stillson wrenches, 3 monkey wrenches, 10 lbs. cotton waste.

PROPERTY AT WEST ROXBURY PUMPING-STATION.

1 axe, 2 lbs. oxalic acid, 2 brooms, 1 window-brush, 8 glass oil-cups, 3 wooden chairs, 3 cold chisels, 1 flue-cleaner, 3 oil-cans, 2 tons anthracite coal, 1 set grates, 1 hoe, 1 mop-handle, 1 hammer, 50 ft. ¾-inch rubber hose, 6 gauge glasses, 1 step-ladder, 2 ladders, 6 lanterns, 1 lawn-mower, 2 oil-measures, 5 gals. kerosene oil, 16 gals. cylinder oil, 36 gals. spindle oil, 8 rubber gauge packing, 22 rubber packings, 5 ft. ⅜-inch flax packings, 2 Knowles pumps, 2 copper pans, 2 pails, 3 lbs. green paint, 1 garden-rake, 1 lawn-rake, 11 pump-springs, 1 saw, 5 fire tools, 1 qt. turpentine, 2 tunnels, 1 socket-wrench, 2 gland wrenches, 7 iron wrenches, 1 pump-valve wrench, 2 monkey wrenches, 2 Stillson wrenches, 1 grate wrench, 1 stopcock wrench, 1 iron wheelbarrow.

PROPERTY OF CITY OF BOSTON ON MYSTIC DIVISION.

REAL ESTATE.

Charlestown District. — About 13,050 square feet of land, corner Tufts and Medford streets, Ward 3, with brick shop, brick stable, and two wooden buildings thereon.

Winchester. — At Mystic Sewerage Station, about 6¼ acres of land, with two wooden buildings and stable thereon; at Bacon's Bridge, about 3½ acres; at Wedge Pond, near Main street, about ½ acre.

Medford. — Near Tuft's College, about 10½ acres of land, on which is built the reservoir; near Mystic Lake, a one-family wooden dwelling, two wooden engine houses, and two sheds, built on leased land.

Arlington. — On Mystic street, about $5\frac{47}{100}$ acres of land; on New Mystic street, about 32,450 square feet.

Somerville. — About 12 acres of land, with brick engine-house, brick and stone coal shed, wooden stable, two wooden sheds, and a two-family wooden dwelling thereon.

PERSONAL PROPERTY.

Statement of Pipes, Specials, etc., on hand.

	Diameter.									
	36 inch.	30 inch.	24 inch.	20 inch.	16 inch.	12 inch.	10 inch.	8 inch.	6 inch.	4 inch.	3 inch.
Pipes	2	19	16	3	34	18	1	1	15	10	. .
Y Branches	. .	1	. .	. .	. .	. .	. .	. .	. .	. .	. .
Syphons	. .	. .	2	. .	. .	. .	. .	. .	. .	. .	. .
Three Way Branches	. .	1	2	. .	33	. .	1	2	. .	. .	. .
Quarter Turns	. .	. .	. .	. .	9	9	. .	. .	4	. .	. .
Eighth Turns	. .	7	. .	. .	4	8	. .	. .	3	. .	. .
Sixteenth Turns	. .	2	. .	. .	5	. .	. .	. .	. .	. .	. .
Offsetts	. .	. .	. .	. .	. .	. .	2	. .	6	1	. .
Reducers	. .	. .	2	1	3	21	4	14	14	6	. .
Sleeves	. .	6	4	6	. .	1	19	17	24	14	11
Plugs	. .	. .	. .	. .	3	17	25	3	5	5	. .
Clamp Sleeves	. .	2	3	3	. .	. .	. .	. .	. .	. .	. .

Charlestown Yard.

Gates. — 2 ten-inch gates, 2 eight-inch gates, 9 six-inch gates, 24 frames and covers, and 25 covers.

Hydrants. — 18 Lowry hydrant bbls., 4 frames, 5 round covers, 2 Lowry frames, tops and covers, 2 Boston Lowry bbls., and 5 Boston Lowry frames and covers.

Service Pipe Materials. — 255 lbs. 1-inch lead pipe, 1,470 lbs. ¾-inch lead pipe, 1,395 lbs. ⅝-inch lead pipe, 111 lbs. ½-inch lead pipe, 120 five-eighths-inch stopcocks, 5 one-inch corporation cocks, 25 three-quarter-inch corporation cocks, 24 five-eighths-inch corporation cocks, 108 lbs. solder, and 30 service boxes.

Paints, Oils, etc. — 1 bbl. kerosene, 3 bbls. cylinder and 20 gallons linseed oils, 2 gallons turpentine, 20 lbs. red lead, 30 lbs. mixed paints, and 1 can putty.

Other Stock, Tools, etc. — 5 tool chests, 7 derricks, 1 Fairbanks scales, 2 tapping machines, 1 drilling machine, 1 sheet-iron roller, 1 bending machine, 2 diaphragm pumps, 15 hand pumps, 2 force pumps, 30 round-pointed shovels, 85 square-pointed shovels, 5 wooden snow shovels, 31 coal scoops, 18 new hoisting-blocks, assorted sizes, 1 portable forge, 26 iron rakes, 11 hoes, 9 crowbars, 10 rammers, 5 lead ladles, 5 lead pots, 2 coils manilla rope, 24 tubular lanterns, 4 bushel baskets, 4 blocks and falls complete, 5 doz. pick handles, 4 bbls. lamp chimneys, 19 bundles lamp wicks, 3 trench furnaces, 5 hydrant chucks; 7 Stillson, 10 Coe's, 4 pipe, 16 gate, 10 monkey, 9 service, and 5 Lowry wrenches; 4 rachets, 2 die stocks; 20 dies, assorted sizes; 4 pipe cutters, 3 pairs bench shears, 1 pipe and 2 bench vises, 3 chain tongs, 2 railroad saws, 2 rachet bit-stocks, 12 cold and 15 cutting chisels, 17 calking hammers, 34 calking sets, 15 wedges, 3 yarn irons, 7 diamond points, 7 paving

and 7 sledge hammers, 30 pairs rubber boots, 4 stoves, 17,100 lbs. pig lead, 270 lbs. jute packing, 6 sheets zinc, 3 office desks with accompanying articles, 4 chairs, and a few patterns.

At Stable. — 3 horses, 3 buggies, 1 express wagon, 1 pung, 2 sleighs, 2 express harnesses, 2 driving harnesses, 5 halters, 6 horse blankets, 2 shovels, 1 rake, and 2 tons hay.

Pumping Station.

1 Worthington pump of 8,000,000 gallons pumping capacity per day, 2 Worthington pumps of 5,000,000 gallons pumping capacity per day, 2 feed pumps, 6 new steel boilers, 1 independent air pump and condenser, 1 combined dynamo and water motor, 1 water motor and lathe, 1 spirit level, 1 grindstone, 1 portable forge, 6 striking and 3 claw hammers, 4 hatchets, 14 stone hammers, 2 ladders, 2 ice hatchets, 2 ice hooks, 6 ice chisels, 23 hay rakes, 14 pond rakes, 1 cross-cut saw, 1 hand saw, 1 wood saw, 6 spades, 9 scoop shovels, 1 small hammer, 3 gate wrenches, 3 hedge cutters, 6 lengths 2½-inch rubber hose, 6 blocks and falls complete, 2 leading blocks, 2 derrick guys, 24 brooms, 12 net handles, 5 gravel screens, 1 brace and bit, 2 bushel baskets, 5 water pails, 1 stove, 3 manure hooks, 18 hoes, 21 rakes, 1 shackle bar, 6 feed bags, 2 screens, 2 wheelbarrows, 16 wooden rollers, 1 pair large pipe wheels, 2 lawn mowers, 6 kegs nails, 2 cold chisels, 1 chain harness, 1 steel square, 1 car harness, 2 ladders, 1 desk, 3 chairs, 2 iron vises, about 800 tons coal, and 1 Fairbanks' platform scales.

Somerville Stable.

4 horses, 3 robes, 7 stable and 8 street blankets, 3 double manure wagons, 1 hay rigging, 2 double tip carts, 2 single carts, 1 express wagon, 1 buggy, 3 double harnesses, 1 express harness, 1 driving harness, 1 double and 2 single sleds, 1 sleigh, 1 pung, 1 mowing-machine, 1 horse-rake, 2 sets car harnesses, 1 stove, 3 shovels, 2 rakes, and about 25 tons hay.

Reservoir.

1 brass water-gauge, 4 shovels, 1 axe, 1 pick, 3 lanterns, 2 lamps, 1 stove, 2 chairs, 1 clock, 1 table, 2 wrenches, 2 sets blocks and falls, 1 chain fall, 1 hoe and 1 saw.

Mystic Sewerage Station.

1 Hoadley engine, 4 pumps, 4 large tanks, 3 vats, 1 Fairbanks' scales, 1 pipe cutter, 1 die stock and set of dies, 1 hammer, 1 pair snippers, 1 spanner, 4 cold chisels, 1 stove, 2 desks, 1 table, 3 chairs, 2 pairs chain tongs, 1 belt clamps, 12 dip nets, 65 brass-mounted sewer poles, 20 iron-mounted sewer poles, 8 picks, 23 shovels, 7 hoes, 1 spirit level, 4 rakes, 3 forks, 3 bars, 1 hay fork, 5 wheelbarrows, ½ bbl. black and ½ bbl. kerosene oils; 3 Stilson, 5 Coe's, 2 T, 1 straight, 2 fork, and five cross wrenches.

Mystic Stable.

2 horses, 2 tip carts, 1 express wagon, 1 pung, 2 sleds, 2 sets harness, 2 wheelbarrows, 3 lamps, 2 shovels, 1 hoe, 2 stable blankets, and 5 tons hay.

Lake.

2 Hoadley engines, 1 portable pump, 12 flat-bottomed boats, 2 keel boats, 6 pairs oars, 1 belt clamps, 25 feet 1½-inch rubber hose, 25 feet 1-inch rubber hose, 2 sets blocks; 1 bbl. kerosene, ¾ bbl. lard, and ¾ bbl. cylinder oils: 12 kerosene lamps, 4 oil cans, 6 monkey wrenches, 2 belt awls, 1 screw-driver, 1 square, 3 lbs. elastic packing, 5 ladders, 2 grappling irons, 1 water pan, 2 hoes, 6 rakes, 6 scrapers, 1 ice tongs, 5 ice chisels, 2 buck saws, 1 hand saw, and 1 pair scales.

LIST OF CITY PROPERTY ON THE WESTERN DIVISION, 1890.

LAKE COCHITUATE.

2 axes, 1 anvil, 1 buggy, 1 boat, 2 border knives, 1 brush scythe, 3 brooms, 1 B. W. W. stamp, 2 pr. block and falls, 1 carryall, 1 cart, 1 coal shovel, 6 chains, 3 chairs, 3 die plates and taps, 2 desks, 2 drawing boards, 1 dust pan, 1 dust brush, 1 dust broom, 2 engines, 50 h. p. "Andrews' pat.," 1 express wagon, 1 feather duster, 3 dung forks, 2 fur robes, 1 grub hoe, 1 garden fork, 1 grind stone, 2 gravel screens, 1 horse, 4 harnesses, 1 house pump, 1 horizontal double acting suction and force pump; 4 hand saws, 5 hoes, 1 hammer, 1 iron vice, 2 iron-bars, 8 iron rakes, 35 iron cranks, 3 kegs of nails, 3 planes, 1 pung, 2 picks, 2 sixteen-inch pumps, Andrews' pat.; 35 posts, 8 percolating boxes, 1 portable forge, quantity of old lumber, 4 rain gauges, 2 pr. rubber boots, 8 receiving tanks, 1 street blanket, 1 stable blanket, 2 sponges, 1 sledge, 1 square, 72 stop planks, 1 Fairbanks scale, 2 small scales, 10 shovels, 3 snow shovels, 4 long-handle shovels, 3 sickles, 2 spades, quantity of old steel and iron, 2 scufflers, 2 tin sprinklers, 2 scythes, 50 feet of smoke-stack, 50 feet of 3-inch steam pipe, 100 feet of 1¼-inch steam pipe, 100 feet of 1¾-inch steam pipe, 1 stove, 1 spirit level, 1 bunch tar rope, 9 thermometers, 2 woollen robes, 5 water pails, 1 eighteen-inch m. wrench, 1 two-inch s. wrench, lot of old window sash, 30 wheelbarrows, 1 pr. oars, 1 pr. row locks, 5 white-wash brushes, 6 paint brushes, 1 hay knife, 1 road roller (stone), 1 range, 1 raft, 1 table, 2 stop-plank hooks, 1 mirror, 1 marble slab.

SO. FRAMINGHAM OFFICE.

2 desks, 1 table, 1 chest of drawers, 1 clock, 1 mirror, 1 letter press, 2 thermometers, 2 lamps, 1 stove and funnel, 1 coal hod, 1 dust pan and brush, 1 feather duster, 1 wash bowl and faucet, 1 pr. shears, 6 chairs, 2 inkstands, 1 tumbler, 1 drawing table, 1 bookcase, 1 barometer, 1 current meter.

TOOL-HOUSE AT SO. FRAMINGHAM OFFICE.

2 axes, 2 augurs, 1 brush, 3 bits, 1 pr. clippers, 1 crow bar, 4 cleavers, 3 tons coal, 1 grub hoe, 2 ice chisels, 1 lawn mower, 1 mallet, 1 oiler, 1 oil can, 1 plane, 1 rake, 100 feet rubber hose, 2 snow shovels, 2 square shovels, 1 c. c. saw, 1 buck saw, 1 steel square, 1 tool chest, 1 sickle.

FARM-POND GATE HOUSE.

1 boat, 1 coal hod, 1 ton coal, 20 rails, 2 pr. car wheels, 1 dust pan, 1 dust brush, 1 fork, 1 gate wrench, 1 hammer, 4 iron rods, 2 ladders, 3 lanterns, 1 monkey wrench, 1 pr. oars, 2 pails, 1 rake, 2 prs. rubber

boots, 58 stop planks, 1 stove with fixtures, 2 shovels, 1 scraper, 1 scythe, 1 screw driver, 1 screen broom, 1 table, 1 wheelbarrow, 2 ice chisels.

STOREHOUSE AT SO. FRAMINGHAM.

1 box of blacksmith's tools, 1 bell, 1 claw bar, 1 desk, 4 drawers, 6 drawing boards, 2 frost bars, 6 cast-iron floor plates, 3 drag forks, 1 grindstone, 2 mortar hoes, 2 sets of hoisting-gear, 1 hay cutter, 4 stone-breakers, 2 wooden horses, 1 striking hammer, 5 stone hammers, 2 hay knives, 2 iron strap hoisters, 4 iron beams, 4 iron standards, lot of iron scraps, 1 iron sink, 1 ice saw, 2 ladders, 8 old lanterns, 1 naphtha stove, 1 oven, lot of different sized pipe, 1 paper rack, 2 pieces steam pipe, 2 old copper pumps, 1 piece of 3-inch pipe with brass strainer, 2 sheet-iron pans, 97 pick handles, 37 old picks, lot of steam pipe, 1 piece lead pipe, 1 iron rod, lot of old rubber boots, 24 new shovels, 1 stump puller, 2 gravel screens, 1 stove, 123 old shovels, 6 screen drums, 33 square shovels, 2 coils of screen, 1 iron safe, 1 B. W. W. sign, 1 hoisting-tub, 1 iron tamper, 6 table leaves, 6 thirty feet weir plank, 10 twenty feet weir plank, 1 coil of wire, 1 old water tank, 4 blacksmith forge, 1 boiler, 1 box of blacksmith's tools, 1 steam shovel, 1 aqueduct cleaning machine.

INLET CHAMBER FARM POND.

26 stop planks, 5 stop planks for siphon culvert under section A; 1 broom, 1 pail, 1 boat hook, 1 differential pulley, 1 wooden stop plank gate.

SLUICE IN FARM POND DYKE.

8 stop planks, 2 sets stop plank hooks.

NEW SOUTH DAM.

4 stop planks.

TEMPORARY DAM.

40 flash boards, 29 stop planks, 1 bulkhead, 2 gates for measuring the flow, 4 stop-plank hooks.

BASIN 1.

1 axe, 2 boat hooks, 1 brand, 1 broom, 1 dust brush, 1 feather duster, 1 long brush, 1 stove brush, 1 scrubbing brush, 1 bushel basket, coal shovel, 41 flash boards, 50 flash-board pins, 2 gate handles, 4 set stop-plank hooks, 1 hammer, 1 kettle, 2 ladders, 1 lantern, 1 monkey wrench, 2 oilers, 2 oil cans, 110 stop planks, 1 poker, 1 dust pan, 1 pail, 1 twelve-foot rod, 1 river gauge, 1 ratchet, 8 pair rubber boots, 1 set steps, 1 stove with pipe, 2 shovels, 1 sponge, 1 tumbler, 1 boat, 1 pair oars.

BASIN 2.

1 axe, 1 boat, 1 long brush, 1 scrubbing brush, 1 stove brush, 1 dust brush, 1 coal hod, 1 duster, 42 flash boards, 3 figured rods, 2 gate handles, 28 bags fertilizer, 1 grass hook, 8 stop-plank hooks, 1 hammer, 1 ice chisel, 1 iron rake, 1 kettle, 1 ladder, 1 lantern, 2 monkey wrenches, 1 qt. naphtha, 2 oilers, 1 pair oars, 2 pails, 1 box polish, 1 ratchet, 2 one-gal. oil cans, 94 stop planks, 1 stove, 1 set of steps, 1 sponge, 1 fire shovel, 2 square shovels, 1 round shovel, 1 snow shovel, 1 scuffle hoe, 1 buck saw, 1 common saw, 1 tumbler.

BASIN 3.

1 axe, 1 boat, 4 brushes, 1 coal hod, 1 duster, 1 twelve-ft. rod, 2 boat hooks, 6 stop-plank hooks, 2 gate handles, 1 hammer, 3 ice chisels, 1 kettle, 1 ladder, 1 lantern, 2 one-gal. oil cans, 2 oilers, 1 pail, 1 ratchet, 1 iron rake, 1 scuffle rake, 1 stove, 1 set of steps, 120 stop planks, 1 sponge, 2 shovels, 1 thermometer, 1 wrench, 2 tumblers.

BASIN 4.

1 boat, 3 bars, 1 bush scythe, 1 border knife, 1 bitstock, 1 bushel basket, 11 pair car wheels, 5 chairs, 1 clock, 1 desk, 1 lot fish plates, 5 frogs, 1 hay fork, 1 dung fork, 1 set flash boards, 2 grindstones, 1 point gauge, 1 hand cart, 2 pieces of hose, 1 nail hammer, 1 sledge hammer, 1 inkstand, 5 ladders, 2 oil cans, 1 pair oars, 1 piece 12-inch pipe, 3 pieces 48-inch pipe, 1183 posts, 5 picks, 2 paving rammers, 1 lot R.R. spikes, 4 R.R. switches, 4 rakes, 590 R.R. rails, 1 lot R.R. chairs, 8 shovels, 1 spade, 1 spirit level, 2 saws, 1 scythe and snath, 16 telegraph poles, 144 sleepers, 4 brass caps, 1 copper float, 2 iron rods, 3 lanterns, 4 levers, 1 monkey wrench, 1 oiler, 3 one-half gal. oil cans, 3 pike poles, 2 ten-inch poles, 1 pair rubber boots, 1 piece rubber hose, 1 steel tape, 1 stove, 1 straight edge.

TOOL HOUSE AND YARD AT BULLARD PLACE.

6 auger bits, 1 anvil, 1 border knife, 6 bits (bridle), 1 brace, 2 B. W. W. brands, 2 slope boards, 3 bill hooks, 2 block and falls, 3 odd blocks, 8 stone chains, 13 crow bars, 1 chain and fall, 4 corking tools, 1 coal hod, 1 carpenter's bench, 1 piece canvas, 20 drills, 1 Edison pump and 2 extra gaskets, 180 fence posts, 4 manure forks, 6 hay forks, 1 fire shovel, lot of old fence rails, 1 grindstone, 16 grub axes, 1 paver's hammer, 1 hay knife, 4 drill hammers, 12 hay caps, 4 wooden horses, lot of old iron, 3 jack screws, 1 jack plane, 1 reflector, 2 ladders, 3 lanterns, 3 wooden malls, 1 melting pot, 1 mallet, 120 lbs. of nails, oil stone, 30 gallons of paint, 3 pails, 26 picks, 67 pick handles, 2 pokers, 10 gallons of kerosene oil, 4 pieces 48-inch pipe and 3 sleeves, lot of old 3-inch plank, lot of short plank, 1 wooden roller, 2 rain scales, 10 iron rakes, 6 wooden rakes, 1 paver's rammer, 2 sickles, 1 rough table, 3 stone hammers, 3 gravel screens, 6 long shovels, 7 short shovels, 17 square shovels, 6 scythes complete, 3 old scythe blades, 1 steel square, 1 spirit level, 1 saw set, 4 hand saws, 3 cross-cut saws, 1 snow shovel, 1 stove, 1 stone drag, 7 rough benches, 1 tree trimmer, 2 tunnels, 1 lot of old timber, 10 old window sash, 2 well pulleys, 1 well bucket, 6 wrenches, 6 wheelbarrows.

BARN AT BULLARD PLACE.

6 horse blankets, 2 horse brushes, 2 brooms, 3 ton bedding, 1 rubber blanket, 2 buggies, 2 surcingles, 2 combs, 1 express wagon, 2 forks, 1 hay wagon, 2 express harness, 1 light harness, 2 cart harness, 14 ton of hay, 1 wagon-jack, 2 hoes, 15 bushel oats, 1 pung, 2 robes, 2 rain gauges, 2 sleighs, 1 cart, 2 wrenches, 3 horses.

COURSE BROOK WASTE WEIR.

1 iron rake, 1 oil can, 1 wheelbarrow, 1 old wheelbarrow, 1 long-handle shovel, 1 grub hoe, 1 scythe, 1 wooden rake, 1 water pail, 1 piece of rope, 1 long-handle ice chisel, 2 old side brushes for cleaning-machine; 12 stop-planks, 4-inch x 8-inch x 9 feet 8 inches long; 8 stop planks, 4 feet 6 inches long; 4 stop plank hooks, machinery and dam used for turning water into Course Brook.

BACON'S BROOK WASTE WEIR.

10 yards old canvass, 2 wooden horses, 1 wooden stand for making brushes, 1 iron bar, 1 hand drill, 1 brush wrench, 1 iron pot, 2 lbs. resin, 1 form for bottom of aqueduct, 1 dam for aqueduct, 2 old brooms; 12 stop planks, 4-inch x 8-inch x 9 feet 8 inches long; 4 stop planks, 4 feet 6 inches long, 1 old stove, 4 stop-plank hooks, 1 wheelbarrow, 3 grub hoes, 1 pick, 1 shovel, 1 spade, 1 long-handle shovel, 1 long-handle spade, 1 grass hook, 1 water pail, 1 oil can, 1 iron rake, 1 old brush, 2 side brushes and 9 lbs. rattan for brushes for cleaning-machine, 50 lbs. nails.

WEST SIPHON CHAMBER.

1 stove, 1 coal hod and poker, 1 coal box, 500 lbs. coal, 1 twelve-foot ladder, 1 closet, 1 water gauge; 52 stop planks, 4-inch x 8-inch x 6 feet long, 1 aqueduct cleaning machine and 4 brushes, 2 screen jacks, 4 hoisting tackles, 100 feet of rope, 1 hard-pine frame for lowering and raising cleaning machine, 31 pairs rubber boots, 1 axe, 1 saw, 1 oil can, 1 wrench, 1 cold chisel, 1 rasp, half-gallon black paint, half-box candles, 1 mat, 2 striking-hammers, 1 barrel used on dam of machine; 1 piece of rope, 20 feet long, 400 feet old boards covering floor.

ROSEMARY BROOK BLOW-OFF.

2 wrenches.

FULLER'S BROOK WASTE WEIR.

12 stop-planks, 4-inch x 8-inch x 9 feet 8 inches long; 8 stop-planks, 4 feet 6 inches long; 4 stop-plank hooks, 1 shovel, 1 long-handle ice chisel, 6 lbs. nails, half-box candles.

TOOL SHED, NEAR FULLER'S WASTE WEIR.

1 sixteen-foot ladder, 2 twelve-foot ladders, 2 wheelbarrows, 2 scythes, 2 water pails, 2 pair pulley blocks, 17 old rattan brooms, 1 cement box, 4 wooden rammers, 1 iron-faced rammer, 1 long-handle spade, 1 spade, 1 iron rake, 1 long-handle ice chisel, 1 cold chisel, 2 hand drills, 1 wooden rake; 2 iron ladders, 8 feet long; 30 reflectors, 3 chains, 1 ton of old scrap iron; 7 pieces hard pine, 6-inch x 8-inch x 8 feet long; 200 old brick, lot of hard-pine wedges.

EAST SIPHON CHAMBER.

6 corn brooms, 1 pickaxe, 1 grub axe, 1 ox chain, 1 pair rubber boots, 1 sixteen-foot ladder, 1 pail, 1 bush scythe, 52 stop planks, 2 hooks; 33 pieces hard pine, 6-inch x 8-inch x 9 feet long.

CHARLES RIVER BRIDGE.

2 wheelbarrows, 1 shovel, 1 rake, 10 reflectors, 1 ten-foot ladder, 7 pairs rubber boots, 7 old corn brooms, 1 rattan broom, 24 candles.

CLARK'S WASTE WEIR.

20 stop planks, 4 stop-plank hooks, 1 grub axe, 1 bar, 3 rattan brooms, 3 reflectors, 2 corn brooms.

SHANTY AT TUNNEL.

1 ladder, sixteen feet long; 2 ladders, twelve feet long; 2 wheelbarrows, 2 scythes, 2 water pails, 2 pair pulley blocks, 17 rattan brooms, 17 corn brooms, 5 rammers, 1 spade, 1 rake, 1 ice chisel, 1 cold chisel, 2 hand-drills, 1 wooden rake, 30 reflectors.

EFFLUENT GATE–HOUSE.

1 stove and coal hod, 1 settee, 1 coal box, 2 tons of coal, hydraulic apparatus, 5 pictures, 1 water gauge, 1 thermometer, 1 broom, 2 brushes, 1 feather duster, 1 dust pan and brush, 2 lanterns, 1 scrubbing brush, 1 sponge, 1 window brush, 2 wire scoops, 1 mat, 1 rattan broom, 1 twelve-foot ladder, 1 step ladder, 3 oil cans, 1 floor brush, 3 wrenches, 2 gate wrenches, 1 fountain nozzle, 4 stop-plank hooks, 100 feet gas pipe, 2 four-foot glass tubes, 2 long ice chisels, 33 stop planks, 1 gallon vinegar, 1 gallon kerosene oil, 2 quarts sperm oil, 1 tunnel, 2 pails, 25 feet rubber hose, 1 shovel, 1 grub hoe, 1 pick, 25 feet galvanized iron, chain and lock.

TERMINAL CHAMBER.

1 stove and coal hod, 1 dust pan and brush, 1 coal box and 1,600 pounds coal, 1 twenty-foot ladder, 1 step ladder, 1 feather duster, 1 mat, 2 stop-plank hooks, 25 stop planks, 6 screens, 1 wire scoop, 2 lanterns, 3 oil cans, 1 pair rubber boots, 1 iron rake, 1 large iron boat.

INTERMEDIATE GATE-HOUSE.

18 stop planks, 1 wrench, 2 hooks.

INFLUENT GATE-HOUSE.

26 long stop planks for aqueduct, 14 stop planks for gate house, 4 hooks, 1 extra brass screw.

TOOL HOUSE.

1 oil cabinet, 1 large tin box, 6 large paint brushes, 16 pairs rubber boots, 6 frost wedges, 1 fifteen-inch pulley block, 4 iron sheaves, 2 ladders, 5 oil cups, 4 oil glasses, 1 flue cleaner, 2 hose wrenches, 1 small set steam pipe, ½ barrel old lamps and chimneys, 175 feet small iron chain, 1 leather belt 9 inches wide, lot of old rope, 1 copper elbow, 8 gallons lard oil, 4 gallons sperm oil, 48 gallons kerosene, 100 pounds cotton waste, ½ box Babbit's soap, 42 boxes candles, ¼ gross matches, 20 candlesticks, 2 dozen rattan brooms, 17 water pails, 22 pick handles, 5 bushel baskets, 3 stable pails, 4 striking hammers, 5 grass hooks, 50 pounds oakum, 1 dozen scrubbing brushes, 5 stove brushes, 1 dozen flat paint brushes, 1 water tank, 2 screen doors, 6 pairs brass butts, 6 hand drills, 4 dozen shims and wedges, 25 pounds white lead, 1 dozen sledge handles, 3 sledge hammers, 3 axes, 16 hay forks, 2 border knives, 2 paving hammers, 1 pruning saw, 5 paving rammers, 1 copper tamping rod, 3 manure forks, 10 dippers, 1 hay knife, 10 scufflers, 1 cross-cut saw, 8 locks, 4 feed baskets, 2 hay ropes, 20 pounds axle grease, 4 spading forks, 4 plow points, 2 painters jacks, 1 jack screw, 40 gallons grey paint, 1 gallon varnish, sand paper, 1 heavy chain fall, 1 copper

pump, 3 doz. hay caps, 10 mason's trowels, 1 sand pump, 40 grain bags, 16 round paint brushes, 5 white-wash brushes, 2 lbs. sponges, 1 lawn mower, 10 tin reflectors, 5 floor brushes, 6 dust brushes, 25 feet rubber hose, 6 kerosene lamps, 16 scythe whetters, 1 bunch window cord, 1 alcohol paint burner, 1 pr. sheep shears, 3 gals. turpentine, 8 spades, 3 small hand hammers, 2 diaphragm pumps, three strainers, 161 picks, 10 grub hoes, 26 iron bars, 15 chains, 20 round-point shovels, 12 square-point spades, 12 snow shovels, 58 hay rakes, 10 iron rakes, 6 snaths, 3 doz. corn brooms, 12 oil jackets, 2 stoves, 2 bush scythes and snaths, 1 hose carriage, and 300 feet of hose.

STABLE.

8 horses, 2 sets double harnesses, 2 heavy wagon harnesses, 2 express harnesses, 2 driving harnesses, 4 cart harnesses, 7 pair hames, 12 halters, 6 surcingles, 1 stove, 1 coal hod, 3 qts. neatsfoot oil, 2 gals. sperm oil, 5 curry brushes and combs, 1 set of lead chains, 1 hay cutter, 100 lbs. bran, 20 bu. oats, 2 bu. cracked corn, 6 bu. salt, 25 tons hay, 1 broom, 1 open buggy, 1 covered buggy, 1 carryall, 1 sleigh, 1 pung, 2 whips, 1 feather duster, 1 jack, 1 water pot, 25 bu. carrots, 3 boats, 1 fire extinguisher, 2 shovels, 1 looking glass, 2 chairs, 3 pigs, 3 oil lanterns, 1 harness pan, 12 dump car wheels and castings, 35 feet 2-inch lead pipe, 2 pr. strap iron hinges, 6 feet long; 100 lbs. old copper wire, 800 lbs. old wire screens, 1 lot of old scrap iron, 1 manhole grate, 1 evaporation tank.

REPAIR SHOPS.

1 forge, 1 anvil, 1 set of blacksmith's tools, 1 vise, 1 set of stock dies and taps, 1 ratchet drill, 2 pair pipe tongs, 2 solid die plates, 2 cold chisels, 2 soldering irons, 500 lbs. scrap iron, 1 rivet cutter, 1 upright drill, 75 lbs. steel, 150 lbs. Norway iron, 1 assortment of rivets and bolts, 1½ doz. files, 1,200 lbs. Cumberland coal, 5 saws, 10 planes, 12 chisels, 2 try squares, 2 steel squares, 1 bevel, 3 screw drivers, 1 spoke shave, 4 augers, 2 levels, 1 clock, 2 gauges, 1 draw knife, 1 stove and coal hod, 800 lbs. coal, 23 kegs assorted nails, 1 oil can, 1 ladder hook, 2 hammers, 1 axe, 1 hatchet, 1 adze, 1 boring machine and bitts, 1 bitt stock and bitts, 1 saw set, sand paper, 1 self-registering rain gauge, 6 hand screws.

YARD.

1 jack, 1 ladder, 1,200 feet plank walk, 1 two-horse cart, 1 scraper, 1 harrow, 1 hay rake, 1 horse mowing machine, 1 horse hay tedder, 2 hay wagons, 2 express wagons, 1 two-horse wagon, 4 dump carts, 2 watering carts, 2 two-horse sleds, 1 two-horse truck, 1 road roller, 4 roller wheels, 2 moving wheels, 2 hand carts, 2 hand rollers, 2 snow plows, 2 sets lead bars, 3 plows, 2 stone drags, 8 wheelbarrows, 25 granite bounds, 4 gravel screens, 2 grindstones, 300 feet spruce boards, 800 feet spruce plank, 2 bundles laths, 1 set Fairbank's hay scales, 3 gravel screen frames, 25 brick hods, 8 tons coal, 1 tripod derrick, 1 boom derrick and rigging, 1 movable jaw, 2 check pieces, and 1 jaw plate for crusher, 1,500 bricks, 1 old boiler, 4 earthen pipe, 3 feet long 1 foot diameter, 8 earthern pipe, 3 feet long, 3 inches diameter, 5 earthen pipe, 3 feet long, 1½ feet diameter, 350 stone tile, 18 feet service pipe, and 2 elbows, 2½ tons old railroad iron, 24 settees, 2 rain gauges, 1 self-recording rain gauge, 2 thermometers, 1 self-recording thermometer.

BROOKLINE RESERVOIR.

1 writing desk, 2 keys, 1 book, 1 pen rack, 1 pitcher, 1 tumbler, 1 spittoon, 1 lantern, 1 stove, 34 feet of pipe, 1 coal hod, 1 fire shovel, 1 poker, 1 stove brush, 1 dust brush, 1 dust pan, 1 feather duster, 1 corn broom, 1 rattan broom, 2 scrubbing brushes, 2 settees, 1 chair, 1 floor mat, 1 water gauge, 4 gate keys, 1 wrench, 2 wheels, 1 cover, 1 air-cock wrench, 1 frame for gates, 2 chamber wheels, 1 crank, 89 stop planks, 8 screens for water, 4 notices, 2 thermometers, 4 iron rods, 2 screen doors, 6 window screens, 3 gas fixtures, 1 pair rubber boots, 1 scythe, 3 shovels, 1 pick, 1 hoe, 1 sickle, 1 scuffler, 1 spade, 2 water pails, 1 sponge, 1 bushel basket, 1 border knife, 1 sprinkler, 1 axe, 1 cold chisel, 3 ladders, 1 step-ladder, 1 crowbar, 4 padlocks, 197 earthen pipe, 3 feet long, 1 foot diameter; 25 stone posts, 5 feet long.

FISHER HILL GATE–HOUSE.

1 writing desk, 1 book, 1 pen stand, 1 lamp, 1 lantern, 1 stove, 1 poker, 1 piece of zinc, 1 coal hod, 1 dust pan, 1 brush, 1 duster, 1 broom, 2 gauges, 1 gate wrench, 1 window brush, 1 shovel, 81 stop planks, 2 iron rods, 3 chairs, 1 water pail, 1 mat, 2 oil cans, 3 signs, 1 key, 1 scoop net, 1 hammer, 1 grindstone, 4 keys for 48-inch connection, 1 wrench, 2 covers.

PROPERTY OF CITY OF BOSTON, AT BASIN 5, ASHLAND.

There are two farm houses and two stables, one new office, one blacksmith, storehouse and carpenter shop combined, one dining-room, one dormitory and outhouse; 1 weir, 1 high gravel screen, with 3 size screens, 1 water-supply plant, (comprising 1 Worthington duplex pumping engine, 1 wooden tank sixteen feet x eight feet, 1 three-inch check valve, 2 three-inch stop and waste valves, 3 three-inch gate valves, 1 three-inch expansion joint, 16 feet three-inch five-ply hose, 1 strainer for suction pipe, 15 feet of suction pipe, 600 feet three-inch delivery pipe, 500 feet three-inch service pipe, and 1600 feet of piping, three inches and two and one-half and two inches, with thirty-four places for hose connections); 9 engine houses, 1 small tool house, 1 powder magazine, 2 portable sanitaries, 1 Flume, 1 double runner pung; 4 transits, 3 levels, 4 levelling rods, 4 sighting rods, 3 steel tapes, 5 cloth tapes, 4 plumb bobs, 2 steel straight edges, 2 planimeters and engineers' stationery, squares and triangles, and weights. 3 pieces of canvas, 4 sign boards (Private Way).

Axes, Scythes, Mattocks, Hatchets and Adzes. — 2 hay knives, 3 hay snaths, 3 brush scythes, 3 hay scythes, 3 brush snaths, 3 whetstones, 18 axes, 3 adzes, 1 carpenter's bench axe, 15 axe handles, 39 mattocks, 4 bench axes.

Augers. — 8 crank augers, 1 boring machine (and two bits), 1 frame auger, one and one-quarter inch, and 1 set Jennings' bits and brace.

Belting. — 82 feet eight-inch rubber belting, 91 feet six-inch rubber belting, 33 feet four-inch rubber belting, 68 feet eight-inch leather belting.

Barrows. — 28 iron wheelbarrows, 6 new wooden canal barrows and 52 old wooden barrows.

Blacksmith's Fixtures. — 1 portable forge, 1 thirty-six-inch bellow, new, (one bellow broken), 2 anvils, 1 sow anvil, 1 set swages, one and one-half inch, one and one-eighth inch, one inch, seven-eighths of an inch and five-eighths of an inch, 5 bottom fullers one and one-half inch, one and one-eighth inch, one inch, seven-eighths of an inch, and five-eighths of an inch, 4 top fullers, one and one-eighth inch, one

inch, seven-eighths of an inch and five-eighths of an inch, 1 flatter. 1 cold and 1 hot chisel, 1 set heading tools (8 pieces), 2 vises (old), 1 tuyere iron, (and 1 useless), 10 pounds borax, 1 pinion wheel for forge, 15 pairs tongs.

Brick. — About 3,800 bricks.

Boots. — 50 pair serviceable boots (35 hip, 15 short), and 2 other kinds of boots.

Carpenters' Sundries. — 1 jointer, 1 jack plane, 1 steel square, 3 framing chisels, 1 draw shave, 1 level, six hundred feet one-inch finished pine boards, five hundred feet sheating, one hundred and fifty feet oak.

Cement. — 1578 Hoffman & Newark, and 247 Portland cement.

Cement Tester and Fixtures. — 1 cement tester with following articles: 12 pans for saturating samples, 12 moulds for brickets, 3 small scales, 5 assorted sieves (20–100), 1 graduated glass, 1 set steel figures, 1 one-quarter-pound weight, 1 one-pound weight, 1 bitstock and bit, 1 scoop, 1 basket, 3 bags inspector's bungs, 2 wooden racks.

Concrete Mixer. — 2 concrete mixers, 1 useless mixer, 10 diamond paddles, 8 square paddles, 17 bolts for diamond paddles, 25 bolts for square paddles, 1 set of cement paddles for cement only, one-half box for mixer.

Coal. — 5 tons stove coal, and 20 tons Cumberland coal.

Crowbars. — 79 crowbars, and two tamping bars.

Crusher. — 1 fifteen by nine crusher, 1 journal bearing, six toggles, 2 sets jaws, 1 set cheeks, 1 set steel bearings, 4 ten-inch toggles, 4 ten and one-half inch toggles, 3 eleven-inch toggles, 5 twelve-inch toggles, 5 thirteen-inch toggles.

Chain. — 925 feet, various lengths and sizes.

Derrick and Fixtures. — 1 windlass, 1 foot block, 4 twelve-inch single blocks, 1 sixteen-inch single, 10 twelve-inch double blocks, 2 six-inch single blocks, 15 pounds oakum, 7 tackles (6 one hundred and twenty feet long and 1 seventy-five feet long), 2 derricks, standing (1 thirty feet high, fair, 1 twenty-five feet, useless), 1 large derrick, unmounted, 7 Cram derricks and fixtures on hire.

Drags. — 3 three-foot drags for stone.

Drill. — 1 tripod steam drill (Little Giant, No. 2), 50 feet steam hose, 1 sand pump.

Explosives. — 1,650 feet tape fuse, 1 battery wire, 1 battery, 1 box (75 pounds) forcite, 5 boxes dynamite caps, 550 small caps.

Engines and Boilers. — 1 Hawes & Hersey engine and boiler (five-horse power), 1 portable Hoadley, on wheels, No. 1408 (twenty-five horse power), 4 Edward Kendall & Sons' engines, Nos. 2107, 2119, 2126, 2125 (fifteen-horse power each), 2 Edward Kendall & Sons' engines, Nos. 2127, 2128 (ten-horse power) (these engines are double cylinder hoisters), 1 Ames iron-work engine and boiler, No. 10227 (thirty-horse power) 1 Payne engine and boiler (twelve-horse power), 1 Russ & Hittinger engine and boiler, hoister, No. 367 (sixteen-horse power), 1 stuffing box for Payne engine, 1 new economizer boiler, No. 817.

Hammers. — 3 four and one-half pound, hand-drill hammers, 23 striking hammers, 17 hand-drill hammers, 3 iron bracing hammers, 33 stone-breaking hammers, 12 wooden beetles, 3 iron mauls, 1 dozen driving caps, 6 bracing maul handles, 18 striking-hammer handles, 15 bench axe handles, 30 drill-hammer handles, 8 maul handles, 35 stone-breaking hammer handles.

Hoes. — 36 grub hoes, 13 mortar hoes, and 2 mortar beds.

Hose, Common. — 18 fifty-feet lengths, one and one-half-inch wired hose, 5 fifty-feet lengths of hose, 3 nozzles with sprinklers.

Hose, Suction. — 10 feet 4-inch suction hose with flange, 3 strainers, 3 spanners, 5 ten-foot lengths of three-inch suction hose with couplings, 2 twelve-foot lengths of three-inch suction hose wth couplings, 3 sixteen-foot lengths of three-inch suction hose with couplings, 1 seventeen-foot

length of three-inch suction hose with couplings (wired), 2 eighteen-foot lengths of six-inch suction hose with couplings.

Iron. — 17 feet, one-quarter inch round, 129 feet, one-half inch round, 22 feet, five-eighths inch round, 104 feet, seven-eighths inch round, 19 feet, three-quarters inch round, 25 feet, one inch round, 1 foot, one and one-eighth inch round, 35 feet, one and one-quarter inch round, 73 feet. two by one-half flat, 29 feet, one and three-quarters by one-quarter flat, 3 feet, one and seven-eighths by one and one-quarter flat, 1 foot, seven-eighths by one-quarter flat, 70 feet, three-quarters-inch half-round iron, 5 feet two-inch square iron, 20 feet one and one-quarter inch square iron, or about 1,166 pounds of serviceable iron in all.

Steel. — 140 feet one and one-half-inch octagon (jumper drills), 112 feet one and one-quarter-inch octagon steel (jumpers), 82 feet three-quarter-inch octagon (jumper drills), 31 feet one and one-quarter-inch octagon, 5 feet one and one-eighth-inch octagon, 24 feet one and one-half-inch octagon, 64 feet three-quarter-inch octagon, 1 foot one-inch octagon steel, 50 feet three-quarter-inch square steel, 1 foot one-half inch square, 40 feet one inch square steel, 1 foot one and one-half inch square, 44 feet one and one-quarter-inch square steel, or about 2,018 pounds serviceable steel in all.

Lanterns and Globes. — 30 lights of glass for square lanterns, 6 square lanterns No. 8, 20 lanterns, 28 white lantern globes, and 20 red lantern globes.

Machinist Fixtures. — 1 two and one-half-inch globe valve, 6 one and one-half-inch globe valves, 9 one and one-quarter-inch globe valves, 11 one-inch globe valves, 7 three-quarter inch, 5 one-half inch, 2 three-eighth inch, 2 one-quarter inch, 3 three-quarter-inch gate valves, 3 one-inch check valves, 3 one-quarter inch, 3 one-half inch, 2 three-quarter inch, 2 three-eight inch, 1 die stock (small), one-eighth, one inch with dies, taps, and bushings (6 dies, 6 taps), 1 die stock (large) one and one-quarter, 2 inches, 2 taps, 3 dies, and bushing, 10 twelve-inch monkey wrenches, 1 fourteen-inch monkey wrench, 1 six-inch monkey wrench, 1 eighteen-inch monkey wrench, 1 twenty-four-inch monkey wrench, 1 six-inch Stillson wrench, 1 twelve-inch Stillson wrench, 1 fourteen-inch Stillson wrench, 2 pairs blacksmith's and engineer's tongs, 2 pairs No. 3 chain tongs, 3 pairs No. 3 Brown's tongs, 1 large and 1 small pipe cutter, 1 Packer ratchet, 1 Brest drill, 1 set of twist drills (7 pieces), 1 Hack saw and two blades, 17 squirt cans, 12 oil cans (snout), 1 gallon can, 1 two-quart can, 4 quart cans, 4 square feet rubber sheet packing, 13 feet one inch square Tuck's packing (water), 20 feet half-round steam packing, 1 package Selden's packing, 2 one-inch steam whistles, 1 Ellis lubricator, 2 square feet one-sixteenth rubber sheet packing, 20 pounds best Babbitt and ladle, 2 angle irons, ½ roll of No. 70 emery cloth, 25 pounds waste, 2 hand lamps, 1½ pounds copper rivets and burrs, 12 eight-inch maple rollers, 8 six-inch maple rollers, 1 two and one-half-inch tube cleaner, ¼ side of lace leather, 1 ball of lamp wicking, ½ dozen miscellaneous water glasses.

Nails and Bolts. — 3 kegs 40d wire nails, 1 keg 40d cut, 1 of 30d cut, 1½ of 20d cut, 1 of 10d cut, 2 of 70d cut, 60 twelve-inch spikes, ¼ barrel bolts, four and one-half by five-eighths, ½ keg bolts half-inch by two and one-half-inch, 250 coach screws four-inch by one-half inch, and 300 pounds miscellaneous bolts and nuts.

Oil Clothing. — 32 oil suits (old, 33 coats, 28 pants).

Oils and Tallow. — ¼ barrel tallow, 2 barrels cylinder oil, 2 barrels lard oil, 2 barrels lubricating oil, 2 barrels centennial oil.

Paints and Oils. — 30 pounds white lead, 20 pounds putty, 3 four-inch flat brushes, 1 gallon linseed oil, 1 pound lamp black, 1 barrel standard paint, 1 barrel asphaltum paint.

Ploughs. — 3 ploughs (2 common and 1 Hildreth's), and 1 No. 4 plough point.

Pumps and Fixtures. — 1 No. 2 spout pump, 3 six-inch Edwards' centrifugal, 1 four-inch Edwards' centrifugal, 1 submerged pump (with 520 pounds shafting, 7 boxes, 6 collars, 2 couplings), 2 Blake steam pumps, 1 Blake wrecking pump No. 5175, 3 No. 3 Edson diaphragm pumps, 2 Douglass hand pumps, 1 Worthington duplex, 2 rubber diaphragms for Edson pump, 2 four-inch foot valves, 2 six-inch foot valves.

Plugs and Feathers. — 25 pounds of plugs and feathers.

Pails. — 26 water pails (old), 15 other pails for cement and mortar, ½ dozen new cup dippers, ½ dozen old dippers.

Picks and Handles. — 250 pick handles (48 of which are new), 150 serviceable picks.

Piping and Fixtures. — *Couplings.* — 7 three-inch, 2 two and one-half inch, 6 two-inch, 15 one and one-half inch, 10 one and one-quarter inch, 8 one-inch, 7 three-quarter inch, 2 three-eighth inch, 1 one-inch, right and left coupling, 3 three-inch brass hose and pipe coupling, 1 one-half inch to three-eight inch reducing coupling, 2 one and one-half inch by one-inch hose and pipe coupling brass. *Unions.* — 7 one and one-half inch, 8 one and one-quarter inch, 4 one-inch, 5 three-quarter inch, 5 one-half inch, 1 three-eighths inch, 3 one-quarter inch, 1 one and one-quarter-inch brass union, 1 three-quarter-inch brass union. *Close nipples.* — 1 eight-inch, 1 three-inch, 2 two-inch, 13 one and one-half inch, 11 one and one-quarter inch, 9 one-inch, 3 three-quarter inch, 1 one-half inch, 3 one-quarter inch; short nipples: 2 two and one-half inch, 2 one and one-quarter inch, 2 one-inch, 5 three-quarter inch, 2 one-half inch, 2 three-eighth inch, 1 one-quarter inch. *Elbows.* — 1 eight-inch, 3 three-inch, 1 five-inch, 3 two and one-half inch, 11 one and one-half inch, 19 one and one-quarter inch, 9 three-quarter inch, 15 one-inch, 2 two-inch, 13 one-half inch, 7 three-eighth inch, 5 one-quarter inch, 1 one-half inch by three-eighth inch reducing elbow, 4 forty-five's elbows. *Reducing bushings.* — 1 eighth-inch by six-inch, 2 one and one-half inch by one inch, 1 one and one-half inch by three-quarter inch, 2 one and one-half inch by one-quarter inch, 4 one and one-half inch by one and one-quarter inch, 8 one inch by three-quarter inch, 6 three-quarter inch by one-half inch. 1 three-quarter inch by three-eighth inch, 2 one-half inch by three-eighth inch, 2 one-half inch by three-eighth inch, 3 three-eighth inch by one-quarter inch, 1 one-quarter inch by one-eighth inch, 9 one and one-quarter inch by one inch, 2 three-quarter inch hose and pipe bushing, 1 one and one-quarter inch by three-quarter inch reducing bushing. *Tees.* — 1 three-inch, 10 one and one-half inch, 7 one and one-quarter inch, 16 one-inch, 9 three-quarter inch, 3 one-half inch, 4 one-quarter inch, 3 two inch by two inch by one and one-quarter inch, 1 three inch by three inch by one and one-half inch, 1 three-quarter inch by three-quarter inch by one-quarter inch, 2 three-eighth inch tees. *Plugs.* — 1 two-inch, 4 one and one-half-inch, 1 one and one-quarter inch, 2 one-inch, 9 three-quarter-inch, 3 one-half-inch, 1 three-eighth-inch brass plug. *Caps.* — 4 one-inch, 1 three-inch, 1 one and one-half-inch. *Pipe.* — 90 feet of three-inch steam pipe, 54 feet of two-inch, 790 feet of one and one-half-inch, 385 feet of one and one-quarter-inch, 12 feet of two and one-half-inch, 45 feet of one-inch, 194 feet of three-quarter-inch, 18 feet of one-half-inch, 16 feet of three-eighth-inch, 10 feet of one-quarter-inch, 12 feet of one-eighth-inch. 3 four-inch pipe flanges, 4 two-inch iron flange unions. *Piping.* — 7 pieces four-inch galvanized suction pipe, 38 feet for Edwards' pump, 18 pieces six-inch galvanized suction pipe, 81 feet for Edwards' pump.

Rope. — 19 chain ropes (six feet chain on each rope), 10 tag ropes, 1434 feet of two and one-half-inch, 344 feet of two-inch, 1275 feet of three and one-half-inch, 54 feet of three-inch, and 1 coil about 700 feet five-inch rope.

Rollers. — 3 street rollers (iron) (two horse).

Saws. — 3 cross-cut saws, 6 hand saws, 1 compass saw, 2 saw sets.

Shovels. — 12 round points long-handled, 433 round-pointed short-handled (new and old), 83 square-pointed short-handled (new and old).

Sand Screens and Gravel Screens. — 2 new sand screens three-quarter-inch mesh, 18 sand and gravel screens.

Tubs. — 20 three-quarter-yard steel buckets or tubs, 4 one-half-yard steel tubs, 4 wooden tubs (two large and two small), and 2 iron tubs.

Wire Netting. — 15 feet of one-half-inch mesh, 3 feet 2 inches of three-eighth-inch mesh wire netting.

Office and Fixtures. — *Old Office*: 1 table, 1 settee, 1 Rochester lamp, 1 swivel office chair, 5 arm chairs (only two good), 1 old desk. In new office are the following: 11 wire window screens, 3 wire door screens, 12 arm chairs, 6 stools, 8 awnings, 3 engineer's tables and 1 chest, 2 cabinets for plans, 1 roll for paper, 2 student lamps, 3 Rochester lamps, 4 waste-paper baskets, 2 cuspidors, 1 water pitcher, 1 pan, 1 brush, 3 wooden spittoons, 2 roll-top desks (new), 1 oak counter desk, 2 flat desks (old), 2 safes (one a combination new, and one an old one), 9 window curtains, 3 desk chairs, 3 rubber mats, 1 pulp pail, basin and tin dipper, 1 kettle (hot water), 1 large clock, 1 small clock, 1 copying press, 1 water brush and mug, 1 shoe brush and dauber, 1 stove brush, 1 hand brush, 1 wire soap dish, 2 brush brooms, 1 stamp, 2 double inkstands, 4 ink wells, 1 mucilage bottle, and engineer's books, and a number of time books and account books and stationery.

Stoves and Fixtures. — 1 No. 3 cylinder stove, with 1 shovel, poker, three-gallon boiler, 1 chair, 1 Magee parlor, with 1 hod and 2 pokers, 1 globe heater (old), 1 No. 23 Devonshire range (useless), 1 "Railroad King" No. 14, with pipe, elbows and tainter, 2 Bowdoins' with pipe and elbows, 1 hod, 1 shovel, and 3 pokers.

Stable and Fixtures. — 15 tons hay, 3 wooden rakes, 1 iron rake, 3 pitchforks, 3 horses (two bays and one black), 1 Concord buggy, 1 Goddard buggy, 1 express wagon, 1 cover for express wagon, 1 black fur robe, 1 plush robe, 4 street blankets, 3 stable blankets, 3 surcingles, 3 halters, 1 express harness, 2 carriage harnesses, 1 wagon jack, 1 rubber blanket, 1 duster, 1 currycomb, 1 dandy brush, 2 chamois, 2 sponges, 2 ox yokes with 4 bow pins, 2 ox chains, 2 ox goads, 3 linen sheets, 1 brush.

Sundries. — 1 large and 1 small grindstone, 2 jack screws, 7 corn brooms, 3 stove-pipe elbows, 10 sticks of solder, 6 clothes-line pulleys, 2 stencils (Basin 5, B. W. W.), 1 whiffletree, 2 rolls tarred paper, 5 boxes of railroad spikes and miscellaneous iron, 1 roll copper wire, 1½ dozen of stable broom handles, 1 dozen of new stable brooms, 2 old stable brooms, 1 table and settee, 17 yale locks, 8 hogsheads, 3 branding irons, 1 mason trowel, 6 tool boxes, 25 railroad rails, 75 railroad sleepers, 2 railroad stone dump carts, 5 surprise whistles, 2 two-inch foot rules, 6 goggles, 2 dozen carpenter's pencils, 1 mason's line, 1 tape line, 1 old tape line, 2 mortar beds.

Lumber. — 400,000 feet in two-inch, and timber sizes (in and out of trench), capable of being used again for future needs.

CIVIL ORGANIZATION OF THE WATER-WORKS, FROM THEIR COMMENCEMENT TO JANUARY 1, 1891.

WATER COMMISSIONERS.

NATHAN HALE,‡ JAMES F. BALDWIN,‡ THOMAS B. CURTIS. From May 4, 1846, to January 4, 1850.

ENGINEERS FOR CONSTRUCTION.

JOHN B. JERVIS, of New York, Consulting Engineer. From May, 1846, to November, 1848.‡

E. S. CHESBROUGH, Chief Engineer of the Western Division. From May, 1846, to January 4, 1850.‡

WILLIAM S. WHITWELL, Chief Engineer of the Eastern Division. From May, 1846, to January 4, 1850.

CITY ENGINEERS HAVING CHARGE OF THE WORKS.

E. S. CHESBROUGH, Engineer. From November 18, 1850, to October 1, 1855.‡

GEORGE H. BAILEY, Assistant Engineer. From January 27, 1851, to July 19, 1852.

H. S. MCKEAN, Assistant Engineer. From July 19, 1852, to October 1, 1855.‡

JAMES SLADE, Engineer. From October 1, 1855, to April 1, 1863.‡

N. HENRY CRAFTS, Assistant Engineer. From October 1, 1855, to April 1, 1863.

N. HENRY CRAFTS, City Engineer. From April 1, 1863, to November 25, 1872.

THOMAS W. DAVIS, Assistant Engineer. From April 1, 1863, to December 8, 1866.

HENRY M. WIGHTMAN, Resident Engineer at C. H. Reservoir. From February 14, 1866, to November, 1870.‡

A. FTELEY, Resident Engineer on construction of Sudbury-river works. From May 10, 1873, to April 7, 1880.

DESMOND FITZGERALD, Resident Engineer on Additional Supply. From February 20, 1889, to present time.

JOSEPH P. DAVIS, City Engineer. From Nov. 25, 1872, to March 20, 1880.

HENRY M. WIGHTMAN, City Engineer. From April 5, 1880, to April 3, 1885.‡

WILLIAM JACKSON, City Engineer. From April 21, 1885, to present time.

After January 4, 1850, Messrs. E. S. CHESBROUGH, W. S. WHITWELL, and J. AVERY RICHARDS were elected a Water Board, subject to the direction of a Joint Standing Committee of the City Council, by an ordinance passed December 31, 1849, which was limited to keep in force one year; and in 1851 the Cochituate Water Board was established.

COCHITUATE WATER BOARD.

Presidents of the Board.

THOMAS WETMORE, elected in 1851, and resigned April 7, 1856‡ . . . . . Five years.

JOHN H. WILKINS, elected in 1856, and resigned June 5, 1860‡ . . . . . Four years.

EBENEZER JOHNSON, elected in 1860, term expired April 3, 1865‡ . . . . . Five years.
OTIS NORCROSS, elected in 1865, and resigned January 15, 1867‡ . . . . . One year and nine months.
JOHN H. THORNDIKE, elected in 1867, term expired April 6, 1868‡ . . . . . One year and three months.
NATHANIEL J. BRADLEE, elected April 6, 1868, and resigned January 4, 1871‡ . . . . Two years and nine months.
CHARLES H. ALLEN, elected January 4, 1871, to May 4, 1873 . . . . . Two years and four months.
JOHN A. HAVEN, elected May 4, 1873, to Dec. 17, 1874‡ . . . . . One year and seven months.
THOMAS GOGIN, elected Dec. 17, 1874, and resigned May 31, 1875 . . . . . Six months.
L. MILES STANDISH, elected August 5, 1875, to July 31, 1876‡ . . . . . One year.

Members of the Board.

THOMAS WETMORE, 1851, 52, 53, 54, and 55‡ . . Five years.
JOHN H. WILKINS, 1851, 52, 53, *56, 57, 58, and 59‡ . Eight years.
HENRY B. ROGERS, 1851, 52, 53, *54, and 55‡ . . Five years.
JONATHAN PRESTON, 1851, 52, 53, and 56‡ . . . Four years.
JAMES W. SEAVER, 1851‡ . . . . . One year.
SAMUEL A. ELIOT, 1851.‡
JOHN T. HEARD, 1851‡ . . . . . One year.
ADAM W. THAXTER, Jr., 1852, 53, 54, and 55‡ . . Four years.
SAMPSON REED, 1852 and 1853‡ . . . . . Two years.
EZRA LINCOLN, 1852‡ . . . . . One year.
THOMAS SPRAGUE, 1853, 54, and 55‡ . . . . Three years.
SAMUEL HATCH, 1854, 55, 56, 57, 58, and 61 . . . Six years.
CHARLES STODDARD, 1854, 55, 56, and 57‡ . . . Four years.
WILLIAM WASHBURN, 1854 and 55 . . . . . Two years.
TISDALE DRAKE, 1856, 57, 58, and 59‡ . . . . Four years.
THOMAS P. RICH, 1856, 57, and 58‡ . . . . Three years.
JOHN T. DINGLEY, 1856 and 59‡ . . . . . Two years.
JOSEPH SMITH, 1856‡ . . . . . Two months.
EBENEZER JOHNSON, 1857, 58, 59, 60, 61, 62, 63, and 64,‡ Eight years.
SAMUEL HALL, 1857, 58, 59, 60, and 61‡ . . . . Five years.
GEORGE P. FRENCH, 1859, 60, 61, 62, and 63‡. . . Five years.
EBENEZER ATKINS, 1859‡ . . . . . One year.
GEORGE DENNIE, 1860, 61, 62, 63, 64, and 65 . . . Six years.
CLEMENT WILLIS, 1860‡ . . . . . One year.
G. E. PIERCE, 1860‡ . . . . . One year.
JABEZ FREDERICK, 1861, 62, and 63‡ . . . . Three years.
GEORGE HINMAN, 1862 and 63 . . . . . Two years.
JOHN F. PRAY, 1862 . . . . . One year.
J. C. J. BROWN, 1862 . . . . . One year.
JONAS FITCH, 1864, 65, and 66‡ . . . . . Three years.
OTIS NORCROSS, *1865 and 66‡ . . . . . Two years.
JOHN H. THORNDIKE, 1864, 65, 66, and 67‡ . . . Four years.
BENJAMIN F. STEVENS, 1866, 67, and 68 . . . . Three years.
WILLIAM S. HILLS, 1867 . . . . . One year.
CHARLES R. TRAIN, 1868‡ . . . . . One year.
JOSEPH M. WIGHTMAN, 1868 and 69‡ . . . . Two years.
BENJAMIN JAMES, *1858, 68, and 69 . . . . Three years.
FRANCIS A. OSBORN, 1869 . . . . . One year
WALTER E. HAWES, 1870‡ . . . . . One year.
JOHN O. POOR, 1870 . . . . . One year.
HOLLIS R. GRAY, 1870 . . . . . One year.

NATHANIEL J. BRADLEE, 1863, 64, 65, 66, 67, 68, 69, 70, and 71‡	Nine years.
GEORGE LEWIS, 1868, 69, 70, and 71‡	Four years.
SIDNEY SQUIRES, 1871‡	One year.
CHARLES H. HERSEY, 1872	One year.
CHARLES H. ALLEN, 1869, 70, 71, and 72	Four years.
ALEXANDER WADSWORTH, *1864, 65, 66, 67, 68, 69, and 72	Seven years.
CHARLES R. MCLEAN, 1867, 73, and 74‡	Three years.
EDWARD P. WILBUR, 1873 and 74	Two years.
JOHN A. HAVEN, 1870, 71, 72, 73, and 74‡	Five years.
THOMAS GOGIN, 1873, 74, and 75*	Three years.
AMOS L. NOYES, 1871, 72, and 75	Three years.
WILLIAM G. THACHER, 1873, 74, and 75‡	Three years.
CHARLES J. PRESCOTT, 1875	One year.
EDWARD A. WHITE, 1872, 73, 74, 75, and 76†	Five years.
LEONARD R. CUTTER, 1871, 72, 73, 74, 75, and 76†	Six years.
L. MILES STANDISH, 1860, 61, 63, 64, 65, 66, 67, 74, 75, and 76†‡	Ten years.
CHARLES E. POWERS, *1875 and 1876†	Two years.
SOLOMON B. STEBBINS, 1876†	One year.
NAHUM M. MORRISON, 1876†	One year.
AUGUSTUS PARKER, 1876†	One year.

*Mr. John H. Wilkins resigned Nov. 15, 1855, and Charles Stoddard was elected to fill the vacancy. Mr. Henry B. Rogers resigned Oct. 22, 1865. Mr. Wilkins was re-elected Feb., 1856, and chosen President of the Board, which office he held until his resignation, June 5, 1860, when Mr. Ebenezer Johnson was elected President; and July 2 Mr. L. Miles Standish was elected to fill the vacancy occasioned by the resignation of Mr. Wilkins. Otis Norcross resigned Jan. 15, 1867, having been elected Mayor of the City. Benjamin James served one year, in 1858, and was reëlected in 1868. Alexander Wadsworth served six years, 1864–69, and was reëlected in 1872. Thomas Gogin resigned May 31, 1875. Charles E. Powers was elected July 15, to fill the vacancy occasioned by the resignation of Mr. Gogin.

†Served until the organization of the Boston Water Board.

‡Deceased.

BOSTON WATER BOARD,

Organized July 31, 1876.

TIMOTHY T. SAWYER, from July 31, 1876, to May 5, 1879; and from May 1, 1882, to May 4, 1883.
LEONARD R. CUTTER, from July 31, 1876, to May 4, 1883.
ALBERT STANWOOD, from July 31, 1876, to May 7, 1883.
FRANCIS THOMPSON, from May 5, 1879, to May 1, 1882.‡
WILLIAM A. SIMMONS, from May 7, 1883, to Aug. 18, 1885.
GEORGE M. HOBBS, from May 4, 1883, to May 4, 1885.
JOHN G. BLAKE, from May 4, 1883, to Aug. 18, 1885.
WILLIAM B. SMART, from May 4, 1885, to March 18, 1889.
HORACE T. ROCKWELL, from Aug. 25, 1885, to April 25, 1888.
THOMAS F. DOHERTY, from Aug. 26, 1885, to May 5, 1890.
ROBERT GRANT, from April 25, 1888, to present time.
PHILIP J. DOHERTY, from March 18, 1889, to present time.
JOHN W. LEIGHTON, from May 5, 1890, to present time.

ORGANIZATION OF THE BOARD FOR YEAR 1890.

Chairman.

ROBERT GRANT.

Clerk.

WALTER E. SWAN.

City Engineer and Engineer of the Board.

WILLIAM JACKSON.

Water Registrar.

WILLIAM F. DAVIS.

Deputy Collector and Clerk, Mystic Department.

JOSEPH H. CALDWELL.

Superintendent of the Eastern Division of Cochituate Department.

DEXTER BRACKETT.

Superintendent of the Western Division and Resident Engineer of Additional Supply.

DESMOND FITZGERALD.

Superintendent of Mystic Department.

EUGENE S. SULLIVAN.

‡ Deceased.

TABLE OF CONTENTS.