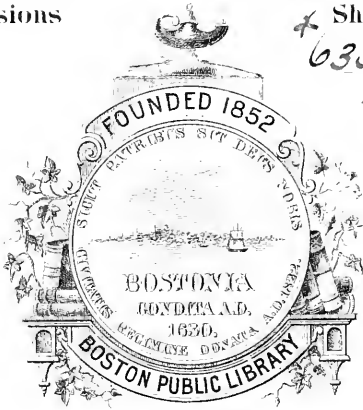


Accessions

* Shelf No.

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1892

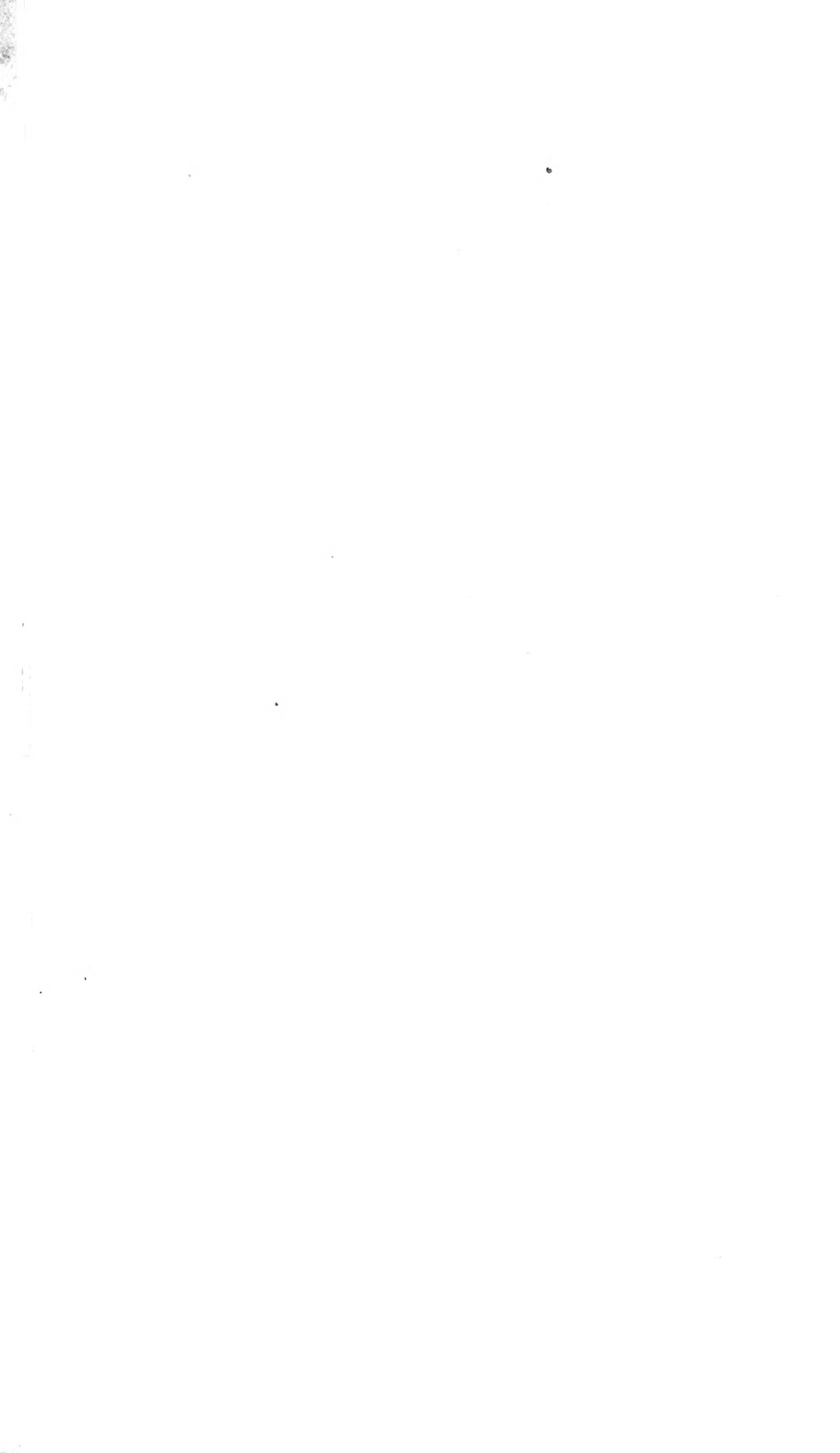


GIVEN BY

Boston City Engineer
Aug. 10. 1892.







ENGINEERING DEPARTMENT.

TWENTY-SIXTH ANNUAL REPORT

OF THE

CITY ENGINEER,

BOSTON,

FOR THE YEAR 1892.

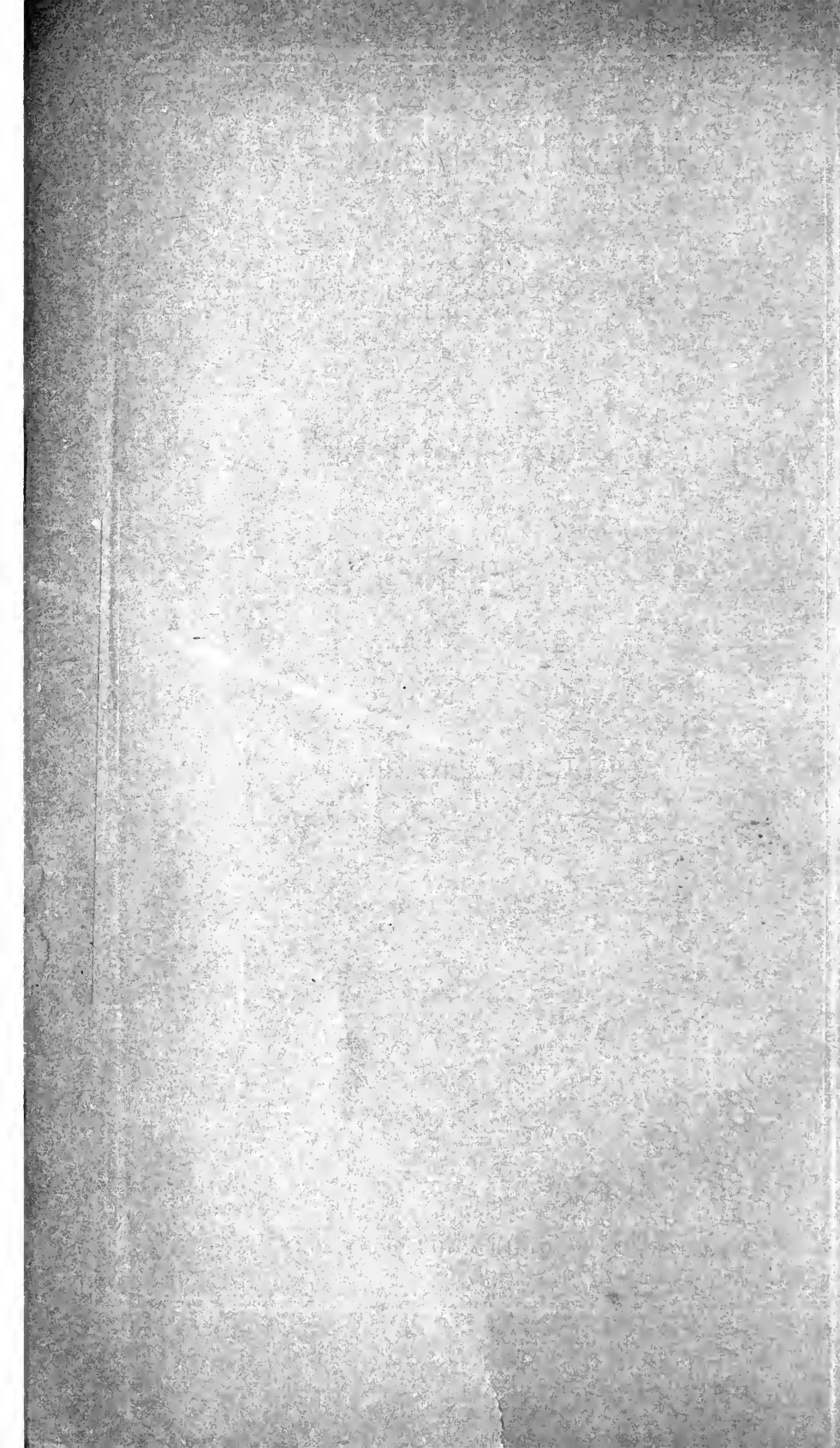
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BOSTON:

ROCKWELL AND CHURCHILL, CITY PRINTERS.

1893.



ENGINEERING DEPARTMENT.

TWENTY-SIXTH ANNUAL REPORT

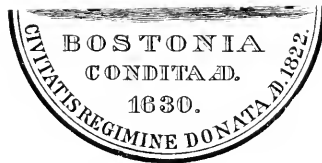
OF THE

CITY ENGINEER,

With reports of

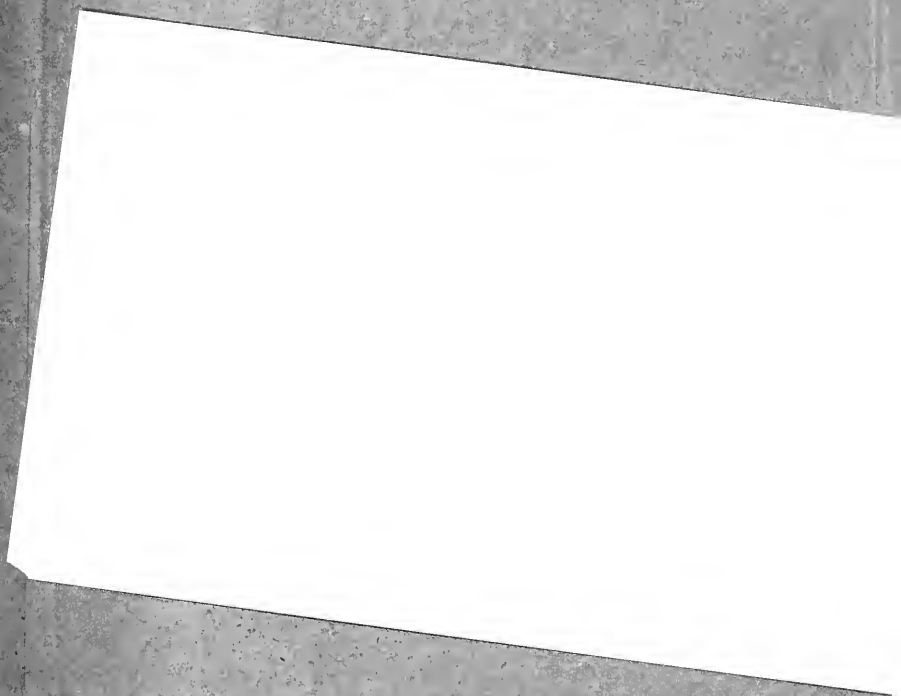
William Jackson,

City Engineer.



BOSTON:
ROCKWELL AND CHURCHILL, CITY PRINTERS.
1893.

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ENGINEERING DEPARTMENT.

TWENTY-SIXTH ANNUAL REPORT

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Printed for the Department.



BOSTON:
ROCKWELL AND CHURCHILL, CITY PRINTERS.
1893.

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Portland City Engineer

Aug. 16, 1893

\$ 6357.56

1892

ENGINEERING DEPARTMENT, CITY HALL,

BOSTON, Feb. 1, 1893.

HON. NATHAN MATTHEWS, JR.,

Mayor of the City of Boston:

SIR: In compliance with the Revised Ordinances the following report of the expenses and operations of the department for the year 1892 is submitted:

The report of this department may be classified under the following heads:

A. — The examination and supervision of structural repairs of bridges, the designing and superintending the construction of new bridges, retaining-walls, city wharves, etc., and in miscellaneous engineering work called for by the City Council.

B. — Charge of the engineering work in connection with the Sudbury-river, Cochituate, and Mystic Water-Works, including charge of new constructions for these works.

C. — Charge of the construction of a system of intercepting and outlet sewers.

D. — Charge of the engineering work in connection with the parks.

E. — Charge of the engineering work, except for Sewer Division, in connection with the Street Department.

The expenses incurred under the head "C" are paid wholly from a special appropriation.

A.

The following is a statement of engineering expenses from February 1, 1892, to January 31, 1893 :

Amount of department appropriation for 1892-93	\$40,000 00
Amount expended from department appropriation for 1892-93	39,999 22
	<hr/>
Unexpended balance	\$0 78

STATEMENT OF EXPENDITURES, DEPARTMENT APPROPRIATION.

Object of expenditures :

Salaries of City Engineer, assistants, draughtsmen, transitmen, levellers, rodmen, etc.	\$35,497 58
Engineering instruments and repairs of same	430 56
Drawing-paper, and all materials for making plans	413 44
Stationery, printing-stock, note-books, postage, etc.	356 31
Printing	283 77
Reference library, binding books, and photographs of works	349 80
Travelling expenses (including horse-keeping, repairs on vehicles, expenses to Chicago, Baltimore, and Philadelphia, etc.)	1,232 63
Telephone service	195 30
Furniture cases for plans and books, etc.	408 00
Blue-process printing	154 74
Incidental expenses, and all other small supplies	442 09
Electric-light wiring	235 00
	<hr/>
Total	<u>\$39,999 22</u>

ALLSTON BRIDGE.

Appropriation city of Boston	\$90,000 00
“ Boston & Albany R.R. Co.	40,000 00
	<hr/>
	\$130,000 00
Items of expenditure :	
Abutments	\$27,800 00
Advertising and miscellaneous	443 82
Bridge guard-posts	185 15
Engineering and inspection	3,129 82
Fences, stairs, and sidewalks	1,341 05
Filling, miscellaneous	111 33
Flagmen	1,690 00
Labor and teaming, Street Department	252 90
Lumber	6 13
Model of bridge-crossing	60 80
Printing and stock	70 74
Raising buildings and grading	4,342 51
Rebuilding sewer, south abutment	1,032 05
Street filling and grading	2,469 76
B. & A. R.R. Co., contractors for filling north side	13,554 27
McBride, Chris., contractor for filling south side	9,962 46
Cofrode & Saylor, contractors for iron bridge	18,990 27
Dalton, T. S., damages to property	1,300 00
Property of J. W. Hollis deeded to the city	21,000 00
	<hr/>
Total	\$107,743 06
Total appropriation	\$130,000 00
Expended by city of Boston, \$67,743 06	
“ “ Boston & Albany	
R.R. Co., 40,000 00	
	<hr/>
	107,743 06
	<hr/>
Balance Feb. 1, 1893	\$22,256 94
	<hr/>

FEDERAL-STREET BRIDGE.

Appropriation \$100,000 00

Statement of Expenses from Feb. 1, 1892, to Feb. 1, 1893.

Items of expenditure :

Com. of Mass., displacement of tide-water,	\$26 25
Hardware	10 90
Machinery and iron work	143 37
Transferred to Congress-street Bridge (guard)	534 31
Total	<u>\$714 83</u>

Appropriation	\$100,000 00
Expended previous to Feb. 1, 1892	\$99,285 17
Expended from Feb. 1, 1892, to Feb. 1, 1893	714 83
Total	<u>\$100,000 00</u>

L-STREET BRIDGE.

Appropriation \$160,000 00

Items of expenditure :

Advertising	132 54
Boat	70 00
Counter-balance and labor	232 67
Draw-trucks	3,736 00
Draw-tender's house (complete)	2,033 18
Engines (2) for draw	1,563 00
Engine-house and foundation (complete)	1,900 24
Engineering and inspection	3,759 03
Fuel	30 80
Hardware	27 42
Iron-work	49 14
Lead ballast	794 04
Lumber	179 67
Machinery for draw	1,266 92
Machinery-work and labor	166 15
Printing and stock	71 54
Soundings	10 00
Steel rails and angle bars	438 70
Sundries	88
Teaming	25 00

ENGINEERING DEPARTMENT.

5

Timber covering	\$89 40
Water	6 50
Wire rope	132 94
King Bridge Co., contractors for iron draw,	10,100 00
Miller, Wm. L., contractor for pile bridge .	92,756 62
Rowe, T. A., contractor, retaining-wall coping	681 98
Total	\$120,254 36
Loan negotiated Feb. 2, 1892	\$100,000 00
“ “ Oct. 11, 1892	30,000 00
Transferred from Public Institutions, Jan. 31, 1892	254 36
	<hr/>
	\$130,254 36
Transferred to Street Department	10,000 00
	<hr/>
Expended by Engineering Department	<u>\$120,254 36</u>

REBUILDING BRIDGES TO WATERTOWN.

Appropriation, Western avenue and North Beacon street	\$18,000 00
Items of expenditure :	
Advertising	\$20 14
Engineering and inspection	245 25
Printing and stock	18 18
	<hr/>
Total	\$283 57
Loan negotiated Sept. 26, 1892	\$9,000 00
Expended	283 57
	<hr/>
Balance, Feb. 1, 1893	<u>\$8,716 43</u>

STATUES.

Robert G. Shaw Monument.

Appropriation, Robert G. Shaw monument,	\$19,500 00
Item of expenditure :	
Printing and stock	\$28 40
Appropriation	\$19,500 00
Expended from Feb. 1, 1892, to Feb. 1, 1893	28 40
	<hr/>
Balance, Feb. 1, 1893	<u>\$19,471 60</u>

IMPROVED SEWERAGE.

Total appropriations \$6,222,240 93

Statement of Expenses from Feb. 1, 1892, to Feb. 1, 1893.

Object of expenditure :	
General office expenses	\$13,030 23
Brighton sewers	4,574 29
Charles-river pollution	982 63
East shaft	3 63
Flume, removal	28 45
“ East End connection	1,940 00
“ West End connection	2,743 90
Pumping-station (inside)	3,370 30
Sections 5 and 6, East Side Intercepting Sewer	1,211 00
Section 6, Dorchester Intercepting Sewer	21,777 19
“ 8, “ “ “	13,966 55
“ 9, “ “ “	4 00
“ 10, “ “ “	2,594 34
“ 3, Outfall Sewer	22,606 46
“ 3C, “ “	73,126 93
Total	<u>\$161,959 90</u>
Loans negotiated (less \$67,500 transferred)	\$6,005,500 00
Revenue	66,740 93
Total	<u>\$6,072,240 93</u>
Expended previous to Feb. 1, 1892	\$5,865,246 41
Expended from Feb. 1, 1892, to Feb. 1, 1893	161,959 90
	<u>6,027,206 31</u>
Balance, Feb. 1, 1893	<u>\$45,034 62</u>

IMPROVED SEWERAGE CONSTRUCTION, 1892.

Tables showing the cost of the sewer sections in progress during the year of 1892, and other miscellaneous work.

General Office Expenses.

Items of expenditure :	
Salaries	\$10,029 03
Engineering instruments and repairs	53 85
Drawing-paper and materials for plans	69 70
Stationery and printing-stock	52 37
Travelling expenses	579 48
Printing	20 30
Telephone service	90 00
Board and shoeing of horse	444 50
Blue-process printing	64 14
Sundry small supplies	223 25
Office rent	896 03
Rubber clothing	32 58
Exchange of horse	200 00
Exchange of buggy	275 00
Total	\$13,030 23

BRIGHTON SEWERS.

Item of expenditure :	
Labor rolls	\$4,574 29
Total	\$4,574 29

CHARLES-RIVER POLLUTION.

Items of expenditure :	
Engineering	\$927 53
Miscellaneous	55 10
Total	\$982 63

EAST SHAFT.

Item of expenditure :	
Advertising	\$3 63
Total	\$3 63

FLUME REMOVAL.

Item of expenditure :	
Advertising	\$28 45
Total	<u>\$28 45</u>

FLUME, WEST END CONNECTION.

Items of expenditure :	
Bricks	\$274 49
Car-fares	31 25
Cement	232 85
Gravel and sand	201 40
Lumber	58 60
Labor	1,646 86
Teaming	153 20
Miscellaneous	145 25
Total	<u>\$2,743 90</u>

FLUME, EAST END CONNECTION.

Item of expenditure :	
Perkins & White (contractors)	\$1,940 00
Total	<u>\$1,940 00</u>

PUMPING-STATION (INSIDE).

Items of expenditure :	
Atlantic Works	\$1,000 00
Fuel Economizer Co.	2,370 30
Total	<u>\$3,370 30</u>

SECTIONS 5 AND 6, EAST SIDE INTERCEPTING SEWER.

Items of expenditure :	
Street paving	\$1,203 00
Miscellaneous	8 00
	<u>\$1,211 00</u>
Expended previous to 1892	90,662 26
Total	<u>\$91,873 26</u>

SECTION 6, DORCHESTER INTERCEPTING SEWER.

Items of expenditure :

Advertising	\$93 88
Bricks	1,827 80
Car-fares	12 00
Cement	1,325 02
Coal	695 59
Drain-pipe	195 67
General supplies	336 31
Hardware	14 44
Insurance	220 00
Labor	13,549 20
Lumber	834 29
Miscellaneous	11 02
Piles, and labor on same	608 40
Rent of machinery	749 40
Rubber clothing	112 30
Sand and gravel	612 40
Stationery	29 98
Teaming	536 00
Tools	13 49
	<hr/>
	\$21,777 19
Expended previous to 1892	447 38
	<hr/>
Total	<u>\$22,224 57</u>

SECTION 8, DORCHESTER INTERCEPTING SEWER.

Items of expenditure :

Bricks	\$1,638 33
Car-fares	12 00
Cement	397 20
Coal	208 86
Drain-pipe	49 98
General supplies	96 12
Hardware	41 00
Labor	9,379 12
Lumber	25 70
Rent of machinery	835 88
“ “ land	30 00
Rubber clothing	73 83
Sand and gravel	125 70
Stationery	14 45
Teaming	713 50
Tools	324 88
	<hr/>
<i>Carried forward,</i>	\$13,966 55

<i>Brought forward,</i>	\$13,966 55
Expended previous to 1892	14,324 42
	<hr/>
Total	<u>\$28,290 97</u>

SECTION 9, DORCHESTER INTERCEPTING SEWER.

Item of expenditure :

Car-fares	\$4 00
Expended previous to 1892	39 20
	<hr/>
Total	<u>\$43 20</u>

SECTION 10, DORCHESTER INTERCEPTING SEWER.

Items of expenditure :

Inspection	\$50 00
Teaming	27 25
A. A. Hall, contractor	2,517 09
	<hr/>
Expended previous to 1892	\$2,594 34
	41,098 26
	<hr/>
Total	<u>\$43,692 60</u>

SECTION 3C, OUTFALL SEWER.

Items of expenditure :

Advertising	\$94 43
Hardware	1,048 38
Inspection	1,599 25
Iron rods and nuts (Bacon & Co.)	1,705 00
Lumber	470 59
Miscellaneous	97 54
Printing	64 83
Perkins & White, contractors	68,046 91
	<hr/>
Total	<u>\$73,126 93</u>

SECTION 3, OUTFALL SEWER.

Items of expenditure :

Coal and lumber	\$322 64
Inspection	713 75
Miscellaneous	7 00
Nawn, H. P., contractor	21,563 07
	<hr/>
Expended previous to 1892	\$22,606 46
	71,788 48
	<hr/>
Total	<u>\$94,394 94</u>

BRIDGES.

The inspection of the highway bridges for the annual report of their safety and completeness has been made, and as usual, besides the highway bridges, all such bridges as the Public Garden footbridge and the bridges in the parks have also been inspected.

LIST OF BRIDGES INSPECTED.

In the list those marked with an * are over navigable water, and are each provided with a draw.

I. — BRIDGES WHOLLY SUPPORTED BY BOSTON.

Agassiz Road, in Back Bay Fens.

Allston, over Boston & Albany Railroad, Ward 25.

Ashland street, Ward 23, over Providence Division Old Colony Railroad.

Athens street, over New York & New England Railroad.

Beacon Entrance, Back Bay Fens, over Boston & Albany Railroad.

Beacon street, over outlet to Back Bay Fens.

Beacon street, over Boston & Albany Railroad.

Berkeley street, over Boston & Albany Railroad.

Berkeley street, over Providence Division Old Colony Railroad.

Blakemore street, over Providence Division Old Colony Railroad, Ward 23.

Bolton street, over New York & New England Railroad.

Boylston street, in Back Bay Fens.

Boylston street, over Boston & Albany Railroad.

*Broadway, over Fort Point Channel.

Broadway, over Boston & Albany Railroad.

Brookline avenue, over Boston & Albany Railroad.

Byron street, over Boston, Revere Beach, & Lynn Railroad.

*Castle Island, from Marine Park, South Boston, to Castle Island.

*Charles River, from Boston to Charlestown.

*Chelsea (South), over South Channel, Mystic River.

*Chelsea street, from East Boston to Chelsea.

Columbus avenue, over Boston & Albany Railroad.

*Commercial Point, or Tenean, Ward 24.

Commonwealth avenue, in Back Bay Fens.

*Congress street, over Fort Point Channel.

Cottage-street footbridge, over Flats, East Boston.

- Cornwall street, over Stony Brook, Ward 23.
 Dartmouth street, over Boston & Albany and Providence
 Division Old Colony Railroad.
 *Dover street, over Fort Point Channel.
 *Federal street, over Fort Point Channel.
 Fen, Back Bay Fens.
 Ferdinand street, over Boston & Albany Railroad.
 Franklin-street footbridge, over Boston & Albany Rail-
 road.
 Gold street, over New York & New England Railroad.
 Huntington avenue, over Boston & Albany Railroad.
 Irvington street, over Providence Division Old Colony
 Railroad.
 *L-street Bridge, over Reserved Channel, South Boston
 Flats.
 Leyden street, over Boston, Revere Beach, & Lynn Rail-
 road.
 Linden Park street, over Stony Brook.
 *Malden, from Charlestown to Everett.
 *Meridian street, from East Boston to Chelsea.
 *Mt. Washington avenue, over Fort Point Channel.
 Neptune Road, over Boston, Revere Beach, & Lynn Rail-
 road.
 Newton street, over Providence Division Old Colony Rail-
 road.
 Public Garden footbridge.
 Shawmut avenue, over Boston & Albany Railroad.
 Stony Brook, Back Bay Fens.
 Swett street, east of New York & New England Railroad.
 Swett street, west of New York & New England Railroad.
 *Warren, from Boston to Charlestown.
 West Chester park, over Boston & Albany Railroad.
 West Chester park, over Providence Division Old Colony
 Railroad.
 West Rutland square footbridge, over Providence Divis-
 ion Old Colony Railroad.
 Winthrop, from Breed's Island to Winthrop.

II. — BRIDGES OF WHICH BOSTON SUPPORTS THE PART WITHIN ITS LIMITS.

- *Cambridge street, from Brighton to Cambridge.
 Central avenue, from Ward 24 to Milton.
 *Chelsea (North), from Charlestown to Chelsea.
 *Essex street, from Ward 25 (Brookline) to Cambridge.
 *Granite, from Dorchester, Ward 24, to Milton.
 Longwood avenue, from Ward 22 to Brookline.

Mattapan, from Ward 24 to Milton.

Milton, from Ward 24 to Milton.

*Neponset, from Ward 24 to Quincy.

*North Beacon street, from Brighton to Watertown.

*North Harvard street, from Brighton to Cambridge.

Spring street, from West Roxbury to Dedham.

*Western avenue, from Brighton to Cambridge.

*Western avenue, from Brighton to Watertown.

III. — BRIDGES OF WHICH BOSTON PAYS A PART OF THE COST OF MAINTENANCE.

Albany street, over Boston & Albany Railroad.

*Canal, from Boston to Cambridge.

Dorchester street, over Old Colony Railroad.

Everett-street Bridge, over Boston & Albany Railroad, Ward 25.

*Harvard, from Boston to Cambridge.

*Prison Point, from Charlestown to Cambridge.

*West Boston, from Boston to Cambridge.

IV. — BRIDGES SUPPORTED BY RAILROAD CORPORATIONS.

1st. — Boston & Albany Railroad.

Cottage Farm, Brighton.

Harrison avenue.

Market street, Brighton.

Tremont street.

Washington street.

2d. — Boston & Maine Railroad, Western Division.

Mystic avenue.

Main street.

3d. — Boston & Maine Railroad, Eastern Division.

Mystic avenue.

Main street.

4th. — Boston, Revere Beach, & Lynn Railroad.

Everett street.

5th. — New York & New England Railroad.

Broadway.

Dorchester avenue.

Fifth street.

Forest Hills avenue, Ward 24.
 Fourth street.
 Harvard street, Ward 24.
 Norfolk “ “ “
 Norfolk “ “ “
 Second street.
 Silver street.
 Sixth street.
 Third street.
 Washington street, Ward 24.

6th.—Old Colony Railroad.

Adams street.
 Ashmont street and Dorchester avenue.
 Cedar Grove Cemetery.
 Commercial street.
 Savin Hill avenue.

7th.—Old Colony Railroad, Providence Division.

Beech street, Ward 23.
 Bellevue street, Ward 23.
 Canterbury street, Ward 23.
 Centre street, or Hog Bridge, Ward 23.
 Centre and Mt. Vernon streets, Ward 23.
 Dudley avenue, Ward 23.
 Park street, Ward 23.

RECAPITULATION.

I.	Number wholly supported by Boston	54
II.	Number of which Boston supports the part within its limits	14
III.	Number of which Boston pays a part of the cost of maintenance	7
IV.	Number supported by railroad corporations :	
1.	Boston & Albany	5
2.	Boston & Maine, Western Division	2
3.	“ “ Eastern Division	2
4.	Boston, Revere Beach, & Lynn	1
5.	New York & New England	13
6.	Old Colony	5
7.	“ “ Providence Division	7
	Total number	110

Four bridges have been added to the list this year, namely :
 Allston Bridge, on Boston & Albany R.R. ; Castle Island,

in Marine Park at South Boston; Everett-street, over the Boston & Albany R.R., in Ward 25; and L-street Bridge, over Reserved Channel, South Boston Flats.

The following list includes all the bridges supported by the city, either in whole or in part.

✓ AGASSIZ-ROAD BRIDGE IN BACK BAY FENS.

This bridge was built in 1887, of brick and stone masonry. It is maintained by the Park Department, and is in good condition.

ALBANY-STREET BRIDGE (OVER BOSTON & ALBANY R.R.).

The original structure was built in 1856-57; was rebuilt in 1867-68; and again in 1886-87. It is maintained in part by the City of Boston and in part by the Boston & Albany R.R. It is in good condition.

ALLSTON BRIDGE (OVER BOSTON & ALBANY R.R.,
WARD 25).

This is a new bridge. To be maintained by the city of Boston (see page 29.)

ASHLAND-STREET BRIDGE (OVER PROVIDENCE DIVISION
OLD COLONY R.R., WARD 23).

The present structure is of iron, and was built in 1875. It is badly in need of painting; in other respects it is in good condition. The recommendation of last year is renewed: "The iron-work and fences should be painted."

ATHENS-STREET BRIDGE (OVER NEW YORK & NEW
ENGLAND R.R.).

This is an iron bridge, and was built in 1874. The wood-work of the bridge has been renewed and the iron-work and fences painted. It is in good condition.

BEACON-ENTRANCE BRIDGE (IN BACK BAY FENS, OVER
BOSTON & ALBANY R.R.).

This is an iron bridge, and was built in 1881-82. It is maintained by the Park Department, and is in good condition.

BEACON-STREET BRIDGE (OVER OUTLET OF BACK BAY).

This is an iron bridge, built in 1880-81. It has been painted, and is in good condition.

BEACON-STREET BRIDGE (OVER BOSTON & ALBANY R.R.).

This is an iron bridge; it was built in 1884-85, and was widened in 1887-88. It is in good condition.

BERKELEY-STREET BRIDGE (OVER BOSTON & ALBANY R.R.).

This is an iron bridge; the present structure was built in 1891, and the permanent fence has recently been finished. The bridge is in good condition. The abutments should be pointed.

✓ BERKELEY-STREET BRIDGE (OVER PROVIDENCE DIVISION
OLD COLONY R.R.).

Parts of this bridge are in poor condition. The under floor is old and decayed; the concrete sidewalks are poor; it was long since necessary to strengthen the span over the main tracks with wooden beams, and it should be taken up and renewed. Nothing has been done toward rebuilding this part of the bridge for the benefit of the railroad, as was proposed at one time, the railroad to bear a proportion of the expense.

BLAKEMORE-STREET BRIDGE (OVER PROVIDENCE DIVISION
OLD COLONY R.R.).

This is an iron bridge; it was built in 1881-82. It should be painted. It is in good condition otherwise.

BOLTON-STREET BRIDGE (OVER NEW YORK & NEW ENGLAND R.R.).

This is a wooden bridge, built in 1889. It is in good condition.

BOYLSTON-STREET ARCH BRIDGE (IN BACK BAY FENS).

This is a stone arch-bridge, built in 1881. It is in good condition.

BOYLSTON-STREET BRIDGE (OVER BOSTON & ALBANY R.R.).

This is an iron bridge. It was built in 1886-88. No permanent fence has yet been built, but an ornamental railing should be provided. The abutments and adjoining retaining-walls are in good condition; the iron-work needs painting.

* BROADWAY BRIDGE (OVER FORT POINT CHANNEL).

This is an iron bridge. It was built in 1869-71, and the draw and its foundation were rebuilt in 1874-75. The concrete sidewalks have been repaired, and the floor underneath renewed in part. A new wooden under-floor has been laid on the Foundry-street and Lehigh-street spans. The under part of the structure has been painted with red lead in all parts except the column section between the Foundry-street span and the railroad. Estimates have been made for strengthening the weak places in the bridge, in anticipation of increased travel during the closing of Dover-street bridge.

The draw pier has not been repaired for some years, and it should be carefully examined in favorable weather. The bridge as a whole is in an unsatisfactory condition.

BROADWAY BRIDGE (OVER BOSTON & ALBANY R.R.).

This bridge is of iron, and was built in 1880-81. The wood-work on the bridge has been renewed, and the iron-work of the floor has been painted where it is readily accessible. A hard-pine floor was laid; a cheaper spruce floor, and more thorough cleaning and painting would have been preferable.

It has been found in practice that bridges located over railroads where there is very much traffic, and especially where the bridges are low, should not be provided with an under-floor which will last more than four years, as the iron will rapidly deteriorate unless it is frequently cleaned and painted, and this can only be done to the floors when they are stripped of all woodwork.

BROOKLINE-AVENUE BRIDGE (OVER BOSTON & ALBANY R.R.).

This bridge is of iron, and was built in 1884. It is in good condition.

BYRON-STREET BRIDGE (OVER BOSTON, REVERE BEACH, & LYNN R.R.).

This is a wooden bridge; it was built in 1889. The fences should be painted; otherwise it is in good condition.

* CAMBRIDGE-STREET BRIDGE (FROM BRIGHTON TO CAMBRIDGE).

This is a wooden pile-bridge with a wooden leaf-draw. The city maintains the part within its limits. It was re-

built in 1884. The draw was rebuilt and the passageway for vessels widened to thirty-six feet in 1891. The bridge and draw are in good condition. It is operated by hand power, and requires careful adjustment in order that the men may be able to raise it. The draw pier is in bad condition; the covering-plank is poor, and the down-stream end has been damaged by vessels. The pier is too short to accommodate the larger class of vessels that the widening of the draw-way allows to pass through the bridge.

* CANAL OR CRAIGIE'S BRIDGE.

This is a wooden pile-bridge, with wooden turn-table draw. The city pays one-half of the cost of maintenance. The bridge was originally built in 1808, was rebuilt in 1852, and again rebuilt and widened in 1874. The bridge is in the care of a commission consisting of one commissioner from Boston and one from Cambridge. The draw has been painted. New tracks for electric cars have been laid by the street-railway company, and additional repaving has been done by the commissioners. The paving is in good condition; the fender and the faces of the passageway for vessels through the bridge are in bad condition. The draw is old for a wooden structure, and should be thoroughly overhauled and kept in the best condition in order to safely carry electric cars.

* CASTLE-ISLAND BRIDGE (FROM MARINE PARK, SOUTH BOSTON, TO CASTLE ISLAND).

This is a new bridge (see page 148). It is in good condition.

CENTRAL-AVENUE BRIDGE (OVER NEPONSET RIVER, DORCHESTER LOWER MILLS).

This is an iron bridge, and was built in 1876. The city maintains the part within its limits. The under plank is in poor condition, and the iron-work should be cleaned and painted.

* CHARLES-RIVER BRIDGE (FROM BOSTON TO CHARLESTOWN).

This is a wooden pile-bridge, with an iron draw. The original bridge was built in 1785-86; the present structure was built in 1854-55; the draw was built in 1870. The bridge has been partly repaved with the old stock, some edgestones have been reset, and the roadway is now in fairly

good condition. The sidewalks on the Charlestown end are in very poor condition. The bulkhead at the Charlestown end of the draw has been partly rebuilt, and the sides of the waterway partly replanked.

The draw and draw foundation are in poor condition; the wooden floor-beams are twenty-three years old, and the exposed ends are rotten.

The heavy counterbalance on the short end of the draw is insecurely fastened in its place. The rails on which the draw runs, the track stringers, and the pile foundation are all in bad condition. On the fixed part of the bridge the side bulkheads are very rotten, the paving-stones, although recently reset, are old and worn. The bridge is out of line to a serious extent: the fender and piers on the lower side of the bridge are in a ruinous condition.

Electric cars are not allowed to cross the draw on account of its weakness, and an inspection of the draw-tender's books shows that travel over the bridge was interrupted seventeen times during the year 1892 on account of necessary repairs or breakdowns of the draw — the detentions on this account varying from half an hour to five days. The bridge is worn out and not worth repairing. It should be replaced by a new structure at once.

* CHELSEA BRIDGE, NORTH (FROM MYSTIC RIVER CORPORATION WHARF TO CHELSEA).

The city maintains the part within its limits.

The original structure was built in 1802-3; the present structure was built in 1880, except the draw, which was built in 1873. The bridge is in a rotten condition. The draw is twenty years old, and is in a poor condition. It is moved by steam, and electric cars cross it. The foundation for the draw pivot has been patched. The end floor-beam of the draw has been renewed, and the fender on the Boston side, near the draw, rebuilt.

The down-stream draw pier is entirely too short for the class of vessels now using the draw, and complaints of poor accommodation have been made.

* CHELSEA BRIDGE, SOUTH (OVER SOUTH CHANNEL, MYSTIC RIVER).

This is a pile bridge, with an iron draw. The original bridge was built in 1802-3, and the present structure in 1876-7. The apparatus for moving the draw by steam has been finished. New sidewalks and fences have been built on

the draw, and the fender has been repaired. The old Warren Bridge storehouse has been moved to this bridge.

The contemplated abolition of the Chelsea-street grade crossings will require the rebuilding of this bridge at a higher grade.

* CHELSEA-STREET BRIDGE (FROM EAST BOSTON TO CHELSEA).

This is a wooden pile-bridge; was originally built in 1834; was rebuilt in 1848, and again rebuilt in 1873, and the present draw was built in 1868. There is no change for the better in this bridge; its bad condition was fully reported last year. It is old and narrow, and the draw and its foundation are in a dangerous condition.

COLUMBUS-AVENUE BRIDGE (OVER BOSTON & ALBANY RAILROAD).

This is an iron bridge. It was originally built in 1865, and the present structure was built in 1876-77. The bridge has been painted, and is in good condition. It is still made an anchorage for telegraph-pole guys, which should be removed.

* COMMERCIAL-POINT OR TENEAN BRIDGE (WARD 24).

This is a wooden pile-bridge, with a wooden leaf-draw. It was originally built in 1833, and the present structure was built in 1875. No repairs of importance have been made. The draw is in poor condition, and should be repaired at once.

COMMONWEALTH-AVENUE BRIDGE (IN BACK BAY FENS).

This is an iron bridge; it was built in 1881-82. It has been painted, and is in good condition.

* CONGRESS-STREET BRIDGE (OVER FORT POINT CHANNEL).

This is a wooden pile-bridge, with an iron turn-table draw on a stone-masonry foundation. It was built in 1874-75. The engines, boilers, shafting, and gearing are worn from long service, and require extensive repairs. The fender guard is now being repaired. The under floors of the bridge and sidewalks and the concrete sidewalks are in poor condition. The draw is in good order, but the wheels and tracks are worn from long use.

CORNWALL-STREET BRIDGE (OVER STONY BROOK,
WARD 23).

This is a small wooden bridge, built in 1892. It is in good condition, except that the outlets for water are insufficient. The bridge is at the foot of the grade at either end.

COTTAGE-STREET FOOTBRIDGE (OVER FLATS, EAST
BOSTON).

This is a new wooden pile-bridge, built in 1889 for foot travel only. It is in good condition. It was painted, partly, in 1891, and finished in 1892.

DARTMOUTH-STREET BRIDGE (OVER BOSTON & ALBANY
AND PROVIDENCE DIVISION OLD COLONY R.R.).

This is an iron bridge. It was built of wood in 1869, and the present structure was built in 1878-79. It is in good condition.

DORCHESTER-STREET BRIDGE (OVER OLD COLONY R.R.).

This is an iron bridge. It was built in 1869. The bridge is principally supported by the Old Colony Railroad. No repairs have been made upon it. In the report for 1890 the following statement was made, and repeated in 1891: "The bridge has not been stripped and painted for ten years. It is known to be in bad condition, just how bad cannot be ascertained without removing all the wood-work. It should be thoroughly overhauled in the spring." Nothing has yet been done.

The contemplated widening of the railroad for four tracks will necessitate rebuilding the bridge; but meanwhile it is not prudent to run the electric cars over it without stripping it, and making a careful examination of its condition.

* DOVER-STREET BRIDGE (OVER FORT POINT CHANNEL).

This is a wooden pile-bridge, with a double iron draw. It was originally built in 1805, was rebuilt in 1858-59, and the present structure was built in 1876. This bridge is in safe condition, and but few repairs have been made. The abolition of the grade crossing on West Fourth street will require the rebuilding of this bridge during the coming season.

* ESSEX-STREET BRIDGE (FROM BRIGHTON TO CAMBRIDGE).

The city maintains the part within its limits. This is a wooden pile-bridge, with a wooden leaf-draw, and was originally built in 1850; the draw was rebuilt in 1891. The under floor and stringers have been renewed in part, and are in good condition; the draw pier has been repaired, and draw-tender's house from Malden Bridge has been brought here. The changes of grade incident to the widening of Commonwealth avenue will require the rebuilding of this bridge in the immediate future.

EVERETT-STREET BRIDGE (OVER BOSTON & ALBANY R.R.,
WARD 25).

This is an iron bridge. It was built by the Boston & Albany Railroad under the grade-crossing act of 1890. The railroad will maintain the structure of the bridge, and the city the approaches and the wearing-surface of the roadway.

* FEDERAL-STREET BRIDGE (OVER FORT POINT CHANNEL).

This bridge was originally built in 1827-28; was rebuilt in 1857-58; was again rebuilt in 1872-73; and the present structure, which is a wooden pile-bridge with a double iron draw, was built in 1891-92. The bridge is in good condition. The necessary structures have been built, and electric cars now cross the bridge. A new public landing for boats has been built. The draws are moved by electricity.

FEN BRIDGE (BACK BAY FENS).

This bridge was built in 1891-92. It is in good condition.

FERDINAND-STREET BRIDGE (OVER BOSTON & ALBANY
R.R.).

This is an iron bridge. It was originally built in 1864-65, and was strengthened in 1877. The present structure was built in 1892. The bridge is in good condition. The abutments should be pointed.

FRANKLIN-STREET BRIDGE (FOOTBRIDGE OVER BOSTON
& ALBANY R.R.).

This is an iron bridge, and was built in 1883. It has been painted and the stairs repaired. It is in good condition.

GOLD-STREET BRIDGE (OVER NEW YORK & NEW
ENGLAND R.R.).

This is a wooden footbridge, built in 1890. It needs painting; otherwise it is in good condition.

* GRANITE BRIDGE (FROM WARD 24 TO MILTON).

The city maintains the part within its limits. This bridge was originally built in 1837. It is a wooden pile-bridge, with a wooden leaf-draw.

The draw piers are not well placed with reference to the course of the river and the direction of the current; consequently great difficulty is found in passing vessels through the draw, and travel over the bridge is delayed by the unnecessary time required to pass vessels of large size, on account of this defect. It has been painted, and is in good condition.

* HARVARD BRIDGE (FROM BOSTON TO CAMBRIDGE).

This bridge is an iron bridge, and was built in 1887-1891, with an iron turntable draw. The city pays one-half of the cost of maintenance. The bridge is in the care of a commission consisting of one commissioner from Boston and one from Cambridge.

This bridge was opened to the public September 1, 1891, and has been in constant use since that date. The plank upper floor was laid in 1889, and was in poor condition when the bridge was opened, it was kept in repair until October, 1892, when a new upper floor was laid at an expense of \$3,533.51.

The electric cars of the West End Street Railway Company commenced running on the bridge August 15, 1892.

The centre of the pin of the draw has been stayed to the track circle by rods.

The bridge is in good condition, except that it should be thoroughly painted.

HUNTINGTON-AVENUE BRIDGE (OVER BOSTON &
ALBANY R.R.).

This is an iron bridge. It was built in 1872, and the abutments were rebuilt in 1876-77. The wing walls of the abutment should be pointed. The bridge is in good condition, but its surface should be regulated so as to conform to a proper grade of the approaches. The iron-work needs painting.

IRVINGTON-STREET BRIDGE (OVER PROVIDENCE DIVISION
OLD COLONY R.R.).

This is an iron footbridge, built in 1892. It should be painted; otherwise it is in good condition.

L-STREET BRIDGE.

(See page 78.)

LEYDEN-STREET BRIDGE (OVER BOSTON, REVERE BEACH,
& LYNN R.R.).

This is an iron bridge, built in 1889. It needs painting, and some small repairs to the wood-work; otherwise it is in good condition.

LINDEN PARK-STREET BRIDGE (OVER STONY BROOK).

This is a wooden bridge, built in 1887. It is in fair condition.

LONGWOOD-AVENUE BRIDGE (FROM WARD 22 TO
BROOKLINE).

The city maintains the part within its limits. The present structure was built in 1877. This is a wooden bridge, on wooden posts set in the ground. The posts which carry the bridge are decaying near the surface of the ground. They should be put in order; otherwise the bridge is in fair condition. The construction of the Riverdale Park, which the bridge crosses, will hasten the removal of this bridge, which is only a temporary structure.

* MALDEN BRIDGE (FROM CHARLESTOWN TO EVERETT).

The original bridge was built in 1787. The present structure was built in 1875, and the draw was built in 1892. The draw has been rebuilt in its original form, and the electric cars now cross the bridge. The draw piers are old, weak, and entirely too short; the fender is in ruinous condition. The fences are old and rotten. The paving is poor in places.

MATTAPAN BRIDGE (FROM WARD 24 TO MILTON).

The city maintains the part within its limits. This is an old iron bridge; it is in a dangerous condition, and should be replaced by a stone bridge.

* MERIDIAN-STREET BRIDGE (FROM E. BOSTON TO CHELSEA).

This is a wooden pile-bridge, with a wooden turn-table draw on a pile foundation. The original structure was built in 1858. It was rebuilt soon afterwards; was widened and rebuilt as at present in 1864, excepting the draw, which was built in 1875-76. It has had only ordinary repairs, but is in fair condition.

MILTON BRIDGE (FROM WARD 24 TO MILTON).

The city maintains the part within its limits. The original structure is very old; it was widened in 1871-72. The older part of this bridge was built of stone, and the widening is an iron structure on stone columns. One sidewalk has been damaged, and the fence posts broken, apparently by a team; otherwise the bridge is in fair condition.

* MT. WASHINGTON-AVENUE BRIDGE (OVER FORT POINT CHANNEL).

This is a wooden pile-bridge, with an iron draw. It was built in 1854, and was rebuilt in 1870-71. A new sidewalk has been built on the down-stream side, and from the draw to South Boston on the up-stream side.

The draw pier is in poor condition, and is so low that it is covered with water at every high course of tides. This is the only draw of importance in the city that is moved by hand power. The bridge is in fair condition.

* NEPONSET BRIDGE (FROM WARD 24 TO QUINCY).

The city maintains the part within its limits. The original structure was built in 1802; the present structure in 1877. The lower draw-pier has been repaired, and other small repairs made. The draw has been painted; the counterbalance end that is submerged in salt water at every opening was not painted, and it is much wasted by rust. The draw is too heavy to be handled by hand, and it should be replaced by a turn-table draw. The bridge is in fair condition; the iron-work should be painted.

NEPTUNE ROAD (OVER BOSTON, REVERE BEACH, &
LYNN R.R.).

This is an iron bridge, and was built in 1887-88. It is maintained by the Park Department. It needs painting; otherwise it is in good condition.

NEWTON-STREET BRIDGE (OVER PROVIDENCE DIVISION OLD COLONY R.R.).

This is an iron bridge, and was built in 1872. It is in good condition.

* NORTH BEACON-STREET BRIDGE (FROM BRIGHTON TO WATERTOWN).

The city maintains the part within its limits. This is a wooden pile-bridge, with a wooden leaf-draw. The original structure was built in 1822, and the present structure in 1884. It is in fair condition. Estimates have been made for rebuilding and widening the waterways of the bridge, the expense to be divided between Boston and Watertown.

* NORTH HARVARD-STREET BRIDGE (FROM BRIGHTON TO CAMBRIDGE).

The city maintains the parts within its limits. This bridge was originally built in 1662, and was rebuilt in 1879. The draw was rebuilt in 1891. The bridge is in good condition, with the exception of the abutment to which attention has been called in previous reports.

* PRISON-POINT BRIDGE (FROM CHARLESTOWN TO CAMBRIDGE).

The city pays one-half of the cost of maintenance. This bridge was originally built in 1833, and the present structure was built in 1876-77. It is a wooden pile-bridge, with an iron leaf-draw. This bridge is in the care of a commission, consisting of one commissioner from Boston and one from Cambridge. The bridge is in fair condition. The draw-bridge is not convenient either for the passage of vessels or for land travel; it is raised with difficulty, works very slowly, and is not in line with the centre of the channel. It will be necessary to rebuild it on a different plan before many years, in case the efforts to close the river to vessels are not successful.

PUBLIC GARDEN FOOTBRIDGE.

This is an iron bridge. It was built in 1867, and was thoroughly repaired in 1887. The floor is worn and needs renewal; otherwise it is in good condition.

SHAWMUT-AVENUE BRIDGE (OVER BOSTON & ALBANY R.R.).

This is an iron bridge, and was built in 1871. The electric-wire poles of the West End Street Railway Co. are so placed as to make an unsightly bend in the ornamental parapet. The bridge is in fair condition.

SPRING-STREET BRIDGE (FROM WARD 23 TO DEDHAM).

This is a stone bridge. The city maintains the part within its limits. A new picket fence has been built the whole length of the bridge. The bridge is in good condition.

STONY-BROOK BRIDGE (BACK BAY FENS).

This is an ornamental brick arched bridge, with stone facings, built in 1891-2. It is not yet quite completed.

SWETT-STREET BRIDGES (OVER SOUTH BAY SLUICES).

These are wooden bridges, and were built in 1875. They are temporary structures, and are in poor condition. The roadway in both bridges is safe, but the bulkheads that support the adjoining sluices are very much out of shape, and may require repairs at any time.

* WARREN BRIDGE (FROM BOSTON TO CHARLESTOWN).

This is a wooden pile-bridge, with a double iron draw. It was originally built in 1828, and the present structure was built in 1883-84. The sidewalk on the down-stream side is in poor condition, and the draws and draw piers are in but fair condition. A building for the accommodation of the Bridge Division has been erected, and electric cars have been run over the bridge this year. Only temporary repairs have been made, and the bridge is in generally fair condition.

* WESTERN-AVENUE BRIDGE (FROM BRIGHTON TO CAMBRIDGE).

The city maintains the part within its limits. The original structure was built in 1824; the present structure was built in 1879-80; the draw was rebuilt in 1891. The roadway and draw are in good condition. The draw pier is too short; it needs replanking, and some repairs to the piling.

* WESTERN-AVENUE BRIDGE (FROM BRIGHTON TO
WATERTOWN).

The city maintains the part within its limits. This is a wooden pile-bridge. It was built in 1824; the present draw was built in 1883; and the abutment was rebuilt in 1886. (See page 84.)

* WEST BOSTON BRIDGE (FROM BOSTON TO CAMBRIDGE).

The city pays one-half of the cost of maintenance. This is a wooden pile-bridge, with wooden turn-table draw. The bridge was originally built in 1792-93, was rebuilt in 1854, and repaired in 1871. This bridge is in the care of a commission, consisting of one from Boston and one from Cambridge. A new bulkhead has been built next to the Charlesbank. The bridge has been painted; the roadway, sidewalks, and fences are in good condition. The draw pier, draw, and waterway will require repairs during the coming season. (See page 83.)

WEST CHESTER-PARK BRIDGE (OVER BOSTON &
ALBANY R.R.).

This is an iron bridge, and was built in 1876. The fences and iron-work require painting. The approaches should be regraded, as has been recommended for several years past.

WEST CHESTER-PARK BRIDGE (OVER PROVIDENCE
DIVISION OLD COLONY R.R.).

This is an iron bridge, and was built in 1876. The iron-work is rusty. The bridge should be stripped of wood-work, cleaned, carefully examined, and painted.

WEST RUTLAND-SQUARE FOOTBRIDGE (OVER PROVIDENCE
DIVISION OLD COLONY R.R.).

This is an iron bridge. It was built in 1882, and is in good condition.

WINTHROP BRIDGE (FROM BREED'S ISLAND TO WINTHROP).

This is a pile bridge, without a draw. It was originally built in 1839, was rebuilt in 1851, and was extensively repaired in 1870. The bridge is old and poor, but is yet in safe condition.

There are thirty-five highway bridges wholly supported by railroad corporations.

Savin Hill Bridge, over the Old Colony Railroad at Savin Hill, has been rebuilt, widened, and lengthened. The railroad has done all the work and assumed all the expenses, including grade damages, and the city is to pay not more than five thousand (\$5,000) dollars to the railroad in consideration of the bridge being built to conform to the widening of Savin Hill avenue.

The following-named bridges have been strengthened so that electric cars can cross them safely, and in some cases other repairs have been made.

Broadway, over New York & New England R.R.

Dorchester avenue, over New York & New England R.R.

Fourth street.

Sixth street.

Washington street.

Centre-street or Hog Bridge, Providence Division Old Colony R.R.

Cottage Farm Bridge, over the Boston & Albany R.R., will probably be rebuilt in connection with the widening of the avenue.

Harvard-street and Norfolk-street Bridges will probably be rebuilt in connection with street widenings.

The remaining bridges are strong enough for ordinary travel, and require no special mention.

MISCELLANEOUS WORK AND CONSTRUCTION IN 1892.

ALLSTON BRIDGE.

On March 28, 1892, a contract was made with the Boston & Albany R.R. Co., for the construction of the abutments and retaining-walls required for a bridge over the railroad at Cambridge street, Allston.

The foundations of the abutments and retaining-walls are 10 feet in width and 4 feet deep, built of American cement concrete. A footing-course of large rectangular granite blocks two feet in thickness is laid upon the concrete base, and upon this are built the abutments and retaining-walls, of quarry-faced ashlar masonry, with joints not exceeding one inch in width.

The bridge seat-courses are $5\frac{1}{2}$ feet in width, 2 feet thick, with their top surfaces rough pointed.

The retaining-walls are capped with a granite coping 3 feet in width, 2 feet thick, rough pointed on top, and doweled to the course below with 1-inch iron dowels. The walls are ballasted with quarry chips.

The work of building the abutments was delayed on account of the difficulty of obtaining the stone from the quarry, and the work was not completed until October 17.

On June 13, a contract was made with Messrs. Cofrode & Saylor for the construction and erection of an iron bridge across the railroad.

The bridge as built consists of one through span skewed at each end, with four pin-connected trusses, to which the floor system of the bridge is suspended. The floor of the bridge is divided into a centre roadway 28 feet 6 inches wide between centres of trusses, two side roadways varying in width from 27 feet 6 inches to 29 feet 6 inches between centre lines of trusses. A portion of each side roadway is occupied by a sidewalk 7 feet 6 inches in width.

The trusses vary in length from 137 feet to 144 feet between centres of end pins, and are 22 feet in depth between centres of top and bottom chord-pins.

The roadway stringers are 4-inch \times 14-inch hard pine spaced 2 feet 3 inches on centres. Roadway planking is in two courses; the under course of 4-inch spruce, the upper course of 2-inch vulcanized spruce. The sidewalk planking is 2-inch hard pine.

Contracts for doing the filling required to raise the streets on either side of the railroad to the new grades were made with the Boston & Albany R.R. on June 3, 1892, and with Christopher McBride on August 1, 1892.

The Boston & Albany R.R. Co. commenced work on the contract on August 6, and completed the same on September 24, depositing 26,577 cubic yards in Cambridge, Lincoln, and Mansfield streets, on the north side of the bridge, at 51 cents per cubic yard, and Christopher McBride, between August 6 and October 24, deposited 17,478 cubic yards in Cambridge and Linden streets and Highland avenue, on the south side of the railroad, at 57 cents per cubic yard.

For the finished surface of the streets about 2,000 cubic yards of stone and gravel were furnished, watered, and rolled by Neil McBride and Wm. Scollans, at a cost of \$2,469.76.

Buildings affected by the changes of grade have been raised to conform to the revised grades, and the lots re-graded; new fences have been built on the lines of the streets, edgestones reset, and gutters repaved.

The total amount expended to date is \$107,743.06.

Of this amount the Boston & Albany R.R. Co. has paid \$40,000.

BOSTON COMMON.

Plans and specifications were made for reconstructing the steps in Boston Common opposite Joy street, to improve the descent. A bid from Austin Ford, of Cambridgeport, to do the work for \$550 was accepted August 17, and the work was done in November.

CASTLE ISLAND BRIDGE.

(See page 148.)

CHARLES-RIVER POLLUTION.

In September and October, 1892, at the request of your Honor, an examination of the Charles River was made, to ascertain the nature and location of the sources of its pollution. Previous examinations of a similar nature had been made by the State Board of Health (see Report dated January, 1876), and by the Massachusetts Drainage Commission (see Report of 1886).

The sources of pollution found, and a few others, information concerning which was obtained by correspondence with the local boards of health, are given in the list which follows:

The list contains also a number of drains from manufacturing establishments, etc., which were not found to be contaminating the river, but of which a record is of interest. Factories in course of construction, or those which have adopted means of preventing pollution, and sewers and drains which have been abandoned, or which discharge nothing but storm water, are included in the latter category. Where pollution was observed, its nature is shown in the fifth column of the table; and where no pollution was observed, the fifth column is left blank.

Several of the establishments and drains which were polluting the river when the examination was made have since ceased to do so. This is the case especially in Waltham and Watertown, where the discharge has, in many cases, been diverted into the local sewers which flow into the South Metropolitan system. Other pollutions will probably be diverted from the river in a few months. In either of these cases, if the fact is known to this department, it is noted in the column headed "Remarks added January, 1893."

In cases where it is known that the State Board of Health has discussed means of stopping the pollution, reference to their discussion is made in the same column, which contains also in some cases a note as to the obvious course to be pursued in putting an end to the pollution.

Sources of Pollution of Charles River and its Tributaries, October, 1892.

Reference Number.	Town or City.	Locality.		Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
1 . . .	Milford . . .	Central st.	Sewer	Sewage	Pollutes the river badly . . .	Systems of sewage disposal for Milford are discussed in State Drainage Report (1886), p. 175.
2 . . .	" . . .	Main st.	Sewer	Sewage . . . . .	. . . . .	Flows into bed of stream below dam, where there is but little current except in wet weather; makes river very dirty.
3 . . .	" . . .	Cedar-swamp Pond,	Privies and drains of 12 dwellings	Discharge from privies and house drains . . . . .	. . . . .	Discharge into Cedar-swamp Pond
4 . . .	" . . .	" . . .	Green Bros., bleachery	Waste liquor from bleaching	12	Use dry privies. Bleach leather and clean carpets.	
5 . . .	" . . .	Below Main st.	Several privies & house drains,	Discharge from privies and house drains . . . . .	. . . . .	Discharge into stream and raceway below Main-st. sewer
6 . . .	" . . .	"	Gas works	Waste liquor from gas making . . . . .	. . . . .	Liquor dark and bad smelling
7 . . .	" . . .	" . . . . .	" . . . . .	" . . . . .	. . . . .	Below Central st. the river is very shallow and almost dammed up with deposits from mills and sewers above

Since October the river at Milford village is said to have been cleaned out and straightened.

8	"	Central st.	Milford Shoe Co.	Water-closets, and dust and scrapings of leather	600	Factory directly over the river
9	"	North of Central st.	Green Bros., heel manufacturers and renderers of scrap leather	Liquor from rendering vats	200	Use dry privies. The liquor from the vats is offensive
10	"	South of Central st.	Small brook or drain	Sewage from several private residences and Eastman's box factory		Employees of Milford Shoe Co. are troubled by bad smells from this brook
11	"	$\frac{1}{2}$ mile below Central-st. bridge	Clapp, Huckings, & Temple, shoe shop	Overflow from cesspool	350	Cesspool receives all factory waste, including drainage from water-closets
12	"	$\frac{1}{2}$ mile below Central-st. bridge	Electric Car Manufactory . . . . .	. . . . .		In course of construction near river. No plan as yet for sewage disposal, } Rebuilding — will employ about 5 hands.
13	Bellingham	Bellingham	Shoddy mill of Norfolk Woollen Co.	Privies, waste water from wool-scouring and spent dye-liquor	130	
14	"	North Bellingham,	Ray Woollen Co.	Privies, waste water from wool-scouring, and spent dye-liquor	105	
15	"	Caryville	Taft-McKean Woollen Co.	None observable		Very little wool is scoured. Run only part of the year.
16 & 17	"	Between North Bellingham and Caryville	Two saw-mills	Privies, spent dyes, and all waste matter	60	Scour some wool, but not so much as formerly. The pollution here is a cause of complaint at Ray & Wilson's mill below .
18	Medway	West Medway	Medway Woollen Co.			No wool is now scoured at this mill.

Systems of sewage disposal for Milford are discussed in State Drainage Report (1886), p. 173.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
19 . . .	Medway . . .	West Medway . . .	Waste from dye vats	15	Use dry privies. No washing or scouring done. Dye vats drained into river once a month.	
20 . . .	Franklin . . .	Franklin	Privies, wash water, and spent dye	185	Discharge into a brook which runs into Mine Brook	
21 . . .	"	"	Privies, wash water, and spent dye	45	Discharge into a brook which runs into Mine Brook. No wool scoured here	
22 . . .	"	"	A little waste water goes into brook	20	Use dry privies	Systems of sewage disposal for Franklin are discussed in State Drainage Report (1886), p. 181, and State Board of Health Report for 1889, p 64.
23 . . .	"	"	Privies and waste water	45	Discharge into the brook which runs into Mine Brook	
24 . . .	"	"	Privies and waste liquor from scouring and dyeing	150	Discharge into the brook which runs into Mine Brook	
25 . . .	"	Near W. W. Pumping-station . . .	Waste water from washing gum	200	Use dry privies. Waste water runs in a covered drain, and through a meadow into Mine Brook. Very offensive	

26	"	Unionville	F. E. Ray, woollen mill	Privies and waste liquors, from wool scouring and dyeing	about 35	Scour 20,000 lbs. wool per year. Dye 150,000 lbs. Water below mill is dark red, and pond is almost filled with black mud.
27	"	"	Franklin Cotton Mills, twine and cord	Privies	20	Mill and privies directly over water.
28	"	Franklin	Dean Academy	Sewage of 100 pupils . . . . .	. . . . .	Drain leads into a swamp.
29	"	"	E. P. Bassett & Sons, hat factory	Sewage . . . . .	. . . . .	Discharge into Dean Academy drain.
30	Norfolk	City Mills	City Mills Co., felt	Privies and waste liquors from wool scouring and dyeing	88	150,000 lbs. wool scoured yearly.
31	"	About 1 mile above City Mills	J. C. Wall's paper-mills	Small amount of waste dye	6 to 8	Use earth privies.
32	Wrentham	Near Whiting's Pond	Two small shoddy-mills	Privies and waste liquor, including vitriol	12	
33	Millis	Rockville	P. A. Waite, felt mill	Waste water from washing and dyeing and a little scouring	25	Use dry privies.
34	"	"	Baltimore Paper Co.	Waste from a very little washing	7	Use earth privies.
36	Norfolk	Norfolk	Ray's shoddy-mill	Vitriol and waste from disintegrated rags, and waste dye-liquor	30	Effluent looks like ink. Drains into Stop River.
37	"	Highland Lake	Picnic ground . . . . .	. . . . .	. . . . .	Several thousand people congregate here at times. One of the privies is on the bank of the pond.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
38. . . .	Norfolk . . .	Highland Lake . . .	Campbell's paper-mill	3 or 4	Not running at present. Does but little business. Makes coarse paper without bleaching or color.	
39. . . .	Medfield . . .	Medfield	Filter bed for sewage from straw shops . . . . .	. . . . .	{ Filter bed not well cared for, but does not cause nuisance. Receives waste liquor from dyeing, and also sewage of 800 operatives. Sec. Jour. Ass. Eng. Soc., July, 1888, p. 255; also Mass. State Board of Health Report for 1887. No pollution of stream was observed.	
40. . . .	"	"	Straw shops	800		
41. . . .	Holliston . . .	Holliston	Boot factory	15		
42. . . .	"	"	Two large livery-stables . . . . .	. . . . .	
43. . . .	"	"	Several house-drains & privies, . . . . .	. . . . .	
45. . . .	"	East Holliston . . .	Clark's blanket-mill	80		Makes blankets of wool, and of wool and shoddy colored and natural. Pollutes Boagister Brook badly.
46. . . .	Natick	South Natick	Privy near mill-pond . . . . .	. . . . .	Overflow from privy	Privy at top of steep bank about 100 feet from pond — other privies in vicinity are not allowed to overflow.

47	Wellesley	Near Waban Lake, paper mill	Henry Woods' Sons & Co. paper mill	40	The bed of the tail race is highly colored by a considerable deposit of sediment. Vitriol, chromic ores, and litharge said to be used.
48	"	"	Stone Hall, a part of Wellesley College		The sewage runs into a cesspool, from which the solids are occasionally cleaned out. The liquid portion runs through a pipe into a small filter-house where it is strained through peat. The strained liquid runs into Waban Brook
49	"	"	Wellesley College filter-bed		The college authorities do not intend to connect "48" with "49," but they may, perhaps, build a new filter-bed for "48."
50	Needham	Charles River Village	Waban Paper-mills	6 or 7	About 1.5 acres artificially graded receive sewage of three of the college buildings, including the kitchen and laundry building. This bed serves about 450 students, etc.
51	Deedham	Near cut-off ditch	Sink drain		Makes colored wrapping-paper.
52	"	Deedham Village	Sink drain		Runs into river.
53	"	"	Cesspool of house of Mrs. J. W. Clark		Runs into brook from Wigwam Pond.
54	"	"	County jail		Runs into brook from Wigwam Pond.
			Overflow from cesspool		The sewage of the jail runs into a filter-bed on the Waring System.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.		Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
55 . . .	Dedham . . .	Near Spring-street Bridge	House of Mrs. Shorrey, rag washer	Water from rag washing . . . . .	. . . . .	Water collects in pools about the house, to be washed into the river when it rains.	
57 . . .	Newton . . .	Upper Falls . . .	Pettee's Machine Co. . . . .	. . . . .	400	Use cesspools. Some oily substance fouls the race-way.	
58 . . .	" . . .	" . . .	Nelson Chemical Co.	A little rinsing-water.			
59 . . .	" . . .	" . . .	Phipps & Train, silk mills	Privy, also a little aniline dye and soap	175	Privy over river for office employees. Employees in main works use cess-pools.	
60 . . .	" . . .	" . . .	Hickey's paper-mill . . . . .	. . . . .	. . . . .	Not running at present.	
61 . . .	" . . .	" . . .	Newton Rubber Co. . . . .	. . . . .	75	Cesspool within 10 feet of river.	
63 . . .	" . . .	Lower Falls . . .	Crehore's paper-mill, press paper	A little bleach-i-g-powder	12	Water-closets drain into vaults.	
64 . . .	" . . .	" . . .	Cordingley's shoddy-mill	Waste from di-integrated rags,	25	Water-closets drain into vaults.	
65 . . .	" . . .	" . . .	Wiswall paper-mill	A little lime, soda-ash, bleach-ing-powder, alum, and very little chromate and prussiate of potash	6	Cess-pool 15 feet from river.	

66	"	"	"	Mrs. Boury's 2-tenement house,			Privies on steep bank, 40 feet from river. Leaky near the top. Hogshhead for sink water.
67	Needham	Highlandville		Union Cycle Mfg. Co.	Privies	180	Privies discharge into Rosemary Brook
68	Wellesley	Lower Falls		Dudley Hosiery Co.	Privies, also suds from washing completed garments	120	7,000 to 8,000 lbs. wool used weekly.
69	"	"		Adam Beck's machine-shop	Privy	10	No manufacturing waste gets into river.
70	"	"		R. B. Bishop's paper-mill	Water-closet drainage. Some waste dye		Not now running — when running full time, employs 25 hands. Uses wood pulp.
71	"	"		R. T. Sullivan, shoddy mill	Privies, also vitriol and waste from disintegrated rags	38	Uses about 5,000 lbs. rags daily, of which 5/8 is waste, and 30 to 40 carboys of vitriol monthly.
72	"	"		Billings, Clapp, & Co., chemical works	Water from washing bottles	12	Privy is over a vault which is cleaned out regularly. No waste chemicals enter the river.
72A	Weston	Riverside		Privy near R.R. bridge	Privy.		
73	Waltham	Roberts		William Roberts' paper-mill		25	Makes only asbestos paper — waste water goes into a basin where liquids soak into the ground, and solids are cleaned out. Hands use earth closets.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
74 . . .	Waltham . . .	400 feet south of watch factory . . .	Orange-street drain . . . . .	. . . . .	Takes surface water from Orange st. and a small part of Crescent st.	
75 . . .	" . . .	Near watch factory	Robbins-street drain . . . . .	. . . . .	Takes surface water from Robbins st.	
76 . . .	" . . .	Under " . . .	Old drain . . . . .	. . . . .	Takes surface water from part of Brown st.	
77 . . .	Waltham . . .	Crescent st.	American Waltham Watch Co.,	2,865	Water-closets drain into a cesspool from which the solids are frequently cleaned out; liquids at present overflow into river, but a pump has been bought for pumping the liquids into the sewer.	The pump is now in good working order; no sewage escapes to river.
78 . . .	" . . .	Prospect-st. Bridge	Crescent-st. drain . . . . .	. . . . .	Takes surface water of Brown and Ash sts. and part of Adams and Crescent sts.	
79 . . .	" . . .	About 900 ft. east of Prospect-st. Bridge	Walnut-st. drain . . . . .	. . . . .	Takes surface water of Walnut, Maple, and part of Crescent sts.	
80 . . .	" . . .	East of Moody-st. Bridge	Moody-st. drain . . . . .	. . . . .	Takes surface water of Moody and Robbins sts.	

81	Moody-st. Bridge	Upper Main-st drain . . . . .	. . . . .	. . . . .	Takes surface water of Moody, Main, Common, Grant, Facon, Francis, Howard, Kussel, and Hammond sts., also water of an unpolluted brook.
82	Between Moody and Elm sts.	Boston Mfg. Co., cotton goods,	Discharge from water-closets	1,250	A stream of water flows through water-closets and discharges into river. } Will soon be connected with the Waltham Sewer.
83	Near Elm-st. Bridge	Felton st. drain	Sewage from several water-closets and two meat-markets . . . . .	. . . . .	Takes surface water of Carter, Elm, Water, Williams, Fountain and part of Charles st., also sewage from F. R. R. Station, Parliament Block, and two meat-markets. } The meat-markets and water-closets now drain into the Waltham Sewer.
84	Opposite Boston Mfg. Co.	Lowell-st. drain	Drainage from wet collars . . . . .	. . . . .	Takes surface water of Lowell, Hall, and parts of Pine, Alder, Ash, and Brown sts.
85	Near branch R. R.	Waltham Gas and Electric Light Co. . . . .	. . . . .	. . . . .	. . . . .
87	Elm st.	W. A. Hunnewell's coal-yard	Privy	12-15	Privy overhangs river. } This now drains into the Waltham sewer.
88	"	American Watch Tool Co.	Discharge from water-closets . . . . .	. . . . .	. . . . .
89	Newton-st. Bridge,	American Laundry Co.	Chloride of lime and dirty water from washing clothes,	25	Water-closets drain into cess-pool about 30 ft. from river. } Now connected with sewer.
90	"	Newton-st. drain	The waste from laundry (89) reaches river through this drain . . . . .	. . . . .	Takes surface water from Gorham st. and part of Calvary and Newton sts. } No. 40 now receives no drainage from laundry.

NOTE.—The Waltham Board of Health estimates that about 70 houses drain their sewage into the surface-water drains on the south side of the river. The inspections of the Board are now engaged in finding out which these houses are, in order that the practice may be stopped. [December, 1892.] About one-half of these houses have been connected with the Waltham sewers since October.

Sources of Pollution of Charles River and its Tributaries, October, 1892 — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
91	Waltham	Main st. and Beaver Brook	Lower Main-st. drain . . . . .	. . . . .	Conveys to Beaver Brook the surface water from Pleasant, Harris, Cross, and Liberty sts. and part of Main st.	
92	"	Lower R.R. bridge.	Calvary-st. drain . . . . .	. . . . .	Takes surface water from Moore, Oak, Avorn, Cedar, and Ballou sts. and a part of Calvary st.	
93	"	700 ft. above Farwell-st. Bridge.	Atlas Chemical Works, sulphuret of antimony	3	No privy; 6,000 lbs. of sulphur and 3,900 lbs. of caustic soda used weekly.	
94	"	700 ft. above Farwell st. Bridge.	Brook . . . . .	. . . . .	This brook runs through the field where is dumped the filth cleaned out from the cesspools of Newton, part of which gets into brook.	
95	"	Bleachery st.	Waltham Bleachery and Dye Works	260	Water-closets and privies, also waste from bleaching and dyeing	Will soon be connected with sewer.
96	Newton	Farwell st.	Houses of Mr. Farwell . . . . .	. . . . .	Privy of one family has chute into river. Sink drainage of three families goes into river.	

97	"	Nouantum, near bridge	Dr. Denis' boarding-house	Overflow from privy	Privy overflows into river	Will connect with sewer.
98	"	Nouantum	Nouantum, Mills (worsted)	Water-closet drainage and waste dye-liquor, etc.	550 Sewage reaches river by a pipe drain	} Will connect with Metropolitan Sewer.
99	"	Off California st.	Barker & Co., starch m'f'g.	Sour waste containing gluten	10 Privy eight ft. from river. Waste liquor reaches river by an open ditch.	} Will soon connect with Metropolitan Sewer.
100	"	Newtonville	Brackett Coal Co., stable	Drainage from stable	Drain from stable enters laundry brook.	
102	Watertown	Bemis	Ethna Woollen Mills	Water-closet drainage, water from wool washing and spent dye-liquor	240 Wash a large amount of wool	} These will soon enter the extension of town sewer now being constructed.
103	"	"	Indurated Fibre Co.	Water containing a little wood pulp	10 Foul privy ten ft. from river bank. The sour water is very offensive.	} These houses now drain into tight vaults.
104	"	Near Bemis	Crystal Spring Mfg. Co., starch	Sour water containing gluten	Privies are over river	
105	"	Near Galest. Bridge	Six houses	Discharge from privies and sinks	" " "	
106	"	Near Galest. Bridge	Hollingsworth & Whitney, paper	Privies and a little chloride of lime	125 " " "	
107	"	Near Galest. Bridge	Lewando's Dye-house	Water-closet drainage and highly colored dye-liquor.	150 Dye-house is over river	} These will soon enter the town sewer; the work of making connections is now going on.
108	"	Near Galest. Bridge	Walker & Pratt Mfg. Co., stoves	Privies and very small amount of acid	100-125 Privies are over river	
109	"	Near Galest. Bridge	Watertown Grist-mill	Privy	8 Privy is over river	} Will soon enter town sewer; connections partly made.
110	"	Near Galest. Bridge	Block of buildings with stores,	Sewage		

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
111	Watertown.	Near Galen-st. Bridge	Dirty water from two laundries, swill, etc.	6	This branch is foul. There are several privies a few feet from brook.	
112	"	Near Galen-st. Bridge	Privy	6	Two stables near brook. Cesspool fifteen feet from brook. Privy over brook at M. Whitney's carpenter shop on Church st.	
113	"	Near Galen-st. Bridge	Privy	6	Privy over river.	
115	"	California st.	Sewage	6	Discharges all sewage into a brook which runs into the river	Will soon connect with town sewer.
116	"	Morse's Pond	Privy	6	Open privy 6 ft. from pond.	
117	"	Outlet of Morse's Pond	Privy	6	Privy over outlet from Morse's Pond	Will soon connect with town sewer.
119	"	Galen st.	Sewage	6	Discharges sewage into river by 12-in. pipe just above Galen-st. Bridge.	Now connected with the town sewer.

120	"	"	Water st.	Warren Soap Mfg. Co.	Water-closet drainage and waste water	14	Discharges sewage into river by 4 in. pipe	} Will soon enter the town sewer.
121	"	"	"	Newton & Watertown Gas Co.	Privy	20	Uses cesspools for all privies and drains, except one privy	
122	"	"	"	Two-tenement house of D. O'Keefe	Privy and sink water		Privy over river	
123	"	"	"	Street drain			Enters river by a 16-in. iron pipe under privy of "122,"	
124	"	"	"	Watertown Starch Co.	Privy, also sour waste containing gluten	16	Privy over river—waste water is offensive; it enters river by four 6-in. pipes	Will soon enter the town sewer.
125	"	"	"	Stanley Dry Plate Co.	Water-closet drainage and wash water	16	Sewage enters river by wooden box 8-in. X 12 in.	
126	"	"	"	Elliot Cycle Co.	Water-closet drainage and wash water	150	Sewage enters river by 6-in. iron pipe	Will soon enter the Metropolitan sewer.
127	Newton			Hyde Brook	Privy and drainage of a two-tenement house		Brook runs under a barn, under which the drain and privy discharge. The cows have been removed from this barn by order of Board of Health. Cesspool formerly discharged through the ground into the river. The construction of the Metropolitan Sewer cut off this underground drainage, making overflow probable.	
128	"			Mrs. Parker Emerson's residence				

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
129	Newton	W. Lawson's residence	Overflow from cess-pool		Liquid from cess-pool overflows and runs on surface of ground into river.	
131	Watertown	Arsenal st.	Some domestic sewage and part of drainage of Union Market		This drain was built for surface drainage, but some houses have made connection with it.	
132	"	Near Union Market Station	Drainage from two houses and part of the Union Market drainage.			
133	"	Near Union Market Station	Cattle-yard washings		2,000 to 4,000 cattle here; manure collected and sold, but when it rains a large amount of barn-yard washings goes into the drains which lead to "131" and "132."	
134	"	Near Union Market Station	Drainage from privy	8		
135	"	Near Union Market Station	A little house-sewage			A few houses have connections with this drain.
136	"	Near Union Market Station	Street drain			

137	"	Near N. Beacon Bridge	8-in. pipe from Watertown arsenal.	Sewage.	No discharge when observed.	
138	"	Near N. Beacon Bridge	24-in. stone drain from arsenal foundry		The filth from this privy is partly washed into the river when it rains.	
139	"	Off Arsenal st.	Privy on edge of marsh	Washings from privy	Privy over edge of river.	
140	"	Near Western-ave. Bridge	Privy in coal yard	Privy	5 or 6	
142	Boston (Brighton)	Faneuil	Faneuil sewer	Sewage of 15 houses.		
143	"	Near Abattoir	N.E. Dressed Meat & Wool Co.,	Water from washing sheep-skins		Will probably enter Metropolitan Sewer by April, 1893.
144	"	"	Sewer from N. Beacon and Parsons sts.	Sewage		
145	"	"	Brook from Strong's and Chandler's Ponds	Drainage from several houses,		The Board of Health has sent notices to the owners of the houses.
146	"	"	Boston Fresh Tripe Co.	Floor washings of tripe works,		Will probably enter the Metropolitan by May, 1893.
147	"	"	Brighton Abattoir	Blood and foul floor-washings,		The dumping of rubbish behind the abattoir ought to be prohibited.

Wash 12,000 skins (with wool on) per week. Water-closet drainage goes into cesspool . . .

Has outlet in common with "143" and "145."

Several houses on Tremont and Nonantum streets, near Oak square, pollute a branch of this brook

Three drains convey washings to river; said not to take any blood .

Seventeen drains lead to the river, the banks and bed of which are made very filthy and offensive.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
148 . . .	Doston (Brighton)	Wstm.-ave. Bridge,	Sewage . . . . .	. . . . .	Outlet, 2 ft. X 3 ft. 4 in.	[Dec., '92.] Now connected with Metropolitan Sewer.
149 . . .	"	Near Western-ave. Bridge	Privies . . . . .	. . . . .	Two privies over river.	
150 . . .	"	Off Western ave.,	Privy for 3 men. Water-closet and sink-drainage of 4 families . . . . .	. . . . .	Privy over river; pipe from water-closets and sinks enters river just west of coal wharf.	
151 . . .	"	Off Western ave., near Everett-st..	Sewage . . . . .	. . . . .	Outlet, a 24-in. X 24-in. box sewer enters a foul ditch which flows into the river	Now connected with the Metropolitan Sewer.
152 . . .	"	Near Western ave.,	Privy, water-closet, sink, and stable drainages . . . . .	. . . . .	Several houses and stables north of Western avenue, and at Barry's Corner, and Grant street, drain into the river; on to the marsh, or into ditches in the marsh	The Board of Health has sent notices to the owners.
153 . . .	"	Near North Harvard-st. Bridge .	Privy	2 to 8	Privy over river.	

154	"	"	Near Western-ave. Bridge . . .	Gillette & Pierce, coal yard . . .	Privy and stable manure . . .	15	Privy over river. Stable on bank of small stream.
155	"	"	Above Cambridge-st. Bridge . . .	Small polluted stream . . .	Sewage of several houses . . .		The sewage reaches the small stream by an 8-in. box drain.
156	"	"	Below Cambridge-st. Bridge . . .	Brookline Gas Co.	Discharge from water-closet and sink	8	The sewage comes through a 6-in. iron pipe; an 8-in. pipe discharges nothing but water.
157	"	"	Beacon Park . . .	Drain from Beacon Park (12 in. X 24 in.) . . . . .	. . . . .		Surface water only.
158	"	"	Near Beacon Park, . . .	Allston sewer (36 in. X 38 in., wood)	Sewage		Runs into a foul stream which runs 600 or 700 ft. to the river
159	"	"	Near Cottage Farm, . . .	Signal Tower No. 9, B. & A. R.R.	Sink drainage		Sink drainage enters river by a 6-in. pipe.
160	"	"	"	B. & A. R.R. Roundhouse . . .	Water-closet and sink drainage.		
161	"	"	Cottage Farm . . .	Gate-tender's house, Essex-st. Bridge	Privy	1	Privy over river.
162	"	"	"	Factory and several houses . . .	Sewage.		
163	Cambridge	"	Opposite Lowell-st., . . .	Lowell-st. sewer	"		Two outlets, one 48-in. X 48-in., wood, and one 18-in. X 18-in., wood. Drains about 252 acres
164	"	"	"	Sewer opposite Maynard place, . . .	"		Outlet, 22-in. X 22-in. wood. †
165	"	"	Foot of Maynard st., . . .	Privy over river (stone yard) . . .	Privy	10	†

{ Will probably be connected with Metropolitan sewer by April, 1893.

† A dagger indicates that the discharge in question will probably be diverted into the North Metropolitan Sewer soon after the latter is ready to receive sewage.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
167	Cambridge	Opposite Sparks st.	Sewage		Outlet, 24-in. × 23-in. wood. Drains about 68.8 acres.	†
168	"	Opposite Bath st.	"		Outlet, 40½-in. × 52½-in. Drains about 246 acres.	†
169	"	Opposite Willard st.	"		Outlet, 24-in. × 28-in. wood. Drains 21 acres.	†
170	"	Stable of Paving Department			8-in. pipe and 4-in. pipe, relics of old gas-works; no discharge at present.	
171	"	Opposite Brewer st.			14-in. × 14-in. wood. Said to be disused.	
172	"					
173	"	Foot of Murray st.	Bad-smelling water.			
174	"	"	Privy		Used by about 20 persons.	
175	"	"	Public dump.			
175	"	"	Murray-st. sewer			
176	"	260 ft. west of North Harvard-st. Bridge	Sewage		Outlet, 24-in. × 30-in. wood. Drains 62.8 acres.	†
176	"	8-in. × 10 in. box, draining marsh behind dike.				
178	"	Opposite Dunster st.	Sewage		Outlet, 24-in. × 26-in. Drains about 12 acres.	†

179	"	Richardson & Bacon, coal wharf	Privies		Two privies over river. 18-in. ground drain enters river.	†
180	"	Opposite Charles-River st.	Sewage		Outlet, 54-in. × 54 in. wood. Drains about 469 acres	†
181	"	West of Western-ave. Bridge	"		Outlet, 12-in. × 15-in. wood. Drains about 6 acres	†
182	"	Under Western-ave. Bridge	"		Outlet, 44-in. × 40-in., another 24-in. × 24-in. Drains about 114 acres	†
183	"	Blackstone st.	Riverside Press		Four waste-water pipes and ground drains. No serious pollution.	†
184	"	Off Pleasant st.	Pleasant-st. sewer		Outlet, 36-in. × 42-in. Drains about 92 acres	†
185	"	Opposite Pearlst.	Pearl-st. sewer		Outlet, 56-in. × 30-in. Drains about 94 acres	†
186	"	Under Brookline Bridge	Sewer		Outlet, 12-in. × 12-in. box. Drains a small area	†
187	"	Opposite Hamilton st.	Public sewer		Outlet, 36-in. × 42-in. Drains about 71 acres	†
188	"	Below Harvard Bridge near end of sea-wall	"		Outlet, 20-in. × 20-in.	†
189	"	"	Street drains from Main st.			
190	"	Near Brookline Bridge	Drain from Norcross Bros. stone yard	50	Outlet, 15-in. × 15-in. wood.	†

†A dagger indicates that the discharge in question will probably be diverted into the North Metropolitan Sewer soon after the latter is ready to receive sewage.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
191 . . .	Cambridge . . .	Main st.	Privies	50	Privies overhang river.	
192 . . .	" . . .	"	Drainage from privies	50	Privies discharge into a tank which is flushed by the tide.	
193 . . .	" . . .	Broad Canal	Sewage	30	Sewage runs into canal by pipe.	
194 . . .	" . . .	"	"	40	Sewage runs into canal by pipe.	
195 . . .	" . . .	Stone yards (Horgan's & Ford's)	Privies	20-30	Two privies over canal.	
196 . . .	" . . .	Vinegar factory	Water-closet drainage and refuse vinegar		Drains into canal by an 8-in. box drain.	
197 . . .	" . . .	Leander Greeley's building	Sewage	200	The building is used by several tenants for wood working.	
198 . . .	" . . .	S. Tower, Son, & Co., wood working	"		Said to drain into canal by pipes.	
199 . . .	" . . .	Wharf west of 6th st.	Privy	150		
200 . . .	" . . .	Chemical works below 6th st.	Lime water			
201 . . .	" . . .	Seavey's Tin Shop	Sewage	100	Sewage enters canal through a 10-in. pipe under Fourth-st. Bridge.	

202	"	"	Stone yards north of canal			An 8-in. box drains the yards.	
203	"	"	Between Broad, Canal, and Binney sts.	Dump		Flats behind sea-wall are being filled with ashes, refuse, etc.	
204	"	"	Binney st.	Binney-st. sewer	Sewage	Outlet is a 98-in. × 84-in. box; drains about 853 acres.	†
205	"	"		Dugan Bros., stone works	Sink drainage	12-in. × 12-in. drain for waste water, etc.	
206	"	"	South of Bridge st.	Public sewer	Sewage	Outlet, 18-in. × 24-in. wood; drains a small area.	†
207	"	"	Wharf south of Bridge st.	8-in. box drain from ground behind wall.			
208	"	"	On wharf west of Craigie's Bridge,		Privies.		
209	"	"	Under Craigie's Bridge	Bridge-st. sewer	Sewage	{ The outlet is 100 in. × 96 in. wood. The discharge is very offensive. The apron, bridge-piles, etc., are covered with a greasy deposit. Takes sewage of about 33,000 people in Cambridge and Somerville; also the drainage of Squire's and North's packing-houses	†
211	"	"	Under Prison-pt. Bridge	Sewer	Sewage	12-in. outlet	†
212	"	"	Above Prison-pt. Bridge	Privy on wharf	Privy.		

† A dagger indicates that the discharge in question will probably be diverted into the North Metropolitan Sewer after the latter is ready to receive sewage.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
213	Cambridge	Miller's River	Sewer overflow, 10 in. X 13 in.		Enters river at head of West End Ry. wharf. Formerly a sewer connecting with Squire's packing-house; now disused except as an overflow.	
214	"	"	West End Ry., power house		A 10-in. pipe and a 30-in. pipe discharge warm water from condensers, etc.	
215	"	"	Cambridge Sugar Refinery		A 30-in. iron pipe discharges water from condensers.	
216	"	"	10-in. pipe, draining ballast and coal yard.			
217	"	"	Wharf, west of Cambridge Sugar Refinery		Privy.	
219	Boston, Rox.	Opposite St. Mary's st.	St. Mary's-st. sewer, overflow,		Storm overflow of sewer in St. Mary's st.	The St. Mary's-st. sewer receives the sewage of Brookline. The ordinary flow runs into the South Metropolitan Sewer and so goes to Moon Island.
220	"	Off Commonwealth ave.	W. J. Sullivan, freestone cutting yard	76	Privy	Privy over river.
221	"	Off Commonwealth ave.	Crescent Boat-house			

222 . . .	"	"	Off Bay State road,	Muddy-river Conduit (3 ft. x 11 ft.) . . . . .	. . . . .	. . . . .	No. sewage now runs into Muddy River.
223 . . .	"	"	Raleigh st.	House	House drainage . . . . .	. . . . .	House drains into an old pipe-sewer which runs into river.
224 . . .	"	"	45 Bay State road . . . . .	. . . . .	Privy . . . . .	. . . . .	Privy over river used by men at work on houses.
225 . . .	"	"	Stony Brook	Three-tenement house, No. 80 Rogers ave.	Sink drainage . . . . .	. . . . .	Sink drains enter Stony Brook by a leak in the wall
225 . . .	"	"	"	Three-tenement house, No. 78 Rogers ave.	Water-closet and sink drainage . . . . .	. . . . .	Sewage enters brook by an 8-in. pipe
227 . . .	"	"	"	House, No. 17 Rogers ave. (one family)	Sink drainage . . . . .	. . . . .	. . . . .
228 . . .	"	"	"	House, No. 16 Rogers ave.	"	"	Sink drains into brook by a 6 in. pipe
229 . . .	Boston (Rox.)	"	Stony Brook	Three-tenement house, No. 15 Rogers ave.	Sink drainage . . . . .	. . . . .	The Street Department is making plans for a sewer to intercept the discharge from Nos. 225 to 280.
230 . . .	"	"	"	Three-tenement house, No. 15 Rogers ave.	Water-closet and sink drainage, . . . . .	. . . . .	Sink water drains into brook through a leak in the wall
231 . . .	"	"	"	Three-tenement house, No. 15 Rogers ave.	"	"	Sewage goes into brook by an 8-in. pipe
232 . . .	"	"	"	House, No. 11 Rogers ave.	Sink drainage . . . . .	. . . . .	Sewage goes into brook by a 10-in. pipe
233 . . .	"	"	"	Three-tenement house, No. 7 Rogers ave.	Water-closet and sink drainage, . . . . .	. . . . .	Sewage goes into brook by a 10-in. pipe
234 . . .	"	"	"	Six-tenement house, No. 6 Rogers ave.	"	"	Sewage goes into brook by a 6-in. pipe

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
235	Boston (Rox.).	Stony Brook . . .	Water-closet and sink drainage, . . . . .	. . . . .	Sewage goes into brook by an 8-in. pipe	
236	"	"	Sink drainage . . . . .	. . . . .	Sink water goes into brook by an 8-in. pipe	
237	"	"	" (one family) . . . . .	. . . . .	Sink water goes into brook by a 6-in. pipe. Privy is soon to be drained into brook	
238	"	"	Water-closet and sink drainage, . . . . .	. . . . .	Sewage goes into brook by an 8-in. pipe	
239	"	"	Water-closet and sink drainage (one family) . . . . .	. . . . .	Sewage goes into brook by an 8-in. pipe	
240	"	"	Sewage of 13 families . . . . .	. . . . .	Sewage goes into brook by a 10-in. pipe	
241	"	"	Water-closet drainage of 16 families. Sink drainage of 23 families . . . . .	. . . . .	Nos. 1, 2, 3, 4, 5, 7, 8, 9, and 11 drain into this 10-in. pipe	
243	"	"	Sink drainage . . . . .	. . . . .	Leaks into brook through the wall	
244	"	"	Water-closet and sink drainage,	Abt. 125	Sewage goes into brook by a 6-in. pipe	
245	"	"	"	75	Sewage goes into brook by a 6-in. pipe	

The Street Department is making plans for a sewer to intercept the discharge from Nos. 225 to 289.

246	"	"	"	"	"	12-in. X 10-in. wooden box-drain	Carriage washings	From stable of Hayward & Co.
247	"	"	"	"	"	House on S.W. cor. Tremont and Culvert sts.	Water-closet and sink drainage of 19 families	Sewage enters brook through two 8-in. pipes.
248	"	"	"	"	"	House, No. 1 Culvert st.	Water-closet and sink drainage of 6 families	Sewage goes into brook through a 6-in. pipe and a 4-in. pipe
249	"	"	"	"	"	Eastern Electric Co., cor. Culvert and Hampshire sts.	Water-closet drainage	Sewage goes into brook through a 12-in. X 8-in. box-drain
250	"	"	"	"	"	House, No. 5 Downing st.	Water-closet and sink drainage,	Sewage goes into brook through a leak in the wall.
251	"	"	"	"	"	" " 13	" "	Sewage goes into brook through a 4-in. pipe
252	"	"	"	"	"	" " 15	" "	"
253	"	"	"	"	"	" " 19	" "	Sewage enters brook through a leak in wall.
254	"	"	"	"	"	" " 21	" "	Sewage enters brook through a 3-in. pipe
255	"	"	"	"	"	" No. 145 and No. 148 Vernon st.	" "	Sewage enters brook through an 8-in. pipe
256	"	"	"	"	"	6-in. pipe drain from house No. 10 Simmons st.	" "	House not occupied
257	"	"	"	"	"	J. M. Marston & Co., Tor. Cary and Culvert sts.	Water-closet and sink drainage,	Sewage enters brook by a pipe
258	"	"	"	"	"	No. 35, No. 37, and No. 59 Culvert st.	" "	Sewage enters brook by two 8-in. pipes

The Street Department is making plans for a sewer to intercept the discharge from Nos. 255 to 280.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — *Continued.*

Reference Number.	Town or City.	Locality.	No. of Operatives.	Kind of Pollution entering Stream.	Remarks.	Remarks added January, 1893.
260 . . .	Boston (Rox.),	Stony Brook		Water-closet and sink drainage of one family		
261 . . .	"	"		"	Connected with brook, but not now in operation	
262 . . .	"	"		Water-closet, sink, and stable drainage	Sewage enters brook by an 8-in. pipe	
263 . . .	"	"		Water-closet and sink drainage,	Sewage enters brook by a 6-in. pipe	
264 . . .	"	"		" " " "	Sewage enters brook by two 6-in. pipes	
265 . . .	"	"		" " " "	Sewage enters brook by a 6-in. pipe	
266 . . .	"	"		" " " "	Sewage enters brook by a 4-in. pipe	
267 . . .	"	"		" " " "	Connected with brook by a 6-in. pipe, but this pipe is not used, as there is a pipe to the sewer	The Street Department is making plans for a sewer to intercept the discharge from Nos. 225 to 280.
268 . . .	"	"		Water-closet and sink drainage,	Drains into brook by a 6-in. pipe	
269 . . .	"	"		" " " "		
270 . . .	"	"		" " " "		
271 . . .	"	"		" " " "	Drains into brook by a 6-in. pipe	

272	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
					Nos. 3 and 4 Siegel court, 4 families		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Drains into brook by a 6-in. pipe
273	"	"	"	"	Nos. 5 and 6 Siegel court, 4 families		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Drains into brook by a 12-in. pipe
274	"	"	"	"	No. 5 Linden ave.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Drains into brook by a 12-in. × 12-in. box
275	"	"	"	"	Stable on Linden ave., Mark Lynch		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	The cesspool is near the bank of the brook
276	"	"	"	"	No. 10 Simmons st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Privy over brook
277	"	"	"	"	" 42 Simmons st. and 6 houses in rear		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
278	"	"	"	"	" 94 Linden Park st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Privy over brook; sink drains into vault, thence into brook
279	"	"	"	"	" 98 " " " "		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Privy over brook; sink drains into brook
280	"	"	"	"	" 29 Elmwood st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Two privies over brook
282	"	"	"	"	Two houses and silk factory. Rear of No. 87 Lynchon st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Houses and factory drain into cesspool
283	"	"	"	"	William Jacobs, lager beer. Nos. 5, 8, 9, & 11 Lynchon st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Pure water from beer-pump goes into brook
284	"	"	"	"	E. D. Conklin, stable for 34 horses		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Privy is over brook
285	"	"	"	"	Stony-brook Gatehouse, Lynchon st.		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Sewage goes into a cess-pool which overflows into brook
286	"	"	"	"	Colbert place, 6 houses, 12 families		"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	Privy is over brook

The Street Department is making plans for a sewer to intercept the discharge from Nos. 255 to 280.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
287	Boston (Rox.),	Stony Brook . . .	Sewage.			
288	"	" " " "	Urine		Urinal drains into brook.	
289	"	" " " "	Drainage from dump and manure heap		Small brook runs from dump, etc., to Stony Brook (about 200 ft.). Brook is dark with manure.	
290	"	" " " "	A very little oil.			
292	"	" " " "				This is a 3-ft. X 2-ft. 6-in. emergency storm overflow from "292," mentioned below, into the new channel of Stony Brook. It is intended to be used only in emergencies.
293	"	" " " "	Sewage from pipe sewers in Parker and Greenleaf sts., also storm overflow from 48-in. sewer in Huntington ave.			The ordinary flow of the Huntington-ave. sewer is intercepted and goes to Moon Island, but the ordinary flow of the Parker and Greenleaf st. sewers goes into Stony Brook.

294	"	"	"	"	Huntington ave. and Rogers ave., sewer overflow	Storm overflow from 36-in. X 48-in. sewer in Huntington av.	This overflow is of wood 16 in. square, and enters on the east side of the brook. The ordinary flow is intercepted and goes to Moon Island, but a few drains enter below the point of interception. Ordinary flow goes to Moon Island.
295	"	"	"	"	Rogers ave. and E. & P. R.R., sewer overflow	Storm overflow from sewer in Ruggles st.	Ordinary flow goes to Moon Island.
296	"	"	"	"	Tremont and Culvert sts., sewer overflow, east side	Storm overflow from 39-in. X 24-in. sewer in Tremont st.	Ordinary flow goes to Moon Island.
297	"	"	"	"	Tremont and Culvert sts., sewer overflow, west side	Storm overflow from 48-in. X 32-in. sewer in Tremont st.	Ordinary flow goes to Moon Island.
298	"	"	"	"	Culvert and Hampshire sts., sewer overflow	Storm overflow from 36-in. X 39-in. sewer in Hampshire st.	Ordinary flow goes to Moon Island.
299	"	"	"	"	Downing and Vernon sts., sewer overflow	Storm overflow from 49-in. X 40-in. sewer in Vernon st.	Ordinary flow goes to Moon Island, but a few old drains enter below point of interception.
300	"	"	"	"	Downing and Vernon sts., 15-in. pipe sewer	Sewage from three buildings	This was formerly a sewer outlet, but now the rest of the sewer is "bunk-headed" off.
301	"	"	"	"	Elmwood st., sewer overflow	Storm overflow from 48-in. X 39-in. sewer in Elmwood st.	Ordinary flow goes to Moon Island.
302	"	"	"	"	Roxbury crossing, sewer overflow	Storm overflow from 24-in. X 36-in. sewer in Tremont st.	Ordinary flow runs into another sewer whence it goes to Moon Island.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — *Continued.*

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
303 . . .	Boston (Rox.),	Stony Brook . . .	Storm overflow from 48-in. X 30-in. sewer in Pynchon st. . . . .	. . . . .	Ordinary flow goes into another sewer, whence it goes to Moon Island.	
305 . . .	"	"	Storm overflow from 18-in. sewer in Cedar st. . . . .	. . . . .	Ordinary flow goes by an 18-in. pipe into the Pynchon st. sewer, and so to Moon Island.	
306 . . .	"	"	Storm overflow from 20-in. X 16-in. sewer in New Heath st. . . . .	. . . . .	Ordinary flow goes by a 9-in. pipe into the Pynchon st. sewer, and so to Moon Island.	
307 . . .	"	"	Storm overflow from 30-in. X 30-in. sewer in Centre st. . . . .	. . . . .	Ordinary flow goes by a 10-in. pipe into the Pynchon st. sewer, and so to Moon Island.	
308 . . .	"	"	Storm overflow from 35-in. X 27-in. sewer in Hoffmann st. . . . .	. . . . .	Ordinary flow goes by a 10-in. pipe across the brook and into the Stony-brook Sewer in private land, and so goes to Moon Island.	

310 . . . Boston (W. Rox.)	" . . .	Below Paul Gore st., 18-in. sewer overflow	Storm overflow from 18-in. sewer in private land	This 18-in. sewer was built as a relief to the sewer in Lamartine st.; the ordinary flow runs by a 12-in. pipe across brook into Stony brook Sewer, and so to Moon Island.
311 . . . "	" . . .	Boylston ave., sewer overflow,	Storm overflow from 54-in. X 42-in. sewer in Boylston ave.,	Ordinary flow goes across the brook in an iron pipe, and so to Moon Island.
312 . . . "	" . . .	Forest Hills sta., 24-in. sewer overflow	Storm overflow from 36-in. X 48-in. sewer in Washington st.	Ordinary flow goes across the brook in two 20-in. pipes, and so to Moon Island.
313 . . . "	" . . .	Muskat Village, 24-in. sewer overflow	Storm overflow from 36-in. X 48-in. sewer in Washington st.	Ordinary flow goes across the brook in two 20-in. pipes, and so to Moon Island.
314 . . . "	Rosindale Branch of Stony Brook . . .	Washington and Kittredge sts., 28-in. X 42-in. sewer overflow	Storm overflow from 28-in. X 42-in. sewer in Washington st.	Ordinary flow goes by a 12-in. pipe into 30-in. X 24-in. sewer in Washington st., and so to Moon Island.
317 . . . "	Stony Brook . . .	Boylston Brewery at Boylston sta.	Washings from engine-room.	
319 . . . "	" . . .	Sturtevant Flower Works, Jamaica Plain	Urine and dirty water from washing castings (some vitriol)	Only one original drains into brook; other fixtures drain into sewer.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
320 . . .	Boston (W. Rox.)	Stony Brook . . .	Waste dye-liquor . . . . .	. . . . .	Waste liquor runs into cellar, whence some of it escapes into brook.	
321 . . .	"	"	" " and seepage from tank, . . . . .	. . . . .	The waste dye-liquor is turned into a small brook which joins Stony Brook near the Williams-st. Bridge. This small brook is very foul.	
322 . . .	"	"	Sink drainage . . . . .	. . . . .	Sink drains into brook. Privy over vault 4 ft. from bank.	
324 . . .	"	"	. . . . .	. . . . .	Privy over vault 13 ft. from brook. Sink drains into an old well.	
325 . . .	"	"	Slight drainage from manure pile . . . . .	. . . . .	Wooden drain from stable to brook.	
326 . . .	"	"	Seepage from cesspool . . . . .	. . . . .	Cesspool 10 ft. from brook.	
327 . . .	"	"	Water-closet and sink drainage, . . . . .	. . . . .	Drains into a cesspool which overflows into brook.	

329	"	"	John Keeffe, Spruce st.	Stable drainage and overflow from cesspool	Drains into a small brook which runs into Stony Brook.
330	"	"	A. P. Clarke, two-tonement house, Myers st.	Overflow from cesspool	Cesspool overflows into a small brook which runs into Stony Brook.
331	"	"	Geo. Curtis, house on Neponset ave.	" " " "	Cesspool overflow* into brook.
332	"	Canterbury Branch,	House on Canterbury st., near brook	Drainage from privy.	
333	"	"	Mrs. Noonan, Canterbury st. .	Overflow from cesspool.	
334	"	"	Michael Norton, Walk Hill st.,	Sink drainage.	
335	"	"	Three houses, cor. Canterbury and Walk Hill sts.	Cleanings from cesspools	Cleanings from cesspool are put in a hole near the brook, and a part gets into the brook.
336	"	"	House on Canterbury st.	Sink drainage.	
338	"	"	House at cor. of Canterbury and Asbland sts.	" "	
340	"	Roslindale branch of Stony Brook.	Washington st., Roslindale, street drain	House sewage	Three street drains enter the channel of the brook just below the house of Jesse K. Hiscock. One of these drains receives house sewage from a house farther up Washington st.
344	Boston (Rox.)	Between Charlesgate W. and Charlesgate E.	Outlet of Back Bay Fens	See 325-340	The pond in the Fens receives the flood discharge of Stony Brook.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
345 . .	Boston (Rox.)	Between Charlesgate W. and Charlesgate E. . .	Outlet of Stony Brook (for ordinary flow) See 325-340.		Privy over river; sink drain runs into river.	
346 . .	Boston (City Proper) . .	Harvard bridge	Draw-tender's house			
347 . .	" "	Beacon st., between Hereford st. and Otter	About 133 houses and 39 stables		Drains run into the river	The Street Department has been devising a sewer to intercept these discharges.
348 . .	" "	Opp. Hereford st.,	Hereford-st. sewer overflow (4-ft. X 5-ft., wood)		Ordinary flow goes to Moon Island.	
349 . .	" "	" "	Old wooden culvert (24-in. X 42-in.)		Disused.	
350 . .	" "	" Fairfield st.	Fairfield-st. sewer overflow (30-in. iron pipe)		Ordinary flow goes to Moon Island.	
351 . .	" "	" Dartmouth st.,	Dartmouth st. sewer overflow (30-in. iron pipe)		Ordinary flow, except that from 3 houses, goes to Moon Island.	

352	"	Berkeley st., (two 20-in. pipes)	Berkeley-st. sewer overflow (two 20-in. pipes)	Storm overflow from $6\frac{1}{2}$ ft. X 6-ft. brick sewer in Berkeley st.	Ordinary flow, except that from 2 houses, goes to Moon Island.
353	"	"	Otter-st. sewer overflow (3-ft. 2-in. X 4-ft., wood)	Storm overflow from sewers in Brimmer st. and Beaver st.	Ordinary flow, except that from 3 drains, goes to Moon Island.
355	"	Foot of Mt. Vernon st.	Old sewer outlet.		
356	"	Foot of Mt. Vernon st.	"		
357	"	Foot of Pinckney st.	"	Sewage from one house	Cut off from rest of sewer, which now runs into Improved Sewerage System.
358	"	Foot of Revere st.,	Old disused sewer outlet (24-in. X 18-in., brick).		
359	"	"	Old disused sewer outlet (24-in. X 24-in., wood).		
360	"	Eye and Ear Infirmary	Privy in yard north side of st.,	Privy.	
361	"	Cambridge st.; under bridge	Drain	Sewage of Infirmary	
362	"	Charlesbank	Sewer overflow (3 $\frac{1}{2}$ -ft. X 4-ft., wood)	Storm overflow from sewers in Cambridge and Charles sts.	Ordinary flow, except that from one drain, goes to Moon Island.
363	"	"	Eight 6-in. pipes at bottom of wall to drain ballast.		These openings are intended to be used in future for necessary storm-overflows.
364	"	"	Opening in sea-wall 24-in. X 24-in.		

Will probably connect with sewer before June, '85.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Continued.

Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operatives.	Remarks.	Remarks added January, 1893.
366 . .	Boston (City Proper).	Leverett st., under Craigie's Bridge,	Storm overflow from 2-ft. X 3-ft. brick sewer in Leverett st. . . . .	. . . . .	Ordinary flow goes to Moon Island.	
367 . .	"	Lowell & Brighton sts.	Sewer overflow (wood) . . . . .	. . . . .	Ordinary flow goes to Moon Island.	
368 . .	"	Behind B. & L. R.R. station . . .	Sewer overflow (wood) . . . . .	. . . . .	Ordinary flow goes to Moon Island.	
369 . .	"	Behind B. & L. R.R. station . . .	Two pipes from catch-basins. Disused sewer-outlet (3-ft. X 2-ft., wood).	. . . . .	
371 . .	"	Behind Eastern R.R. station . . .	Sewer overflow (3.5-ft. X 4-ft., wood) . . . . .	. . . . .	
372 . .	"	Behind Eastern R.R. station . . .	Privy on wharf . . . . .	. . . . .	Ordinary flow goes to Moon Island.	
374 . .	"	Under Warren Bridge	Storm overflow from west side Intercepting Sewer . . . . .	. . . . .	
375 . .	"	Bartlett's wharf . .	Drainage of F. R.R. station . . . . .	. . . . .	This old sewer is bulk-headed at Causeway st., but still drains some catch-basins and the F. R.R. station.	
376 . .	"	Fletcher's wharf . .	Privy . . . . .	. . . . .	

377	"	"	Under Charles-River Bridge . . .	Old sewer outlet (4-ft. X 5-ft., wood) . . . . .	. . . . .	. . . . .	Bulkheaded off, but still used for street drainage.
378	"	"	Under Charles-River Bridge . . .	Sewer overflow (3-ft. X 3-ft., wood)	Storm overflow from 18-in. X 18-in. sewer in Prince st. . . . .	. . . . .	Ordinary flow goes to Moon Island.
381	"	"	Old Gas Works . . .	Old sewer (4-ft.) X 5-ft., dis-used . . . . .	. . . . .	. . . . .	Probably bulkheaded off.
382	"	"	Opposite Hull st. . .	Old sewer outlet (2-ft. X 1-ft.), now disused.	. . . . .	. . . . .
383	"	"	" Charter st. . .	Sewer overflow (16-in. X 24-in.), wood	Storm overflow from sewers in Charter and Commercial sts. . . . .	. . . . .	Ordinary flow goes to Moon Island.
385	"	"	Slate Wharf . . .	Privy	Privy.	. . . . .
386	"	"	Bartlett's N. Wharf . . .	" . . . . .	"	. . . . .
387	"	"	Fiske's Wharf . . .	4-in. drain from wharfinger's office	Drainage from water-closet.	. . . . .
388	"	"	" " . . .	Sewer outlet (2-ft. X 2 ft.), disused.	. . . . .	. . . . .
390	"	"	Dock next north of Chelsea Ferry . . .	Privy	Privy.	. . . . .
391	"	"	Chelsea Ferry . . .	Two 8-in. drains	Drainage from water-closets.	. . . . .
394	"	"	Somerville . . .	Small sewer	Sewage . . . . .	. . . . .	Drains into a creek which connects with Miller's River †

† A dagger indicates that the discharge in question will probably be diverted into the North Metropolitan Sewer soon after the latter is ready to receive sewage.

Sources of Pollution of Charles River and its Tributaries, October, 1892. — Concluded.

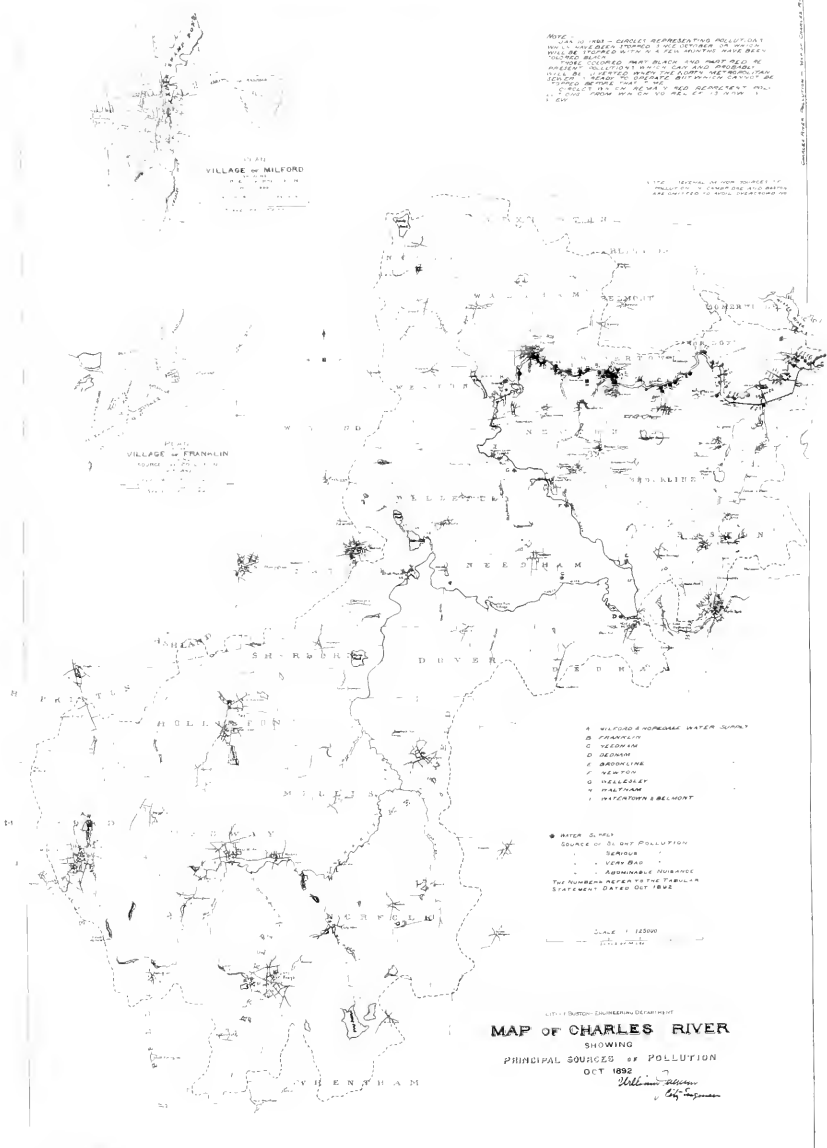
Reference Number.	Town or City.	Locality.	Kind of Pollution entering Stream.	No. of Operators.	Remarks.	Remarks added January, 1893.
396 . .	Boston (Chsn),	B. & M. R. R., near Prison	Sewer overflow (4-ft. X 3-ft., wood) . . . . .	..	
397 . .	"	B. & M. R. R., near Prison	Sewer overflow (4.3-ft. X 4.3-ft., wood) . . . . .	..		†
398 . .	"	Eastern R. R., near round house . .	Sewer outlet (6 ft. X 6-ft., wood) . . . . .	..		†
399 . .	"	Under Prison-point Bridge	Austin-st. sewer outlet (15-in. pipe) . . . . .	..		†
400 . .	"	S. side of "Island," B. & M. machine-shop drain (1-ft. X 1 ft., box)	Sewage . . . . .	..		†
401 . .	"	Opposite Fourth st.	Sewer outlet . . . . .	..		†
403 . .	"	Under F. R. R., opposite Miller & river draw	12-in. iron pipe with flap valve.	..		†
404 . .	"	Under F. R. R. opposite Walford st.	Sewer outlet (13-in. X 24-in., wood) . . . . .	..		†
406 . .	"	Under Warren Bridge	Sewer outlet (3-ft. X 3-ft., brick) . . . . .	..		†

Two old sewer-overflows; probably not used now.

Discharge into Miller's River just above Prison-point Bridge. This sewer drains a large area on the west side of Charlestown.

NOTE: (1) RED - SOURCE REPRESENTING POLLUTION WHICH HAS BEEN STOPPED & RESTORATION WORK WILL BE INSTALLED WITHIN A YEAR UNLESS OTHERWISE NOTED. (2) BLACK - SOURCE REPRESENTING POLLUTION WHICH IS BEING CONTROLLED BY TREATMENT PLANT WHICH HAS BEEN INSTALLED WITHIN A YEAR UNLESS OTHERWISE NOTED. (3) WHITE - SOURCE REPRESENTING POLLUTION WHICH IS BEING CONTROLLED BY TREATMENT PLANT WHICH HAS BEEN INSTALLED WITHIN A YEAR UNLESS OTHERWISE NOTED. (4) SOURCE REPRESENTING POLLUTION WHICH IS BEING CONTROLLED BY TREATMENT PLANT WHICH HAS BEEN INSTALLED WITHIN A YEAR UNLESS OTHERWISE NOTED.

NOTE: SEVERAL OF THE COURSES OF THE CHARLES RIVER ARE SHOWN AND BEING REROUTED TO MORE FAVORABLE LOCATIONS.

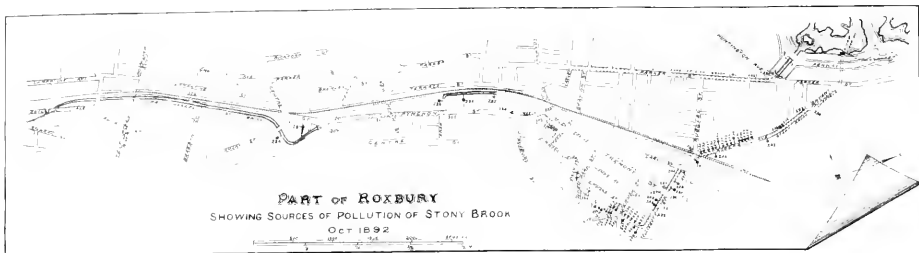


- A WALTHAM & WOBURN WATER SUPPLY
- B FRANKLIN
- C NEEDHAM
- D BOSTON
- E BOSTON LINE
- F NEWTON
- G MIDDLESEX
- H WALTHAM
- I WATERTOWN & BELMONT

● WATER QUALITY
 SOURCE OF POLLUTION
 SERIOUS
 - - - - - VERY BAD
 - - - - - MODERATE
 THE NUMBERS REFER TO THE PUBLISHED STATEMENT DATED OCT 1962

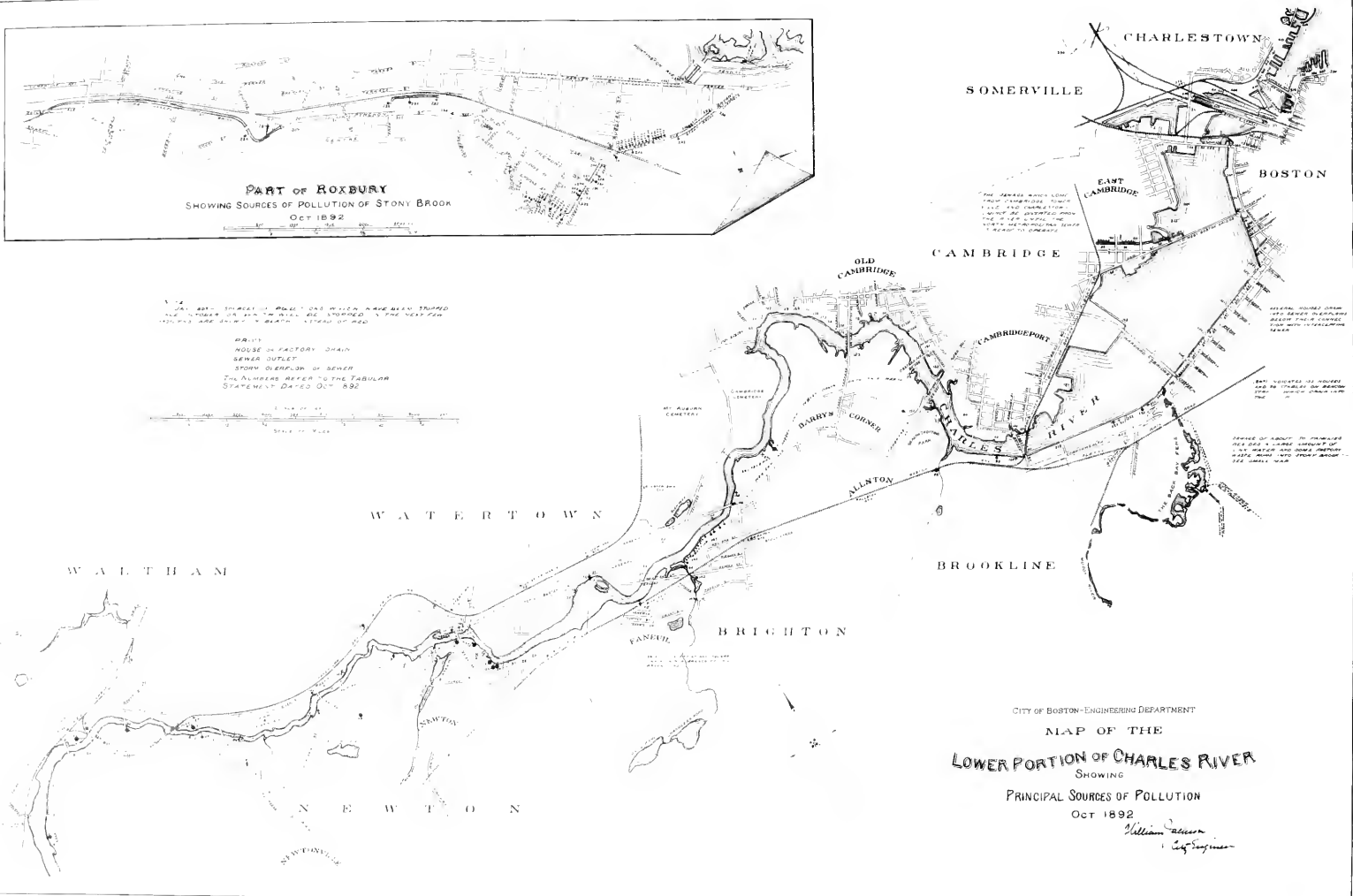
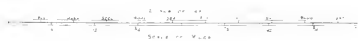
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 1" = 1/4 MILE

U.S. GOVERNMENT PRINTING OFFICE
MAP OF CHARLES RIVER
 SHOWING
 PRINCIPAL SOURCES OF POLLUTION
 OCT 1962
 William J. Sullivan
 by J. Sullivan



THE ABOVE STATEMENT OF POLLUTION HAS BEEN MADE BY TRIPPLING AND TAKING UP THE RIVER AND STREAMS IN THE NEARBY LOCALITIES AND SHOWING THE RESULTS OF THE TRIPPLING.

NOTE:
HOUSE IN FACTORY CHAIN
SEWER DITCHES
SEWER OVERFLOW OF SEWER
THE ALLEGED REFER TO THE TABULAR STATEMENT DATED OCT 1892



CITY OF BOSTON—ENGINEERING DEPARTMENT

**MAP OF THE
LOWER PORTION OF CHARLES RIVER**
SHOWING

PRINCIPAL SOURCES OF POLLUTION

OCT 1892

William Jackson
City Engineer

407	"	West of Charles-river Bridge . . .	Privy over dock	Privy.			
408	"	Under Charles-river Bridge . . .	Sewer outlet (36-in. X 30-in., brick)	Sewage.			†
409	"	East of Charles-river Bridge . . .	Privy over dock	Privy.			
410	"	Hoosac Docks	Wooden drain (18-in. X 18-in.)	Sewage			†
411	"	"	Privy at head of Eastern Dock,	Privy.			
412	"	Opposite Gray st.,	Sewer outlet (4-ft. X 3-ft., wood)	Sewage			†
413	"	Opposite Wapping st., in Navy Yard,	Sewer outlet (5- ft. X 2½ ft., wood)	"			†
414	"	In Navy Yard, between basins	Sewer outlet (3-ft. X 4 ft., wood)	"			†
415	"	Navy Yard	12-in. brick sewer near machine-shop			Disused.	†

† A dagger indicates that the discharge in question will probably be diverted into the North Metropolitan Sewer soon after the latter is ready to receive sewage.

Considered with reference to pollution, the Charles River may be divided into three portions: the upper river, including everything above the mouth of Boggistere Brook in Millis; the middle portion: reaching from the mouth of Boggistere Brook to the lower dam at Watertown; and the tidal portion, reaching from the Watertown Dam to Boston Harbor.

The upper portion receives considerable sewage and factory waste, in proportion to the natural flow of the stream. The middle portion, except at its very lower end, receives very little sewage, except that from the upper division of the river. The tidal portion receives a great proportion of sewage, even considering the tidal water with which it is twice a day flushed. The bed and banks of this portion are very foul, and in some places are offensive to both sight and smell.

Starting at Milford, the upper division of the river is bordered by Hopedale, Bellingham, Franklin, Medway, Norfolk, Millis, and Medfield. In Franklin it receives the waters of Mine Brook and in Norfolk of Mill River. In Medfield Stop River, and in Millis, Boggistere Brook enter the main stream, coming from Norfolk and Holliston respectively. This division of the river receives, directly or through its tributaries, manufacturing waste from twenty-four establishments, at eight of which wool is scoured. It receives, also, the day sewage of about 1,938 operatives, and the domestic sewage of a number of families, besides the discharge from two sewers at Milford. The water, in several places where the total flow is small, notably in Boggistere Brook at East Holliston, in Mine Brook at Franklin, and in the main river at Milford, is quite foul. But, diluted by frequent accessions of clean water, the appearance of the stream becomes very much improved as it approaches the mouth of Boggistere Brook, the head of the second division.

As it flows thence, bordered by Sherborn, Dover, Natick, the southern end of Wellesley, Needham, Dedham, West Roxbury, and Newton, the stream receives but little sewage and hardly any factory waste until it reaches the mouth of Rosemary Brook in Wellesley, from which brook it receives the day sewage of about 180 operatives in the Union Cycle Works at Highlandville in Needham. At the Lower Falls in the north-eastern part of Wellesley it receives waste from a hosiery mill, a paper mill, and a shoddy mill, and the day sewage of about 193 operatives. A little factory waste comes from the Newton side at this point. Weston contributes but little that is objectionable. In October, when the examination was made, Waltham, Watertown, and the

northern part of Newton discharged into the river a large amount of offensive factory-waste, the day sewage of about 5,400 operatives, and the domestic sewage of about 93 families; but a large part of the discharge from Watertown, Waltham, and Newton has since been diverted into the South Metropolitan Sewer.

The middle division of the river does not appear to be offensive to sight and smell, except between Waltham and Watertown. Above Waltham the water, though brownish in color, does not look unclean, and analyses reported by the State Board of Health show that it is not very foul. The offensiveness complained of above the dam at Watertown must therefore be due principally to the sewage and factory waste received from Waltham, Watertown, and the northern part of Newton, and when this discharge has been entirely diverted into the Metropolitan Sewer, as it soon will be, and any existing deposits of filth have been removed from the river, the nuisance above the dam will probably be abated, so that the entire middle division of the river will be inoffensive to the senses.

Needham, Dedham, Brookline, Newton, Wellesley, Waltham, Watertown, and Belmont take their water supplies from filter basins, filter galleries, or large wells on or near the banks of this portion of the Charles. These supplies, except that of Needham, are probably subject at times to the percolation of river water. The works of Dedham, Brookline, and Newton have also a direct connection with the river, and the Wellesley works, with Rosemary Brook, for use in emergencies. The aggregate population of the cities and towns which are supplied with ground water from the banks of the middle portion of the Charles is about 75,000. Ice is cut on the river at Waltham, and at Cow Island in West Roxbury.¹

The tidal portion of the river received in October from Watertown considerable factory and water-closet drainage; from Brighton the whole sewage of about 6,500 people and the drainage of the Abattoir, the Tripe Works, and a wool-washing establishment; from Cambridge the sewage of nearly the whole population and that of a part of Somer-

¹ NOTE. — Other water-supplies taken from the Charles River water-shed are as follows: Milford and Hopedale are supplied from three wells on the banks of the Charles above all sources of pollution. Holliston takes its water from a well near an uncontaminated pond on a branch of Boggistere Brook, and Concord from Sandy Pond in Lincoln, at the head-waters of the Weston Stony Brook. Cambridge has built a storage basin on Stony Brook near its junction with the Charles. All the foregoing are probably free from pollution. Franklin's supply comes from a well near Mine Brook below the village, where the brook is certainly contaminated. Ice is cut on Cedar Swamp Pond in Milford, which is contaminated by drainage from several dwellings.

ville, besides the drainage of North's and Squire's pork-packing houses. Charlestown contributed the sewage of about 19,100 people; Boston proper that of, perhaps, 200 families; and Roxbury and West Roxbury the sewage of 150 families, considerable sink-drainage, and a little factory-waste.

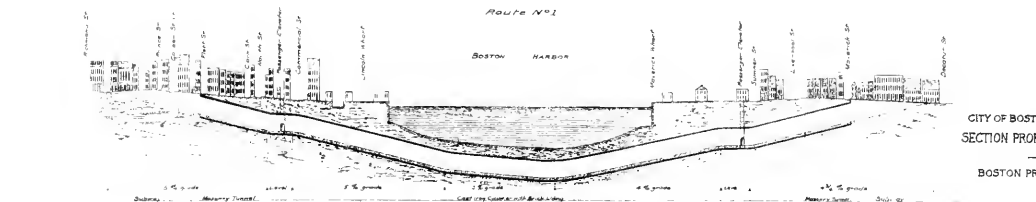
Since October a part of the Watertown and Brighton sewage has been diverted into the Metropolitan Sewer, and nearly all the rest, including the Abattoir drainage, will probably be diverted before the summer of 1893. Boston is taking measures to put an end to nearly all the pollution which comes from the south bank of the river, but the sewage of Cambridge, Somerville, and Charlestown cannot be diverted until the North Metropolitan Sewer is ready to receive it.

The amount of sewage discharged into Charles River from two of the Cambridge sewers, between Craigie's Bridge and the West Boston Bridge, is probably as great as the sum of all discharges of sewage or other filth into the whole river above the latter point, but the volume of salt water with which it is diluted is so very great that the river between these bridges does not seem to be so foul as at other points on the tidal stream where the discharge of sewage and the volume of tidal water are both less. The most offensive place seems to be at the North Beacon-st. Bridge just above the Brighton Abattoir and one of the Brighton sewers, though above and below the North Harvard-st. Bridge it is nearly as foul.

The filth in the bed of the river between the bridge at the Arsenal and the Watertown Dam is probably for the most part sewage and refuse brought up by the tide from the Brighton and Old Cambridge sewers, and from the Brighton Abattoir, and deposited at slack water. This deposition of filth may be expected to diminish when the Brighton sewage and the Abattoir drainage are diverted into the Metropolitan, and to diminish still further when the Cambridge sewage is diverted.

The surface of the water between Cambridge and Boston is made unsightly by floating rubbish consisting of chips, shavings, and small sticks, grass, paper, manure, dead animals, and the like. A part of this rubbish is probably unavoidably blown into the river, a part is thrown overboard from vessels, but the greater part of it probably comes from the numerous public and private dumps on the banks of the river, and on the adjoining marshes. The dumps at the rear of the Abattoir are especially objectionable on account of the temptation they offer for easily getting rid of very foul refuse.

A large part of the rain water which falls on the streets of Boston goes into the common sewers, and when the volume

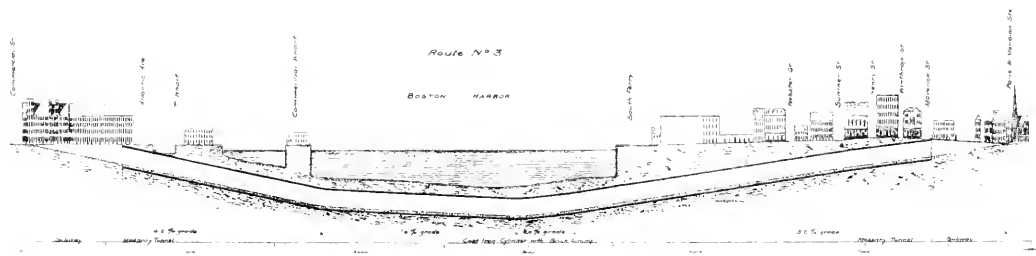
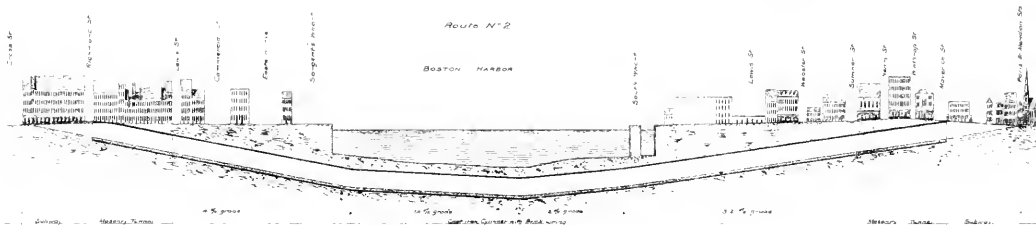


CITY OF BOSTON-ENGINEERING DEPARTMENT.
SECTION PROFILES OF PROPOSED TUNNEL
CONNECTING
BOSTON PROPER AND EAST BOSTON.

JAN. 1883.

Geo. S. Rice, Consulting Engineer.
Geo. C. Cross, City Engineer.

HORIZONTAL SCALE
VERTICAL SCALE



of water becomes too great to be taken care of by the intercepting sewers, the surplus is discharged into tide water by means of the "storm overflows;" the street wash itself is sometimes very muddy, and it takes with it the sewage with which it has become mixed.

Cambridge and Charlestown, being also sewerred on the "combined" system, will have to adopt a like system of overflows when they make connection with the Metropolitan Sewer. Therefore, even after the completion of the Metropolitan system, heavy storms must still produce some discoloration and pollution of the water in the Charles-river basin.

EAST BOSTON TUNNEL.

In compliance with the following order, dated April 18, 1892, plans and estimates have been prepared for eight different plans (A, B, C, D, E, F, G, and H) for a tunnel connecting East Boston with the city proper:

"Ordered, That the City Engineer be requested to prepare plans for the construction of a tunnel from East Boston to the city proper; the expense thereof not to exceed one thousand dollars, to be charged to the appropriation for incidental expenses."

Proposed Routes.

No. 1 has been selected with especial reference to the present street-car system; it extends from the corner of Hanover and Richmond streets in the city proper to the corner of London and Decatur streets in East Boston, and is almost a straight line throughout its length. Commencing at the corner of Hanover and Richmond streets, the line of the tunnel passes under Prince, Garden Court, Fleet, Clark, North, and Commercial streets, descending from Richmond street to Commercial street by a five-per-cent. grade to the latter street, where elevators connecting the tunnel with the surface are proposed; thence by descending and ascending grades of five per cent. or less under portions of Union and Lincoln wharves, the channel, Maverick and Kelly's wharves, to a point near the corner of Summer and Liverpool streets, where elevators on the East Boston side of the tunnel are proposed; thence by an ascending grade of four and three-quarters per cent. under Liverpool and Maverick streets, and along the west side of London street to Decatur street.

No. 2 lies to the south of the previous route. It begins in the city proper, at the corner of Commercial and Clinton streets, and terminates at the corner of Meridian and Paris

streets in East Boston. Commencing at the corner of Commercial and Clinton streets, the approach to the tunnel passes at the present grades of the surface to the corner of Cross and Fulton streets, where the tunnel descends by a four-per-cent. grade under Richmond, Lewis, and Commercial streets; thence by descending and ascending grades under Eastern avenue, Sargent's wharf, and the channel to the South Ferry on the East Boston side of the harbor; thence by an ascending grade of about three per cent. through and under Lewis street, under Sumner street, Maverick square, and Maverick street, to the intersection of Meridian and Paris streets.

No. 3 lies to the south of both routes Nos. 1 and 2. It begins on Commercial street, between State and Commerce streets, and ends at the corner of Meridian and Paris streets in East Boston. Commencing at Commercial street, the tunnel passes by a four and one-tenth per cent. grade under the block of buildings lying between State and Commerce streets; thence by the same descending grade under Atlantic avenue and portions of Long, T, and Commercial wharves to the pier line; thence by descending and ascending grades under the channel to the South Ferry on the East Boston side of the harbor; and thence by a three and one-tenth per cent. ascending grade through and under Lewis street, under Sumner street, Maverick square, and Maverick street to the intersection of Meridian and Paris streets.

Plans.

Plan A contemplates a single tunnel with inclined approaches on Route "No. 1," and is designed for two lines of street cars and a walk ten feet wide for pedestrians, with passenger elevators on both sides of the water, near the pier lines.

This tunnel will be about five thousand feet long, and will cost, including land damages, \$3,315,000; the land damages being estimated at \$710,000.

Plan B contemplates two tunnels with inclined approaches under the channel on Route "No. 1," each tunnel being designed for a single street-car line and a walk six feet wide for pedestrians, with passenger elevators on both sides of the water, near the pier lines.

This tunnel will be about five thousand feet long, and will cost, including land damages, \$3,996,000; the land damages being estimated at \$710,000.

Plan C contemplates the single larger passenger tunnel on the harbor portion of Route "No. 1;" but instead of having the inclined approaches, there are sets of three passenger and

three street-car lifts at each end of the tunnel, — one on Commercial street in the city proper, and the other on Summer street, near Liverpool street, in East Boston.

This tunnel will be about two thousand five hundred feet long, and will cost, including land damages, \$2,430,000; the land damages being estimated at \$147,000.

Plan D is the same as Plan C, except that it contemplates two smaller passenger tunnels, instead of the single larger one. This tunnel will be about two thousand five hundred feet long, and will cost, including land damages, \$2,974,000; the land damages being estimated at \$147,000.

Plan E contemplates a single tunnel with a roadway 27 feet wide, having inclined approaches at each end on Route "No. 2," and is designed for carriages and teams solely. It will be about five thousand nine hundred feet long, and will cost, including land damages, \$4,026,000; the land damages being estimated at \$1,175,000.

Plan F is the same as Plan E, except that it contemplates two tunnels instead of a single one, each tunnel having a roadway 18 feet wide. It will be about five thousand nine hundred feet long, and will cost, including land damages, \$4,973,000; the land damages being estimated at \$1,200,000.

Plan G contemplates a single tunnel, with a roadway 27 feet wide, having inclined approaches at each end on Route "No. 3," and is designed for carriages and teams solely. This tunnel will be about five thousand nine hundred feet long, and will cost, including land damages, \$3,875,000; the land damages being estimated at \$1,115,000.

Plan H is the same as Plan G, except that it contemplates two smaller tunnels instead of the single larger one. This tunnel will be about five thousand nine hundred feet long, and will cost, including land damages, \$4,775,000; the land damages being estimated at \$1,115,000.

The above estimates have been based on an iron tunnel lined with brick, and provision has been made for the use of compressed air and the building of proper shields for driving the headings.

No borings have been made, as the amount of the appropriation was not sufficient for that purpose; and the plans have necessarily been made on the assumption that the material to be encountered would be of a yielding nature, like gravel or clay.

If desired, the tunnels on Routes "Nos. 2 and 3" could be built for foot passengers and car traffic; the estimated cost being practically the same as for the teaming tunnels. It would also be possible to build on either of the three routes both passenger-traffic and teaming-traffic tunnels.

ELECTRIC LIGHTING.

Several estimates have been prepared of the cost of establishing and maintaining an electric-lighting plant for the city. Messrs. Stone & Webster were engaged as Consulting Engineers.

The details of the estimate are given in City Doc. 48, 1893.

FERRY DEPARTMENT.

The work on the foundation for the head-house and rebuilding part of two ferry-piers at the East Boston landing of the North Ferry, which was begun October 24, 1891, by Nay & Ellis, as mentioned in the last report, was resumed April 19, 1892, and the work was completed August 1; the cost of the contract work was \$9,449.

Plans and specifications were made for an additional drop foundation and the contract for doing the work, except furnishing the piles, was awarded, June 27, to Nay & Ellis. The work was finished in July, at a cost for contract work of \$1,640.

Plans and specifications have been made for changing the location of the head-house and rebuilding two ferry-piers at the Boston landing of the North Ferry.

L-STREET BRIDGE.

The following act was passed by the Legislature of 1892:

[CHAP. 12.]

AN ACT TO EXTEND THE TIME FOR BUILDING A PUBLIC HIGHWAY BRIDGE ACROSS THE RESERVED CHANNEL IN SOUTH BOSTON.

Be it enacted, etc., as follows:

SECTION 1. The time for completing the bridge across the reserved channel on the South Boston flats in the city of Boston, authorized by chapter three hundred and eighty-eight of the acts of the year eighteen hundred and ninety-one, is hereby extended to the thirty-first day of December in the year eighteen hundred and ninety-two; and if said bridge is completed before said day the Commonwealth shall reimburse said city the portion of the cost thereof provided for in said act, the same as if said bridge had been completed before the first day of August in the year eighteen hundred and ninety-two.

SECT. 2. This act shall take effect upon its passage.

[Approved February 13, 1892.]

On the approval of this act the contract for building the L-street Bridge between the abutments, with the exception of the iron draw, was awarded to William L. Miller, of Boston, the lowest bidder, for \$91,743; the bridge to be finished December 1. The work was begun February 29, and was completed October 12, 1892.

The bridge is 60 feet wide between fences, and is built of hard-pine timber on an oak-pile foundation. There are two sidewalks, each 8 feet wide, covered with asphalt on a base of coal-tar concrete. The roadway is 44 feet wide, except at the draw, where it is divided into two roadways, each of 19 feet in width. The roadway is covered with 6-inch hard-pine floor; this is coated with an asphalt compound; on this a layer of fine coal-tar concrete, 3 inches thick and rolled; above this is a granite-block paving laid on a bed of sand, having the joints filled with pebbles and run with hot paving-cement.

There are two piers and a wharf on the Congress-street side of the channel, and fender guards on the L-street side. The drawway is 40 feet in width, and is planked vertically.

There is one draw of the retractile type, having three lines of girders, the middle line dividing the roadway into two parts. The width between centres of outside girders is 53 feet; the space along the middle of the draw occupied by the middle girders and fenders is 4 feet; there are two sidewalks of 5 feet 6 inches each, and two roadways of 19 feet each.

Each line of girders is composed of two non-continuous plate girder-spans, one of which spans the channel; the other, or rear span, being supported on trucks running on tracks built on the draw foundation.

When the draw is in position for travel, the front end of the channel span rests on shoe plates on the draw landing of the main bridge, the other end being attached to and supported by the rear span by a pin connection. When the draw is in motion or run off, the front end of the channel span is supported by suspension rods passing over Samson posts on the rear span to back end of this span, proper counter-balances of cast-iron boxes filled with lead being provided where necessary.

The draw is operated by steam power; the draw and machinery for operating it were designed by this department.

The contract for building and erecting the draw was made August 3, with the King Bridge Company, of Cleveland, Ohio, for \$9,970. The first load of iron arrived at the bridge October 18, and the draw was completed November 15.

The draw-tender's house, which is on the Congress-street side of the channel, was built by Thomas Keyes, of South Boston; the engine-house was built by William Miller; the trucks were furnished by Charles Carr, of Boston; the machinery was built by Miller & Shaw, of Cambridge.

The cost of the bridge, draw, buildings, machinery, etc.,

but not including the abutment or wing walls, was \$119,-572.38. The sum of \$50,166.21 has been paid to the City by the Commonwealth, as provided by Chapter 388 of the Acts of 1891, and Chapter 12 of the Acts of 1892.

The bridge has not yet been opened to travel.

L-STREET BRIDGE ABUTMENT.

(See page 163.)

L-STREET BRIDGE RETAINING-WALLS.

(See page 163.)

MALDEN-BRIDGE DRAW.

(See page 163.)

ROXBURY-CANAL SEA-WALL.

(See page 163.)

RAPID TRANSIT.

The investigations of the Rapid Transit problem have been continued.

ROBERT G. SHAW MONUMENT.

The following orders were passed by City Council :

Ordered, That permission be and hereby is granted for the location, under the supervision of the Superintendent of Public Grounds, of a monument in honor of Colonel Robert G. Shaw, on Boston Common, in front of the State House, and between the Beacon street mall and the sidewalk on Beacon street.

Further Ordered, That the sum of \$19,500 be and hereby is appropriated for the construction of a suitable base and pedestal for said monument ; said sum to be expended under the direction of the City Engineer, and to be charged to the special appropriation heretofore made for statues of Grant, Sheridan, and Farragut.

And in compliance with them, after several consultations with City Architect Edmund M. Wheelwright, conferences were had with Messrs. John M. Forbes, Henry Lee, Martin P. Kennard, and Edward Atkinson, a committee having charge of the monument, with Mr. Augustus St. Gaudens, the sculptor, and with Messrs. McKim, Mead, & White, the architects of the pedestal. It was thought that there was a

possibility that the building of the monument as proposed might cause injury to the two trees enclosed by it, and in reply to the question raised the following correspondence was forwarded to me :

BOSTON, July 27, 1892.

M. P. KENNARD, ESQ. :

DEAR SIR: Herewith I beg to present to you the plans and specifications for the proposed monument to Col. R. G. Shaw.

In explanation of them, I wish to say that the plans have been drawn carefully with regard to the preservation of the two elm-trees on the site. The walls are supported by piers and arches, so as to keep the roots of the trees from being damaged, while suitable openings are provided for the inlet of rain-water and air. I enclose letters from Messrs Henry S. Codman, H. H. Hunnewell, and C. S. Sargent, whose indorsement of the scheme proposed ought to be, in my opinion, satisfactory evidence of its feasibility.

With regard to the specification, I beg to say that, according to information received from Mr. William Jackson, the City Engineer, the form of the contract and specification will have to be arranged in his office, in accordance with the rules of the city; therefore the specification presented, while containing all the requirements I consider necessary for the construction, is to be regarded as an explanation of my views on the subject, which I wish to see embodied in the contract.

In conclusion, I beg to say that although the superintendence of the work is to be done by Mr. William Jackson, the City Engineer, I reserve the right of the artistic superintendence of the work for myself or representative.

I remain,

Yours respectfully,

(Signed)

AUGUSTUS ST. GAUDENS.

Accompanying this: 1 specification, 2 letters, 8 drawings.

BROOKLINE, MASS., June 17, 1892.

MY DEAR SIR: I have examined the plans and specifications for the proposed terrace to be built on Beacon street, opposite the State House in Boston, to support the Shaw monument, with reference to its probable effect upon two large elm-trees, the trunks of which you wish to enclose in the structure.

If the terrace walls are supported on iron beams resting on masonry piers, or upon arches so that the roots of the trees may have an opportunity to extend freely beyond the area to be occupied by the structure, and if the grade of the bank on which the trees now stand is not altered either by removing or by adding soil to it, I see no reason why the trees should suffer. The open spaces around the trunks which you propose will allow the water falling on the surface of the terrace, if this is graded properly, to reach the roots of the trees, and the openings in the side and rear walls of the terrace will furnish ventilation to the enclosed ground.

I believe, therefore, that the terrace can be built, if the slight modifications I have suggested in the construction of the foundations are made, without impairing the health or shortening the lives of the trees.

Yours very truly,

(Signed)

C. S. SARGENT.

A. ST. GAUDENS, ESQ.

JUNE 22, 1892.

MY DEAR ST. GAUDENS: I saw Mr. Hunnewell Sunday, and explained to him as well as I could what your plan was in regard to the Shaw monument. He said that his experience in filling up with soil about trees had been an unfortunate one, but that if you left the space entirely open under the floor, as you propose to do, he thought there would be little damage. He expressed his opinion that great care should be used in digging the foundations for the piers which carry the monument, and which carry the walls of the terrace, to cut as few of the roots as possible, and that, where necessary, bridge stones should be used to preserve the roots.

Our opinion, as I have already expressed to you verbally, and as I have no doubt Mr. Olmsted would were he here, is a very similar one: that if proper precautions are taken, we do not think any injury will be done to the trees. We cannot urge too strongly that great care should be taken not to cut the roots in building the foundations.

We think that the gratings about the trees should be as large as is consistent with your design of seats, and that the floor of the terrace should be sloped in such a way that the water falling on it will drain to these gratings. The trees will thus get water in about the normal quantity, and if some precaution is taken to prevent this water from immediately flowing down the bank, we think they will thrive as well as they do now. It would be a good opportunity to

enrich the soil, and this should not be forgotten, nor should the ventilation which was suggested.

Yours very truly,
(Signed) HENRY SARGENT CODMAN.

MR. AUGUSTUS ST. GAUDENS, *148 West 36th Street, New York, N. Y.:*

DEAR SIR: Agreeably to your request, I will here say that the above letter of Mr. Codman's is in conformity with the conversation I had with him in regard to the proposed plan of the Shaw monument, and that I fully concur with him in the opinion that no appreciable injury will be caused to the trees if the proper precautions, as suggested, are taken in doing the work. Great care will be necessary in protecting their roots when digging for the foundations, and to avoid making any change in the present level of the ground by filling up around the trees with soil or any other material.

Yours truly,
(Signed) H. H. HUNNEWELL.

WELLESLEY, June 29.

Upon the receipt of the above, the preparation of the contracts and specifications was commenced. Bids were invited from several parties, approved by Mr. St. Gaudens and by the Messrs. McKim, Mead, & White, and the contract was awarded to Norcross Brothers, of Worcester, Mass., the lowest bidder, at \$17,980. It is hoped that the monument will be completed during the coming summer.

WEST BOSTON BRIDGE.

A contract was made with John L. P. Ackers, of Cambridge, in June, 1892, for painting the fences, gates, and draw of West Boston Bridge with two coats of pure white-lead and raw linseed-oil. The total length of fences painted on the bridge, exclusive of the draw, was 4,329 feet; the length of the draw being 141 feet. The contract price for doing the work was \$429.50, one-half of which was paid by the city of Cambridge.

A contract was made with Gore & Cowin June 20, 1892, for paving the roadway of West Boston Bridge from the draw to the Boston abutment, with the exception of about 112 feet in length by 11 feet in width and the space between the street-car rails.

Such old blocks as were found suitable were used in the

new work, all others being new blocks and furnished by the contractor. The cost of the work was \$936.65, one-half of which was paid by the city of Cambridge.

WESTERN-AVENUE OR ARSENAL-STREET BRIDGE (TO
WATERTOWN).

Plans and estimates have been made in previous years for rebuilding this bridge in order to do away with the sharp angle which the opening for the passage of vessels makes with the channel, thus making it very inconvenient for the passage of vessels through the draw; but the town of Watertown, not wishing to coöperate with the city in doing the work, has made it necessary to delay the same from year to year.

In September, 1890, Congress passed an act whereby the sum of \$20,000 was appropriated for dredging the Charles River above the Western-avenue Bridge, provided, however, that the draws in the Western-avenue and North Beacon-street Bridges be made to conform to the projected channel without cost to the United States.

Accordingly plans were made by this department for rebuilding the bridges so as to have the drawways conform to the projected channel, and these were approved by the Secretary of War, July 20, 1892.

Whereas, By an act of Congress approved September 19, 1890, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," the sum of twenty thousand dollars was appropriated for continuing the improvement of Charles river, at Boston, Massachusetts, to be expended under the direction of the Secretary of War; and

Whereas, It is provided by the said act of Congress that no expenditure of said twenty thousand dollars shall be made until the draws in the Arsenal-street and Market-street bridges shall be made to conform to the projected channel, without cost to the United States; and

Whereas, The city of Boston, Massachusetts, has submitted to the Secretary of War, for his examination and approval, plans for rebuilding the drawways in the Market-street and Arsenal-street bridges across Charles river, at Boston, Massachusetts, so as to make the drawways conform to the projected channel; now,

Therefore, I, Stephen B. Elkins, Secretary of War, having examined and considered the said plans, which are hereto attached, do hereby approve the same, subject, however, to the following condition:

That the engineer officer of the United States Army, in charge of the district within which the bridges are located, may supervise their alteration, in order that said plans shall be complied with.

WITNESS my hand this twentieth day of July, 1892.

(Signed)

S. B. ELKINS,

Secretary of War.

THE CONDITIONS of this INSTRUMENT are hereby accepted by the city of Boston, Massachusetts, by its Mayor, thereunto lawfully authorized, this fourteenth day of July, 1892.

(Signed)

N. MATTHEWS, JR.,

Mayor.

In presence of

(Signed) NATHANIEL H. TAYLOR.

(Signed) JAMES A. MCKIBBEN.

Previous to the rebuilding of the bridge the abutment on the Watertown side was rebuilt by that town; plans being furnished by this department. A contract was made September 12, 1892, with Trumbull & Ryan, of Boston and Lawrence, for doing the work, the contract price being \$1,639.39.

The plans for rebuilding the bridge call for a wooden pile-bridge 33 feet wide between fences, and a sidewalk 8 feet wide on the down-stream side of the bridge, the pier forming an angle of 50° with the street, and a clear width of opening for the passage of vessels of 36 feet.

October 25, 1892, a contract was made with Benj. Young, of Chelsea, for doing the work, which was commenced November 1, 1892, and was nearly completed early in January, 1893, when, owing to the severity of the weather, the contractor was unable to prosecute the work with diligence, and will be unable to complete the work until the ice breaks up in the river.

January 7, 1893, a contract was made with the Boston Bridge Works for furnishing an iron swing-draw 29 feet in width, including a 6-foot sidewalk on the down-stream side of the bridge; to be erected on the oak-pile foundation already built. The draw is now in process of construction at the shops of the Boston Bridge Works. The contract price for doing the work is \$9,250.

B.

[FROM THE CITY ENGINEER'S REPORT TO THE BOSTON WATER BOARD.]

SIR: I hereby submit the following report of the work done and records kept during the past year, for your Board:

SOURCES OF SUPPLY.

The rainfall during the past year was the smallest since 1883, and the percentage collected was also unusually small. The storage in the several lakes and reservoirs was gradually reduced during the summer and fall months until November, when all fears of a short supply were removed by the large rainfall during that month.

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

	Sudbury.	Cochituate.	Mystic.
Rainfall in inches	41.83	39.04	39.115
“ collected in inches	16.456	15.35	15.98
Daily average yield of water-shed, gallons	58,753,000	13,753,500	20,390,700

The quality of the water from all the supplies has been as good as usual, and the supply from Sudbury river is gradually being improved.

The condition of the different reservoirs during the year is given below.

Reservoir No. 1. — Water was wasting at the dam from January 3 to April 15, and from May 12 to June 7.

No water was wasted for the balance of the year, except during six days in November and ten days in December, other than the daily flow of one and a half million gallons required by law.

The dam is in good condition.

Reservoir No. 2. — Water was flowing over the dam almost constantly from January 4 to July 10. From this date till August 18 the surface of this reservoir was gradu-

ally lower, and at the latter date was at grade 161.36, or 5.76 feet below the top of the flash-boards.

During the balance of the year the surface of this reservoir rose and fell, reaching its lowest point on November 10, when it was 7.58 feet below the top of flash-boards; on January 1, 1890, it was 4.08 below.

The dam of Reservoir 2 is in good condition.

Reservoir No. 3. — The water in this reservoir was 8.05 feet below the crest of the dam on January 1, but was flowing over the crest on January 18, and continued to do so almost constantly until the last of June. From this date the surface gradually fell until August 26, when it was 6.20 feet below the crest of the dam. This was the lowest point reached during the year. On January 1, 1893, it stood at grade 171.58, or 3.66 feet below the crest of the dam. The dam of this reservoir is in good condition.

Reservoir No. 4. — The surface of the water in this reservoir was 6.36 feet below the crest of the dam, on January 1, but had filled to overflowing on January 21, and continued in this condition until August 16, when the gates were opened to furnish a portion of the supply for the city. From this date the water gradually fell to grade about 185.34, or 28.87 feet below the crest of the dam, when the outlet gate was closed. On January 1, 1893, the water had risen to grade 194.22, or 19.99 feet below the crest of the dam. The dam at Reservoir 4 is in good condition.

Farm Pond. — The water in this pond has been kept at an average height of 148.92 above tide marsh level. The conduit through the pond was used all the year except from May 14 to July 20, and from August 18 to August 30, when the supply was drawn through the pond.

The Framingham Water Company has pumped 82,800,000 gallons from the pond, an average of 226,200 gallons per day.

Lake Cochituate. — On January 1 the water in this lake was 7.02 feet below high-water mark, and the lake did not fill until May 4. Water was wasting at dam on May 20 to 24, and May 26 to 28, inclusive.

The lake continued near high-water mark until the latter part of June when it began to fall, and continued to do so with great regularity until November 13, when it was 6.80 feet below high-water mark.

The lowest point reached was on December 8, when it was 6.91 feet below high water.

No water was drawn from the lake after December 10, and on January 1, 1893, the surface was at grade 128.41, or 5.95 feet below high water. The dams are in good condition.

Water has been drawn from the different reservoirs as follows :

RESERVOIR No. 1.

January 9 to 11, inclusive.	February 25 to 28.
January 14 to 17.	March 3 to 6.
January 22 to 24	March 10 to 13.
January 28 to 30.	March 16 to 20.
February 4 to 7.	March 24 to 27.
February 11 to 14.	March 29 to July 19.
February 18 to 21.	

RESERVOIR No. 2.

January 1 to 5.	November 21.
August 26 to 27.	November 26 to 27.
September 1 to 9.	November 29.
September 13 to Novem- ber 14.	December 9 to 10.
November 18.	December 13 to 17.

RESERVOIRS Nos. 2 AND 3.

July 20 to August 25.	November 23 to 25.
August 28 to 31.	November 30 to Decem- ber 4.
September 10 to 12.	December 7 to 8.
November 5 to 17.	December 11 to 12.
November 19 to 20.	

The heights of water in the various storage reservoirs on the first day of each month are given on page 89.

		RESERVOIRS.				FARM POND.	LAKE COCHITUATE.
		No. 1.	No. 2.	No. 3.	No. 4.		
		Top of Flash-boards.	Top of Flash-boards.	Crest of Dam.	Crest of Dam.	High Water.	Top of Flash-boards.
		159.29	167.12	175.24	215.21	149.25	134.36
January 1,	1892	157.20	163.55	167.19	207.85	148.99	127.34
February 1,	"	157.86	166.10	175.49	214.42	148.50	130.09
March 1,	"	158.00	166.15	175.58	214.49	148.65	130.27
April 1,	"	157.95	166.23	175.64	214.56	149.14	132.75
May 1,	"	155.72	167.21	175.05	214.78	149.00	134.17
June 1,	"	159.54	167.69	175.57	214.58	149.21	134.23
July 1,	"	156.84	167.38	174.89	215.31	149.45	133.83
August 1,	"	156.70	162.63	171.94	214.43	149.05	132.23
September 1,	"	156.35	164.79	169.60	210.55	148.95	130.84
October 1,	"	156.89	165.83	169.88	199.68	148.89	129.51
November 1,	"	156.22	159.70	170.14	187.40	148.55	127.98
December 1,	"	157.60	163.71	173.51	199.66	148.81	127.75
January 1,	1893	157.44	163.04	171.58	194.22	148.63	128.41

AQUEDUCTS AND DISTRIBUTING RESERVOIRS.

The Sudbury-river aqueduct has been used 322 days, and the Cochituate has been used 342 days, conveying water to the distributing reservoirs. The former has delivered 9,633,200,000 gallons into Chestnut-hill and Brookline reservoirs, equal to a daily supply of 28,800,000 gallons; and the Cochituate aqueduct has delivered 5,464,800,000 gallons, or 14,930,000 gallons per day. For 44 days the Sudbury aqueduct has also conveyed water to Lake Cochituate, delivering 902,400,000 gallons into the lake.

A nearly uniform depth of six and one-half feet was maintained in the Cochituate aqueduct while in use. The aqueduct was not used after December 10, on account of excavations under it by the city of Newton.

The rate of flow in the Sudbury aqueduct was varied from day to day to maintain the desired depth of water in the distribution reservoirs. Both aqueducts were cleaned as usual during the year.

The Chestnut-hill, Brookline, Fisher-hill, Parker-hill,

and East Boston reservoirs and the Breed's-island water-tower are in good condition.

I renew the recommendations made in the last annual report in regard to Chestnut-hill and South Boston reservoirs, and the water-tower on Bellevue hill.

HIGH-SERVICE PUMPING-STATIONS.

At Chestnut hill the pumping-engines and boilers are in excellent condition. It has been necessary to run the pumps much above their rated capacity, and although the normal capacity of each pump is 8,000,000 gallons in 24 hours, Engine No. 2 has pumped over 11,000,000 gallons in 24 hours with apparent safety.

A duplicate dynamo and engine has been added to the lighting plant, which is now located in a wooden extension built in the rear of the boiler-room.

The foundations for Engine No. 3 are nearly completed, and the work of building the engine is progressing rapidly.

The table on page 130 shows in detail the work done by the pumping-engines and boilers during the year.

Engine No. 1 was used	3,976 $\frac{5}{6}$	
hours, pumping	.	1,569,863,445 gallons.
Engine No. 2 was used	3,758 $\frac{3}{4}$	
hours, pumping	.	1,480,154,830 "
Total amount pumped	.	3,050,018,275 "
Total amount coal consumed	.	3,548,105 pounds.
Percentage, ashes and clinkers	.	8.5
Average lift in feet	.	126.27
Quantity pumped per lb. of coal	.	859.6 gallons.
Daily average amount pumped	.	8,333,400 "

The amount pumped is an increase of 14.7 per cent. over that of 1891.

The boilers have been run alternately, one boiler being sufficient to furnish the steam for lighting and heating the pumping-station and other buildings near it, besides that required for pumping.

COST OF PUMPING.

Salaries	.	.	.	.	.	.	\$10,150 40
Fuel	.	.	.	.	.	.	7,490 76
Repairs	.	.	.	.	.	.	192 48
Oil, waste, and packing	.	.	.	.	.	.	574 95
Small supplies	.	.	.	.	.	.	352 48
Total	.	.	.	.	.	.	<u>\$18,761 07</u>

Cost per million gallons raised one foot high, \$0.049.

Cost per million gallons pumped to reservoir, \$6.15.

At the West Roxbury pumping-station, 33,588,675 gallons have been pumped, or a daily average of 91,800 gallons, an increase of 39.1 per cent. over the amount pumped in 1891.

At the East Boston pumping-station an average of 18,400 gallons per day has been pumped into Breed's island water-tower, an increase of 36.3 per cent. over the amount pumped in 1891.

Since July 22 water has been pumped daily into the East Boston reservoir during the daytime to furnish an additional head for the high-service district. The check-valve with bypass, against which the pumps work, is weighted to give about 20 pounds additional pressure on the mains while pumping. About 400,000 gallons were pumped daily for this service.

The small pump that was formerly used at the Brighton pumping-station is badly worn, and requires a good deal of attention to keep it in running order. The two larger pumps can be maintained in good condition with ordinary repairs.

MYSTIC LAKE.

Water was wasted over the dam almost constantly from January 14 to June 7, and from June 27 to July 7. From this date the surface of the lake gradually fell until it was 6.72 feet below high water on November 1; this was the lowest point reached during the year.

During November it filled to within 2.70 feet of high water, and on January 1, 1893, the lake was eighteen inches below high-water mark. The pumps were placed in position to pump water into the conduit in October, but the November rains raised the level of the lake before it became necessary to use them.

One of the rain-gauges used in the calculation of the yield of the water-shed was moved from Symmes Corner to the north reservoir, Winchester, on September 1.

MYSTIC VALLEY SEWER.

The pump was run 346 days during the year, working 6,142 $\frac{2}{3}$ hours, and has pumped 134,576,100 gallons of sewage, an average of 389,500 gallons per day of pumping.

The amount pumped is 12.9 per cent. more than was pumped in 1891.

The total amount of sulphate aluminum used during the year was 338,065 lbs., and 182.9 tons of coal were used in pumping.

MYSTIC CONDUIT AND RESERVOIR.

The conduit is in good condition, except that a new gate should be placed on the blow-off pipe.

Both divisions of the reservoir were cleaned in June. The brick paving on the slopes was found to be in better condition than it was at the time of the previous cleaning, and but few repairs were necessary.

There are serious objections to the method now used for cleaning the reservoir, and to remedy it a drain should be laid to the Mystic river, through which the deposits that collect in the reservoir can be flushed; or sufficient time should be allowed for the deposits to dry, so that they can be hoisted over the banks.

If the flushing method be continued, the concrete bottom of the reservoir should be renewed, as it is now badly disintegrated. I renew the recommendation that new sills and grooves for the screens be placed in the screen-chamber, and that the roof of the chamber be raised to facilitate the changing of the screens.

MYSTIC PUMPING-STATION.

The increased consumption has required that in addition to the 8,000,000-gallon pump, one of the smaller pumps be run several hours nearly every day, thus reducing the duty obtained in 1891.

The running of Pumping-engine No. 1, which was built in 1864, is neither satisfactory nor economical; the pump has outlived its usefulness. New fronts have been placed on boilers Nos. 1, 2, and 3, and the Lamprey attachment for heating the feed-water has been placed inside the fire doors.

I renew the recommendations made in the last report, which have not been carried out.

Engine No. 1 was in use	669 $\frac{1}{4}$	
hours, pumping	.	131,022,700 gallons.
Engine No. 2 was in use	3,897 $\frac{3}{4}$	
hours, pumping	.	799,198,200 "
Engine No. 3 was in use	8,042 $\frac{1}{4}$	
hours, pumping	.	2,666,495,500 "
Total amount pumped	.	3,596,716,400 "
Total amount coal consumed	.	7,873,000 pounds.
Percentage ashes and clinkers	.	10.2
Average lift in feet	.	148.84
Quantity pumped per lb. of coal	.	456.8 gallons.
Average duty of engines per 100 lbs. of total coal, no deduction	.	56,709,000 ft. lbs.

Daily average amount pumped 9,827,100 gallons.

The amount pumped was an increase of 8.8 per cent. over that of 1891.

COST OF PUMPING.

Salaries	\$9,613 93
Fuel	14,294 22
Repairs	511 09
Oil waste and packing	744 51
Small supplies	348 44

Total \$25,512 19

Cost per million gallons raised one foot high \$0.048

Cost per million gallons pumped to reservoir 7.09

The table on page 131 shows in detail the work done by the pumping-engines during the year.

CONSUMPTION.

The daily average consumption for 1892, and a comparison with that of 1891, is shown by the following table :

1892.	COCHITUATE.		MYSTIC.		COMBINED SUPPLIES.	
	Consumption in Gallons.	Percentage of Consumption, 1891.	Consumption in Gallons.	Percentage of Consumption, 1891.	Consumption in Gallons.	Percentage of Consumption, 1891.
January	36,756,400	98.7	9,878,200	105.2	46,634,600	100.0
February	38,881,500	104.3	10,332,200	109.1	49,213,700	105.3
March	38,395,100	108.1	9,970,500	113.2	48,365,600	109.1
April	37,171,000	104.0	9,145,000	113.7	46,316,000	105.8
May	37,055,900	101.3	9,204,900	104.1	46,260,800	101.8
June	41,564,000	109.9	10,146,300	107.0	51,710,300	109.4
July	45,738,100	117.1	10,702,900	111.7	56,441,000	116.0
August	45,031,600	114.1	9,751,500	106.9	54,783,100	112.8
September	45,261,000	111.3	9,549,400	104.6	54,810,400	110.0
October	44,626,700	114.9	9,340,500	100.9	53,967,200	112.2
November	41,347,800	112.8	9,230,000	107.5	50,577,800	111.8
December	43,766,400	118.3	10,473,700	116.9	54,240,100	117.1
Average	41,312,400	109.6	9,810,800	108.3	51,123,200	109.4

The daily average consumption per head of population was as follows :

Sudbury and Cochituate supply	95.3 gallons.
Mystic supply	78.6 “
Combined supplies	91.6 “

The above figures show an increase of 9.6 per cent. in the consumption from the Sudbury and Cochituate works from that of the previous year; of 8.3 per cent. increase in the consumption for the Mystic Works; and of 9.4 per cent. increase for the combined supplies.

DISTRIBUTION.

The total length of main pipe laid on the Cochituate division was nearly 18 miles, and 4,270 feet of pipe have been abandoned, making a net increase of a little more than 17 miles in the total length in use.

Only about 1,500 feet of pipe were relaid with larger sizes to improve the fire service, and I recommend that at least one mile of the old mains be relaid this year for that purpose.

The laying of the 30-inch main to South Boston was completed on May 27th.

This main connects with the 30 and 36 inch mains in Tremont street at West Chester park, and extends through Chester park and Swett street to Washington Village, a distance of 7,600 feet, connecting with the 20-inch main in Boston street.

A spiral weld steel pipe was used for crossing the sluices in Swett street; the pipe being reduced to 24 inches in diameter at the two bridges, which are considered to be temporary structures.

A 6-inch pipe was laid from Squantum to supply the Asylum and Farm School on Thompson's island. The work was done by John Cavanagh & Co., who were the lowest bidders. The length of the pipe was 6,760 feet, 300 feet under the channel between Squantum and the island being laid with the Ward flexible-jointed pipe. Water was turned on in this pipe July 5.

Water-pipes were laid from the pipe on Long island to the hospitals on Gallop's island in the fall; 2,874 feet of 6-inch pipe on Long island and 991 feet of 6-inch pipe on Gallop's island were laid by John Cavanagh & Co., under a contract. A temporary 3-inch wrought-iron pipe 3,798 feet in length, on the bottom of the channel between the

islands, was laid by George W. Townsend, under a contract. The pipe was put together with screw couplings by divers, and was laid in two weeks' time. The temporary pipe was paid for by the Board of Health.

The sea-water has been so unusually cold that the 6-inch pipe between Moon and Long islands was frozen, after having successfully passed through four winters without accident. The pipe is encased in a wooden box of 3½-inch plank, and is buried in a trench where there is less than 10 feet of water over the pipe at low tide. The freezing probably began in deep water, as the water in the bay was only 28 degrees above zero.

In Charlestown the mains were extended 2,208 feet, and 216 feet of 4-inch pipe were relaid with 6-inch pipe.

ADDITIONAL SUPPLY.

The development of the Sudbury system has been continued during the past year. The work of building the basin on Indian brook (Basin No. 6) has made fair progress, and it will be so far advanced at the end of the present season that the basin can be put into service. The surveys for additional basins have been nearly finished, and their construction must be commenced at once, as the increasing consumption of water by the city has more than kept pace with development of the water supply; and even with Basin No. 6 the works have barely sufficient capacity in a dry year to supply the present consumption.

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

SOUTH FRAMINGHAM, MASS., January 30, 1893.

WILLIAM JACKSON, Esq., *City Engineer*:

SIR: I submit herewith a brief report of engineering work accomplished during the past year by the Additional Supply force.

At Basin No. 6 the core-wall was uncovered early in April, and on April 25 the first gravel was delivered on the dam. Work on the shallow flowage, stripping of basin, and building up of the dam was actively prosecuted throughout the season. The dam has been raised from grade 250 to 271, or 21 feet. Both gate-chambers have been built to grade. The valves have been placed in the lower gate-house. The wasteway has been completed. Excellent progress was made by the contractors in stripping the basin. Sections A, B, and C, which were let in 1891, have been completed and final estimates made. Section D is nearly finished. Section E, above the

Cordaville road, was let to John Berry & Co., on January 13, and is practically completed.

Mr. N. S. Brock, Assistant Engineer, has been in charge of Basin 6.

WORK DONE AT BASIN 6 DURING 1892.

Concrete	4,116 cubic yards.
Backfilling	148 " "
Plaster	2,140 square yards.
Embankment	126,726 cubic yards.
Loaming slope	1,572 " "
Riprap "	2,546 " "
Stone crushed	1,579 " "
Sand and gravel screened	1,521 " "
Stone masonry	256 " "
Brick "	143 " "
Stripping earth (contract)	321,516 " "
" " (city)	17,415 " "
WASTEWAY.	
Earth excavation	3,000 " "
Rock	660 " "
Concrete	526 " "
Paving	747 square yards.
Rubble masonry	1,136 cubic yards.
Dimension masonry	102 " "
Coping	1,420 lineal feet.

During the winter of 1891-2 surveys for Basin 5, on Stony brook, were extended, and a new plan made showing contours to grade 250, extending down stream as far as Nichol's mill.

A large amount of engineering work has been done on problems connected with Cedar swamp. After many trial lines, a line for the principal canal has been located and plans perfected for all details of construction.

In May, studies were begun for a basin on the site of this swamp. This involves raising the B. & A. R.R. between Chattanooga and Westboro', and extensive excavations of mud. Plans and approximate estimates have been prepared.

Very truly yours,

(Signed)

DESMOND FITZGERALD,

Resident Engineer.

SEWERAGE SYSTEMS.

South Framingham, Marlboro', Westboro', Natick.

The sewerage system of South Framingham has, with the exception of the discharging from the town underdrain, worked satisfactorily. The city of Marlboro' and the town of Westboro' have so far completed their sewer system as to have them in successful operation.

The town of Natick has made a plan of works and seems to be in earnest to do something this year.

FILTRATION OF THE MYSTIC SUPPLY.

Although the quality of the water furnished by the Mystic works has been comparatively good during the past year, the large and increasing population on the water-shed, together with the objectionable character of the large number of factories on the borders of the streams, renders the task of maintaining the purity of the water a more difficult one from year to year; and in case of an epidemic of cholera or typhoid fever in Winchester or Woburn, there would be great danger in using the Mystic water unless it was thoroughly filtered.

If the Mystic works are to be continued in use as a source of supply for ten years, and I can see no way by which they can be abandoned before that time, I am of the opinion that a filtration plant should be at once constructed.

Judging from the results of the experiments of the State Board of Health and of your Board, I can see no reason why, if this is done, these works should not furnish water of satisfactory quality.

With this end in view, surveys and estimates have been made of the cost of works capable of filtering the entire Mystic supply.

The scheme of works as planned comprises seven filtering basins, each having an area of about one acre, to be built on the shore of the lake, near the present dam, with a pumping-station and engines to raise the water from the lake to the filter basins.

The estimated cost of these works is \$575,000.

CAPACITY OF DISTRIBUTION SYSTEM.

In accordance with a vote of your Board, dated January 27, 1892, an investigation has been made of the capacity of the distribution system, considered with reference to the water supply available for fire protection, and comparisons have

been made with the distribution systems of other large cities in the United States.

Connected with the Sudbury and Cochituate works, there were, January 1, 1892, 514.4 miles of supply and distributing mains, of which 468 miles are of sizes from 4 inches to 16 inches in diameter, and may be properly termed the distributing mains. The remaining 46.4 miles consist of main pipes from 20 inches to 48 inches in diameter, which are not tapped for service-pipe or fire-hydrant supplies.

From the Chestnut-hill and Brookline reservoirs the water is brought to the city, a distance of about four miles, by four mains, — 30-inch, 36-inch, 40-inch, and 48 inches in diameter.

These mains will supply in the city, with a pressure of 40 pounds to the square inch, at least 100 cubic feet per second, which is equivalent to an ample supply for 100 steam fire-engines.

Since the great fire of November 9, 1872, the distribution system of Boston has been greatly improved by the relaying of about 40 miles of 4 and 6 inch mains, with others of much greater capacity, and also by the introduction of larger and improved patterns of hydrants.

Throughout the business portion of the city, 16-inch, 12-inch, 10-inch, and 8-inch pipes are extensively used; the proportion of these sizes being about 45% of the total distribution.

Throughout the mercantile section of the city, embracing the district bounded by Washington street, State street, Broad street, Atlantic avenue, Federal street, and Beach street, a system of water supply is provided for fire protection, in addition to the supply afforded by the hydrants connected with the low-service distribution pipes, by a separate system of distribution-pipes to be laid throughout this district for the sole purpose of supplying water under high pressure (80 to 90 pounds) to stand-pipes and sprinkler systems in the buildings of the district. This enables the property-owners in this district to provide themselves with a water supply for fire protection which is available at all times, and which will not be affected by the drafts which are made by the fire department from the hydrants.

In the residential districts the pipes are somewhat smaller, and in the suburban sections of Dorchester, West Roxbury, and Brighton the capacity of the distribution system for fire protection is, as must be expected, much smaller than in the more thickly settled portions of the city.

Connected with the distributing mains there were 5,682 hydrants and 238 reservoirs for use in case of fire.

Four styles of hydrants are used; viz., the Boston, the Lowry, the Boston Lowry, and the Post.

The Boston hydrant is the pattern exclusively used from 1848 to 1868. It has a barrel three inches in diameter, with a single $2\frac{1}{2}$ -inch outlet, and is supplied by a branch pipe from the main 4 inches in diameter.

The hydrants of this pattern are being gradually replaced by others of greater capacity.

The Lowry hydrant, of which there were 2,449 in use, has a 9-inch barrel, and is arranged to supply four steam fire-engines, by means of a portable chuck having two $2\frac{1}{2}$ -inch and two 4-inch outlets, each outlet being provided with a separate valve.

Hydrants of this pattern are generally placed directly over the supplying main, and at the junction of connecting pipes. When placed in the sidewalk they are supplied by 9-inch or 12-inch branches from the mains.

The Boston Lowry hydrant has a 6-inch barrel, and is supplied by a 6-inch branch pipe from the main. This hydrant is generally placed in narrow sidewalks where the Post hydrant would inconvenience public travel. Four steamers can be attached to this hydrant, but when set in the sidewalk it is not often convenient to attach more than two steamers.

The Post hydrant has a 6-inch barrel supplied by a 6-inch branch pipe, and has one 4-inch and two $2\frac{3}{4}$ -inch outlets.

As previously stated, the hydrants used from 1848 to 1868 had 3-inch barrels, with a single outlet $2\frac{1}{2}$ inches in diameter; and at the latter date there were in use in the city proper, South Boston, and East Boston 1,590 hydrants of this pattern.

During the past twenty years a large number of these old hydrants have been replaced by hydrants of the Lowry and Post patterns, so that to-day the number of "Boston" hydrants in use in the city proper, South Boston, and East Boston is 660 less than in 1869.

Throughout the business portion of the city the hydrants are spaced from 150 to 250 feet apart, and from 250 to 300 feet in the residential districts.

Below are given extracts from the report of Mr. Dexter Brackett, Assistant Engineer, who visited the larger cities of the country, and made a personal examination of their distribution systems.

"A comparison of the distribution system of Boston with those of the other large cities of the country shows that the system here is not behind the modern practice in the matter of fire protection.

"As a result of a personal examination of the systems in New York, Brooklyn, Philadelphia, Baltimore, Washington, Pittsburgh, Cincinnati, St. Louis, Chicago, Detroit, and Cleveland, the following tables and accompanying plans have been prepared.

"The plans in all cases cover the thickly settled business portions of the cities.

"Table No. 1 shows the length in miles of the different sizes of pipe in use in the cities named, and table No. 2 gives for each city the percentage used of the different sizes.

TABLE I.
Miles of Pipe of Different Sizes in Use in some of the Large Cities of the United States, January, 1892.

	3-in.	4-in.	4½-in.	6-in.	8-in.	10-in.	12-in.	14-in.	15-in.	16-in.	18-in.	20-in.	24-in.	30-in.	36-in.	40-in.	42-in.	46-in.	48-in.	Total Miles.
New York	3.2	6.2	422.6	580.8	242.1	5.1	78.9	3.3	3.2	37.9	2.2	7.9	21.6	14.3	685.5	14.3	685.5	14.3	685.5	685.5
Chicago	3.2	203.9	580.8	242.1	5.1	78.9	3.3	3.2	37.9	2.2	7.9	21.6	14.3	685.5	14.3	685.5	14.3	685.5	685.5	685.5
Philadelphia	0.7	0.7	286.3	77.9	10.5	9.8	40.9	10.2	2.1	19.7	6.4	8.9	10.6	4.4	4.8	514.4	4.8	514.4	4.8	514.4
Brooklyn	11.9	1.9	239.1	10.5	9.8	40.9	10.2	2.1	19.7	6.4	8.9	10.6	4.4	4.8	514.4	4.8	514.4	4.8	514.4	514.4
St. Louis	11.9	1.9	239.1	10.5	9.8	40.9	10.2	2.1	19.7	6.4	8.9	10.6	4.4	4.8	514.4	4.8	514.4	4.8	514.4	514.4
Boston ¹	108.7	126.6	13.8	64.2	6.3	35.8	11.7	7.2	1.2	22.1	10.5	5.3	7.4	420.7	420.7	420.7	420.7	420.7	420.7	420.7
Baltimore	11.1	91.7	85.9	12.6	45.6	3.9	6.3	17.9	1.2	0.1	4.8	0.7	0.7	282.6	282.6	282.6	282.6	282.6	282.6	282.6
Cincinnati	2.7	23.9	187.4	58.0	21.6	5.7	5.4	3.3	2.9	14.5	7.9	7.9	7.9	333.3	333.3	333.3	333.3	333.3	333.3	333.3
Cleveland	5.5	52.0	95.6	23.4	6.0	10.6	0.3	7.0	1.0	8.0	1.8	5.2	6.3	217.9	217.9	217.9	217.9	217.9	217.9	217.9
Pittsburgh	5.5	24.0	142.0	1.1	2.3	14.5	3.8	3.8	0.5	6.2	4.3	4.3	4.3	209.8	209.8	209.8	209.8	209.8	209.8	209.8
Washington	15.9	150.3	135.1	35.8	18.3	0.7	4.9	0.1	13.9	9.3	0.1	8.5	8.5	392.9	392.9	392.9	392.9	392.9	392.9	392.9
Detroit	15.9	150.3	135.1	35.8	18.3	0.7	4.9	0.1	13.9	9.3	0.1	8.5	8.5	392.9	392.9	392.9	392.9	392.9	392.9	392.9

¹ These figures are for January, 1892, to compare with data from other cities.

TABLE II.
Percentage of the Different Sizes of Pipe used, January, 1892.

	3-in.	4-in.	4½-in.	6-in.	8-in.	10-in.	12-in.	14-in.	15-in.	16-in.	18-in.	20-in.	24-in.	30-in.	36-in.	40-in.	42-in.	46-in.	48-in.	Percentage less than 6-in.	Percentage less than 8-in.
New York . . . . .	. . .	0.9	. . .	61.6	. . .	0.2	24.6	. . .	. . .	0.5	. . .	5.5	0.3	1.2	3.1	. . .	. . .	. . .	2.1	0.9	62.5
Chicago	0.3	16.9	. . .	48.2	20.1	0.4	6.5	0.3	. . .	3.1	. . .	0.1	2.8	0.1	1.2	. . .	. . .	. . .	. . .	17.2	65.4
Philadelphia . . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Brooklyn . . . . .	. . .	0.2	. . .	63.6	17.3	. . .	8.9	. . .	. . .	0.4	. . .	4.4	. . .	1.4	2.0	. . .	. . .	. . .	2.7	0.2	63.8
St. Louis	3.2	0.5	. . .	65.0	2.9	2.7	11.1	. . .	2.8	. . .	. . .	7.0	. . .	1.9	2.9	. . .	. . .	. . .	. . .	3.7	68.7
Boston . . . . .	. . .	4.7	. . .	42.0	11.6	1.6	28.6	. . .	. . .	2.6	. . .	2.2	2.1	2.1	0.8	0.5	. . .	. . .	0.9	4.7	46.7
Baltimore	25.8	30.1	3.3	15.3	1.5	8.5	2.8	. . .	. . .	1.7	0.3	5.2	. . .	2.5	1.2	1.8	. . .	. . .	. . .	53.9	74.5
Cincinnati	3.9	32.4	. . .	30.4	4.5	16.1	1.4	. . .	. . .	2.2	. . .	6.3	0.4	0.1	1.7	0.2	. . .	0.2	0.1	36.3	66.7
Cleveland	0.8	7.2	. . .	56.2	17.4	6.5	1.7	. . .	. . .	1.6	. . .	1.0	0.9	4.3	2.4	. . .	. . .	. . .	. . .	8.0	64.2
Pittsburgh . . . . .	. . .	23.9	. . .	43.9	10.8	2.7	4.8	0.1	3.2	0.5	. . .	3.7	0.8	2.4	2.9	. . .	. . .	. . .	0.3	23.9	67.8
Washington	2.6	11.4	. . .	67.7	0.5	1.1	6.9	. . .	. . .	. . .	. . .	1.8	0.2	3.0	2.1	. . .	. . .	. . .	2.7	14.0	81.7
Detroit	4.0	38.3	. . .	34.4	9.1	4.7	0.2	. . .	. . .	1.2	. . .	. . .	3.5	2.4	. . .	. . .	2.2	. . .	. . .	42.3	76.7

" Bearing in mind the fact that pipe less than six inches in diameter is of very little value for fire protection, a study of the tables shows very clearly the comparative value of the different systems. It will be noticed that the proportion of the sizes below eight inch is less in Boston than in any of the cities examined.

" Baltimore has 235 miles, or more than one-half of its distribution system of 3 and 4 inch pipe; Chicago has 207 miles, Detroit 166 miles, and Cincinnati 103 miles, while Boston has but 24 miles. On the other hand, Boston has 147 miles of 12-inch pipe, the proportion of this size being larger than in any of the other cities.

" The efficiency of a system for fire protection depends not only upon the size of the mains, but also on the number and capacity of the fire hydrants connected with those mains. If, as in some of our large cities, the hydrants used are of small capacity with a single outlet, allowing of but one steamer connection and spaced from 300 to 500 feet apart, the efficiency of the system is much diminished by the inability to concentrate a large number of steamers near any given point. To perform effective service, a steamer should not be obliged to use more than 500 feet of 2½-inch hose to reach the fire. With a line of hose 600 feet in length a water-pressure of 120 pounds at the steamer will give an effective fire stream about 60 feet above the ground and will discharge 240 gallons per minute, while with 100 feet of hose the same pressure would give an effective stream of 94 feet in height and discharge 340 gallons per minute.

" It is, therefore, of great advantage to have hydrants of large capacity so located that a large number of steamers may be placed within a short distance of the fire.

" The Lowry hydrant used in Boston, being located in the centre of streets and provided with outlets for four steamer connections, permits of the concentration of the steamers much better than any other hydrant in general use. At the Bedford-street fire on November 28, 1889, fifty-two steamers were in service, and none were located more than 600 feet from the fire. In Brooklyn and St. Louis the hydrants have but one outlet or hose connection.

" In New York 80 per cent. of the hydrants have but one 2½-inch outlet, and all of the hydrants set there during the past year (1891) were of this pattern. Table No. 3 shows the number of hydrants and fire reservoirs in use in the different cities, with the number and size of hose connections.

TABLE III.
Number of Hydrants and Fire Reservoirs in Use in Different Cities.

	NUMBER AND DIAMETER OF HYDRANT NOZZLES.													Fire Reservoirs connected with Mains.	Total Number of Hydrants and Reservoirs.	Hydrants per Mile of Distribution.	Total Number of Hydrant Nozzles.	Hose Connection per Mile of Pipe.	
	1 2-in.	1 2½-in.	1 3-in.	1 4-in.	2 2½-in.	2 3-in.	1 2½-in.	1 4-in.	2 2½-in.	2 4-in.	3 2½-in.	3 4-in.	1 2½-in.						2 2½-in.
	200	500	1,530	986	3,490	223	1,359	1,467	3,024	238	1,359	3,024	238						3,024
New York	6,825						1,927								8,752	12.8	10,079	15.6	
Chicago	2,739			6,328				2,203	566						11,923	9.9	23,397	19.4	
Philadelphia	3,696			1,032					2,408				969		8,105	8.1	12,451	12.4	
Brooklyn	4,538														4,538	10.1	4,538	10.1	
St. Louis		3,715													3,715	10.1	3,715	10.1	
Boston	1,191							1,467					3,024		5,920	11.5	18,402	35.8	
Baltimore								1,359							1,359	3.2	4,077	9.7	
Cincinnati		1,530			223										300	7.3	2,876	10.2	
Cleveland	200							134							3,824	11.5	7,582	22.7	
Pittsburgh	500			986		3,490			250						1,736	8.0	1,983	9.1	
Washington				300											1,200	5.7	3,300	15.7	
Detroit				1,768											439	6.1	3,485	8.9	



NORTH RIVER

EAST RIVER

MAP OF A SECTION
 OF
 NEW YORK CITY
 SHOWING
 PIPE LINES, HYDRANTS & CONNECTIONS

SCALE OF FEET
 100 200 300
 January, 1892.

Thirty six inch pipe shown thus	—————
Thirty	-----
Twenty four	-----
Twenty	-----
Sixteen	-----
Twelve	-----
Six	-----
Four	-----
Connections, Single Nozzle	-----
Hydrants, Single Nozzle	-----
Double	-----

LAKE MICHIGAN



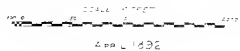
PLAN OF A PORTION OF **CHICAGO** SHOWING PIPE LINES, HYDRANTS — AND — CONNECTIONS.

SCALE OF FEET
JAN. 1892.

- 36 inch pipe shown thus
- 24 "
- 16 "
- 12 "
- 10 "
- 8 "
- 6 "
- 4 "
- 3 "
- Hydrants Single Nozzle
- Double
- Reservoirs

PLAN OF A PORTION
OF
ST. LOUIS
SHOWING

PIPE LINES, HYDRANTS & CONNECTIONS.



- 30 inch pipe shown thus
- 20
- 15
- 12
- 10
- 8
- 6
- 4
- 3
- Connections
- Hydrants



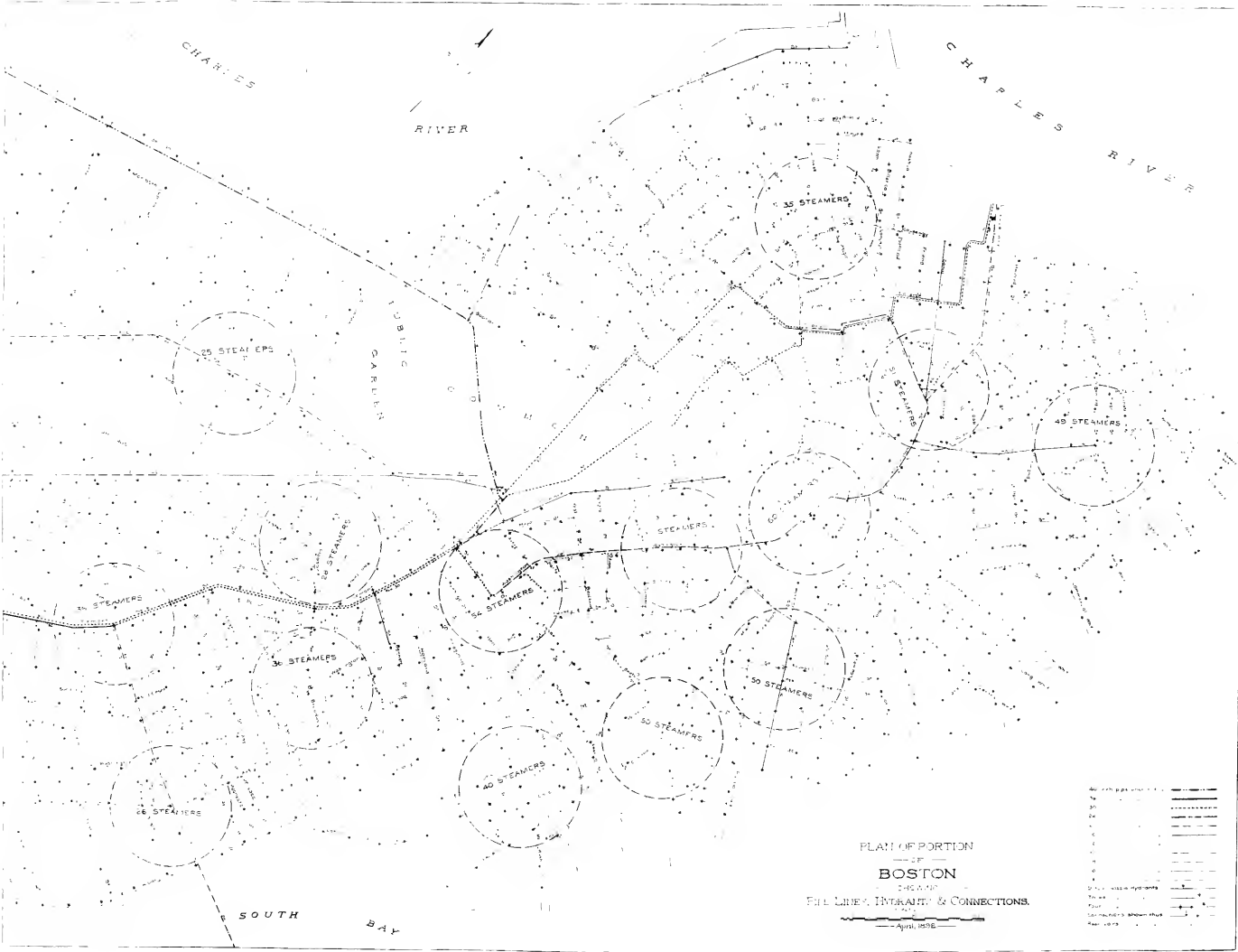
RIVER

MISSISSIPPI

CHARLES

RIVER

CHARLES
RIVER



PLAN OF PORTION

BOSTON

RAIL LINES, TRAMWAYS & CONNECTIONS.

April, 1876.

1	—
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99	—
100	—

PLAN OF A PORTION
OF THE
CITY OF BALTIMORE
SHOWING
PIPE LINES, HYDRANTS & CONNECTIONS.
JAN 1892

40 inch pipe diameter	—
36 "	—
30 "	—
24 "	—
18 "	—
15 "	—
12 "	—
10 "	—
8 "	—
6 "	—
4 "	—
Hydrants	•
Single Valve Connections	—



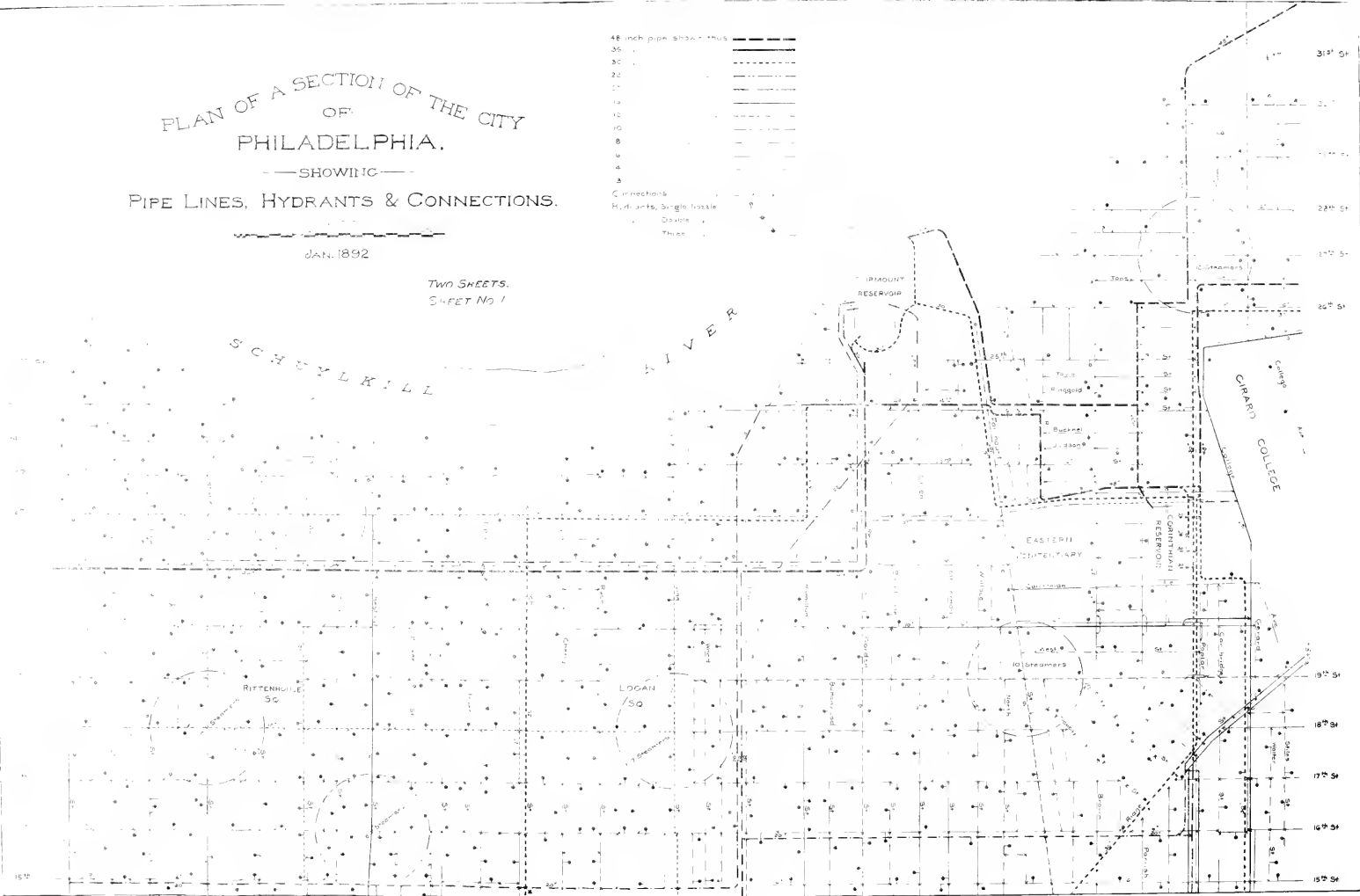
PLAN OF A SECTION OF THE CITY
OF
PHILADELPHIA.

— SHOWING —
PIPE LINES, HYDRANTS & CONNECTIONS.

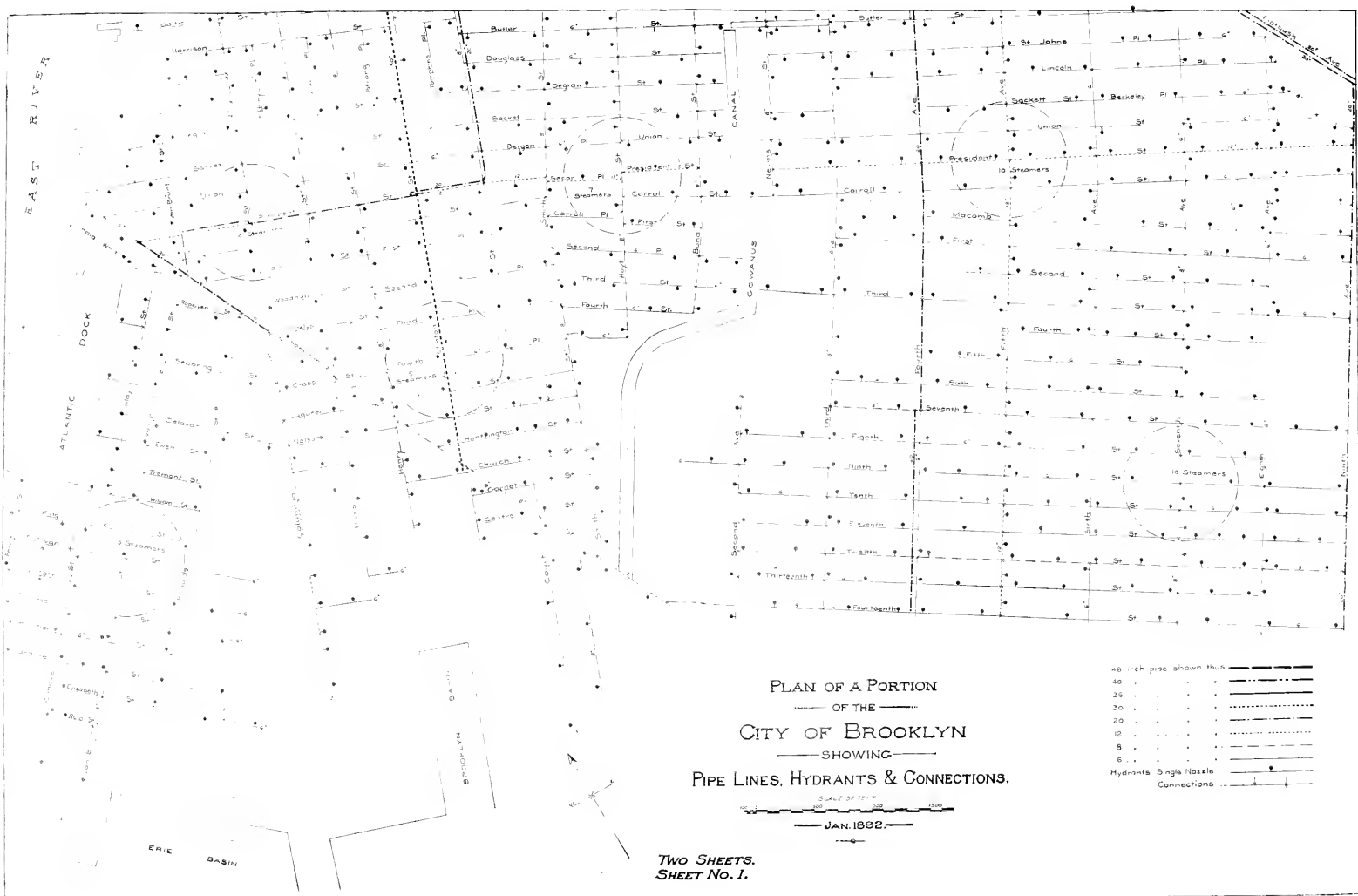
JAN. 1892

TWO SHEETS.
SHEET No. 1

48 inch pipe shown thus	—————
36 "	-----
30 "	-----
24 "	-----
18 "	-----
12 "	-----
10 "	-----
8 "	-----
6 "	-----
4 "	-----
3 "	-----
Connections	-----
Hyd. sets, Single nozzle	-----
Double	-----
Three	-----







PLAN OF A PORTION
OF THE
CITY OF BROOKLYN
SHOWING
PIPE LINES, HYDRANTS & CONNECTIONS.

- 48 inch pipe shown thus
- 40 " " " "
- 35 " " " "
- 30 " " " "
- 20 " " " "
- 12 " " " "
- 8 " " " "
- 6 " " " "
- Hydrants - Single Nozzle
- Connections

SCALE OF FEET
0 100 200 300
JAN. 1892.

Two SHEETS.
SHEET No. 1.

CITY OF BROOKLYN.
SHEET NO. 2.

E A S T

R I V E R



"As before stated, the sizes of the mains and the number and capacity of the hydrants are all factors in determining the value of any distribution system as a means of fire protection.

"Taking all of these facts into consideration, a study has been made of the corresponding portions of the systems of several cities as shown on the accompanying plans.

"Calculations have been made as to the number of steamers that will receive an ample supply of water from hydrants located within 500 feet of various points. The points selected and the results attained for each city are shown by the following tables and by the figures enclosed by circles on the plans :

" Tables showing the number of hydrants and fire reservoirs located within 500 feet of different points in or near the business sections of the cities named, also the number of steamers, each of 500 gallons capacity, that would receive an adequate supply of water from those hydrants:

NEW YORK.

	Hydrants.	Res.	Steamers.
Canal street, junction Bowery	35		62
Canal street, junction Broadway	31		47
Franklin street, junction West Broadway	25		44
Washington street, junction Chamber street	26		42
Prince street, junction Broadway	26		42
Church street, junction Park place	24		41
Chamber street, junction Park row	27		38
Christie street, junction Rivington street	23		35
Cherry street, junction Clinton street	18		26
Grand street, junction Margin street	16		26
Broome street, junction Clinton street	15		17
Market street, junction Madison street	12		12
Pearl street, junction Peck street	11		12
Spring street, junction Varick street	10		10

CHICAGO.

Randolph street, junction Wabash ave.	11	4	32
Adams street, junction La Salle street	14	2	30
Wabash avenue, junction Adams street	11	2	27
Van Buren street, junction Dearborn street	16		27
Lake street, junction Franklin street	13	1	27

	Hydrants.	Res.	Steamer.
Madison street, junction Fifth avenue .	13	1	25
Ontario street, junction La Salle street .	14		25
Van Buren street, junction Franklin street	10	1	22
Randolph street, junction La Salle street,	11	1	22
Ontario street, junction Market street .	8	1	18
Union street, junction Indiana street .	10		17
Madison street, junction Jefferson street,	10		17
Ontario street, junction Pine street . .	9		14
Van Buren street, junction Jefferson street	9		13

ST. LOUIS.

Locust street, junction 11th street . .	19		19
Locust street, junction 3d street . .	19		19
Clark street, junction 3d street . .	16		16
Carr street, junction Broadway . .	16		16
Market street, junction 7th street . .	13		13
Gratiot street, junction 7th street . .	12		12
Market street, junction 14th street . .	11		11
Franklin street, junction 13th street . .	11		11
O'Fallon street, junction 9th street . .	8		8
Gratiot street, junction 14th street . .	7		7
Papin street, junction 21st street . .	6		6
Market street, junction 21st street . .	5		5
O'Fallon street, junction 16th street . .	5		5
Carr street, junction 21st street . .	4		4

BOSTON.

Washington street, junction State street .	24	4	60
Washington street, junction Essex street,	20	2	54
Washington street, junction Franklin street	19	2	51
Haymarket square	22	2	51
Franklin street, junction Pearl street .	20	1	50
Summer street, junction Federal street .	18		50
Hanover street, junction Fleet street .	21		49
Kneeland street, junction South street .	16		40
Washington street, junction Pleasant street,	18	2	36
Tremont street, junction Dover street .	14		36
Causeway street, junction Leverett street,	20	3	35
Pleasant street, junction Piedmont street,	18	3	28
Dover street, junction Harrison avenue .	12		26
Boylston street, junction Berkeley street,	11		25

BALTIMORE.

	Hydrants.	Res.	Steamer.
Calvert street, junction Baltimore street,	21		37
Liberty street, junction Baltimore street,	12		29
Calvert street, junction Franklin street .	11		25
Lombard street, junction Frederick street,	13		23
Camden street, junction Eutaw street .	8		16
Lombard street, junction Central avenue,	8		15
Gorman street, junction Greene street .	7		12
Orleans street, junction Central avenue .	6		10
Fremont street, junction Portland street,	5		7

PHILADELPHIA.

Market street, junction 12th street .	14		23
Chestnut street, junction 16th street .	13		18
Spring Garden, junction 6th street .	15		18
Chestnut street, junction 5th street .	15		17
Market street, junction 2d street .	14		16
Spruce street, junction 12th street .	9		14
Walnut street, junction 22d street .	8		13
Poplar street, junction 27th street .	11		12
Vine street, junction 3d street .	11		12
Fairmount street, junction 10th street .	10		10
Fairmont street, junction 19th street .	10		10
Spruce street, junction 18th street .	8		10
Vine street, junction 11th street .	7		8
Vine street, junction 18th street .	7		7

BROOKLYN.

Fulton street, junction Flatbush avenue .	15		15
Fulton street, junction Adams street .	15		15
Nassau street, junction Adams street .	11		11
Hicks street, junction Peirrepoint street .	10		10
President street, junction Fifth avenue .	10		10
Seventh avenue, junction 9th street .	10		10
Court street, junction Congress street .	9		9
Bond street, junction Wykoff street .	9		9
Park street, junction North Portland street	8		8
Hoyt street, junction Secor place .	7		7
Fulton street, junction Adelphi street .	6		6
Columbia street, junction President street	6		6
Sullivan street, junction Van Brunt street	5		5
Clinton street, junction Fourth place .	5		5 "

A careful study of the facts given warrants the conclusion that Boston has as good, if not a better, system of water dis-

tribution for fire purposes than any of the other large cities of the country; that the Lowry hydrant in use here will supply more steamers than any other hydrant in general use, and that the Boston pattern of Post hydrant is of greater capacity than that used by many other cities.

Of the 1,200 old-style hydrants and 24 miles of 4-inch pipe that are now in use, about 50 per cent. should be replaced within a few years.

Appended are tables showing for all sections of the city the number of steamers that it is estimated would receive a supply of 500 gallons per minute each from hydrants located within 500 feet of the locations given. In considering these tables, it must be borne in mind that 500 gallons per minute provides for two efficient streams from each steamer, and as at any fire some steamers will be using but one line of hose, and others will be stopped at any given moment, the number of steamers which, under the usual circumstances, could be adequately supplied would be somewhat larger than the figures given.

CITY PROPER — BUSINESS SECTION.

Albany street, junction Canton street	26
Albany street, junction Concord street	27
Albany street, junction Dover street	25
Albany street, junction East Chester park	35
Albany street, junction Oak street	32
Albany street, junction Randolph street	16
Albany street, junction Union Park street	16
Albany street, junction Wareham street	32
Albany street, junction Way street	30
Atlantic avenue, junction Central wharf	35
Atlantic avenue, junction Clinton street	45
Atlantic avenue, junction Federal street	50
Atlantic avenue, junction India street	45
Atlantic avenue, junction Oliver street	40
Atlantic avenue, junction Pearl street	50
Beach street, junction Albany street	40
Beach street, junction Harrison avenue	40
Bedford street, junction Kingston street	50
Bowdoin square	33
Brattle square	50
Causeway street, junction Beverly street	25
Causeway street, junction Friend street	33
Causeway street, junction Leverett street	35
Chapman street, junction Shawmut avenue	22
Chapman street, junction Village street	26
Charlestown street, junction Beverly street	60

Charlestown street, junction Causeway street . . .	31
Columbus avenue, junction Berkeley street . . .	25
Columbus avenue, junction Ferdinand street . . .	24
Columbus avenue, junction Pleasant street . . .	30
Commercial street, junction Charter street . . .	24
Commercial street, junction Clinton street . . .	56
Commercial street, junction Fleet street . . .	48
Commercial street, junction North street . . .	48
Commercial street, junction Richmond street . . .	48
Commercial street, junction State street . . .	60
Court street, junction Sudbury street . . .	33
Eliot street, junction Carver street . . .	29
Federal street, near the bridge . . .	12
Federal street, junction East street . . .	35
Federal street, junction Kneeland street . . .	20
Ferdinand street, junction Melrose street . . .	20
Fort Hill square . . .	50
Franklin street, junction Congress street . . .	50
Hanover street, junction Cross street . . .	45
Hanover street, junction Fleet street . . .	49
Harrison avenue, junction Castle street . . .	30
Harrison avenue, junction Dover street . . .	26
Harrison avenue, junction Harvard street . . .	30
Harrison avenue, junction Oak street . . .	30
Haymarket square . . .	45
Kneeland street, junction Lincoln street . . .	40
Leverett street, junction Charles street . . .	29
Leverett street, junction Minot street . . .	40
Merrimae street, junction Chardon street . . .	35
Milk street, junction Oliver street . . .	50
North street, junction Cross street . . .	36
Piedmont street, junction Pleasant street . . .	25
Prince street, junction Salem street . . .	48
Prince street, junction Snowhill street . . .	28
Scollay square . . .	35
Travers street, junction Canal street . . .	32
Tremont street, junction Boylston street . . .	30
Tremont street, junction Castle street . . .	35
Tremont street, junction Eliot street . . .	33
Tremont street, junction Mason street . . .	20
Tremont street, junction Pleasant street . . .	33
Tremont street, junction School street . . .	15
Tremont street, junction Winter street . . .	15
Washington street, junction Bedford street . . .	40
Washington street, junction Boylston street . . .	48
Washington street, junction Castle street . . .	25
Washington street, junction Hanover street . . .	60

Washington street, junction Hollis street . . .	32
Washington street, junction Milk street . . .	55
Washington street, junction State street . . .	60
Washington street, junction Summer street . . .	43
Winthrop square	50

CITY PROPER — RESIDENTIAL SECTION.

Allen street, junction Blossom street	24
Beacon street, junction Arlington street	15
Beacon street, junction Charles street	18
Beacon street, junction Chester park	18
Beacon street, junction Exeter street	14
Beacon street, junction Joy street	15
Berkeley street, junction Chandler street	16
Boylston street, junction Arlington street	15
Boylston street, junction Berkeley street	20
Boylston street, junction Clarendon street	20
Boylston street, junction Exeter street	20
Cambridge street, junction Blossom street	30
Cambridge street, junction Hancock street	27
Charles street, junction Allen street	27
Charles street, junction Cambridge street	17
Charles street, junction Revere street	24
Clarendon street, junction Appleton street	17
Columbus avenue, junction Clarendon street	18
Columbus avenue, junction Dartmouth street	19
Columbus avenue, junction Holyoke street	20
Columbus avenue, junction Rutland square	22
Columbus avenue, junction West Chester park	19
Commonwealth avenue, junction Clarendon street	12
Commonwealth avenue, junction Fairfield street	20
Dalton street, junction Dundee street	17
Dartmouth street, junction Buckingham street	12
Harrison avenue, junction Dedham street	35
Harrison avenue, junction Newton street	30
Harrison avenue, junction Worcester street	24
Huntington avenue, junction Dartmouth street	24
Huntington avenue, junction Gainsborough street	18
Huntington avenue, junction Holyoke street	13
Huntington avenue, junction Newton street	18
Marlborough street, junction Berkeley street	18
Marlborough street, junction Dartmouth street	14
Marlborough street, junction Hereford street	26
Mt. Vernon street, junction Brimmer street	20
Mt. Vernon street, junction Louisburg square	18
Myrtle street, junction Grove street	18

Myrtle street, junction Irving street	15
Shawmut avenue, junction Chester square	20
Shawmut avenue, junction Concord street	18
Shawmut avenue, junction Lenox street	12
Shawmut avenue, junction Newton street	24
Shawmut avenue, junction Union park	21
Somerset street, junction Ashburton place	15
Tremont street, junction Camden street	26
Tremont street, junction Clarendon street	20
Tremont street, junction Dartmouth street	27
Tremont street, junction Pembroke street	25
Tremont street, junction Worcester street	20
Warren avenue, junction Dartmouth street	18
Washington street, junction Dedham street	16
Washington street, junction Newton street	21
Washington street, junction Northampton street	32
Washington street, junction Waltham street	27
West Chester park, junction Belvedere street	20
West Chester park, junction Westland avenue	26

SOUTH BOSTON.

A street, junction Congress street	10
Dorchester avenue, junction Broadway	25
Dorchester avenue, junction Dorchester street	17
Dorchester avenue, junction East First street	16
Dorchester avenue, junction Kemp street	11
Dorchester avenue, junction Middle street	17
Dorchester avenue, junction West Seventh street	18
Dorchester street, junction Broadway	20
Dorchester street, junction Eighth street	20
Dorchester street, junction East Second street	18
Dorchester street, junction Newman street	15
Dorchester street, junction Old Harbor street	16
Dorchester street, junction Woodward street	15
Dorr street, junction Earl street	9
East Broadway junction I street	17
East Broadway, junction M street	12
East Broadway, junction O street	9
East Eighth street, junction G street	12
East Eighth street, junction Mercer street	18
East Fifth street, junction N street	12
East First street, junction I street	16
East First street, junction L street	12
East First street, junction O street	12
East Fourth street, junction L street	14
East Fourth street, junction P street	12

East Ninth street, junction K street	12
East Ninth street, junction Old Harbor street	12
East Second street, junction P street	12
East Seventh street, junction I street	15
East Seventh street, junction N street	12
East Sixth street, junction G street	5
East Sixth street, junction H street	12
East Sixth street, junction L street	14
East Sixth street, junction P street	12
East Third street, junction I street	16
East Third street, junction K street	12
East Third street, junction O street	9
Foundry street, junction West Fourth street	18
Foundry street, junction Ontario street	15
Granite street, junction Mt. Washington avenue	14
Granite street, junction Richards street	20
Newman street, junction Lowland street	6
Old Harbor street, junction Telegraph street	3
Pacific street, junction Thomas park	8
Ward street, junction Preble street	9
West Broadway, junction B street	18
West Broadway, junction F street	17
West Fifth street, junction B street	18
West Fifth street, junction F street	14
West First street, junction B street	14
West First street, junction D street	18
West First street, junction F street	14
West First street, junction Granite street	25
West Fourth street, junction A street	20
West Fourth street, junction D street	22
West Ninth street, junction D street	17
West Ninth street, junction Lark street	15
West Seventh street, junction D street	20
West Seventh street, junction F street	20
West Third street, junction A street	25
West Third street, junction C street	14
West Third street, junction E street	16

EAST BOSTON.

Bennington street, junction Chelsea street	14
Bennington street, junction Marion street	14
Bennington street, junction Putnam street	15
Brooks street, junction Condor street	8
Central square	21
Chelsea street, junction Brooks street	16
Chelsea street, junction Curtis street	4

Chelsea street, junction Decatur street	10
Chelsea street, junction Eagle street	10
Chelsea street, junction Marion street	12
Chelsea street, junction Porter street	10
Condor street, junction Putnam street	12
Eagle street, junction Falcon street	17
Marginal street, junction Cottage street	13
Marginal street, junction Lewis street	14
Marginal street, junction Orleans street	14
Marginal street, junction R. B. & L. R.R.	8
Maverick street, junction Border street	16
Maverick street, junction Cottage street	12
Maverick street, junction Lamson street	8
Maverick street, junction London street	16
Meridian street, junction Condor street	12
Meridian street, junction London street	20
Meridian street, junction Maverick street	16
Meridian street, junction Princeton street	21
Meridian street, junction Trenton street	18
Meridian street, junction White street	17
Moore street, junction Homer street	4
Porter street, junction Havre street	12
Princeton street, junction Brooks street	10
Princeton street, junction Marion street	10
Princeton street, junction Prescott street	12
Princeton street, junction Putnam street	12
Saratoga street, junction Moore street	6
Saratoga street, junction Swift street	8
Sumner street, junction Cottage street	13
Sumner street, junction Jeffries street	8
Sumner street, junction Lamson street	8
Sumner street, junction Lewis street	16
Sumner street, junction Liverpool street	16
Sumner street, junction Orleans street	15
White street, junction Brooks street	12
White street, junction Putnam street	10

CHARLESTOWN.

Alford street, junction Arlington avenue	8
Arlington avenue, junction Dorrance street	6
Austin street, junction Lawrence street	20
Bartlett street, junction Concord street	18
Bartlett street, junction Cross street	18
Bartlett street, junction Salem street	17
Bartlett street, junction Walker street	13
Bunker Hill street, junction Belmont street	10

Bunker Hill street, junction Concord street	18
Bunker Hill street, junction Pearl street	20
Bunker Hill street, junction Quincy street	17
Bunker Hill street, junction Tufts street	18
Cambridge street, junction Parker street	10
Cambridge street, junction Perkins street	17
Chelsea street, junction Henley street	20
Chelsea street, junction Prospect street	16
Chelsea street, junction Vine street	18
Front street, junction Arrow street	20
High street, junction Concord street	18
High street, junction Green street	16
High street, junction Lexington street	18
Main street, junction Auburn street	20
Main street, junction Haverhill street	17
Main street, junction Medford street	23
Main street, junction Mill street	20
Main street, junction Salem street	20
Medford street, junction Baldwin street	19
Medford street, junction Chelsea street	20
Medford street, junction Lexington street	20
Medford street, junction Mead street	16
Medford street, junction Pearl street	10
Perkins street, junction Brighton street	15
Russell street, junction Mead street	12
Rutherford avenue, junction Allen street	12
Rutherford avenue, junction Dunstable street	20
Rutherford avenue, junction Mill street	12
Tremont street, junction Edgeworth street	18
Tremont street, junction Lexington street	20
Union street, junction Main street	20
Union street, junction Washington street	20
Warren street, junction Water street	20
Water street, junction Joiner street	20
Winthrop street, junction Main street	20

ROXBURY.

Alaska street, junction Perrin street	8
Albany street, junction Hunneman street	18
Albany street, junction Mall street	16
Blue Hill avenue, junction Cherry street	10
Blue Hill avenue, junction Edgewood street	8
Blue Hill avenue, junction Moreland street	8
Blue Hill avenue, junction Quincy street	6
Blue Hill avenue, junction Waverley street	8
Brookline avenue, junction Burlington avenue	8

Brookline avenue, junction Francis street	12
Brookline avenue, junction Longwood avenue	13
Brookline avenue, junction Maple avenue	8
Cabot street, junction Windsor street	16
Cedar street, junction Hawthorn street	7
Centre street, junction Cedar street	12
Centre street, junction Heath	14
Centre street, junction Lamartine street	10
Centre street, junction Pynchon street	12
Centre street, junction Sheridan avenue	10
Centre street, junction Walden street	10
Centre street, junction Wyman street	7
Circuit street, junction Regent street	8
Clifton street, junction Langdon street	11
Dale street, junction Mills street	8
Day street, junction Creighton street	12
Dudley street, junction Adams street	15
Dudley street, junction Dearborn street	20
Dudley street, junction Dennis street	15
Dudley street, junction Elmwood street	22
Dudley street, junction Hampden street	22
Dudley street, junction Highland street	10
Elm Hill avenue, junction Cheney street	6
Elm Hill avenue, junction Howland street	10
Eustis street, junction Magazine street	20
Hampden street, junction Norfolk avenue	16
Heath street, junction Bickford street	8
Heath street, junction Day street	10
Highland street, junction Cedar street	8
Highland street, junction Ellis street	12
Highland street, junction Marcella street	8
Highland street, junction Milmont street	10
Humboldt avenue, junction Crawford street	12
Humboldt avenue, junction Munroe street	14
Huntington avenue, junction Longwood avenue	17
Huntington avenue, junction Parker street	13
Lambert avenue, junction Bartlett street	6
Lambert avenue, junction Milmont street	7
Moreland street, junction Fairland street	8
Mt. Pleasant avenue, junction Fairland street	4
Norfolk avenue, junction Gerard street	18
Norfolk avenue, junction Magazine street	18
Palmer street, junction Winslow street	16
Parker street, junction Parker Hill avenue	10
Parker street, junction Prentiss street	16
Pynchon street, junction Cedar street	12
Pynchon street, junction Heath street	12

Regent street, junction Fountain street . . .	7
Roxbury street, junction Linden Park street . . .	6
Ruggles street, junction Duncan street . . .	13
Ruggles street, junction Parker street . . .	12
Ruggles street, junction Warwick street . . .	22
Ruggles street, junction Westminster street . . .	18
Shawmut avenue, junction Hammond street . . .	10
Shawmut avenue, junction Ruggles street . . .	20
Tremont street, junction Bumstead lane . . .	12
Tremont street, junction Heath street . . .	16
Tremont street, junction Francis street . . .	12
Tremont street, junction Parker street . . .	20
Tremont street, junction Prentiss street . . .	16
Tremont street, junction Pyncheon street . . .	26
Tremont street, junction Ruggles street . . .	20
Vernon street, junction Auburn street . . .	10
Vernon street, junction Haskins street . . .	10
Walden street, junction Minden street . . .	8
Walnut avenue, junction Bainbridge street . . .	12
Walnut avenue, junction Circuit street . . .	10
Walnut avenue, junction Dale street . . .	10
Walnut avenue, junction Townsend street . . .	14
Warren street, junction Clifford street . . .	12
Warren street, junction Dunreath street . . .	12
Warren street, junction Munroe street . . .	14
Warren street, junction Regent street . . .	10
Warren street, junction Warren place . . .	14
Warren street, junction Waumbeck street . . .	12
Washington street, junction Atherton street . . .	14
Washington street, junction Bartlett street . . .	8
Washington street, junction Circuit street . . .	10
Washington street, junction Dale street . . .	15
Washington street, junction Dudley street . . .	24
Washington street, junction Nawn street . . .	18
Washington street, junction Ruggles street . . .	24
Washington street, junction Thorndike street . . .	25
Washington street, junction Thornton street . . .	18
Washington street, junction Townsend street . . .	16
Washington street, junction Vernon street . . .	20
Washington street, junction Westminster avenue . . .	11
Westminster street, junction Windsor street . . .	9
Winthrop street, junction Cleveland street . . .	6

DORCHESTER.

Adams street, junction Ashmont street . . .	8
Adams street, junction King street . . .	7

Adams street, junction Minot street	6
Adams street, junction Neponset avenue	9
Adams street, junction Richmond street	5
Allston street, junction Centre street	2
Ashland street, junction Mill street	4
Ashland street, junction Park street	5
Ashmont street, junction Carruth street	3
Ashmont street, junction Train street	2
Bird street, junction Bodwell park	4
Boston street, junction Eastman street	14
Boston street, junction Mt. Vernon street	12
Bowdoin street, junction Adams street	4
Bowdoin street, junction Olney street	4
Bowdoin street, junction Washington street	5
Blue Hill avenue, junction Columbia street	8
Blue Hill avenue, junction Harvard street	5
Blue Hill avenue, junction Norfolk street	4
Blue Hill avenue, junction River street	4
Blue Hill avenue, junction Wales street	6
Carruth street, junction Beale street	2
Columbia street, junction Bird street	4
Columbia street, junction Seaver street	4
Columbia street, junction Quincy street	4
Columbia street, junction Stanwood street	5
Columbia street, junction Washington street	8
Commercial street, junction Greenwich street	11
Commercial street, junction Park street	9
Cottage street, junction Boston street	17
Cottage street, junction Clifton street	8
Cottage street, junction Norfolk avenue	12
Cottage street, junction Pleasant street	9
Crescent avenue, junction Carson street	4
Dorchester avenue, junction Adams street	12
Dorchester avenue, junction Ashmont street	8
Dorchester avenue, junction Beach street	5
Dorchester avenue, junction Codman street	5
Dorchester avenue, junction Commercial street	18
Dorchester avenue, junction Crescent avenue	13
Dorchester avenue, junction King street	7
Dorchester avenue, junction Leeds street	12
Dorchester avenue, junction Mayfield street	14
Dorchester avenue, junction Mt. Vernon street	10
Dorchester avenue, junction Parkman street	8
Dorchester avenue, junction Savin Hill avenue	16
Dorchester avenue, junction Washington street	5
Dudley street, junction Cottage street	18
Dudley street, junction Howard avenue	11

Dudley street, junction Magnolia street	9
Dudley street, junction Monadnock street	12
East Chester park, junction Clapp street	2
Erie avenue, junction Michigan avenue	4
Freeport street, junction Pleasant street	3
Freeport street, junction Preston street	7
Glen street, junction Trull street	3
Hamilton avenue, junction Clark street	4
Hancock street, junction Rill street	4
Hartford street, junction Robinhood street	5
Harvard street, junction Gleason street	5
Harvard street, junction School street	4
Harvard street, junction Wales street	5
Howard avenue, junction Quincy street	5
Howard avenue, junction Sargent street	5
Lauriat avenue, junction Lyons street	2
Magnolia street, junction Howard avenue	5
Magnolia street, junction Robinhood street	4
Milton avenue, junction Evans street	3
Minot street, junction Sheridan street	5
Neponset avenue, junction Commercial street	6
Neponset avenue, junction Minot street	6
Neponset avenue, junction Park street	9
Neponset avenue, junction Pope's Hill street	7
Neponset avenue, junction Taylor street	3
Norfolk avenue, junction Marshfield street	10
Norfolk street, junction Chipman street	3
Norfolk street, junction Fremont street	4
Norfolk street, junction Nelson street	3
Ocean street, junction Welles avenue	3
Pleasant street, junction Mayfield street	10
Richfield street, junction Puritan avenue	4
River street, junction Cedar street	4
River street, junction Temple street	5
Sanford street, junction Cedar street	3
Sanford street, junction Temple street	4
Savin Hill avenue, junction Grampian way	4
Savin Hill avenue, junction Midland street	8
Sawyer avenue, junction Cushing avenue	2
Walnut street, junction Ericsson street	4
Walnut street, junction Franklin street	5
Washington street, junction Ashmont street	4
Washington street, junction Centre street	5
Washington street, junction Fuller street	3
Washington street, junction Wheatland avenue	5
Wheatland avenue, junction Whitfield street	3

WEST ROXBURY.

Alveston street, junction Greenough street	6
Alveston street, junction Revere street	7
Anawan avenue, junction Beech street	3
Anawan avenue, junction Park street	6
Ashland street, junction Florence street	5
Beech street, junction Sycamore street	6
Bellevue street, junction Oriole street	6
Bellevue street, junction Rutledge street	3
Boylston street, junction Burr street	5
Boylston avenue, junction Amory street	6
Brookside avenue, junction Cornwall street	4
Brown avenue, junction Ashland street	4
Brown avenue, junction Poplar street	4
Centre street, junction Boylston street	9
Centre street, junction Burroughs street	18
Centre street, junction Central avenue	4
Centre street, junction Corey street	5
Centre street, junction Eliot street	21
Centre street, junction Green street	18
Centre street, junction La Grange street	3
Centre street, junction May street	6
Centre street, junction Mt. Vernon street	5
Centre street, junction Orchard street	7
Centre street, junction Pond street	9
Centre street, junction Spring Park street	7
Centre street, junction Walter street	3
Chestnut street, junction Fessenden street	5
Corey street, junction Carl street	5
Corey street, junction Weld street	4
Eliot street, junction Brewer street	14
Green street, junction Boylston avenue	5
Green street, junction Chestnut avenue	9
Green street, junction Lamartine street	5
Grove street, junction Washington street	2
Hyde Park avenue, junction Ashland street	4
Hyde Park avenue, junction Neponset avenue	4
Keyes street, junction Starr street	4
Metropolitan avenue, junction Poplar street	4
Pond street, junction Eliot street	11
Pond street, junction May street	8
Pond street, junction Prince street	12
Poplar street, junction Sycamore street	4
Prince street, junction Perkins street	8
Rockview street, junction St. Johns street	7
South street, junction Custer street	11

South street, junction Keyes street	10
Spring Park avenue, junction Rockview street	7
Spring street, junction Baker street	2
Spring street, junction Clarence street	2
Walk Hill street, junction Canterbury street	5
Walk Hill street, junction Hyde Park avenue	6
Washington street, junction Albano street	2
Washington street, junction Ashland street	5
Washington street, junction Beech street	4
Washington street, junction Boylston street	6
Washington street, junction Cornwall street	5
Washington street, junction Metropolitan avenue	3
Washington street, junction School street	10
Weld street, junction Church street	3
Weld street, junction Willow street	4

BRIGHTON.

Allston street, junction Allston square	2
Bennett street, junction Parsons street	5
Brighton avenue, junction Cambridge street	5
Brighton avenue, junction Chester street	6
Brighton avenue, junction Harvard avenue	5
Brooks street, junction Faneuil street	4
Brooks street, junction Newton street	3
Cambridge street, at Charles river	3
Cambridge street, junction Gordon street	10
Cambridge street, junction Harvard avenue	5
Cambridge street, junction North Harvard street	4
Cambridge street, junction Sparhawk street	8
Cambridge street, junction Washington street	10
Chester street, junction Ashford street	5
Chestnut Hill avenue, junction South street	9
Chestnut Hill avenue, junction Union street	10
Englewood avenue, junction Isleworth street	9
Everett street, junction Lincoln street	4
Everett street, junction Western avenue	4
Faneuil street, junction Parsons street	2
Harvard avenue, junction Commonwealth avenue	5
Lake street, junction Kenwick street	6
Market street, junction North Beacon street	4
Market street, junction Sparhawk street	5
Market street, junction Western avenue	4
North Beacon street, at Albany R.R.	3
North Beacon street, junction Dustin street	4
North Harvard street, at Charles river	2
North Harvard street, junction Western avenue	4

Washington street, junction Allston street	4
Washington street, junction Foster street	10
Washington street, junction Lake street	8
Washington street, junction Market street	10
Washington street, near Newton line	2
Washington street, junction Shannon street	8
Washington street, junction Tremont street	5
Washington street, junction Union street	6

IN GENERAL.

A contract was made with Donovan & Brock on August 22 for building the masonry foundations for Engine No. 3 at Chestnut-hill Pumping-station, and the work is nearly completed.

A contract was made with N. F. Palmer, Jr., & Co., of New York, on June 8, for building and erecting Pumping-engine No. 3, in accordance with plans made by Mr. E. D. Leavitt.

The engine will be triple expansion, working three double-acting pumps, with the Riedler patent valve-gear, capable at fifty revolutions of pumping 20,000,000 gallons in twenty-four hours, and maintaining a duty of 140,000,000 ft. lbs. per 100 lbs. of coal.

Plans have also been made by Mr. Leavitt for a 96-inch Belpaire boiler, to supply steam at 185 lbs. pressure for the engine.

The rebuilding of the Brookline-avenue Bridge over Muddy River, required the shutting off of the 40-inch main for several months, and the head throughout the low service was materially reduced. The pipe is relaid in the form of a siphon over the arch of the bridge.

The 30 and 36-inch mains must be relaid over the new bridge on Tremont street at the Brookline line. New 36-inch valves were placed in the 36 and 40 inch mains near the corner of Francis street. Five bents of piles, with 10 × 10 hard-pine caps, were placed under the 40-inch main in Beacon street, near Exeter street, to replace the old trusses which supported the pipe over the former sluices of the Water Power Company.

A plan of a storage reservoir of a capacity of one million gallons, for Long Island, has been made for the Directors of Public Institutions. This reservoir will cause a more constant circulation on the pipe line to the island, and the danger of freezing the pipe will be lessened.

Forty contracts for rock excavation were made during the year. Two hundred and ninety-five petitions for main-pipe

extensions were 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 have been located and plotted on the plans.

Thirty-three profiles of unaccepted streets have been made and grades given for grading the streets and laying pipes where required.

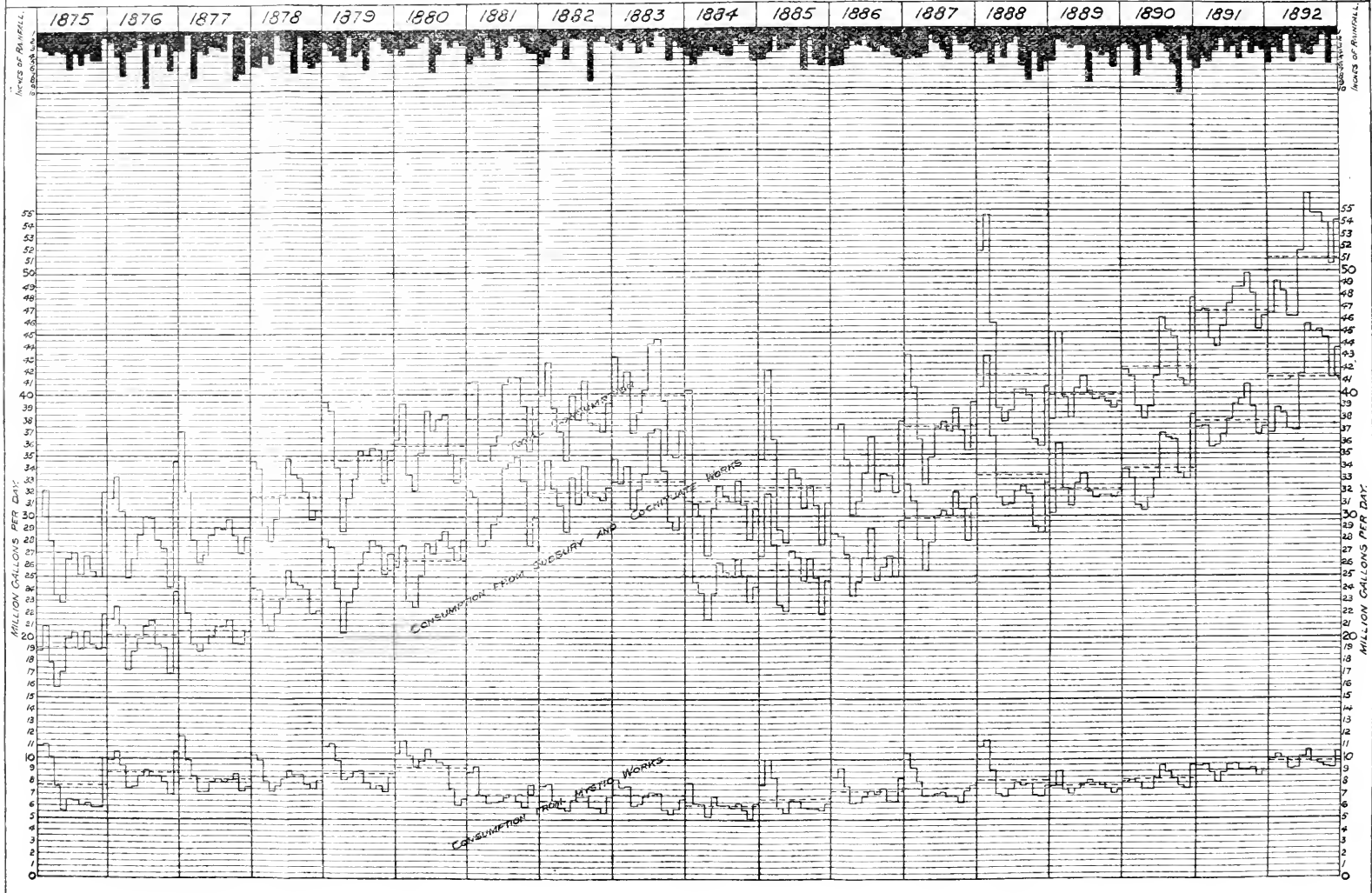
The records from the four pumping-stations, the lakes, reservoirs, the Mystic sewer, and the returns from pipe foundries, etc., have been carefully kept.

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

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.

MONTH.	COCHITUATE WORKS.												MYSTIC WORKS.											
	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1886.	1887.	1888.	1889.	1890.	1891.	1892.										
January	28,561,900	32,687,600	40,485,700	30,172,000	33,680,000	37,230,100	33,736,400	8,510,300	10,488,600	11,107,100	7,769,500	8,187,500	9,389,300	9,878,200										
February	28,291,100	31,224,300	43,103,000	35,865,200	33,030,700	37,280,700	38,881,500	9,275,700	9,346,700	11,020,900	9,073,000	8,299,700	9,466,000	10,352,200										
March	26,886,800	28,124,100	36,463,400	32,180,000	30,844,400	35,533,400	38,305,100	7,780,000	8,175,000	9,242,000	7,597,000	8,055,800	8,811,000	9,970,500										
April	23,470,400	25,591,500	31,473,800	30,814,500	30,446,600	35,751,000	37,171,000	6,633,500	6,633,800	7,276,700	7,185,700	7,481,600	8,045,800	9,145,000										
May	24,630,100	27,025,000	30,802,000	32,719,500	31,281,200	36,580,700	37,655,900	6,444,000	6,916,300	6,682,300	7,663,600	7,488,400	8,811,300	9,204,900										
June	26,574,900	30,069,000	31,026,100	33,377,900	33,022,700	37,801,900	41,564,000	6,941,100	7,159,800	7,615,200	8,017,700	8,206,000	9,478,400	10,146,300										
July	28,987,500	30,469,700	32,014,400	31,870,300	36,701,100	39,062,600	43,738,100	7,437,500	7,250,000	8,267,500	8,315,600	9,463,300	9,581,700	10,702,900										
August	24,476,600	30,053,100	32,432,700	31,403,200	36,316,000	39,460,400	45,031,600	7,166,800	6,871,300	7,859,100	8,113,200	8,622,200	9,122,300	9,751,500										
September	25,835,600	31,046,600	31,836,500	31,722,800	36,165,800	40,677,700	45,261,900	7,585,200	6,868,600	7,266,300	7,006,300	8,436,700	9,128,700	9,549,400										
October	20,713,100	30,562,700	29,110,800	31,702,200	33,420,800	38,845,000	44,026,700	6,562,000	6,436,600	7,096,400	7,627,700	7,781,100	9,259,100	9,340,500										
November	25,036,200	28,062,000	23,539,900	31,562,400	32,955,100	36,940,800	41,947,800	6,546,000	7,391,200	6,960,800	7,316,700	7,691,200	8,583,200	9,250,000										
December	29,706,800	31,511,500	32,686,200	31,829,600	38,334,100	37,542,500	43,766,400	8,043,500	7,855,300	7,918,000	7,473,200	9,448,300	8,660,300	10,473,700										
Yearly average	26,627,900	29,852,100	33,310,700	32,070,600	36,871,700	37,680,900	41,312,400	7,330,800	7,629,000	8,258,400	7,866,500	8,301,400	9,053,200	9,810,800										

Division of Sudbury-river Wafer, 1884-92.

MONTH.	1884.		1885.	1886.	1887.	1888.	1889.		1890.	1891.		1892.	
	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.	To Lake Cochituate.	To Chestnut-hill Res'r.	To Lake Cochituate.	To Chestnut-hill Res'r.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
January	1,094,300,000	697,000,000	473,900,000	592,200,000	692,200,000	895,400,000	484,500,000	484,500,000	518,600,000	715,900,000	630,800,000	630,800,000	630,800,000
February	1,094,300,000	265,400,000	580,400,000	380,800,000	472,000,000	906,700,000	564,600,000	564,600,000	475,000,000	560,800,000	610,400,000	610,400,000	610,400,000
March	1,094,300,000	312,500,000	495,900,000	467,400,000	456,700,000	691,400,000	584,500,000	584,500,000	498,600,000	573,200,000	625,200,000	625,200,000	625,200,000
April	1,094,300,000	228,800,000	350,400,000	307,000,000	385,400,000	468,800,000	490,500,000	490,500,000	417,000,000	641,900,000	682,500,000	682,500,000	682,500,000
May	1,094,300,000	268,400,000	308,500,000	344,700,000	444,200,000	566,300,000	233,400,000	615,700,000	556,300,000	740,300,000	690,400,000	690,400,000	690,400,000
June	1,094,300,000	168,400,000	768,000,000	427,100,000	463,600,000	439,000,000	567,600,000	567,600,000	513,100,000	629,500,000	779,300,000	779,300,000	779,300,000
July	1,094,300,000	152,000,000	434,600,000	534,500,000	387,500,000	528,900,000	534,600,000	534,600,000	664,100,000	755,100,000	948,000,000	948,000,000	948,000,000
August	1,094,300,000	1,600,000	401,100,000	463,100,000	352,800,000	626,600,000	443,700,000	443,700,000	625,500,000	722,300,000	897,700,000	897,700,000	897,700,000
September	1,094,300,000	442,200,000	386,100,000	414,700,000	577,300,000	581,600,000	475,500,000	475,500,000	606,400,000	732,400,000	876,300,000	876,300,000	876,300,000
October	1,094,300,000	432,900,000	388,300,000	474,100,000	672,300,000	435,900,000	414,100,000	414,100,000	539,900,000	715,300,000	908,500,000	908,500,000	908,500,000
November	1,094,300,000	363,900,000	297,600,000	381,800,000	697,100,000	410,900,000	454,600,000	454,600,000	526,000,000	752,200,000	788,000,000	788,000,000	788,000,000
December	1,094,300,000	482,500,000	379,900,000	570,200,000	763,000,000	605,200,000	501,200,000	501,200,000	675,500,000	767,100,000	1,216,100,000	1,216,100,000	1,216,100,000
Totals	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	6,566,000,000	8,306,600,000	9,633,200,000	9,633,200,000	9,633,200,000
Total diversion from Sudbury River }	6,110,600,000		5,224,700,000	5,267,600,000	6,124,100,000	7,224,700,000	6,363,400,000		6,566,000,000	8,306,600,000	10,535,500,000	10,535,500,000	10,535,500,000
Average daily diversion for whole year }	16,695,000		14,314,200	14,431,800	16,478,400	19,739,600	17,435,300		18,071,200	22,751,800	28,800,000	28,800,000	28,800,000

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 1892.

(Water-shed from 1875 to 1878, inclusive, = 77,764 sq. miles; in 1879 and 1880 = 78,238 sq. miles; and from 1881 to 1892, inclusive, = 75.2 sq. miles.)

YEAR.	Amount of Water diverted to Lake Cochituate and Chestnut-hill Reservoir.	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	65,300,000	. . . . .	27,593,700,000	75,593,200	45.490	20.418	44.88
1876	2,528,300,000	. . . . .	26,942,300,000	. . . . .	160,700,000	32,309,000,000	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	94,399,200	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	. . . . .	29,817,500,000	992,200,000	. . . . .	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	8,845,200,000	. . . . .	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	23,656,600,000	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	. . . . .	23,228,600,000	1,744,000,000	. . . . .	31,084,100,000	84,923,200	47.135	23.784	50.46
1885	5,224,700,000	. . . . .	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	. . . . .	23,022,000,000	1,464,500,000	. . . . .	29,831,700,000	81,730,700	46.065	22.825	49.55
1887	6,124,100,000	. . . . .	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	. . . . .	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	. . . . .	31,550,400,000	. . . . .	2,800,000	37,371,000,000	104,030,100	49.95	29.056	58.17
1890	6,596,000,000	. . . . .	28,667,100,000	. . . . .	57,400,000	35,290,200,000	96,655,100	53.00	26.998	50.94
1891	8,206,600,000	. . . . .	28,799,600,000	. . . . .	1,100,800,000	36,085,000,000	98,865,500	49.52	27.612	55.76
1892	10,355,500,000	. . . . .	11,143,000,000	. . . . .	257,700,000	21,503,600,000	58,753,000	41.83	16.456	39.34
Averages	5,953,841,700	. . . . .	23,780,700,000	. . . . .	. . . . .	29,869,263,900	81,605,400	45.786	22.596	48.56

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 1892; 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 Rain-fall 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	48.
1853	3,117,939,500	3,166,417,500		239,580,000		6,923,937,000	17,873,800	55.73	19.51	35.
1854	3,014,290,000	4,187,733,900			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	10,925,900,000		32,670,000		15,363,560,000	41,927,600	63.10	46.69	74.
1858	4,689,155,000	1,934,560,000			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	6,689,095,900	3,377,559,000		1,306,800,000	1,459,260,000	8,557,394,900	23,444,900	45.44	25.45	56.
1862	6,059,000,000	33,200,000				7,399,000,000	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	1,988,120,700		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	20.
1867	4,951,225,000	2,482,041,000			698,811,000	6,734,455,000	18,450,600	56.25	21.80	38.
1868	5,405,515,000	2,567,684,000		346,371,000		8,259,570,000	22,567,200	40.71	24.98	50.
1869	5,503,751,000	1,635,570,000		480,882,000		7,620,203,000	20,877,300	64.34	21.09	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.

ENGINEERING DEPARTMENT.

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1871	5,223,500,000	None.	250,333,000	4,972,507,000	13,623,500	45.39	15.16	33.
1872	5,775,151,200	None.	1,543,995,500	5,642,480,300	15,416,000	48.47	17.22	35.
1873	6,511,836,900	2,917,977,000	.....	.....	.....	515,133,000	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.	.....	1,222,885,000	.....	.....	5,760,040,500	15,780,500	45.49	17.57	39.
1876	7,277,175,200	1,619,243,800	.....	43,438,000	.....	.....	6,411,557,000	17,517,900	48.49	19.54	40.
1877	7,626,889,200	1,484,978,600	.....	378,727,000	.....	.....	7,596,244,800	20,811,600	43.80	23.17	63.
1878	7,743,904,700	3,341,875,000	.....	2,668,300,000	.....	.....	8,637,268,700	23,663,700	53.58	26.34	49.
1879	6,051,838,900	1,523,261,400	.....	411,390,000	.....	1,322,697,300	5,841,263,600	16,003,300	38.61	17.81	47.
1880	4,284,147,100	65,577,700	.....	826,700,000	.....	146,265,000	3,376,756,800	9,226,100	35.83	10.30	29.
1881	2,846,439,700	2,231,016,700	.....	187,600,000	.....	468,089,400	5,367,965,800	14,679,400	41.09	16.34	40.
1882	3,965,490,600	1,358,543,700	.....	.....	.....	357,334,700	4,935,699,600	13,525,200	40.29	15.05	37.
1883	4,731,227,700	162,361,800	.....	1,245,100,000	.....	334,403,000	3,314,089,500	9,079,700	31.20	10.11	32.
1884	4,533,156,450	1,842,837,100	.....	1,416,390,000	.....	.....	6,300,130,250	17,213,450	45.57	19.21	42.
1885	4,091,674,900	1,006,622,800	.....	.....	.....	8,594,800	5,106,882,500	13,991,500	43.66	15.57	36.
1886	4,482,536,100	3,116,283,200	.....	.....	.....	360,662,000	7,188,157,300	19,693,600	46.97	21.92	47.
1887	4,802,120,700	3,658,692,900	.....	.....	.....	763,205,000	7,467,568,600	21,089,200	41.58	23.47	56.
1888	4,968,565,100	4,229,290,900	.....	.....	.....	959,509,000	10,157,912,100	27,751,400	56.93	30.97	54.
1889	5,570,323,600	3,373,929,000	.....	2,340,000,000	.....	.....	9,165,719,400	25,111,600	50.33	27.95	56.
1890	5,723,170,800	2,380,441,200	.....	.....	.....	64,166,300	8,038,445,700	22,023,100	51.23	24.51	48.
1891	5,508,178,900	6,064,000,000	.....	.....	.....	1,953,667,800	10,516,121,100	28,811,300	46.42	32.07	69.
1892	5,464,791,300	281,000,000	.....	902,300,000	.....	.....	5,063,775,600	13,753,500	39.04	15.35	39.
Averages	5,227,234,000	2,394,499,000	.....	.....	.....	.....	7,231,039,700	19,798,800	47.77	21.99	45.5

1 Observations of rainfall at Lake Cochinuate commenced 1832, and these observations are assumed as correct for the whole district.
 2 Lake raised two feet.

Statement showing Amount of Water drawn from Mystic Lake; Amount wasted; Amount of Rainfall collected in Lake; Percentage of Rainfall collected, etc., 1876 to 1892; 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.
	Gallons.	Gallons.	Gain.	Loss.						Gallons.	Inches.	Inches.	Per cent.
1876.	3,230,101,300	6,369,774,700	.....	32,583,000	9,567,293,000	25,140,100	47.00	20.49	43.6
1877.	3,068,564,800	7,250,223,500	.....	16,291,400	10,303,486,900	28,228,700	43.095	22.06	51.2
1878.	3,367,490,400	8,718,547,600	.....	26,000,000	12,060,083,000	33,041,200	54.065	25.82	47.8
1879.	3,490,848,200	4,625,691,800	.....	203,000,000	7,013,540,000	21,680,900	35.30	16.94	48.0
1880.	3,692,195,700	2,188,761,200	.....	113,500,000	5,763,756,900	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.	2,576,896,700	4,444,668,000	15,000,000	.....	7,030,564,700	19,261,800	39.165	15.05	38.4
1883.	2,664,514,200	2,634,702,600	.....	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	25,749,000	44.39	20.18	45.46
1885.	2,639,278,800	5,558,860,500	.....	33,200,000	8,194,939,300	22,451,900	44.50	17.55	39.43
1886.	2,892,947,500	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	12,165,012,400	33,323,300	49.37	26.04	52.75
1891.	3,500,817,500	10,027,714,400	.....	171,000,000	13,357,531,900	36,600,000	47.40	28.60	60.34
1892.	3,811,766,200	3,474,213,200	177,000,000	.....	7,462,979,400	20,390,700	39.115	15.98	40.85
Average	3,092,056,200	6,536,884,600	.....	.....	9,024,855,500	26,348,900	44.122	20.61	45.91

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.	Reservoir No. 2.	Reservoir No. 3.	Reservoir No. 4.	Farm Pond.	Lake Cochituate.	Chestnut-Hill Reservoir.	Brookline Reservoir.	Packer-Hill Reservoir.	Mystic Lake.	Mystic Reservoir.	Fisher-Hill Reservoir.												
	Flash boards. 159.29, 157.12.	Flash boards. 157.12.	Stone cist. 175.24.	Flash boards. 215.21.	High water. 148.25.	High water. 134.36.	High water. 124.00.	High water. 124.00.	High water. 219.00.	High water. 7.00.	High water. 147.00.	High water. 241.00.												
	1891.	1891.	1891.	1891.	1892.	1891.	1891.	1891.	1891.	1891.	1892.	1891.	1892.											
January	158.23	157.01	166.20	166.02	175.32	174.17	213.85	211.91	149.48	148.49	132.65	129.03	123.48	123.49	123.25	123.26	218.78	218.94	4.75	5.26	149.66	146.95	240.12	240.57
February	158.33	157.54	166.06	166.02	174.41	175.31	210.44	214.44	149.53	148.60	132.73	130.04	123.43	123.41	123.20	122.38	218.77	218.85	4.56	5.17	146.87	146.98	240.22	240.87
March	158.45	158.07	165.57	166.06	172.75	174.89	210.35	214.58	149.56	148.94	133.13	131.31	123.27	123.25	123.00	123.11	218.75	218.98	4.79	5.08	146.85	146.94	240.34	240.87
April	158.15	157.35	166.12	166.26	175.39	175.50	214.25	214.48	149.33	149.00	134.23	132.39	123.52	123.47	123.32	123.35	218.76	218.95	5.81	6.41	146.63	146.72	240.17	240.77
May	158.64	158.75	166.59	167.56	175.36	175.42	214.56	214.94	149.32	149.19	133.56	134.27	123.47	123.83	123.02	123.73	218.71	218.95	6.71	6.69	146.52	146.52	240.00	240.69
June	159.26	158.18	165.30	167.58	175.57	175.58	214.84	215.22	149.17	149.26	132.68	134.15	123.70	123.86	123.47	123.73	218.71	218.56	6.58	6.71	146.57	146.57	240.10	240.81
July	157.57	156.90	162.79	165.74	175.30	175.61	214.07	215.12	148.96	149.27	131.44	133.05	123.76	123.81	123.50	123.66	218.83	218.45	5.62	6.22	146.90	146.67	240.60	241.09
August	157.77	156.48	158.86	162.20	175.00	176.41	208.92	213.24	148.83	148.95	130.04	131.45	123.86	123.83	123.58	123.30	218.90	218.07	3.67	3.78	146.93	146.85	240.46	240.89
September	157.36	156.57	160.47	164.97	173.17	169.74	204.72	209.14	148.94	149.04	129.62	130.17	123.69	123.76	123.43	123.44	218.67	218.39	2.29	2.77	146.84	146.85	240.35	240.84
October	157.44	156.60	158.51	163.74	169.84	170.05	203.35	193.34	148.81	148.73	127.67	128.79	123.60	123.88	123.43	123.62	218.69	218.69	0.20	1.47	146.56	146.86	240.61	241.09
November	156.97	156.46	158.61	162.90	164.60	171.18	204.41	187.70	148.75	148.72	126.71	127.81	123.82	123.81	123.31	123.32	218.60	218.75	0.30	2.15	146.90	146.98	240.73	241.19
December	157.00	157.55	162.15	165.14	161.03	173.82	206.51	192.61	148.84	148.71	126.72	127.93	123.73	123.52	123.31	123.19	218.91	217.88	0.68	5.52	146.84	146.93	240.62	240.99
Yearly averages	157.48	157.39	163.11	165.35	172.34	173.23	206.96	207.83	149.12	148.92	130.91	130.95	123.62	123.63	123.34	123.41	218.76	218.64	3.78	4.77	146.78	146.87	240.36	240.89

Statement of Operations at the Chestnut-hill Pumping-station for 1892.

1892.	ENGINE No. 1.		ENGINE No. 2.		Daily amount pumped.	Total amount of coal consumed.	Daily average amount of coal consumed.	Total ashes and Per cent. ashes	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 pump-ing time.	Amount pumped.	Total pump-ing time.	Amount pumped.								Without correction for heating and lighting	Corrected for heating buildings.	Corrected for heating and lighting.		Actual.
Month.	Mins.	Gallons.	Mins.	Gallons.	Gallons.	Pounds.	Lbs.	Lbs.	Per cent.	Gallons.	Feet.	Ft.-Lbs.	Ft.-Lbs.	Lbs.	Lbs.	
Jan.	624 00	243,190,625	. . . . .	243,190,625	7,844,900	280,944	9,353	25,763	8.9	838.10	125.69	87,922,400	92,142,700	100,159,100	10.12	11.95
Feb. . . . .	. . . . .	. . . . .	577 45	222,519,975	7,673,100	276,695	9,541	23,293	8.4	804.2	129.50	84,844,600	90,614,060	97,228,900	10.08	11.90
March	612 10	239,989,875	. . . . .	239,989,875	7,741,600	290,103	9,358	26,058	9.0	827.3	126.48	87,262,700	92,226,700	98,139,800	10.05	11.88
April . . . . .	. . . . .	. . . . .	615 25	237,857,025	7,928,600	285,308	9,510	25,297	8.9	833.7	126.44	87,912,900	89,583,200	96,122,800	10.26	12.09
May	628 15	245,655,350	. . . . .	245,655,350	7,924,400	276,009	8,904	23,783	8.6	860.0	125.87	93,431,100	94,365,400	101,348,500	10.45	12.22
June	23 30	9,916,425	621 46	245,150,605	8,502,200	283,760	9,459	23,455	8.3	898.9	126.07	94,510,700	. . . . .	99,141,700	10.26	11.81
July	698 40	282,466,925	. . . . .	282,466,925	9,111,800	304,265	9,815	26,749	8.8	928.4	126.46	97,911,800	. . . . .	102,513,700	10.33	11.92
August . . . .	. . . . .	. . . . .	691 10	264,497,000	8,532,200	286,731	9,475	25,488	8.7	900.5	126.17	94,753,000	. . . . .	99,774,900	10.28	11.86
Sept.	654 45	265,588,500	. . . . .	265,588,500	8,853,000	293,226	9,774	24,274	8.3	905.7	126.29	95,388,900	. . . . .	101,313,200	10.31	11.94
Oct.	148 05	58,199,370	518 45	206,589,975	8,541,600	309,913	9,997	25,687	8.5	854.4	126.38	90,054,500	92,035,700	98,478,200	10.44	12.18
Nov.	587 25	224,856,375	63 45	24,175,250	8,301,100	298,605	9,954	24,740	8.3	834.0	126.07	87,687,000	91,194,500	98,763,600	10.31	12.12
Dec. . . . .	. . . . .	. . . . .	700 15	279,365,000	9,011,800	346,546	11,179	27,886	8.0	866.1	126.88	85,304,200	89,740,000	97,457,700	10.30	12.20
Totals and averages,	3976 50	1,568,869,445	3758 45	1,480,154,820	3,059,018,275	8,353,409	9,694	302,323	8.5	859.6	126.27	90,525,800	92,879,500	99,195,300	10.26	12.01

Statement of Operations at the Mystic Pumping-station for 1892.

Month.	ENGINE NO. 1.			ENGINE NO. 2.			ENGINE NO. 3.			Total pumped. Gallons.	Daily average amount pumped. Gallons.	Daily average amount of coal consumed. Lbs.	Daily average amount of ash and cinders. Lbs.	Per cent. ash and cinders.	Quantity pumped per pound of coal.	Average lift in feet.	Duty in foot-pounds per 100 foot-coal.
	Total pumping time.		Amount pumped.	Total pumping time.		Amount pumped.	Total pumping time.		Amount pumped.								
	Hrs.	Min.	Gallons.	Hrs.	Min.	Gallons.	Hrs.	Min.	Gallons.								
January	29	00	5,828,600	295	45	69,445,200	713	45	240,384,000	306,657,900	9,892,200	2,264	10.2	445.1	147.92	54,907,000	
February				329	15	63,314,200	686	00	236,262,400	293,577,700	10,230,200	2,406	10.8	464.5	147.83	57,263,400	
March				309	30	62,468,700	726	45	246,832,200	309,392,900	9,977,500	2,204	10.0	454.2	147.66	51,845,100	
April	367	30	70,064,200	444	30	91,506,400	342	30	111,948,800	273,609,400	9,120,300	2,101	9.7	421.9	147.34	55,692,900	
May				228	00	44,545,000	717	15	232,908,800	277,453,800	8,920,100	1,845	9.5	461.7	149.45	57,541,100	
June	62	45	12,563,900	386	00	84,137,200	696	15	234,368,000	331,638,200	11,634,600	2,367	2,315	9.5	452.9	151.29	57,139,600
July	154	45	31,000,300	545	00	115,515,000	576	15	185,216,000	331,751,300	10,701,000	2,384	2,384	10.0	447.7	148.63	55,493,300
August				295	45	58,346,400	730	15	242,861,200	302,257,600	9,749,600	2,184	2,184	10.4	463.6	149.65	57,855,400
September				258	00	50,887,000	711	45	237,494,400	286,381,400	9,546,000	2,280	2,280	11.2	469.1	149.50	58,487,300
October	55	15	11,566,600	258	45	51,022,900	686	15	226,665,200	289,581,700	9,341,400	2,130	2,130	10.5	460.8	149.46	57,463,000
November				202	45	44,273,200	763	30	232,324,800	276,798,000	9,226,000	2,037	2,037	10.6	478.1	149.06	59,414,900
December				344	30	72,076,200	739	45	239,667,200	312,343,500	10,075,600	2,190	2,190	10.4	468.5	148.40	58,000,600
Totals and averages {	689	15	131,622,700	3,897	45	739,198,200	8,642	15	2,666,465,300	3,566,716,400	9,827,100	2,198	2,198	10.2	456.8	148.84	56,709,000

Rainfall in Inches and Hundredths on the Sudbury-river Water-shed for the Year 1892.

1892.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1					0.065		0.175					0.025
2	1.895		1.100					0.260			0.615	
3		0.880			0.770	0.175	0.795					0.010
4				0.070				0.050		0.125	0.070	
5										0.590	0.070	
6	0.620								0.055			0.100
7											0.065	
8		0.290	0.690	0.025								0.615
9	0.045	0.030				0.290	0.220			0.060		
10			0.330								2.275	
11	0.015	1.645			0.480			0.980				
12					0.100			0.140				
13	1.520						0.175					
14		0.160				0.225	0.605		2.440			0.280
15	0.600				0.900							
16							0.335				1.655	
17						1.110				0.285		
18	0.800		1.215								0.320	
19	0.320								0.045			
20		0.080										0.095
21				0.490	2.120							
22				0.125								
23			0.725		0.790	0.125						
24		0.030							0.150			
25		0.025				0.420		1.110				
26					0.235				0.150			
27					0.125	0.395		1.770				
28							0.275				0.140	
29				0.120			0.305			0.110		
30	0.035					0.020					0.590	
31							1.345	0.130				
Totals .	5.850	3.140	4.060	0.830	5.585	2.760	4.230	4.440	2.840	1.170	5.800	1.125

Total rainfall during the year, 41,830 inches, being an average of two gauges, located at Framingham and Ashland.

Rainfall in Inches and Hundredths at Lake Cochituate for the Year 1892.

1892.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1					0.07		0.13					0.05
2	1.21		1.54			0.02		0.29			0.60	
3		0.96			0.71	0.16	0.72					
4										0.86		
5								0.02			0.17	
6	0.54				0.01				0.04			0.11
7											0.06	
8		0.31	0.60	0.07								0.64
9	0.04					0.45	0.12			0.05		
10			0.28								2.17	
11		1.32						1.04				
12					0.55			0.08				
13	1.39											
14		0.17				0.38	0.46		2.57			0.27
15	0.56				0.97							
16							0.17				1.43	
17						1.10				0.28		
18			1.08								0.42	
19	1.03								0.01			
20												0.09
21		0.02		0.49	2.85							
22				0.12								
23			0.62			0.09						
24									0.02			
25		0.02				0.54	0.37					0.02
26					0.21			2.22	0.23	0.01		
27					0.09	0.48						
28				0.10			0.07					
29							0.36			0.22	0.29	
30	0.01					0.01						
31							1.07	0.14				
Totals	4.78	2.80	4.12	0.78	5.46	3.23	3.47	3.79	2.87	1.42	5.14	1.18

Total rainfall during the year, 39.04 inches.

Rainfall in Inches and Hundredths on the Mystic Water-shed for the Year 1892.

1892.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1					0.090		0.165	0.070			0.180	0.020
2	1.070		1.130									
3		1.010			0.695	0.205	0.770	0.525		0.030	0.405	
4				0.025		0.005		0.015		0.060		0.005
5								0.400	0.030	1.035	0.085	
6	0.580								0.035			0.110
7											0.030	
8		0.295	0.660	0.015								0.710
9	0.040					0.405	0.220	0.015		0.055		
10			0.380					0.010			1.870	0.020
11		1.535			0.560							
12					0.035			1.050				
13	1.425							0.150				
14		0.140				0.330	0.170		1.615			0.250
15	0.345		0.005		0.950							
16							0.160			0.410	1.295	
17						1.095						
18	0.875		1.125								0.260	
19	0.145								0.015			
20												0.035
21		0.005		0.515	2.255							
22				0.125								
23			0.705		0.630	0.070						
24	0.005											
25		0.030				1.025						
26					0.215			2.225	0.310	0.105		
27					0.120	1.010		0.090				
28				0.025			0.015				0.145	
29				0.110	0.005		0.175			0.140		
30	0.030					0.005					9.375	
31							0.900	0.270				
Totals	4.515	3.015	4.005	0.815	5.585	4.150	2.575	4.820	2.005	1.835	4.645	1.150

Total rainfall during the year, 39.115 inches, being an average of two gauges, located at Mystic Lake and Winchester.

Monthly Rainfall in Inches, during 1892, at Various Places in Eastern Massachusetts.

PLACE.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Framingham	6.00	3.20	4.01	0.85	5.57	2.75	4.22	4.48	2.59	1.28	5.81	1.14	41.90
Dam 4, Ashland	5.70	3.08	4.11	0.81	5.60	2.77	4.24	4.40	3.09	1.06	5.79	1.11	41.70
Lake Cochituate	4.78	2.80	4.12	0.78	5.46	3.23	3.47	3.79	2.87	1.42	5.14	1.18	39.04
Chestnut Hill	4.45	2.78	3.95	0.75	6.08	3.89	3.35	5.92	2.16	2.39	5.26	1.29	42.27
Mystic Lake	4.54	3.00	4.25	0.89	5.85	4.10	2.54	5.05	2.13	2.11	5.16	1.21	40.83
Mystic Station, Winchester	4.49	3.63	3.76	0.74	5.32	4.20	2.61	4.59	1.88	1.56	4.13	1.69	37.40
Mystic Pumping-station	4.50	2.60	4.06	0.92	5.64	3.87	2.53	4.88	1.88	1.94	4.82	1.26	38.90
Boston Pipe-yard	4.58	2.49	3.73	0.65	4.63	2.98	2.33	4.60	1.81	2.33	4.12	1.29	35.45
Cambridge Observatory	4.30	1.70	2.90	0.80	5.35	3.72	1.24	6.65	2.18	1.76	4.68	1.23	36.51
Waltham, Boston Manufacturing Co.	5.12	2.71	3.59	0.88	5.81	3.98	2.69	4.12	2.82	1.58	5.94	0.93	39.07
Lowell, Locks and Canals Co.	5.38	2.74	3.25	0.63	5.86	4.44	2.32	4.31	1.97	1.38	3.83	1.11	39.22
Lowell, Merrimack Manufacturing Co.													
Average of twelve places	4.894	2.739	3.794	0.791	5.561	3.630	2.867	4.799	2.262	1.710	5.153	1.159	39.359

Rainfall Received and Collected, 1892.

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 . .	5.850	3.335	57.01	4.78	3.18	66.55	4.515	2.49	55.04
February . .	3.140	1.574	50.13	2.80	1.64	58.50	3.015	1.76	58.46
March . . .	4.060	3.488	85.90	4.12	3.12	75.67	4.005	3.03	75.72
April . . .	0.830	1.504	181.15	0.78	0.90	115.52	0.815	1.33	163.57
May	5.585	2.245	40.20	5.46	2.03	37.13	5.585	2.10	37.54
June	2.760	0.739	26.76	3.23	0.49	15.26	4.150	1.17	28.30
July	4.230	0.382	9.03	3.47	0.33	9.52	2.575	0.66	25.70
August . . .	4.440	0.500	11.26	3.79	0.56	14.68	4.820	0.49	10.19
September .	2.840	0.396	13.94	2.87	0.60	21.19	2.005	0.56	27.71
October . . .	1.170	0.224	19.18	1.42	0.57	40.16	1.835	0.45	24.29
November . .	5.800	1.204	20.75	5.14	1.09	21.22	4.645	1.07	23.09
December . .	1.125	0.865	76.89	1.18	0.84	71.09	1.150	0.87	75.23
Totals and } averages, }	41.830	16.456	39.34	39.04	15.35	39.32	39.115	15.98	40.85

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

1892.	TEMPERATURE OF AIR.						TEMPERATURE OF WATER.	
	Chestnut-Hill Reservoir.			Framingham.			Brookline Reservoir.	Mystic Engine-House
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Mean.	Mean.
January	62.0	1.0	28.0	62.0	-3.0	25.7	36.5	36.3
February	44.5	3.5	27.6	49.0	-1.0	27.6	36.8	35.9
March	56.5	12.5	32.3	58.0	8.0	31.3	36.7	35.0
April	77.0	25.5	48.3	76.0	21.0	46.3	45.0	45.2
May	83.0	31.0	55.8	88.0	27.0	54.7	55.7	55.8
June	94.5	43.0	69.8	96.0	38.0	69.5	69.3	70.8
July	94.0	48.0	72.0	96.0	45.0	70.9	74.3	74.5
August	95.0	53.0	70.1	94.0	48.0	65.5	74.7	75.8
September	80.5	40.5	62.3	80.0	34.0	60.3	67.6	66.5
October	75.0	30.0	50.8	77.0	23.0	49.6	56.4	56.9
November	66.5	19.0	40.1	65.0	16.0	38.7	45.5	47.2
December	45.5	0.0	27.3	45.0	-2.0	26.6	36.6	36.8

C.

IMPROVED SEWERAGE.

The construction of the extension of the Improved Sewerage System has been continued the past year, the amount expended being \$161,959.90.

The condition of the appropriation on Feb. 1, 1893, was as follows :

Net appropriations	\$6,072,240 93
Total expenditures	6,027,206 31
	<hr/>
Unexpended balance Feb. 1, 1893	\$45,034 62

OUTFALL SEWER.

Section 3 Outfall, which has been under construction for the past two years, was completed by the contractor, H. P. Nawn, in August last, at a cost of \$86,480.

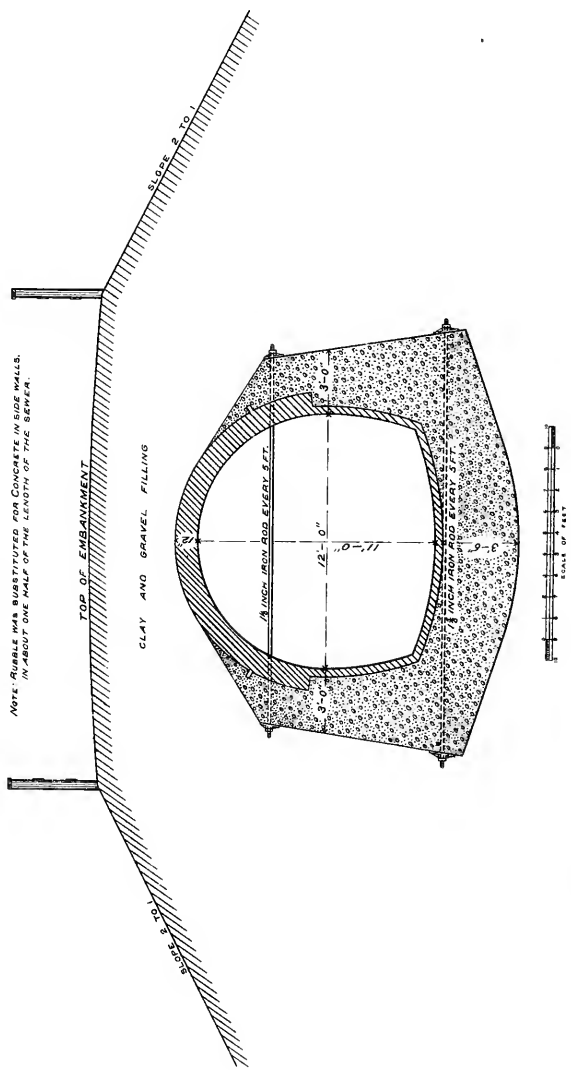
In March, 1892, the contract for building Section 3 C Outfall Sewer was awarded to Messrs. Perkins & White, the lowest bidders, for \$71,904. This section extends in the embankment between Squantum and Moon Islands, a distance of 1,865 feet. The sewer is of brick, horseshoe shaped, 12 feet wide and 11 feet high, with a heavy concrete foundation, and with side-walls and spandrels of concrete; iron rods are built into the foundation and through the arch, to guard against injury to the structure in the event of a slight settlement of the embankment.

The methods of construction pursued by the contractors presented some features of interest: the trench was excavated wide enough to make bracing unnecessary, by a powerful steam "digger," the material being thrown out on each side of the embankment; the back-filling was made by the same machine. All transportation was effected by water, and no horses were employed on the work.

During the working season 37,000 cubic yards of earth were excavated, and 20,000 cubic yards back-filled; 7,492 cubic yards of concrete and 1,806 cubic yards of brick masonry were laid.

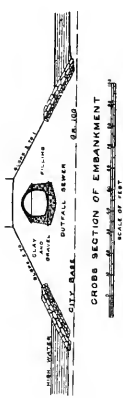
In the latter part of November the masonry conduit was completed by the contractors, and preparations were at once made to build the 55 linear feet of sewer required to connect

NOTE: RUBBLE WAS SUBSTITUTED FOR CONCRETE IN SIDE WALLS.
IN ABOUT ONE HALF OF THE LENGTH OF THE SEWER.



IMPROVED SEWERAGE
CROSS SECTION OF OUTFALL SEWER
IN EMBANKMENT BETWEEN
SQUANTUM HEAD AND MOON ISLAND
1892

William S. ...
City Engineer



the ends of Section 3 and Section 3 C with the old sewer in the embankment: the east "connection" was built by Messrs. Perkins & White, while the force of men belonging to the department, under the superintendence of H. J. White, were transferred from Section 6, Dorchester, to make the west "connection." On the evening of Friday, November 25, work was begun on each end and carried on without interruption, with all possible speed, until 3 A.M. on the following Sunday morning, when the "connections" were completed; pumping at the Calf Pasture Pumping-station, which had been suspended for the time being, was then resumed, and the sewage has since continued to flow through the new conduit. The completion of the outfall sewer was of great moment, as the wooden flume which it replaced has for several years past been in a dangerous condition, and has limited in a serious manner the capacity of the Improved Sewerage Works.

The contract for removing the wooden flume between Squantum and Moon Island was awarded, in December last, to Hugh Farrel, the lowest bidder, for the sum of \$1,527, he agreeing to pay \$127 for the old materials contained in the structure.

The contractor is now engaged on this work.

A contract has been made with Messrs. Perkins & White to build an embankment from the Squantum shore to the east shaft of the tunnel under Dorchester Bay, with the necessary ballast and rip-rap. The prices to be paid are as follows:

Filling (measured in place)	. . .	\$0.25 per cubic yard.
Ballast and rip-rap . . . . .	. . . . .	1.43 " " "

The contractors prosecuted this work until forced to suspend operations in January on account of the cold weather, the surface of Dorchester Bay being completely frozen over.

DORCHESTER INTERCEPTING SEWER.

The construction of this sewer has been carried on entirely by day labor. At the beginning of the year Section 8, Dorchester Intercepting Sewer, was being built in a hill near Granite avenue; the depth of the trench varied from 25 to 39 feet, while the material was exceedingly hard, making the progress, of necessity, slow. This piece of heavy work was completed in June, and the force was moved to Section 6, Dorchester Intercepting Sewer, where work is now in progress.

Section 6, Dorchester Intercepting Sewer, extends from the end of Section 5 (completed in the autumn of 1890) at Freeport street, through private land, Bertram street, Coffee street, Freeport-street extension (as proposed by the Board of Survey), and private land, to Chickatawbut street, Narragansett street, a distance of 2,455 feet.

Bids for furnishing the bricks, cement, screened gravel, and drain-pipe required in construction were called for, and contracts awarded, in each case, to the lowest bidder, as follows :

- F. A. Merriam & Co., 450 M brick, \$9.90 per M.
- Waldo Bros., 1,500 bbls. Am. cement, \$1.13 per bbl.
- Waldo Bros., 275 bbls. Portland cement, \$2.40 per bbl.
- P. J. Lyons, 800 cu. yds. gravel, 87 cents per cubic yd.
- F. A. Merriam & Co., 2,500 lin. ft. drain pipe, 68 per cent. off list price.

The sewer is of brick, circular in shape and 4 feet 6 inches in diameter, laid on a grade of 1 in 2,500; the neat work of the invert is laid in Portland cement. When the material at the bottom of the trench is suitable it is excavated to the exact shape required, and the sewer constructed of two rings of brick-work; under less favorable conditions a foundation of concrete is built with concrete side-walls, the whole resting upon a wooden platform where the bottom is wet and sandy. On this section, for a considerable distance, beds of mud were encountered, and it has been necessary to support the sewer upon piles varying in length from 10 to 30 feet. An embankment has been built over the sewer in the low marsh-land to protect the brick-work; 1,975 linear feet of sewer were built in Dorchester during the year.

To complete the Dorchester Intercepting Sewer to Central avenue, as originally designed, it will be necessary to build 9,100 linear feet of sewer at a cost of \$140,000. It is very desirable, and easily possible, to complete this work during the next year, and afford an outlet for the sewage from the thickly settled district in the neighborhood of Milton Lower Mills and Central avenue.

STONY-BROOK IMPROVEMENT.

A survey has been made and plans and estimates prepared for improving the channel of Stony Brook, by straightening, widening, and deepening, from the Hyde Park line to a point 1,500 feet below Mt. Hope street. The proposed improvement would lower the water level in times of ordinary flow,



CITY OF BOSTON
ENGINEERING DEPARTMENT
PLAN SHOWING
BOSTON IMPROVED SEWERAGE SYSTEM,
THE SOUTH METROPOLITAN
AND A PORTION OF THE
NORTH METROPOLITAN SEWERAGE SYSTEMS

1893.

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WESTINGHOUSE

and permit the drainage of the low land in the neighborhood ; it would have, however, no appreciable effect on the water level in case of floods.

EAST SHAFT.

The following is a copy of the official permission from the United States authorities for filling outside of the established lines :

Whereas, by section 3 of an act of Congress, approved July 13, 1892, entitled " An Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," it is declared that it shall not be lawful to excavate or fill or in any manner to alter or modify the course, location, condition, or capacity of any port, roadstead, haven, harbor of refuge, or inclosure within the limits of any breakwater, unless approved and authorized by the Secretary of War; and

Whereas, The City of Boston, Massachusetts, has applied to the Secretary of War for permission to construct an embankment from Squantum to East Shaft, so called, in Boston Harbor, Massachusetts, and has submitted for his approval plans of said embankment, which are hereto attached ;

Now, therefore, I, L. A. Grant, Acting Secretary of War, do hereby authorize the City of Boston, Massachusetts, to construct an embankment from Squantum to East Shaft, so called, in Boston Harbor, Massachusetts, in accordance with said plans, which are hereby approved, upon the following conditions :

That the engineer officer of the United States Army, in charge of the locality, may supervise the work to be done, in order that said plans shall be complied with.

Witness my hand this 23d day of August, 1892.

(Signed)

L. A. GRANT,

Acting Secretary of War.

Seal of the
U.S.A.
War Office.

The conditions of the instrument are hereby accepted by the City of Boston, Massachusetts, by John H. Lee, Acting Mayor, thereunto lawfully authorized, this nineteenth day of August, 1892.

(Signed)

JOHN H. LEE.

In presence of

JAMES A. MCKIBBEN,
THOMAS W. O'ROURK.

D.

[FROM THE CITY ENGINEER'S REPORT TO THE BOARD OF
PARK COMMISSIONERS.]

THE PARKWAY. BACK BAY FENS.

Roadways and Walks. — The drive on the southerly side of Longwood entrance and the connection with the Audubon road across Fen Bridge have been finished.

Charlesgate east, between Beacon street and Charles River, has been surfaced.

On Huntington entrance and over the Stony-brook Bridge the drives and walks have been completed. The surfacing of the Fenway between Huntington and Tremont entrances has been completed, and that between Tremont and Longwood entrances is nearly done. This leaves only the Tremont entrance to be surfaced.

The ride through the Fens has been entirely finished, and was opened December 28. A contract was made on May 3 with A. A. Libby & Co., for furnishing for the Fenway 1,770 linear feet of curbstone, at \$1.53 per linear foot. The contract was completed October 18.

There have been purchased during the year 44,215 paving-blocks, at \$45 per M, and 6,878 tons of stone for crushing, at 79 and 80 cents per ton.

Filling. — Additional land was acquired for the boundary roads at the Tremont entrance, and it was filled by the Boston & Albany Railroad Company for the sum of 51 cents per cubic yard. The work was finished on May 18, and required 14,092 cubic yards of filling.

Stony-brook Bridge. — This bridge, which was described in the last annual report, was nearly finished at the date of the report, but owing to various delays it was not entirely completed until October 1. The total cost was \$37,655.19.

Retaining-wall and Culvert at Brookline Avenue. — As stated last year, this work was completed at that time, with the exception of the bowlder work forming the face of the wall above the water. The latter work was done early in the season, as was also the grading and surfacing in this vicinity.

Grading of Slopes, Loaming, and Planting. — Most of the grading and loaming has been finished, there remaining unfinished only the ground occupied by the temporary headquar-

ters at Westland entrance, a small portion of Tremont entrance, and some short sections of tree spaces along the border walks. Most of the ground which is covered with loam has been planted.

Miscellaneous. — The wooden gates at the outlet of the pond, near Beacon street, have been rebuilt; the plantations on Commonwealth avenue, between Charlesgate west and Beacon street, have been regraded and planted, and the iron fence between Beacon street and the Boston & Albany R.R. has been painted.

The following table gives the principal items of work completed to date :

		Per cent. of whole.
Channel excavated	1,227,000 sq. ft.	100
Shore completed	26,700 lin. ft.	100
Marsh completed	833,000 sq. ft.	100
Driveways completed	75,000 sq. yds.	85
Walks completed	30,000 sq. yds.	57
Ride completed	14,000 sq. yds.	100
Curbstone set	30,405 lin. ft.	88
Gutters paved	17,100 sq. yds.	86
Area covered with loam	1,187,000 sq. ft.	87
Area planted	1,002,000 sq. ft.	73
Boundary fence	5,687 lin. ft.	37
Drains laid	7,642 lin. ft.	
Man-holes	6	
Catch-basins	98	
Bridges and culverts	7	

In addition, a large amount of work has been partially completed which cannot be classified.

The usual force has been employed for the care of plantations, roads, walks, etc., and the expense of the same charged to the appropriation for maintenance.

STONY BROOK AND MUDDY RIVER.

Covered Channels. — These channels remain in the same condition as they were one year ago. The Muddy-river conduit is in bad condition, a portion of it near the gate-chamber being propped up by inside timbering, which forms a serious obstruction to the flow of water through it, and which will cause serious trouble should a flood occur before this part of the channel is rebuilt.

MUDDY RIVER.

Filling, Grading, and Loam. — The grading on Section C, under the contract with Edward F. Brigham, was completed early in the season. The final estimate was made June 2, and the total amount paid was \$13,944.31. Work under the contract with Moulton & O'Mahoney is still in progress, the payments to date amounting to \$59,171.83.

The filling done on Audubon road by the Boston & Albany Railroad Company, under its contract dated October 21, 1891, was completed July 28, 1892. The amount of filling deposited was 77,170 cubic yards, at the price of 55 cents per cubic yard.

The Boston & Albany R.R. Company began work December 9, under its contract dated September 28, 1891, for transporting loam from Basin 6 of the Boston Water-works; and this work is now in progress.

Bridges. — The bridge on Brookline avenue has been completed, with the exception of a portion of the parapet walls. It is a masonry arch of 15 feet span, the abutments and face walls being of granite resting on a pile and timber foundation; the faces of the walls which show above the ground are of seamed faced granite, and the coping is of red granite. The interior of the arch is of brick. The width of the structure, at right angles to the line of the street, is 95 feet 6 inches, and consists of a driveway, two walks, and a space to be occupied by the 40-inch water main from the Brookline Reservoir.

On April 6 contracts were made with Blanchard & Sias for building bridges on Bellevue-street extension and on Tremont street. Work on these bridges is now in progress.

On August 27 a contract was made with Kelly & O'Hearn, of Brookline, for building three bridges and a culvert on the line of the stream above Leverett Pond. These are small masonry structures which carry the drive and walks across the brook. They are nearly completed.

Each of these bridges and culverts is partly in Boston and partly in Brookline, and the work is being done under the direction of A. H. French, C.E., engineer for the Brookline Park Commissioners. The working plans were prepared by Mr. French, in consultation with this department, from preliminary designs furnished by Messrs. F. L. Olmsted & Co.

Administration Building. — A contract was made on September 26 with Charles H. Dodge, for the erection of a building near Audubon road at its crossing over the Boston & Albany R.R. Work was begun September 27, and it is expected that it will be finished early in the coming season.

The building will contain offices for the police and other department employes, and toilet-rooms for the public.

JAMAICAWAY AND ARBORWAY.

A contract was made on January 2 with Pierce F. Loneragan, for building a drain 4 feet 6 inches in diameter and 1,300 feet in length, to carry the waters of the brook which runs from the land west of Pond street to the Arboretum. Work has not yet been commenced.

On January 16 a contract was made with Saucier Brothers for the grading of the Parkway between Perkins and Centre streets, on which contract work has not yet been commenced.

A contract was made on December 12 with Newell & Snowling for grading the Parkway between Washington street and Forest Hills street. This work has not been commenced.

ARNOLD ARBORETUM.

The Walter-street road was finished early in the season, and opened for travel on July 17. The road around the north side of Bussey Hill and across the meadow to the Parkway, opposite Orchard street, has been finished, and was opened to the public on December 18. Three culverts were built on the line of this road.

The road from the last-described road to the Parkway near South street has been finished, but has not yet been opened, as the approach to it on the Parkway from South street has not been entirely graded.

The above completes the road-building in the Arboretum, with the exception of the Parkway along the northerly boundary.

The following table shows the amounts of the main items of work done to date:

Driveways completed	.	30,338 sq. yds., or 2.1 miles.
Walks completed	. .	16,138 " or 4.2 "
Gutters paved	. .	8,069 "
18-in. pipe drain	. .	315 lin. ft.
15-in. pipe drain	. .	298 "
12-in. pipe drain	. .	612 "
10-in. pipe drain	. .	367 "
8-in. pipe drain	. .	2,641 "
Agricultural tile drain	. .	6,343 "
Catch-basins	. .	63
Man-holes	. . .	2
Culverts	. . .	4

FRANKLIN PARK.

Drives, Rides, and Walks. — Glen lane was entirely completed and opened to travel on August 13.

The entrances from Blue Hill avenue opposite Columbia street and Glen road have been finished, including the circle at the easterly end of the Greeting. The grounds in this vicinity have been graded and seeded.

A shelter, designed by Messrs. Sturgis & Cabot, architects, has been erected at the carriage-stand near the entrance opposite Columbia street, for the accommodation of visitors waiting for the park carriages.

In the Wilderness all of the walks north of the brook have been built, including the construction of several flights of stone steps; the Circuit drive is sub-graded from the easterly end of the Greeting to the Morton-street entrance; the drainage is provided for, the gutters have been paved, and the driveway ballasted for all but 1,800 feet of its length. The drive can be completed early in the coming season.

Drainage. — A culvert 185 feet in length, 4 feet 6 inches wide, and 4 feet 6 inches high, has been built in the valley near Canterbury street. The overflow and outlet for Scarboro' Pond has been built across Morton street.

Schoolmaster Hill. — The woodwork of the Arbor has been put in place, and the framework for the roof of the Shelter has been erected under the direction of the City Architect. A contract has been made for covering the roof with tiles.

Scarboro' Pond. — A contract was made on June 23 with Rowe & Hall for completing the excavation of the ponds, and the work is nearly done.

Miscellaneous. — Temporary buildings for the accommodation of the public have been erected in the Wilderness and in Long Crouch Woods.

The old fence walls in the Country Park have been removed and the ground put in order.

Three hundred additional settees have been purchased. The flock of sheep increased in number during the year to 188, and in December 60 wethers and old ewes were sold for \$256.44. The yield of wool was 815 pounds, which was sold for \$194.69.

The following table shows the principal items of work completed to date, but it should not be understood to be a complete statement of the work done, as a large amount of labor has been expended on work which cannot be classified.

Driveways completed	83,700 sq. yds., or $5\frac{2}{5}$ miles.
Walks completed . . .	51,200 “ or $7\frac{1}{3}$ “
Ride completed . . .	10,500 “ or $\frac{3}{4}$ of a mile.
Gutters paved . . .	18,000 “
Curbstone set	9,000 lin. ft.
12-in. water-pipe laid	200 “
6-in. water-pipe laid	3,500 “
4-in. water-pipe laid	1,150 “
Hydrants	7
Drinking-fountains	8
Bridge	1
Gateways	2
Boundary wall	4,468 lin. ft.
2-ft. 9-in. brick drain	706 “
2-ft. × 2-ft. 6-in. brick drain	180 “
2-ft. brick drain	769 “
18-in. pipe drain	3,140 “
15-in. pipe drain	2,895 “
12-in. pipe drain	1,950 “
10-in. pipe drain	1,954 “
8-in. pipe drain	8,750 “
4-in. pipe drain	190 “
4-in. agricultural tile drain	2,100 “
3-in. agricultural tile drain	3,520 “
2-in. agricultural tile drain	26,713 “
$1\frac{1}{2}$ -in. agricultural tile drain	20,700 “
<hr/>	
Total drains	73,567 lin. ft.
Man-holes	50
Catch-basins and inlets	152
Culverts	1
Open channel for brook	2,300 lin. ft.
Area of ground finished, about	200 acres.

Twenty-eight hundred linear feet of Circuit drive have been ballasted, of which 2,300 linear feet have been covered with crushed stone, and in addition 1,800 linear feet of drive have been graded.

FRANKLIN FIELD.

Surveys were made of this ground early in the season. On August 22 a contract was made with Christopher McBride, for building a drain which is designed to take the ordinary flow of the brook running from the field. It is 2 feet in diameter, 1,320 feet in length, and is at such grade that the low ground can be underdrained. The work is nearly done.

This drain is not designed to take care of the flow of the brook at times of excessive rainfall, and the field at such times will be flooded, as at present, to such a level that the yield of the brook can flow off through the old channel, which must be kept open.

On December 3 a contract was made with P. F. Longergan for the excavation of a temporary drainage-ditch around the northerly and easterly sides of the field. Work was begun on December 15, and is now in progress. The object of this ditch is to intercept the flows of the brooks which overflow the field.

DORCHESTER PARK.

In the spring the grounds were cleared of rubbish and underbrush, and the dead trees were removed.

MARINE PARK.

Filling. — The filling to be done under the contract with Perkins & White, dated September 10, 1890, is still in progress, the amount of material deposited to date being 394,000 cubic yards. The drive and walk along the shore, between the foot of Broadway and Sixth street, have been sub-graded in readiness for surfacing under a contract with Perkins & White, dated April 27, 1892.

Loam. — The ground to be planted southerly of Broadway extended has been covered with loam by Perkins & White, under their contract dated October 12, 1891. The amount of loam furnished was 9,503 cubic yards, at \$1.39 per cubic yard. This ground was seeded to grass in the spring.

Castle-island Bridge. — This is a temporary footbridge, and was built by William L. Miller, under a contract dated July 14, 1891. The bridge, except the draw, was completed June 2, at a cost of \$31,973.06. This bridge was built on the same general plan as the temporary pier built in 1885. It consists of bents of oak piles, 3 piles and 2 spurshores to each bent; the bents are spaced 16 feet apart on centres, and are capped with 6-in. \times 12-in. hard-pine girder-caps; on these caps are placed hard-pine stringers, 2 ft. 6 in. apart on centres; the stringers are 3 in. \times 14 in., except the outside ones, which are 4 in. \times 14 in. The floor is of 2-in. \times 8-in. hard-pine plank, planed on the upper side. There is a railing of hard pine, 3 feet high, on each side of the pier. Seats are built against the railing on each side of the bridge in alternate sections of 48 feet in length, thus occupying one-half the length of the bridge on each side.

The draw was finished on July 2; it consists of Pratt trusses, 14 feet apart on centres, with Samson posts and rods. The whole length is 108 feet, the draw-opening being 50 feet in width; the whole is mounted on trucks. The draw may be opened by running it towards Castle Island over the floor of the bridge.

Owing to delay in obtaining from the United States authorities permission to occupy Castle Island, the bridge and island were not open to the public until July 29.

On September 6 a contract was made with Thomas Keyes, for covering 211 linear feet of the bridge at the Castle-island end with a wooden shelter of the same form as the shelter on the pier. This was completed on November 12, at a cost of \$2,470.

Castle Island. — The grounds have been cleared of weeds and rubbish, and the ruins of several old buildings removed. Two buildings for water-closets have been erected, and the building formerly occupied by the commander of the garrison has been repaired for the use of the ordnance sergeant in charge of the government property.

Miscellaneous. — Eighteen electric arc lights were placed on the bridge and approach. Work was begun late in the fall repainting the iron pier, but owing to the inclemency of the weather it was not completed.

WOOD-ISLAND PARK.

The only work of construction done during the year has been the grading of the playground between the two hills. This was done under a contract with Frank M. Wells, dated May 27, 1892, and at a cost of \$13,993.95.

CHARLESBANK.

No work of construction has been done at this park during the year, except that required on the newly planted grounds.

Men's Gymnasium. — This was opened on May 20, and was kept open until nine o'clock in the evening until November 1, and since that date until dark. The total attendance to December 31 was 148,336, of which 46,903 were present after six o'clock P.M. The attendance was not as large as in 1891, owing to the gymnasium not having been opened until two months later in 1892 than in 1891. Comparing the attendance last year with that of 1891 after May 20, there was an increase of about 6,000 in 1892.

During the summer classes for light athletic exercises were organized by the superintendent, and were very popular. For this purpose a platform was made from the plank-walks

which are used in winter, and dumb bells, bar bells, and Indian clubs were added to the apparatus.

There were four accidents reported during the year, but none of them was of a serious nature. The need of better bathing and dressing accommodations was shown more than ever during the past season.

Skating.—During the recent cold weather the experiment was tried of covering the grounds with ice by flooding and sprinkling while the ground was frozen. A good surface for skating was secured, but with the small fixtures for obtaining water on the ground the work of flooding is necessarily slow. The attendance has been all the grounds could accommodate, having been as high as 2,600 in one day; the largest number admitted to the grounds in one day since they were first opened.

Women's Gymnasium and Girls' Playground.—This was opened on June 1 and was closed on October 31, and was, as in 1891, in charge of the Massachusetts Emergency and Hygiene Association. The report of this association to the Park Commissioners gives the attendance and other matters of interest.

Miscellaneous.—Considerable work has been done keeping the grounds, fences, and apparatus in repair, and everything is in good condition. Settees have been placed along the walk bordering Charles street.

CHARLESTOWN HEIGHTS.

On February 12 a contract was made with Jeremiah Sullivan for grading the grounds. Work was begun on March 8, and the contract was completed on July 19, the amount paid being \$5,229.56. A contract was made on August 22 with Richard D. Shanahan, for building a wall on the line of Medford street, and on a portion of the property line on the southerly side of the park. This was finished on December 13, at a cost of \$5,900. The wall is of granite, and is 4 feet high, capped with a granite coping 10 inches high and 2 feet wide. There are two openings in the wall for entrances, and the wall at these openings is finished by granite posts 5 feet high.

The walls supporting the terraces have been completed, with the exception of the parapets.

The drainage system has been entirely completed.

The surplus stone found in the excavation, and not used in the walls, has been broken up and deposited on the walks for surfacing.

A considerable quantity of loam and manure has been purchased.

CHARLESTOWN PLAYGROUND.

The walls of the old tannery have been removed and the upland graded. A large amount of filling was brought from Charlestown Heights, under the contract for grading that ground, and considerable filling has been received during the year from the Street Department and from individuals.

E.

[FROM THE CITY ENGINEER'S REPORT TO THE STREET DEPARTMENT.]

A statement of the street-paving work done by contract has been arranged in tabular form, and two sheets accompanying this report show the details of the work and the prices paid for doing the same.

As was explained at greater length in the report of last year, the averages given have only a general value, as each piece of work done varies from the others in essential particulars.

The specifications for granite blocks vary from those of last year in the length of the block called for, the length this year being from 9 to 14 inches, to average $11\frac{1}{2}$ inches, instead of — as last year — 8 to 12 inches, to average 10 inches.

As a result of the change about 23 blocks per square yard have been used, instead of about 25 as laid last year; but very few small blocks were used.

Under 56 agreements 5.97 miles of streets have been paved at a cost of \$193,595.85 paid to the contractors, and at a total cost to the city, including the material and labor furnished by the Street Department, of \$435,160.20.

The following are the principal items of work done: Block-stone paving on a concrete base laid with pitch joints, 17,089.6 square yards, at an average cost of about \$4.75 per square yard. Block-stone paving on a gravel base laid with pitch joints, 2,282 square yards, at an average cost of about \$3.70 per square yard. Block-stone paving on a gravel base with gravel joints, 45,170 square yards, at an average cost of about \$3.10 per square yard. Trinidad sheet asphalt on a concrete base and on an old cobble-stone paving base, 20,829 square yards, at an average cost of about \$3.60 per square yard. Sicilian sheet asphalt on a concrete base, 3,329 square yards, at an average cost of about \$3.60 per square yard. Asphalt block pavement on a sand base, 4,232 square yards, at an average cost of about \$3.25 per square yard.

Edgestone set, 36,443 linear feet.

Brick sidewalks relaid, 24,310 square yards.

Flagging cross-walks laid, 3,212 square yards.

The following is a description of the paving done. The details of cost and quantities are shown in a tabular statement.

ATHENS STREET.

Athens street, from B street to C street, South Boston, was paved by H. Gore & Co., with Sicilian rock asphalt, on a Portland cement concrete base. The old macadam surface was utilized on neighboring streets, and the old cobble-stones from the gutters were hauled to the Broadway crusher; edgestones, flagging, and paving-bricks were delivered on the street by the city. Two new catch-basins were built.

BEACON STREET.

Beacon street, from Dartmouth street to Gloucester street, was paved with sheet asphalt on a concrete base, by the Barber Asphalt Paving Co., excepting about 150 feet in length at Gloucester street, which was paved with Hastings asphalt blocks laid on a gravel base by the Metropolitan Construction Company. The surface removed was macadam. The road-bed was prepared by the regular force of the Street Department, which also disposed of the surplus material. The concrete base was laid by the Metropolitan Construction Company. During the work the 40-inch main water-pipe across the old inlet sluices of the full basin of the Boston Water Power Company was uncovered. It was formerly carried in a heavy wooden box for about 150 feet in length, supported by the old stone piers at intervals of about 25 feet. It had been buried for many years, and the wooden trusses were in bad condition, the old wooden box was removed, and piles were driven and capped between the old piers to support the pipe; the excavation was refilled with the old road material. Edgestones were reset by F. H. Cowin & Co., and the brick sidewalks were relaid by F. H. Cowin & Co. and James Grant.

BORDER STREET.

Border street, from White street to Condor street, East Boston, was paved by H. Gore & Co., with granite blocks on a gravel base. The old surface was of macadam, which was delivered with the surplus material on other streets within a distance of one mile. Blocks, edgestone, flagging, and paving-bricks were delivered on the street by the city.

The retaining-wall on and near Condor street was partially rebuilt, and built to grade, as a part of the same contract. A substantial iron fence was built on the line of the

wall by George T. McLauthlin & Co. Three new catch-basins were built.

Border street, from North Ferry to Sumner street, East Boston, was paved by A. A. Libby & Co., with the old granite blocks on a gravel base. The street-railway tracks were relaid, and the foot-walks rearranged to correspond to the relocation of the ferry entrances. The surplus earth was disposed of by the contractor. New blocks, edgestones, flagging, and bricks were furnished by the city on the ground. Two catch-basins were filled up, and one new one was built.

BOYLSTON STREET.

Boylston street, from Church street to Arlington street, was paved with granite blocks on a gravel base, with pitch joints, by J. Doherty & Co. The old surface was of macadam, which was removed and delivered within one mile where required. The new stone blocks, edgestone, and flagging furnished by the city were hauled by the contractors from the Albany-street yard, and paving-bricks were delivered by the city on the work. One new catch-basin was built.

BROADWAY.

Broadway from A street towards Dorchester avenue, South Boston, was paved with Sicilian rock asphalt on an American cement concrete base, by the National Construction Co. The former surface was paved with granite blocks, which were hauled to Seventh street between D and E streets, and to Sixth street between M and O streets, and the surplus material was taken to Vale street. Edgestones and bricks were delivered on the work by the city.

BRIGHTON STREET.

Brighton street, from Allen street to Leverett street, was paved by the Barber Asphalt Paving Co., with Trinidad sheet asphalt laid on the old cobble-stone pavement. The old pavement was partly relaid, and the remains of a former asphalt covering removed in part. A partial base or binder course of coal-tar concrete was laid over the old pavement. The sub-grading was done and the sidewalks put in order by P. W. Hernan.

CABOT STREET.

Cabot street, from Ruggles street to Vernon street, was paved by the Barber Asphalt Paving Co., with Trinidad asphalt on an American cement concrete base. The old

street surface was of macadam. The sub-grading was done by the Street Department. The concrete was laid by the Metropolitan Construction Co., and the sidewalks and edgestones were relaid by T. Payson. One new catch-basin was built.

CHARDON STREET.

Chardon street, from Bowdoin square to Merrimac street, was paved with granite blocks, with pitch joints, on a concrete base, by Jones & Meehan. The old surface was paved with cobble-stones, which were sold to the city of Cambridge. The surplus earth was disposed of by the contractors. Paving-blocks, edgestones, and flagging were furnished by the city at the West yard on Commercial street, and the paving-bricks were delivered on the work. This street was paved with a special stone block, which was about one inch less in depth than the standard block. One new catch-basin was built.

CHARLES STREET.

Charles street, from Beacon street to Pinckney street, was paved by J. Doherty & Co., with granite blocks, laid with pitch joints on a concrete base. The old paving was of granite blocks, which were culled and the best used in the new work. The surplus blocks were removed by the Street Department. The sub-grading, from Beacon to Mt. Vernon street, was done by the Street Department. The remainder of the sub-grading was done by J. Doherty & Co., who disposed of the useless and surplus material. The concrete base was laid by the Metropolitan Construction Co. Edgestones and sidewalks were laid by J. Grant. Paving-blocks, flagging, and paving-bricks were furnished by the city.

CHERRY STREET.

Cherry street, from Shawmut avenue to Washington street, was paved by the Barber Asphalt Paving Co., with Trinidad sheet asphalt laid on an American cement concrete base. The former surface was of macadam. The sub-grading was done by J. Casey. The concrete base was laid by the Metropolitan Construction Co., and the sidewalks were put in order by the Street Department.

DAVIS STREET.

Davis Street, from Washington street to Harrison avenue, was paved with Trinidad sheet asphalt, on an American cement concrete base, by the Barber Asphalt Paving Co.

The former surface was of macadam. The sub-grading was done by the Street Department. The concrete base was laid by the Metropolitan Construction Co., and the sidewalks were put in order by D. Sullivan.

DECATUR STREET.

Decatur street, from Washington street to Harrison avenue, was paved by H. Gore & Co. with Sicilian rock asphalt, on an American cement concrete base. The former surface was of macadam. The sub-grading was done by the Street Department. The concrete base was laid by the Metropolitan Construction Co., and the sidewalks put in order by P. W. Hernan.

DORCHESTER AVENUE.

Estimates were made early in the year for putting this avenue in order from South Boston line to Adams street, Dorchester, and a large amount of work has been done upon it. From Washburn street to Pond street both sides of the street between the curb and the railway track have been paved. From Pond street to Belfort street the westerly side of the street has been paved, the easterly side being already paved. From Belfort street to Adams street the avenue was already paved on both sides. From Adams street to Park street the avenue has been paved on both sides of the street-railway track. From Park street to Ashmont street the avenue has been graded, a new double street-railway track laid, and the roadway on the easterly side of the track paved. On the westerly side of the track, the old macadam surface was in fair condition from Park street to Centre street, and it was repaired and put in order; from Centre street to Ashmont street a new "Telford-Macadam" road has been built on the westerly side of the street. All the paving has been made of granite blocks on a gravel base, and there is now a continuous paved roadway from the city to Ashmont street. From Ashmont street to Richmond street a new single street-railway track, being the easterly section of a future double track, has been laid. The street was graded, a heavy rock cut was made near Richmond street, and a heavy fill made, with slopes covering the old retaining-walls, in the valley between Codman and Richmond streets. This section of the avenue was finished with a "Telford-Macadam" surface, the stone from the rock cut being utilized for this purpose. The improvement has been carried to a point about three hundred feet beyond Richmond street; beyond that point, in the short distance to Adams

street, another heavy rock cut will be required before the improvements are completed. The block paving was done by H. Gore & Co. and C. J. Coates, and portions of the street were graded by J. Donnellan, J. J. Sullivan, and J. McGovern. The rock-work, Telford road-making, and a large part of the grading, was done by the Street Department. Eleven new catch-basins were built.

ELIOT STREET.

Eliot street, from Washington street to Pleasant street, was paved with granite blocks on a concrete base, by C. B. Payson & Co. The old pavement was of granite blocks, which were relaid on Stanhope, Pleasant, and other streets. The surplus earth was delivered on Huntington avenue, beyond Gainsborough street. New granite blocks, edgestones, and flagging were furnished by the city at the Albany-street yard, and the bricks were delivered on the work. The street-railway was relaid and paved with the old granite blocks on a gravel base, and the space between the double tracks was paved with new granite blocks on a gravel base. Two new catch-basins were built.

EUSTIS STREET.

Eustis street, from Washington street to Dearborn street, was paved with granite blocks on a gravel base, by A. A. Libby & Co. The old surface was of macadam with cobble gutters. The old cobble-stones were delivered at the Dimock-street crusher, and the surplus material was used on streets within one-half mile. Granite blocks, edgestones, and flagging were furnished by the city at the Albany-street yard, and the paving-bricks were delivered on the ground. Two new catch-basins were built.

FLORENCE STREET.

Florence street, from Washington street to Harrison avenue, was paved by the Metropolitan Construction Co., with Hastings asphalt blocks on a 4-in. American cement concrete base. The former surface was of macadam. The sub-grading was done by the Street Department, and the sidewalks were put in order by D. Sullivan.

INDIA STREET.

India street, in front of the Custom-house, was paved by J. Doherty & Co., with granite blocks laid with pitch joints, on a concrete base. The old paving, of large granite blocks

about one foot square, was removed by J. J. Sullivan, and the sub-grading was done by the Street Department, and the concrete base was laid by H. P. Nawn. The edgestone, flagging, and sidewalks were relaid by J. Doherty & Co. The granite blocks, edgestone, flagging, and bricks were furnished on the ground by the city.

KEMBLE STREET.

Kemble street, from Gerard street to Magazine street, was paved by Collins & Ham, with granite blocks on a gravel base. This was an ungraded street; it was graded by the contractors, and the surplus material was delivered to the city on East Chester Park extension, to abate a nuisance caused by standing water. Stone blocks, edgestones, and flagging were delivered to the contractors by the city at the Albany-street yard, and paving-bricks were delivered on the ground. Two new catch-basins were built.

From Gerard street to Hampden street the street was partially paved by the same contractors, under an extension of their contract. Work was stopped by cold weather, and the time for finishing it has been extended to allow of its completion in the spring. Four additional catch-basins were built.

MOTTE STREET.

Motte street, from Washington street to Harrison avenue, was paved by H. Gore & Co., with Sicilian rock sheet asphalt laid on an American cement base. The former street surface was granite block paving. The sub-grading was done by the Street Department, the concrete base was laid by H. P. Nawn, and the sidewalks put in order by F. H. Cowin & Co.

PRENTISS STREET.

Prentiss street, from Tremont street through Hallock street, was paved by H. Gore & Co., with granite blocks on a gravel base. The old surface was of macadam. The surplus material was delivered where required within one-half mile, and the old cobble gutter-stones were delivered to the Tremont-street crusher. Paving-blocks, edgestones, and flagging were furnished by the city at the Albany-street yard; the bricks were delivered to the contractor on the street.

RUTHERFORD AVENUE.

Rutherford avenue, from Essex street to Allen street, was paved with granite blocks on gravel by J. Turner & Co.

The roadbed was prepared and all materials were furnished by the Street Department. Eight new catch-basins were built.

SCHOOL STREET.

School street, from Washington street to Tremont street, was paved by C. B. Payson & Co. with granite blocks, with pitch joints, on a concrete base. The old surface was paved with granite blocks, which were all removed, with the surplus material, by H. P. Nawn. The concrete base was laid by the Metropolitan Construction Company. Granite blocks were specially prepared for this work; the granite blocks, edgestones, flagging, and bricks were delivered on the ground.

WASHINGTON STREET.

Washington street, from Cornhill to Essex and Boylston streets, was paved by Jones & Meehan (excepting a small portion by C. B. Payson & Co.) with granite blocks, with pitch joints, on a concrete base. The old surface was granite block paving, which was hauled to Dorchester avenue, beyond Field's Corner. The surplus earth was disposed of by the contractors; part of it was hauled to the South Boston flats, and a part to the vicinity of Huntington avenue. The stone blocks were furnished by the city at the Boston Wharf Company's wharf on Fort Point channel; edgestone and flagging were furnished by the city at the Albany-street yard; the bricks were delivered on the work.

The street railroad was entirely rebuilt by the West End Company, with an improved rail. The paving between the rails is of the same quality, including the concrete foundation, as the rest of the street, and the tracks were laid to a grade conforming with the new street surface. Ten new catch-basins were built, giving much better surface drainage than before.

WEST CHESTER PARK.

West Chester park from Columbus avenue to Tremont street, on the northerly side of the central parkway, was paved with Hastings asphalt blocks, on a gravel base, by the Metropolitan Construction Company. The former surface was of macadam; the sub-grading was done and the sidewalks put in order by the Street Department.

WEST CHESTER PARK AND CHESTER SQUARE.

West Chester park and Chester square, from Columbus avenue to Washington street, on the southerly side of the

central parkway, was paved by the Barber Asphalt Paving Company with sheet asphalt, on an American cement concrete base. The sub-grading was done by the Street Department, the concrete base was laid by the Metropolitan Construction Company, and the edgestones and sidewalks were put in order by the Street Department.

WEST NEWTON STREET.

West Newton Street, from Shawmut avenue to Washington street, was paved by the Metropolitan Construction Company with Hastings asphalt blocks, laid on a sand base. The former surface was of macadam. The sub-grading was done by the Street Department, and the sidewalks were put in order by P. W. Hernan.

WEST SECOND STREET.

West Second street, from B street to E street, South Boston, was paved by H. Gore & Co. with granite blocks, on a gravel base. The old surface was of cobble-stone paving. The cobble-stones were sold to the city of Cambridge, and the surplus material was used to fill streets on the South Boston flats. Granite blocks were furnished by the city at the L-street extension, the edgestones and flagging at the Albany-street yard, and the paving-bricks were delivered on the street. Three new catch-basins were built.

COMMONWEALTH AVENUE.

The plans, specifications, and form of contract for filling the additional width of Commonwealth avenue, between Pleasant street and the forks of the road at the corner of Beacon street, not including a section at the Cottage Farm Bridge, were prepared early in the year, and a contract dated May 4, 1892, was made with the Boston Contracting Company for furnishing and delivering about 136,000 cubic yards of clean filling, at the rate of 49½ cents per cubic yard. The material has been taken from a hill in Brookline near Harvard avenue, a short distance from the corner of Commonwealth avenue and Brighton avenue. A standard gauge track was laid, and February 1, 1893, about 76,000 cubic yards of material, measured in the fill, had been delivered on the avenue. Between Cottage Farm Bridge and Pleasant street, on the marsh, the mud proved to be deep and soft, and a very large displacement took place, probably amounting to 14,000 cubic yards or more.

The contract required the material to be measured in the

fill, and owing to the large quantity of filling required to make good the displacement of the mud, for which no payment could be made under the contract, work was discontinued by the contractors. The City Council, however, authorized the payment of the sum of \$7,000 on account of the displacement, the contract was modified so that the city pays the contractors, for moving the material only, the sum of 37 cents per cubic yard measured in the fill, the owners of the gravel bank being paid by the city 12½ cents per cubic yard for the filling measured in the bank, and the contractors resumed work. Under the original contract with the Boston Contracting Company, 46,640 cubic yards were measured and paid for; under the modified contract 29,542 cubic yards had been delivered to February 1, 1893.

PLANS.

The Street Department has turned over to the care of this department a set of sectional plans covering a large part of the city, and known as "Sidewalk Plans." They are intended to show all structures, whether covered or exposed, and whether belonging to private corporations or to the city, existing in every street. The set is imperfect, and is so many years behind in its corrections as to be of little use. The engineering force, not otherwise occupied, has been employed in an attempt to bring this set of plans up to date.

As the information must be sought for largely on the street itself, progress is necessarily very slow, and the present available force will never be able to bring all the plans up to date at the same time. It is hoped, however, that a system may be arranged by which all changes shall be a matter of record when they are made, and the task of keeping up the plans thus be one of compilation only, after they are once brought up to date. The work can then be carried on in the winter, and the larger part of the force required for summer work kept employed, and skilled men be available when the active season for out-of-door work opens. This set of plans will be of great value when completed, and carefully corrected once a year.

TABLES.

The table showing the lengths of accepted streets and the areas of various kinds of pavement have been corrected to February 1, 1893. The streets laid out as highways during the year by the Street Commissioners have been added, those discontinued deducted, and the changes in the character of surfaces of the streets have been compiled.

Table showing Lengths and Areas of Paving on Accepted Streets. Correct to February 1, 1893.

	LENGTH IN MILES.							AREA OF PAVEMENT IN SQUARE YARDS.								
	Asphalt.	Block.	Brick.	Cobble.	Macadam.	Gravel.	Not Graded.	Totals.	Asphalt.	Block.	Brick.	Cobble.	Macadam.	Gravel.	Not Graded.	Totals.
Year 1892 Report	4.66	69.29	0.36	5.94	204.66	139.48	10.30	434.59	73,906	1,521,562	3,638	80,389	3,755,106	2,311,628	201,941	7,948,170
City Proper, Feb. 1, 1893. *5.10	†40.61	0.36	3.87	29.99	0.77	. . .	. . .	80.70	86,931	872,292	3,638	45,609	587,780	13,811	. . . . .	1,010,061
Charlestown, " "	0.03	8.06	. . .	0.29	14.11	0.09	. . .	22.58	421	186,108	. . . . .	2,936	211,853	1,105	. . . . .	402,423
East Boston, " " . . . . .	. . . . .	3.80	. . . . .	0.27	2.33	29.40	0.18	28.98	. . . . .	88,633	. . . . .	5,311	46,132	387,693	3,555	531,224
South Boston, " "	0.30	11.19	. . . . .	0.15	23.12	2.10	5.57	42.63	6,901	237,172	. . . . .	3,057	462,646	43,503	114,983	806,262
Roxbury, " "	0.37	7.77	. . . . .	0.01	52.82	15.07	0.89	76.93	6,559	158,994	. . . . .	408	940,405	248,627	11,920	1,366,913
W. Roxbury, " " . . . . .	. . . . .	0.09	. . . . .	. . . . .	26.16	46.74	1.40	74.39	. . . . .	2,067	. . . . .	. . . . .	454,181	732,259	20,896	1,209,403
Dorchester, " " . . . . .	. . . . .	3.25	. . . . .	. . . . .	43.41	34.21	1.50	82.38	. . . . .	70,659	. . . . .	. . . . .	773,166	564,750	32,970	1,441,545
Brighton, " " . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	16.80	17.83	2.12	36.75	. . . . .	. . . . .	. . . . .	. . . . .	404,667	273,217	35,893	713,777
Total	6.00	74.78	0.36	4.59	298.74	137.21	11.66	443.34	100,812	1,615,925	3,638	51,321	3,820,830	2,264,965	220,217	8,083,708

Total public streets, 443.34 miles.
 NOTE. — In the above table the city is subdivided on the original boundary-lines between the districts.
 * Of this amount 0.69 miles, or 12,140 square yards, asphalt blocks.
 † Of this amount 2.07 miles, or 41,970 square yards, granite block paving on concrete, with pitched joints.

L-STREET BRIDGE. — ABUTMENT.

The contract for building the abutment of L-street bridge, which was let to Perkins & White under date of October 28, 1891, was completed in November, 1892, at a cost of \$6,231.71.

L-STREET BRIDGE. — RETAINING-WALLS.

A contract for building two retaining-walls between the abutment and the bulkhead built in 1891, and filling the space enclosed, was awarded to Thomas A. Rowe, of Boston. Work was commenced July 19, 1892, and completed in November, at a cost of \$9,824.73.

MALDEN BRIDGE. — DRAW.

This draw has been entirely rebuilt during the year, under a contract with Josiah Shaw, of Somerville. The draw is of the same form and general dimensions as the old one, and rests on a new turn-table. The foundations were also rebuilt, all the work above the piles being new, and twelve new piles were driven.

ROXBURY CANAL. — SEA-WALL.

Plans and specifications were made in April, 1891, for building a sea-wall on Roxbury Canal at the Albany-st. paving-wharf, similar to that built at the wharf of the Water Department in 1888. The work was advertised October, 1892.

October 22 a contract was made with Thomas A. Rowe, of Boston, for building the wall, and it was completed January 9, 1893, at a cost of \$12,657.

SAFETY OF PLANS AND RECORDS.

The offices occupied by this department are not at all fire-proof, and consequently, if a fire should occur, valuable records, plans, original note-books, etc., would be destroyed, entailing great loss and inconvenience. The City Hall, to and including the third floor, is of fire-proof construction, and I recommend that the fourth and fifth floors be reconstructed so as to be fire-proof.

WIDTHS OF DRAW-OPENINGS.

The table showing the widths of draw-openings in the bridges over tide-water in this city is given in Appendix A. The openings have all been remeasured for this report.

Respectfully submitted,

WILLIAM JACKSON,
City Engineer.

CITY ENGINEERS.

1850-1893.

E. S. CHESBROUGH, M. Am. Soc. C. E.,
Nov. 18, 1850, to Oct., 1855.
(Died August 18, 1886.)

JAMES SLADE,
Oct. 1, 1855, to April 1, 1863.
(Died August 25, 1882.)

N. HENRY CRAFTS,
April 1, 1863, to Nov. 25, 1872.

JOSEPH P. DAVIS, M. Am. Soc. C. E.,
Nov. 25, 1872, to March 20, 1880.
(Resigned March 20, 1880.)

HENRY M. WIGHTMAN, M. Am. Soc. C. E.,
April 5, 1880, to April 3, 1885.
(Died April 3, 1885.)

WILLIAM JACKSON, M. Am. Soc. C. E.,
April 21, 1885, to present time.

APPENDIX A.

Table showing the Widths of Openings for Vessels in all Bridges provided with Draws, in the City of Boston, January, 1893.

NAME OF BRIDGES.	LOCATION.	NUMBER OF OPENINGS.	WIDTH.	
			Feet.	In.
Boston & Maine R.R.	Boston to Charlestown .	1	35	5
"	Over Miller's River .	1	35	9
Broadway .	Over Fort-point Channel .	1	43	3
Cambridge-st.	Ward 25 to Cambridge .	1	36	3
Canal .	Boston to East Cambridge .	1	35	10
Charles-river .	Boston to Charlestown .	1	36	0
Chelsea (South Channel)	Charlestown to Chelsea .	1	38	10
" (North ")	" " .	1	44	10
Chelsea-st. (East Boston side)	East Boston to Chelsea .	2	33	1
" (Chelsea side)	" " .	1	34	3
Commercial-point .	Ward 24 .	1	24	0
Congress-st. (Boston side)	Over Fort-point Channel .	2	43	3
" (So. Boston side)	" " .	1	43	11
Dover-st.	" " .	0	0	0
Eastern R.R.	Boston to Charlestown .	1	35	10
"	Over Miller's River .	1	35	10
Essex-st.	Ward 25 to Cambridge .	1	36	0
Federal-st.	Over Fort-Point Channel .	1	41	10
Fitchburg R.R.	Boston to Charlestown .	1	36	0

Fitchburg R.R. (for teaming freight)	.	.	.	Boston to Charlestown . . .	1	35	11
Grand Junction R.R.	.	.	.	Ward 25 to Cambridge . . .	1	35	10
Grand Junction R.R.	.	.	.	East Boston to Chelsea . . .	1	34	6
Granite	.	.	.	Ward 24 to Milton . . .	1	36	0
Harvard (Boston side)	.	.	.	Boston to Cambridge . . .	2	36	8
" (Cambridge side)	.	.	.	" " . . .		36	8
L-street	.	.	.	Over Reserved Channel, South Boston . . .	1	40	0
Lowell R.R. (freight)	.	.	.	Boston to East Cambridge . . .	1	35	8
" (passenger)	.	.	.	" " . . .	1	35	10
Malden	.	.	.	Charlestown to Everett . . .	1	43	4
Meridian-st. (East Boston side)	.	.	.	East Boston to Chelsea . . .	2	59	2
" (Chelsea side)	.	.	.	" " . . .		59	0
Mt. Washington-ave. (Boston side)	.	.	.	Over Fort-point Channel . . .	2	42	1
" (So. Boston side)	.	.	.	" " . . .		42	4
Neponset	.	.	.	Ward 24 to Quincy . . .	1	36	0
New York & New England R.R. (Boston side)	.	.	.	Over Fort-point Channel . . .	2	41	0
" " (So. Boston side)	.	.	.	" " . . .		40	5
" " " "	.	.	.	Over South Bay . . .	1	28	4
North Beacon-st.	.	.	.	Ward 25 to Watertown . . .	1	30	2
North Harvard-st.	.	.	.	Ward 25 to Cambridge . . .	1	36	0
Old Colony R.R.	.	.	.	Over Fort-point Channel . . .	1	36	0
" " " "	.	.	.	Ward 24 to Quincy . . .	1	36	0
Prison-point	.	.	.	Charlestown to Cambridge . . .	1	36	0
Warren	.	.	.	Boston to Charlestown . . .	1	36	3
West Boston (Boston side)	.	.	.	Boston to Cambridge . . .	2	35	8
" (Cambridge side)	.	.	.	" " . . .		36	0
Western-ave.	.	.	.	Ward 25 to Cambridge . . .	1	36	0
" " " "	.	.	.	Ward 25 to Watertown . . .	1	36	0

APPENDIX B.

City of Boston, Revised Ordinances, 1892.

CHAPTER 12.

ENGINEERING DEPARTMENT.

SECTION 1. The engineering department shall be under the charge of the city engineer, who shall be consulted on all matters relating to public improvements of every kind where the advice of a civil engineer would be of service; shall, unless otherwise specially provided, take charge of the construction of all public works of the city which properly come under the direction of a civil engineer; shall, except as to sewers, perform all engineering services, and make all examinations and prepare all statements, plans, specifications, and contracts which any department may need in the discharge of its duties; shall, upon being notified by the superintendent of streets, supervise all repairs on the bridges of the city used as highways which affect the safety of the structures, and shall, when required by the mayor or by any officer or board in charge of a department, measure the work done by contract for the city, and certify to the result of such measurement.

SECT. 2. Said engineer shall in his annual report include a report of the safety and completeness of all ponds, basins, and reservoirs under the charge of the water-supply department, and of all bridges within the city limits used as highways.

APPENDIX C.

ENGINEERING DEPARTMENT, PROPERTY SCHEDULE, MAIN OFFICE.

1 horse.	8,809 Plans Engineering Works, loose.
2 carriages.	14 vols. Plans Engineering Works, bound.
1 sleigh.	Photographs of Engineering Works.
2 harnesses.	Apparatus for blue-printing.
3 robes.	1 microscope.
Instruments for drawing.	1 mercurial barometer.
Instruments for surveying, as follows :	1 aneroid barometer.
2 Temple transits.	1 holosteric barometer.
5 Buff & Berger transits.	1 set hydrometers.
5 Gurley transits.	1 hygrometer.
1 Stackpole transit.	1 pair field-glasses.
3 Temple levels.	2 typewriters.
4 Buff & Berger levels.	2 dynamometers.
5 Gurley levels.	1 pentagraph.
11 Boston rods.	1 calculating-machine.
4 New York rods.	1 volt meter.
3 Troy rods.	
Cases for plans and books.	
Reference Library, 936 vols.	

APPENDIX D.

Elevations referred to Boston city base. (The city base is 0.64 ft. below mean low tide.)

Feet.

- 0.00 City base.
- 15.66 Highest tide, April, 1851.
- 15.33 Coping of dry dock, Charlestown Navy Yard.
- 12.94 Greatest elevation of high tide per U.S. Tide Table, June 14, 1893 ($11.70 + 0.64$) = 12.34.
- 10.44 Mean high water.
- 8.64 Least elevation of high tide per U.S. Tide Table, Feb. 11, 1893 ($7.40 + 0.64$) = 8.04.
- 2.84 Greatest elevation of low tide per U.S. Tide Table, April 8, 1893 ($2.2 + 0.64$) = 2.84.
- 0.64 Mean low tide.
- 1.96 Lowest elevation of low tide per U.S. Tide Table, April 18, 1893 ($-1.8 + 0.64$) = 1.16.
- 5.00 Piles cut off for building.
- 9.91 Water-works base (approx. tide marsh level).
- 9.82 South Boston base.
- ¹ — 4.98 Cambridge city base.
- 0.38 South Boston Flats base.

¹ Cambridge city base is 4.98 ft. below Boston city base.

APPENDIX E.

ENGINEERING DEPARTMENT ANNUAL REPORTS, 1867-1892.

No. of reports.	For the year.	Year published and No. City Document.	No. of reports.	For the year.	Year published and No. City Document.
First.....	1867	1868 — 22	Sixteenth	1882	1883 — 53
Second and Third	1868-69	1870 — 14	Seventeenth	1883	1884 — 55
Fourth	1870	1871 — 15	Eighteenth	1884	1885 — 54
Fifth and Sixth	1871-72	1873 — 23	Nineteenth	1885	1886 — 41
Seventh.....	1873	1874 — 20	Twentieth	1886	1887 — 33
Eighth	1874	1875 — 19	Twenty-first	1887	1888 — 39
Ninth.....	1875	1876 — 24	Special report.....	1888	1888 — 117
Tenth	1876	1877 — 15	Twenty-second	1888	1889 — 38
Eleventh	1877	1878 — 20	Twenty-third	1889	1890 — 39
Twelfth.....	1878	1879 — 22	Twenty-fourth.....	1890	Executive Department Report, Document I, Part I. 1891.
Thirteenth.....	1879	1880 — 33	Twenty-fifth	1891	1892 — 11
Fourteenth	1880	1881 — 25			
Fifteenth.	1881	1882 — 52			

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