A COLLECTION OF DIAGRAMS

Representing the General Plan of

TWENTY-SIX DIFFERENT WATER-WORKS,

Contributed by Members of the

NEW ENGLAND WATER-WORKS ASSOCIATION,

And Compiled by a Committee.

1887.

NEW YORK:
PUBLISHED BY THE ENGINEERING AND BUILDING RECORD,
82 & 84 FULTON STREET.

New England Water-Works Association,

Office of Secretary,

New Bedford, Mass., November 1, 1887.

THIS collection of diagrams is the result of the persistent efforts of Messrs. William B. Sherman, of Providence, R. I., and Walter H. Richards, of New London, Conn., who, as a Committee on Exchange of Sketches, have secured these drawings from members of the Association. The following extract from a report presented by these gentlemen at the Manchester, N. H., meeting in June, 1887, will explain in part the origin of the collection:

"In answer to circular letters sent out to members, there were received rough sketches of general plans of twenty-three water-works represented in the Association. Having this data on hand, though crude in many particulars, it was decided to put the same into available shape for the benefit of the members This has been accomplished by the Committee without cost to the Association. From these rough sketches—revised, reduced to uniform size of 10 by 15 inches—a set of tracings has been made, and a sample folio of blue prints prepared. This folio and set of tracings are herewith presented as forming the main part of this report."

Since the Manchester meeting three more subjects have been received and subscriptions for sets of reproductions from the tracings have been called for. The ready response to the call is evidence of the value of the Committee's work, and arrangements were made with *The Engineering and Building Record* for publication in this present form.

R. C. P. COGGESHALL,

Secretary,

New England Water-Works Association.

INDEX.

BOSTON WATER WORKS.

—1886.—

SCALE OF MILES.

1 0 1 2 3 4 5

	SUDBURY AND COCHITUATE WORKS.	MYSTIC WORKS.
MILES OF PIPE	400.	131.
NUMBER OF SERVICES	51,810.	15,928.
NUMBER OF METERS AND MOTORS	4,417.	550.
NUMBER OF FIRE HYDRANTS	4,681.	781.

SUDBURY RIVER WATER SHED

SUDBURY RIVER WATER SHED. Area 76 Sq. Miles.

RESERVOIR III. Area 280 Acres. Capacity 1,200,000,000 gallons.

DAM III.

RESERVOIR I. Area 49 Acres. Capacity 288,000,000 gallons.

DAM I.

CONDUIT

DAM II.

RESERVOIR II. Area 136 Acres. Capacity 530,000,000 galls.

FARM POND Area 165 Acres. Capacity 130,000,000 galls.

OUTLET DAM

GATE HOUSE

LAKE COCHITUATE Area 800 Acres. Area of Water Shed 18.87 Sq. Miles. Capacity 1,500,000,000 gallons.

SHED LINE

DAM IV.

RESERVOIR IV. Area 162 Acres. Capacity 1,300,000,000 gallons.

COCHITUATE WATER TUNNEL

TUNNEL

BRIDGE

SUDBURY RIVER CONDUIT. Length 14.63 Miles. Fall 3⅝ inches per Mile.

SUDBURY RIVER CONDUIT. Length 15.89 Miles. Fall 1 foot per Mile.

BRIDGE

CONDUIT

TUNNEL

Supplied by Sudbury and Cochituate Works.

CHESTNUT HILL RESERVOIR Elevation above Tide Marsh Level 124 Feet. Area 125 Acres. Capac. 550,000,000.

BROOKLINE RESERVOIR Area 23 Acres. Capacity 115,000,000.

Supplied by Sudbury and Cochituate Works.

RES.

RES.

MYSTIC WATER SHED LINE

MYSTIC LAKE Elevation 7 feet above High Tide. Area of Watershed 27.75 Sq. Miles. Area 200 Acres. Capacity 380,000,000 galls.

DAM

MYSTIC CONDUIT Length 7450 Feet. Fall 5.28 Feet.

MYSTIC RESERVOIR Capacity 26,000,000 galls. Elevation 147 feet above High Tide.

MYSTIC PUMPING STA.

Two 5,000,000 Worthington Engines

One 8,000,000 "

"

Supplied by Mystic Works.

Supplied by Mystic Works.

SUDBURY RIVER CONDUIT. Capacity 109,000,000 gallons per day.

COCHITUATE CONDUIT. Capac. 16,000,000 galls. per day.

MYSTIC CONDUIT.

PLATE I.

General Plan.

C I T Y W A T E R W O R K S ,

BURLINGTON, VERMONT,

F. H. Parker, Supt.,

1886.

Built by D. C. Linsley, 1867-8.

Cost $311,340.13

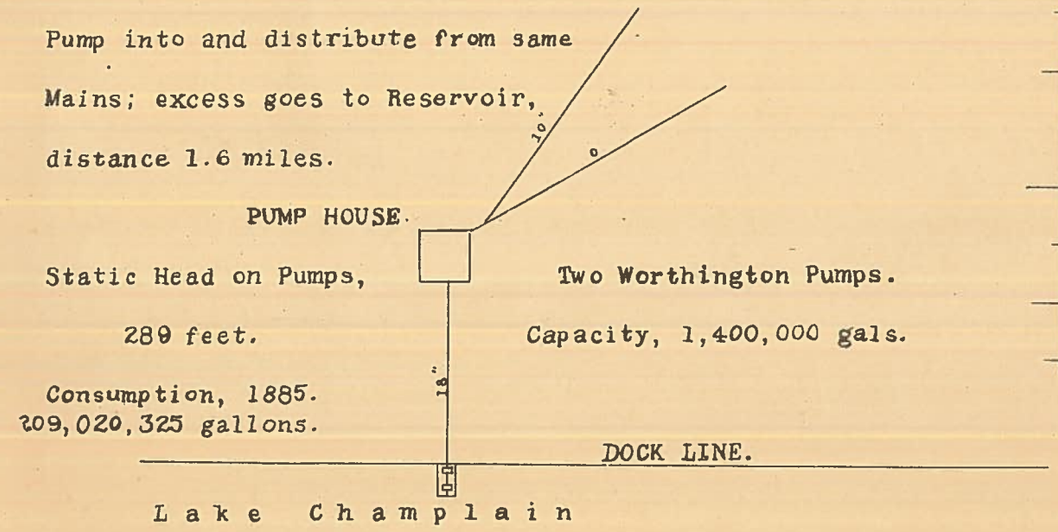
Statistics.
Year ending Dec. 31, 1885.

Population, 13,359.	do. supplied 12,700
Miles of Mains, 28.7.	Hydrants, 162.
No. Services, 2,145.	Gates, 251.
No. Meters, 239.	Motors, 5.
Average Consumption,	572,674 gals.

Pump into and distribute from same

Mains; excess goes to Reservoir,

distance 1.6 miles.



Static Head on Pumps,

289 feet.

Two Worthington Pumps.

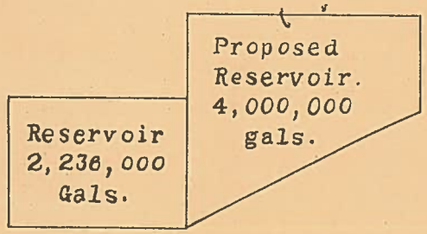
Capacity, 1,400,000 gals.

Consumption, 1885.
209,020,325 gallons.

Tank Higher Service.

Capacity ◯ 105,000 gals.

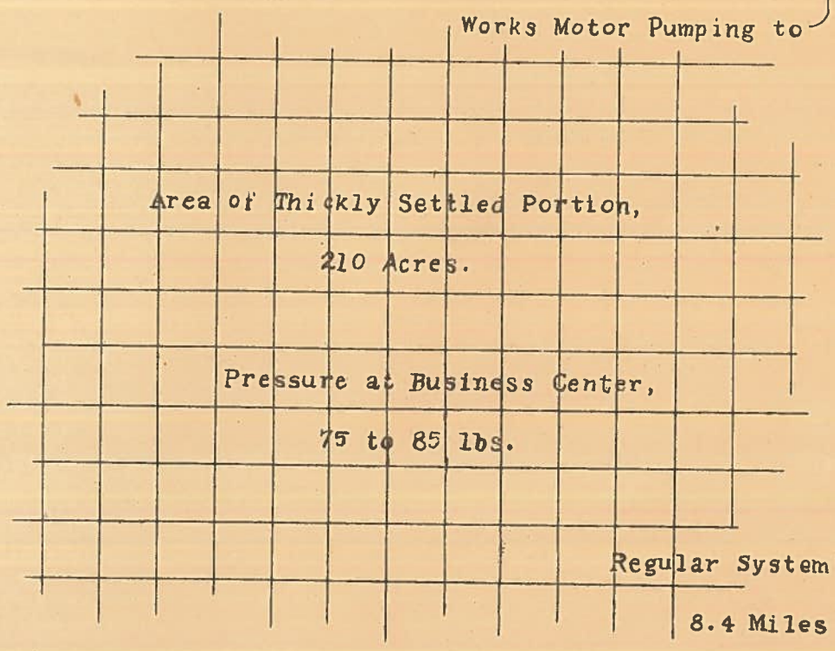
Level Full 85' above Res.



Gate
and
Motor
House.

Water to or from Res.

Works Motor Pumping to



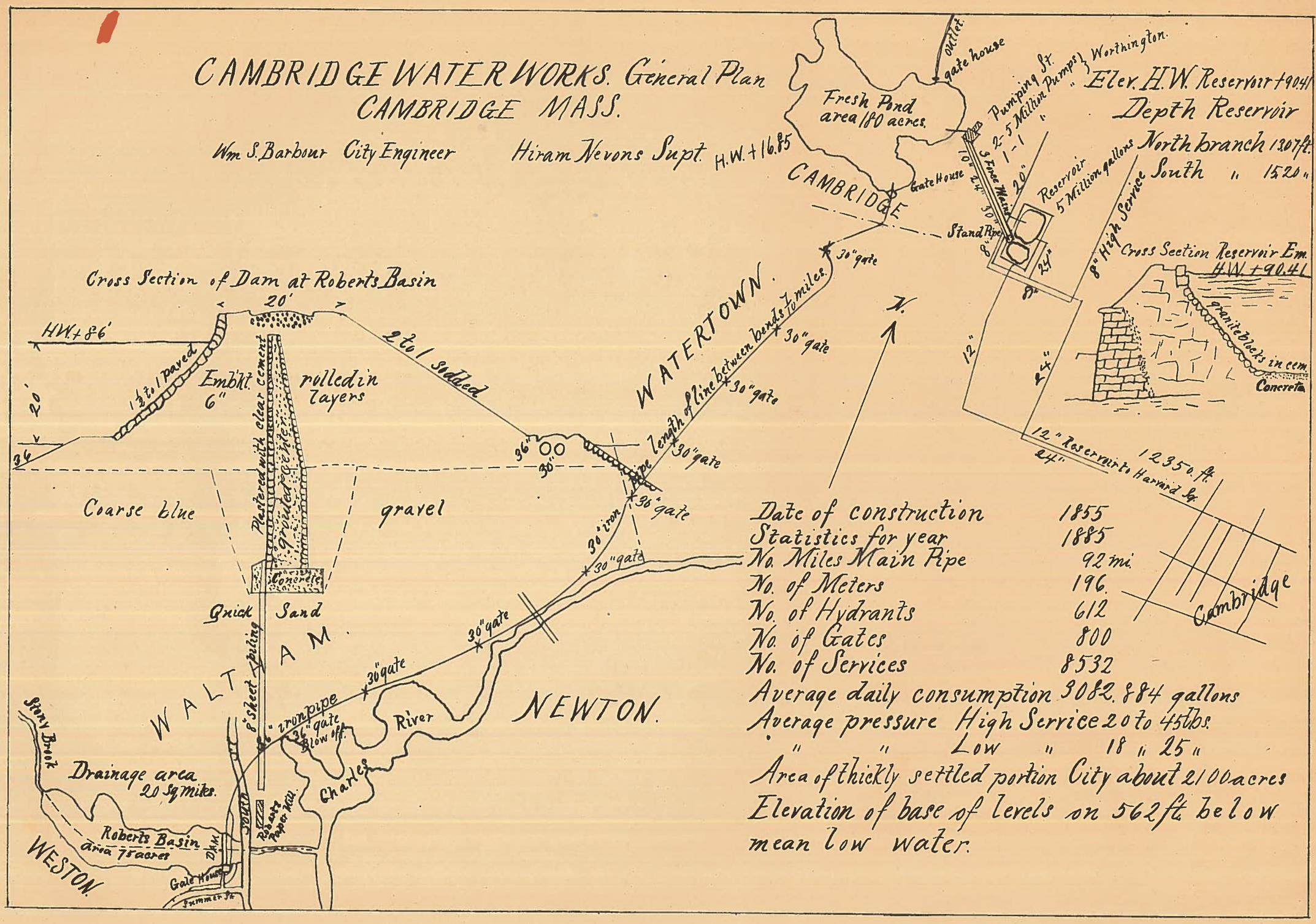
Regular System of Sewerage,

8.4 Miles Built.

PLATE II.

CAMBRIDGE WATER WORKS. General Plan
CAMBRIDGE MASS.

Wm S. Barbour City Engineer Hiram Nevons Supt. H.W. +16.85



Date of construction	1855
Statistics for year	1885
No. Miles Main Pipe	92 mi.
No. of Meters	196.
No. of Hydrants	612
No. of Gates	800
No. of Services	8532

Average daily consumption 3082.884 gallons
Average pressure High Service 20 to 45 lbs.
" " Low " 18 " 25 "
Area of thickly settled portion City about 2100 acres
Elevation of base of levels on 562 ft. below mean low water.

PLATE III.

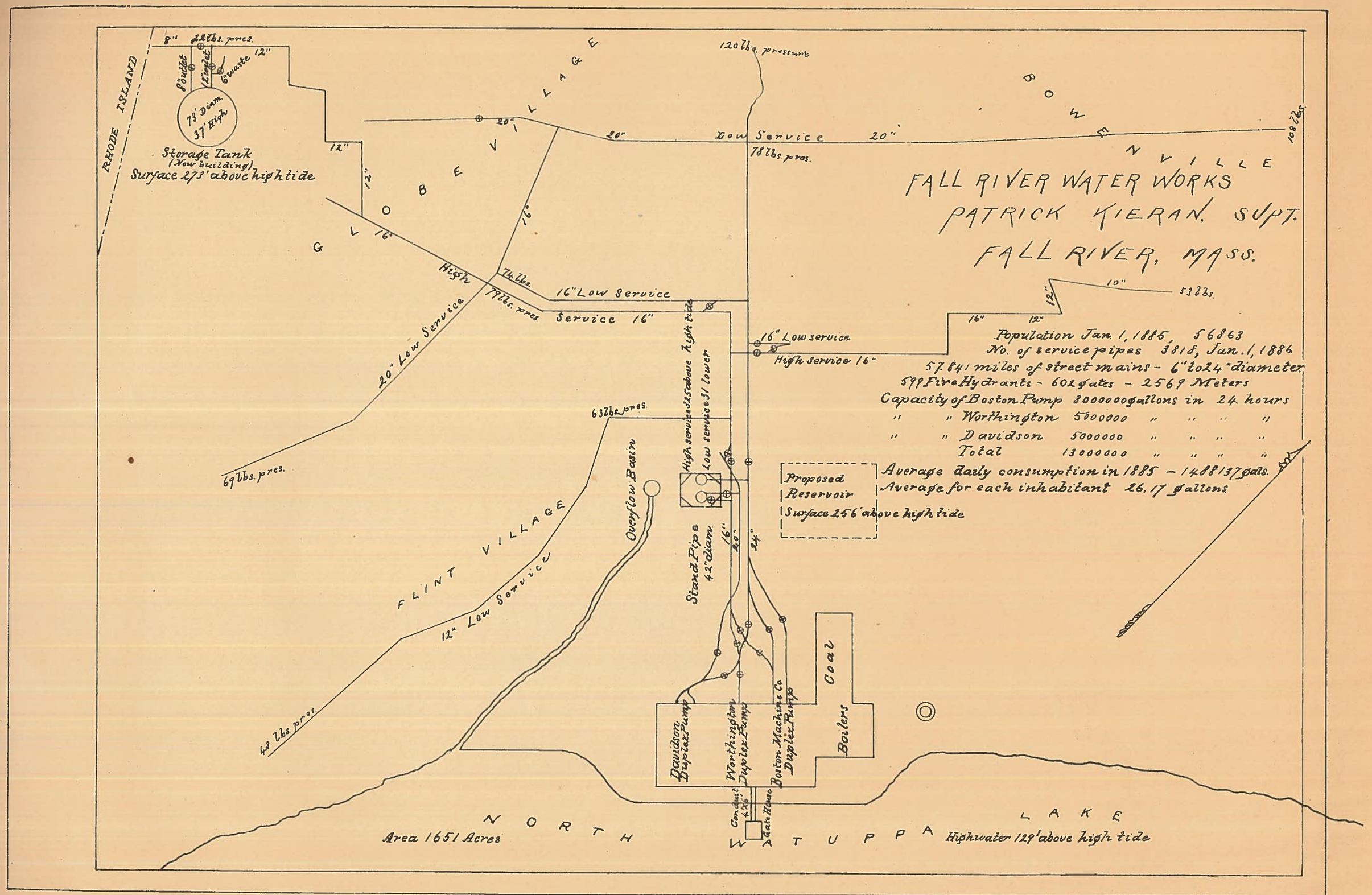

FALL RIVER WATER WORKS
PATRICK KIERAN, SUPT.
FALL RIVER, MASS.
Population Jan. 1, 1885, 56863
No. of service pipes 3815, Jan. 1, 1886
57.841 miles of street mains - 6" to 24" diameter
599 Fire Hydrants - 602 gates - 2569 Meters
Capacity of Boston Pump 3000000 gallons in 24 hours
" " Worthington 5000000 " " " "
" " Davidson 5000000 " " " "
Total 13000000 " " " "
Average daily consumption in 1885 - 1488137 gals.
Average for each inhabitant 26.17 gallons
Proposed Reservoir
Surface 256' above high tide
Storage Tank (Now building)
Surface 273' above high tide
73' Diam. 37' High
8" Outlet
12" Inlet
6" Waste
22 lbs. pres.
RHODE ISLAND
GLOBE VILLAGE
BOWENVILLE
120 lbs. pressure
20" Low Service
78 lbs. pres.
108 lbs.
12"
16"
74 lbs.
79 lbs. pres
16" Low Service
High Service 16"
20" Low Service
53 lbs.
10"
12"
16" Low service
High Service 16"
63 lbs. pres.
69 lbs. pres.
FLINT VILLAGE
12" Low Service
42 lbs pres
Overflow Basin
High service 25' above high tide
Low service 31' lower
Stand Pipe 42" diam.
16"
20"
24"
Davidson Duplex Pump
Worthington Duplex Pump
Boston Machine Co Duplex Pump
Coal
Boilers
Conduit 4'x5'
Main
Gate House
NORTH WATUPPA LAKE
Area 1651 Acres
High water 129' above high tide

PLATE IV.

GENERAL PLAN FITCHBURG WATER WORKS.

T. C LOVELL, SUPT.
FITCHBURG, MASS.

Date of Construction 1879.
Designed by George Raymond.

Statistics for year ending Dec. 1st 1886.

No. miles pipe	33 52/100.
No. hydrants.	245
No. gates	201
No. services	1999
No. meters	453
Av. daily consumption	1,000,000 gals.

Area 35 Acres.
Cap. 210.000 000 gals.
Dam 45' high.
450' above City
Water Shed 500 Acres.

Scott Res.r.

24" Brick Conduit 7800

14" Cement Pipe 8600 ft.

Dam 23' high

Overlook Reservoir

High Service Res.
Cap. 60,000,000 gals
Area 13 Acres. Dam 43' high.
400' above City.

1000' 12" C.I. Pipe
1000' 16" Cement Pipe

Low Service Res.
Cap. 1.000,000 gals.
200' above City.

Shattuck Brook.

Gowen Brook

Billings Brook

Falulah Res.
Cap. 20.000.000 gals.
237 ft. above City.
Water Shed 2800 Acres.

16" C.I. Pipe 13000 ft.

Fox Hill
About 300 Acres
60 lbs press.

16" Main
10" Main High Service

10" Main
High Service

8" Main
High Service

WEST FITCHBURG
Abt. 300 Acres
110 lbs. press.

NASHUA RIVER

16" Main Low Service

FITCHBURG
City Area abt. 600 Acres
80 lbs. press.

8" Main
High Service

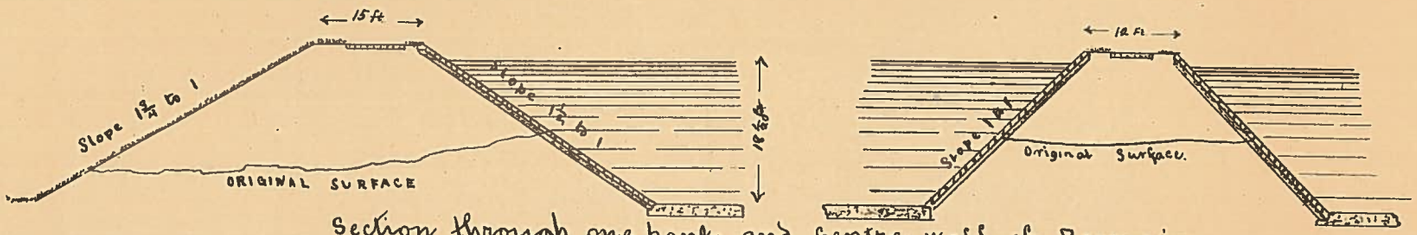
Hales Hill
Area 200 Acres.
80 lbs. press.

PLATE V.

Knoxville Water Works Knoxville Tenn.

Owned by a Stock Company

Constructed 1882-3.
Water turned on May. 83.,



Section through one bank and Centre wall of Reservoir

The Reservoir is built upon a hill in Eastern portion of the city and occupies the site of what was during "the late unpleasantness", an Extensive Earth work.

The hill is composed of the red clay of the country resting upon a foundation of limestone, cavernous and unstable ground

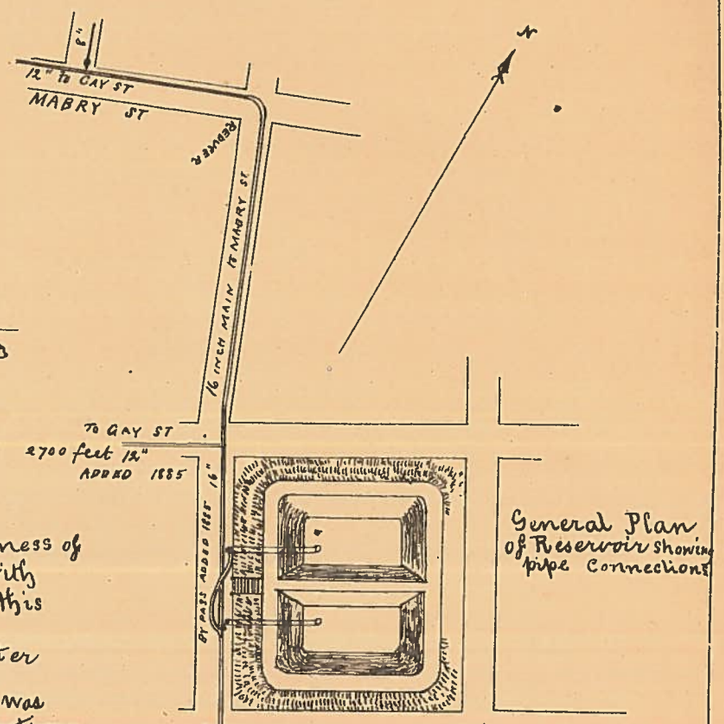
Excavation was made in the original, and the material taken out used for the embankments. Work was done by contract and about all the packing the banks received was from the teams transporting the clay. The inner slopes were faced up with a foot thickness of the same clay, put on in layers and tramped, they were then dressed down and covered with about 3 inches of broken stone, grouted with 1 part Louisville Cement to 2 parts sand, on this bricks were loosely laid on their edges, and brushed over with a thin coat of Cement. The bottom was concreted to a depth of 18" with the same cement, sand and stone. The outer slopes were left unsodded and the tops unpaved.

Soon after the water was let on, the corner of one reservoir went in, and in 5 minutes it was emptied into the caverns below. Repairs were made, but the same result occurred from time to time up to May 1884. When the eighth break was repaired. At that time only 6 to 8 ft. of water was being Carried

In June 1884 the management was changed, and the works generally reconstructed The reservoirs were repaired as well as possible without rebuilding entirely. The bricks were taken off and relaid in Cement mortar and the whole interior surfaces treated with a trowel coat of cement mortar from ½ to ¾ inch thick using Olsen's German Portland, and finished off with a thin smooth trowel coat of pure cement of same make.

The outer banks were sodded, and tops powed sloping inwardly. Since Nov. 1884 they have been worked to their full capacity without any sign of leakage from within, the prevailing fear is of disintegration from outside water leaking in

The pumps at pump station are at the bottom of a pit 30 ft deep, it was found necessary to take them up and reset them on secure foundations



General Plan of Reservoir showing pipe Connections

Constructed in 1882-3 by Contract from modified plans of Moses Soane.

No. miles of cast iron pipe, from 4 to 16" diam.		12 +
" " " Wrought " " " 1 " 3½ "		3 +
" Hydrants, double nozzle.		15.
" " Single "		77.
" Gates, including those at reservoir.		44
" Services,		627
" Hydraulic elevators.		8.

The average daily consumption is about 850,000 galls — Population of city including thickly settled lands outside the limits, reached by water mains, Estimated at 32,000 — The country is hilly and the pressure varies from 23 to 80. pounds — The business portion is S.E. of reservoir. dist about 2200 ft. and is now supplied through 2 - 12" pipes as seen in plan —

A.H. Martine - Supt

The Pumping Station contains
2 M.T. Davidson. Compound Condensing Engines of 1500,000 gallons Capacity each in 24 hours
2 Horizontal Tubular boilers 16 ft. by 54 inches, with 50, 3 in tubes each.

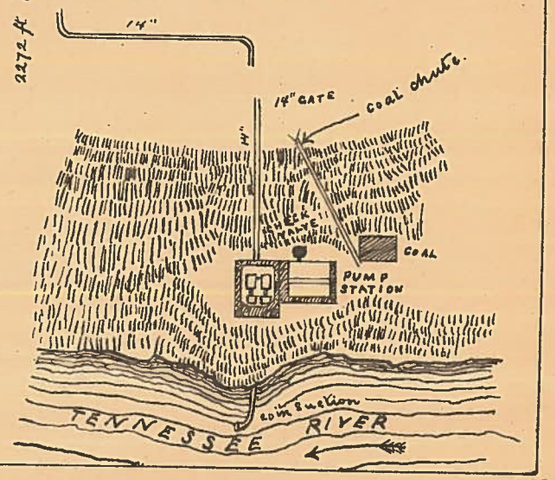
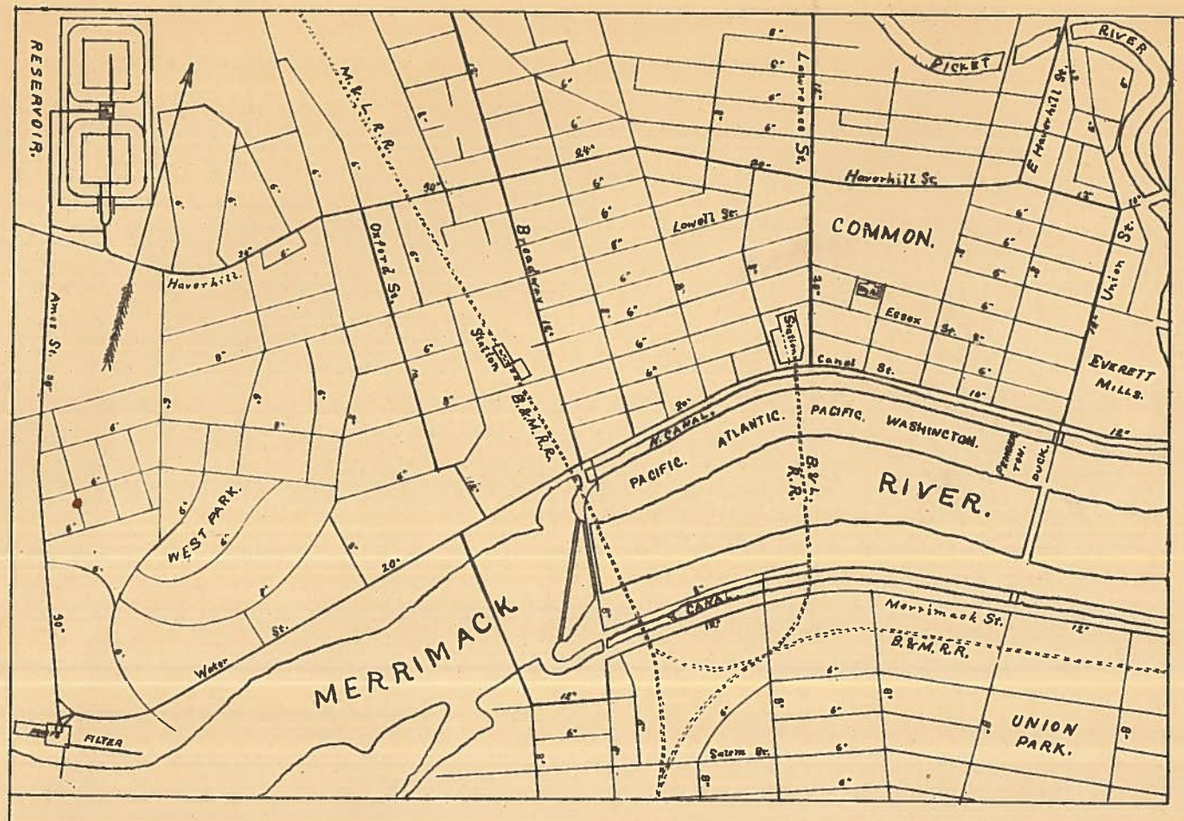
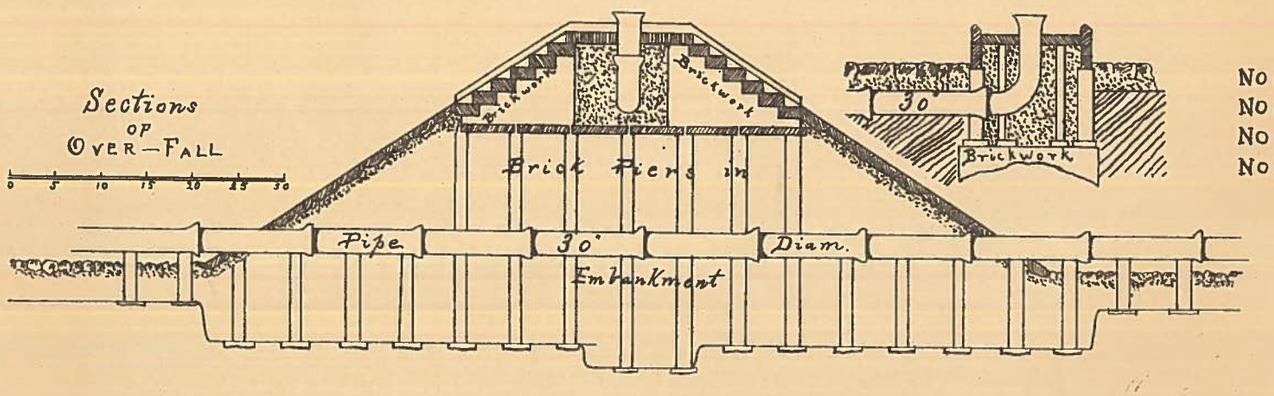


PLATE VI.





GENERAL PLAN LAWRENCE WATER WORKS.

LAWRENCE, MASS.

HENRY W. ROGERS, SUPT.

GENERAL STATISTICS.

Date of construction 1873. Preliminary plans designed by L. Fred.Rice, Boston, Mass. Constructed under direction of W.F. McConnell as Engineer and Jas.P.Kirkwood as Consulting Engineer.

PUMPING STATION.

Conduit, river to pump well, 170feet long. Pumping engines built by I.P.Morris & Co. from designs of E.D. Leavitt Jr. 2 compound beam engines coupled to same crank shaft carrying fly wheel weighing 18 tons (Diam. 30 Ft.) Capacity of each engine 200000 Gals.per hour, with speed 16 rev. per minute. Chimney is 183 ft.in hight above floor line.

Coal room has a capacity of 800 tons. Roof being at grade, coal is dumped through scuttles saving all cost of trimming.

See Vol.I No.2 Journal N.E.W.W.A. for detailed history of the works.

STATISTICS for YEAR ENDING DEC. 31, 1886.

No. of miles main pipe	52 (6 to 30inch Diam.)
No. of hydrants (Lowry)	490
No. of gates	640
No. of services	4300

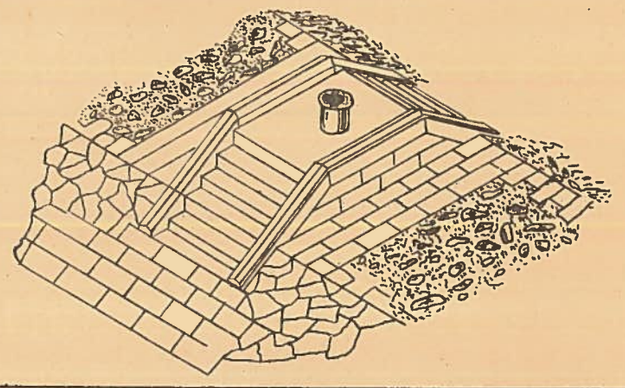


PLATE VII.

GENERAL PLAN OF MANCHESTER WATER WORKS.

CHARLES K WALKER Supt.
MANCHESTER N.H.

Wood Penstock. 6 feet clear internal diameter constructed of Georgia pine staves, four inches thickness. laid in place so as to break joints in a continuous tube hooped every 18" with screw-bolt wrought iron hoops

Date of Construction 1872
Miles of Main Pipe 46
No. of Hydrants 389
" " Gates 332
" " Services 2620
" " Meters 500

Average Daily Consumption 1.500,000 gals.
Water pumped to Reservoir by water power.
45 ft. head on water wheels.
Two wheels 125 H.P. each.
Lift 113 ft. Surface of LAKE to RESERVOIR

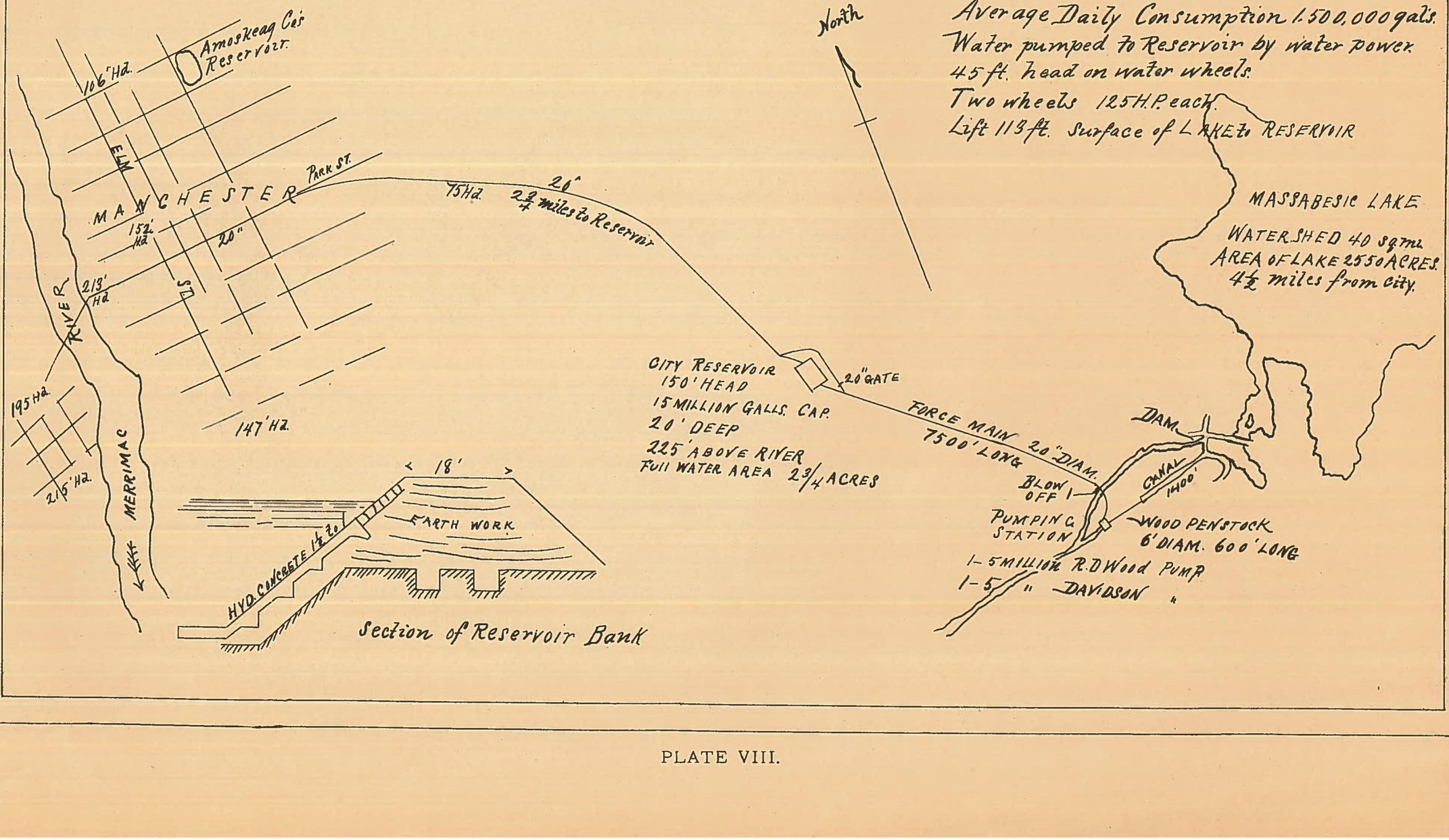
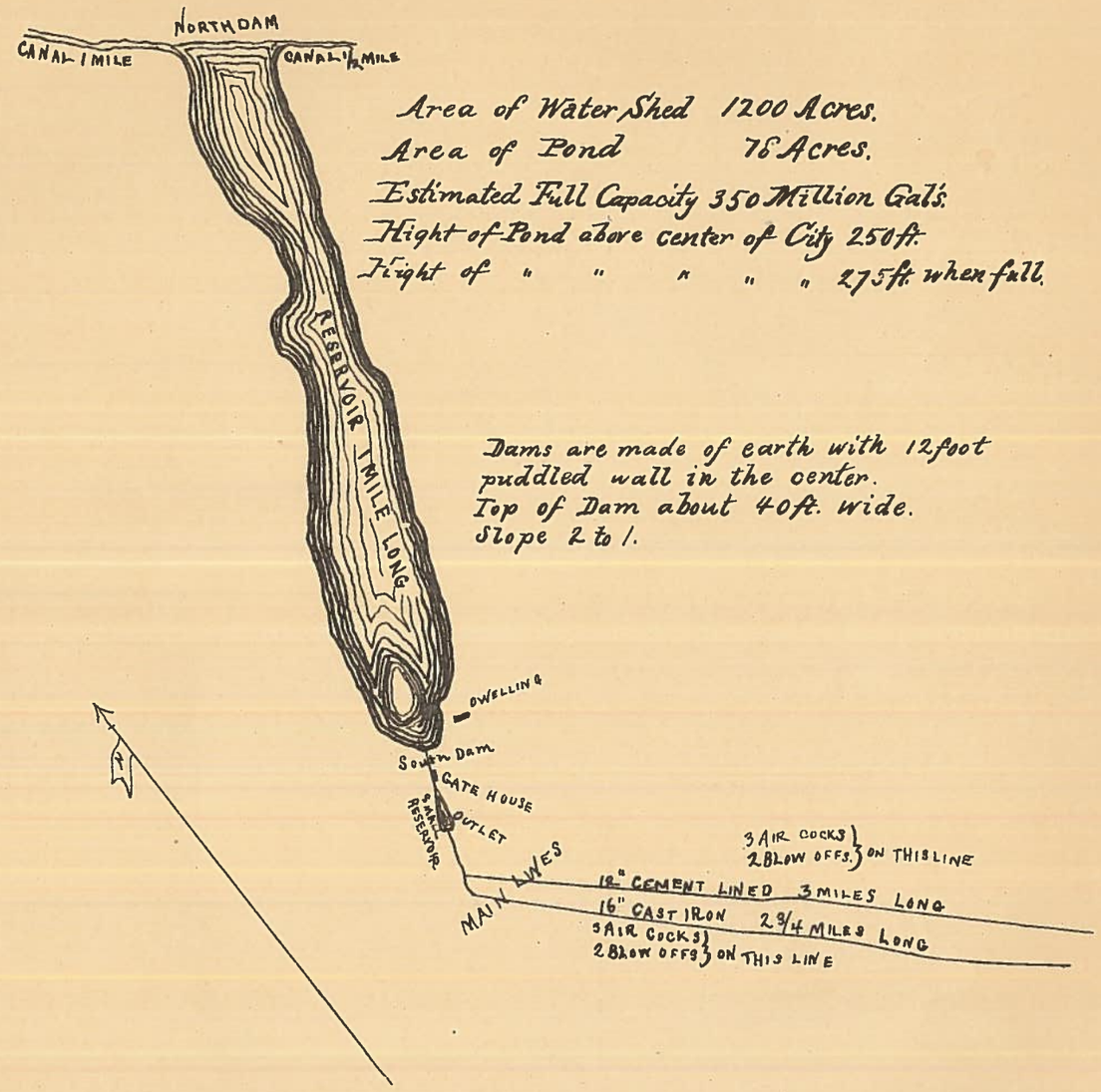


PLATE VIII.

GENERAL PLAN MERIDEN WATER WORKS.

H. L. SCHLEITER. Supt.
MERIDEN, CONN.



Area of Water Shed 1200 Acres.
Area of Pond 78 Acres.
Estimated Full Capacity 350 Million Gals.
Hight of Pond above center of City 250 ft.
Hight of " " " " " 275 ft. when full.

Dams are made of earth with 12 foot puddled wall in the center.
Top of Dam about 40 ft. wide.
Slope 2 to 1.

Date of Construction 1869.
Designed by Geo. W. Bishop

STATISTICS FOR YEAR ENDING DEC. 31ST 1885

No. of Miles of Main Pipe	abt. 30.
No. of Hydrants	193
No of Gates.	160
No. of Services	abt 2800
No of Meters in use	65
Average Daily Consumption	1.200,000 gals.
Population	20,000
Water Takers. no of families	3,500
" " manfrs.	45
Cost of Works	$400,000.
Water Receipts per year	$45,000.

There is no regular system of sewerage for the city.

Our system is Gravity.
Highest Pressure 120 lbs.
Lowest " 40 ".

PLATE IX.

MIDDLETOWN WATER WORKS.

— GENERAL PLAN —

JOHN C. BROATCH, SUPT.
MIDDLETOWN, CONN.

DATE OF CONSTRUCTION, 1866.
DESIGNED BY GEO. H. BISHOP, C.E.

STATISTICS FOR YEAR ENDING DEC 31ST, 1885

NUMBER OF MILES OF MAIN PIPE, 18 70 MILES
" " HYDRANTS, 95
" " GATES. 112
" " SERVICES, 1150
ESTIMATED, AVERAGE DAILY CONSUMPTION 750,000, GALLS

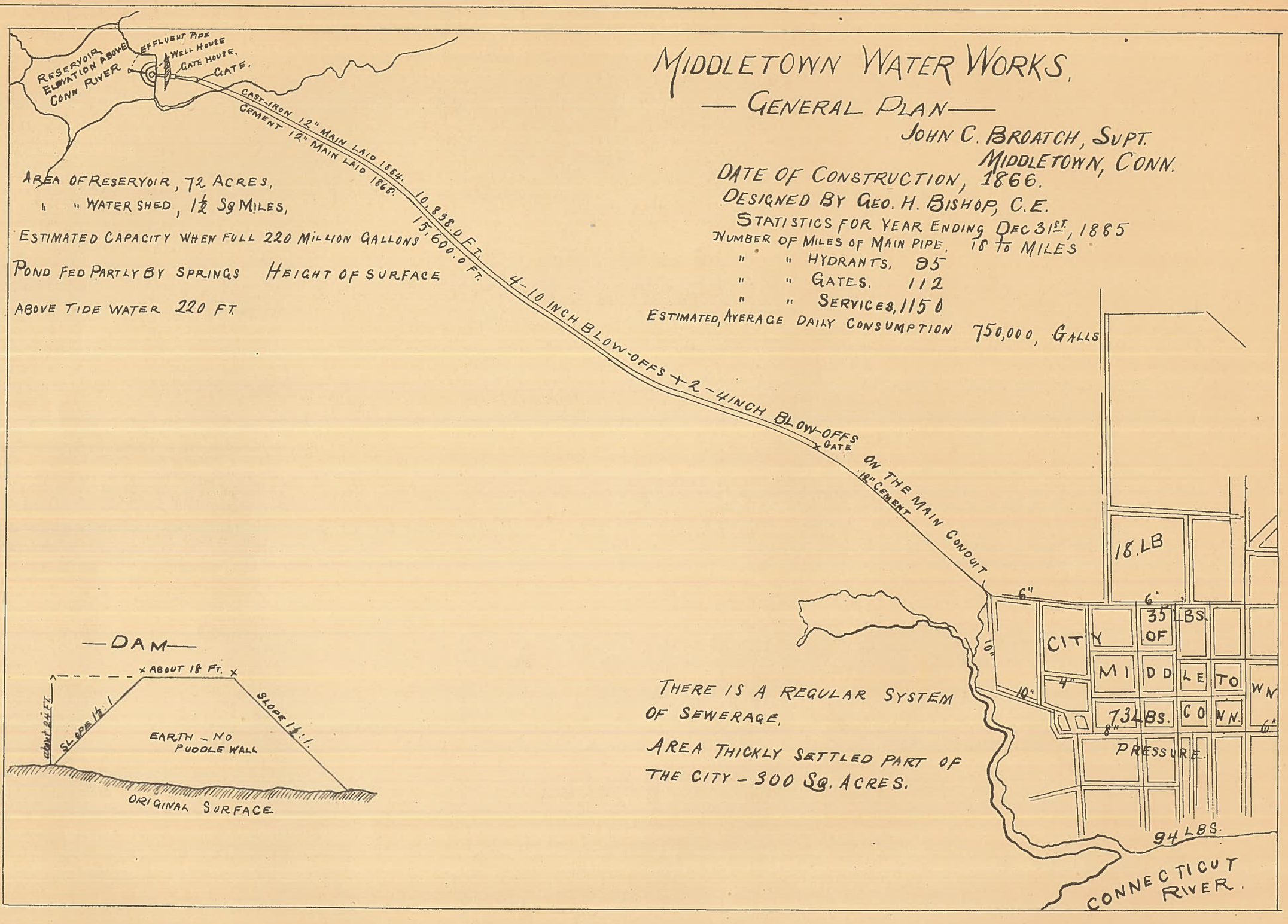


PLATE X.

MILFORD WATER WORKS,

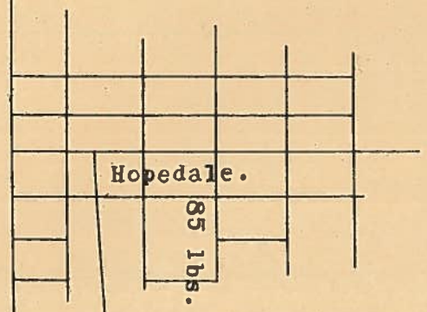
MILFORD, MASS.

WM. H. BARNEY, SUPT.

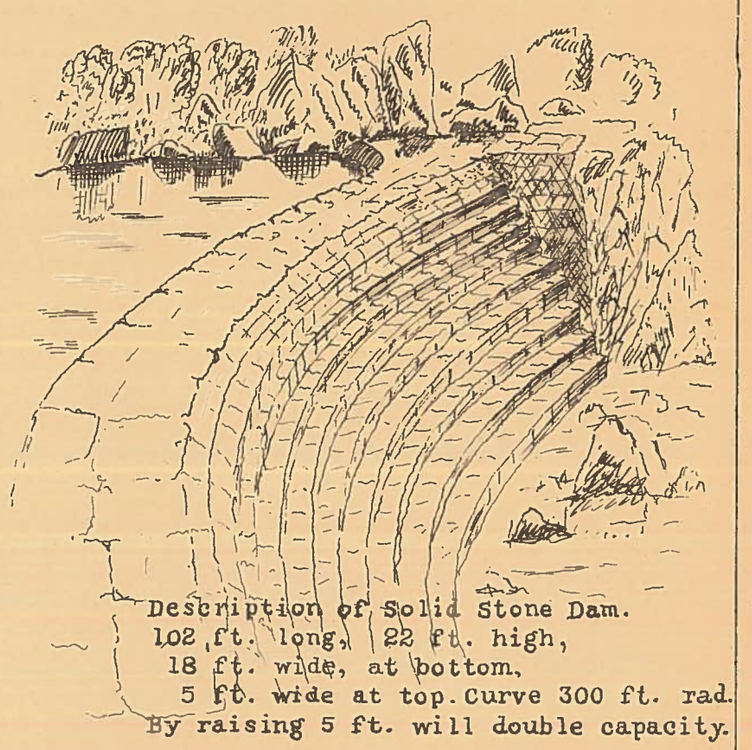
Date of Construction 1881.
Moses Joy, Jr., Engineer.

No. Miles of Mains,	15
No. of Hydrants,	76
No. of Gates,	57
No. of Services,	547
No. of Takers,	887
No. of Motors,	1

Average Consumption 300,000 Gallons.
No system of sewerage.



Proposed Site of Reservoir
180 ft. above
Charles River.
Capacity 1,500,000.



Description of Solid Stone Dam.
102 ft. long, 22 ft. high,
18 ft. wide, at bottom,
5 ft. wide at top. Curve 300 ft. rad.
By raising 5 ft. will double capacity.

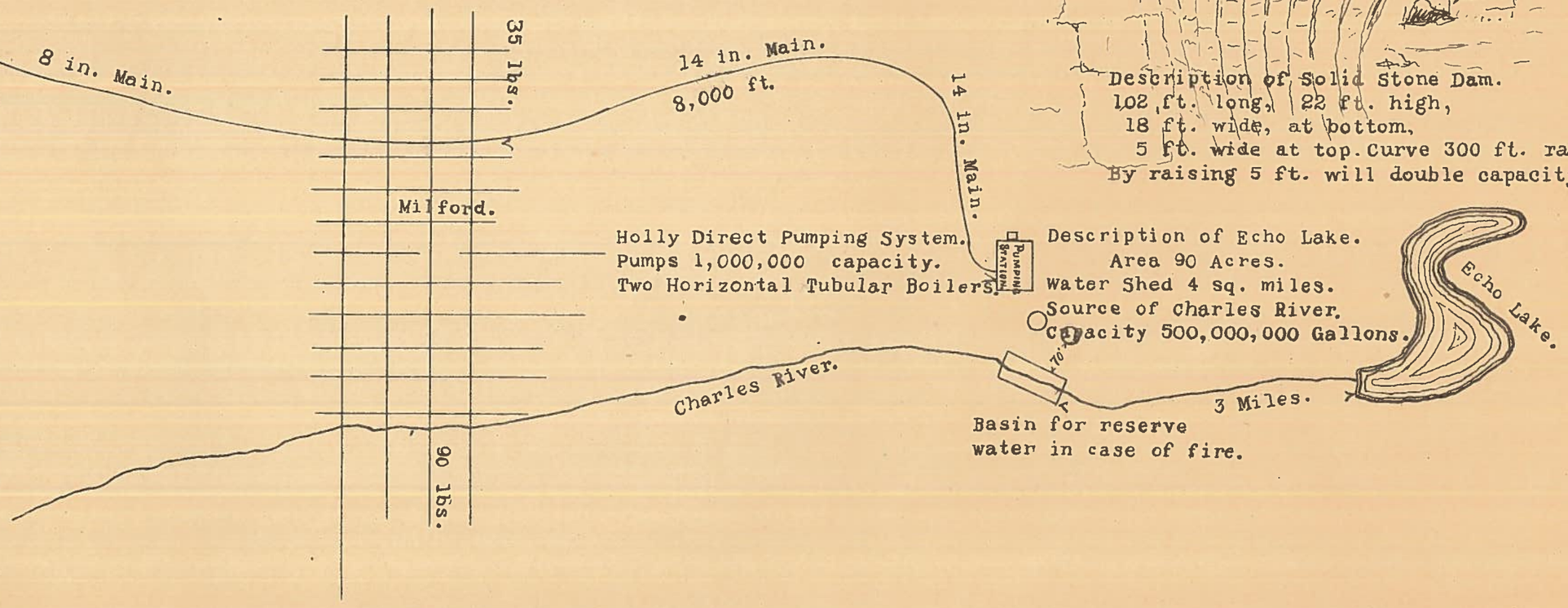


PLATE XI.

Wannacomet Water Works

Wm E Codd Supt.

Nantucket Mass.

Date of Construction 1878

Designed by Moses Joy, Jr.

Dec. 31, 85

No. Miles Main pipe	7
No. Hydrants.	31
No. Gates	37
No. Services	390
Av. daily consumption	50,000 gals.

Pond
Area 8 Acres
Elevation above mean low water 5 ft. at lowest stage. —
Rise & fall about 2 ft.

Tank
Well

1-Worthington pump 1½ M-galls.
1-Duplex Blake "
2-Hor. tubular boilers

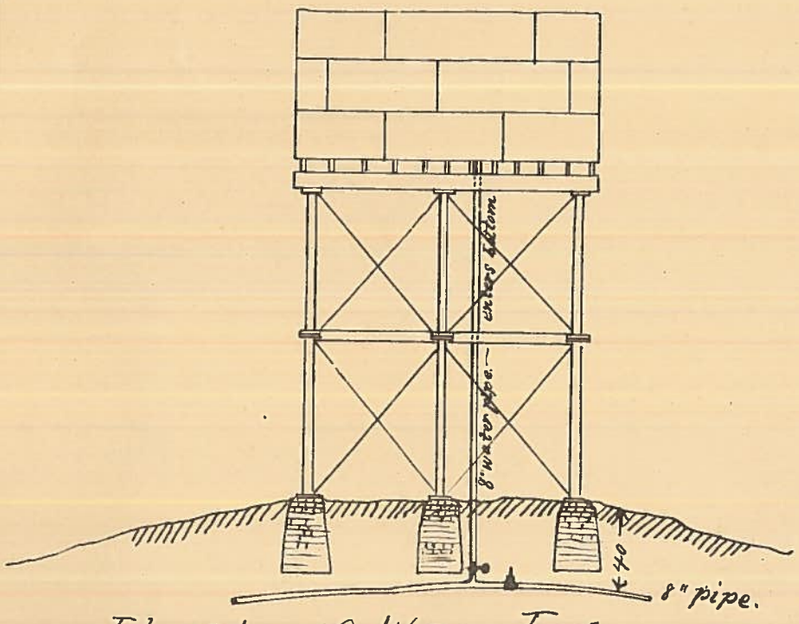
Engine House.—

8" cast iron pipe 11000 ft. to town.

406 ft. Pond to Tank

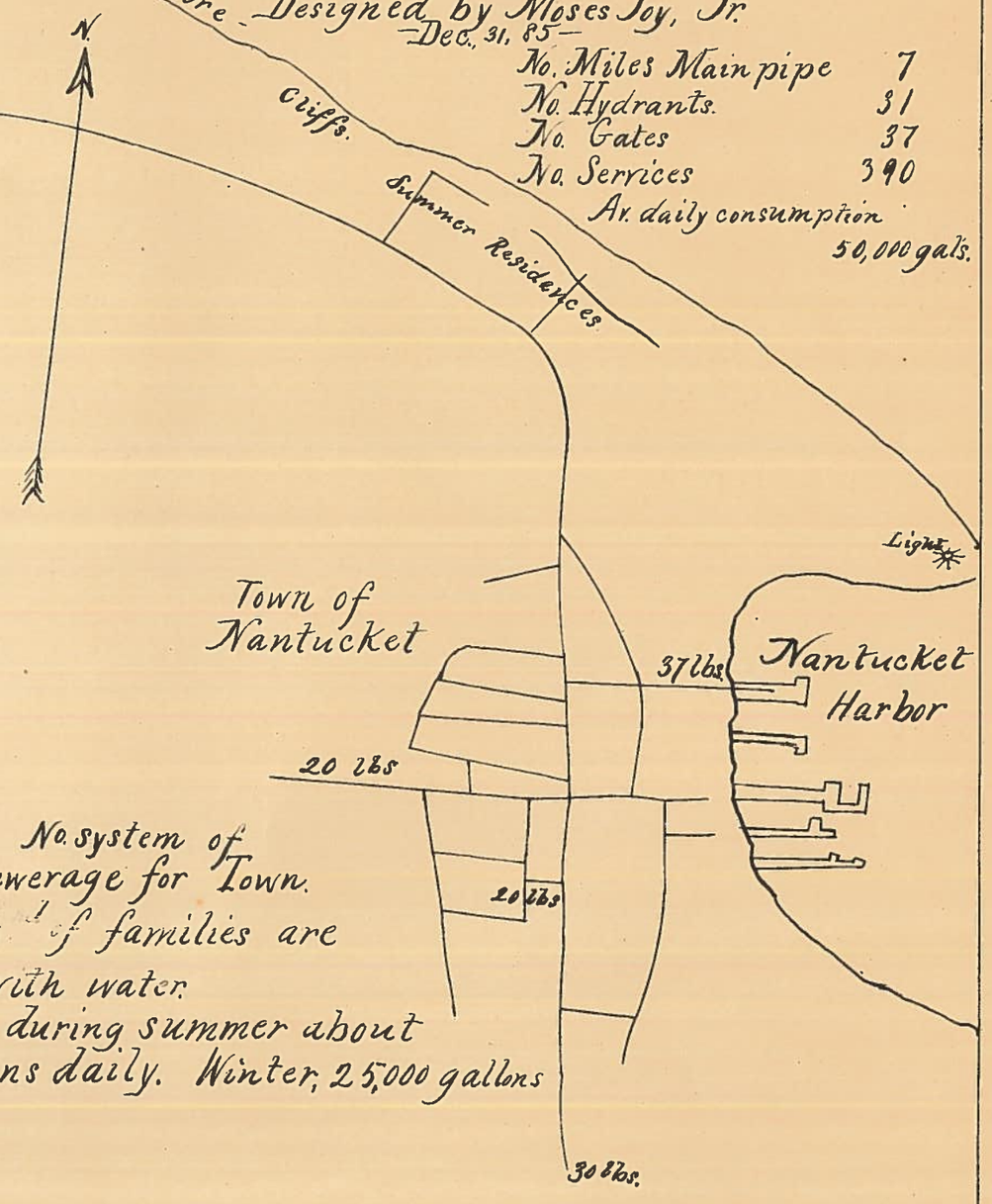
Tank.
50,000 gallons
Stands on Hill 63 ft. high
Tank is shut off for fire pressure

Water shed about 25 Acres
No buildings (dwellings) on water shed.
Pond fed partly by springs
Water very pure.



Elevation of Water Tank

Tank - 24 ft. diam 15 ft. high. - of ¼" boiler iron
Trestle - 27 ft. high 9 cast iron columns
Top of Tank. - 104 ft. above mean low water
Tank not covered on top. —
Stand pipe into tank bored and packed to prevent freezing.



No system of Sewerage for Town.

About ⅓ of families are supplied with water.

Consumption during summer about 100,000 gallons daily. Winter, 25,000 gallons

PLATE XII.

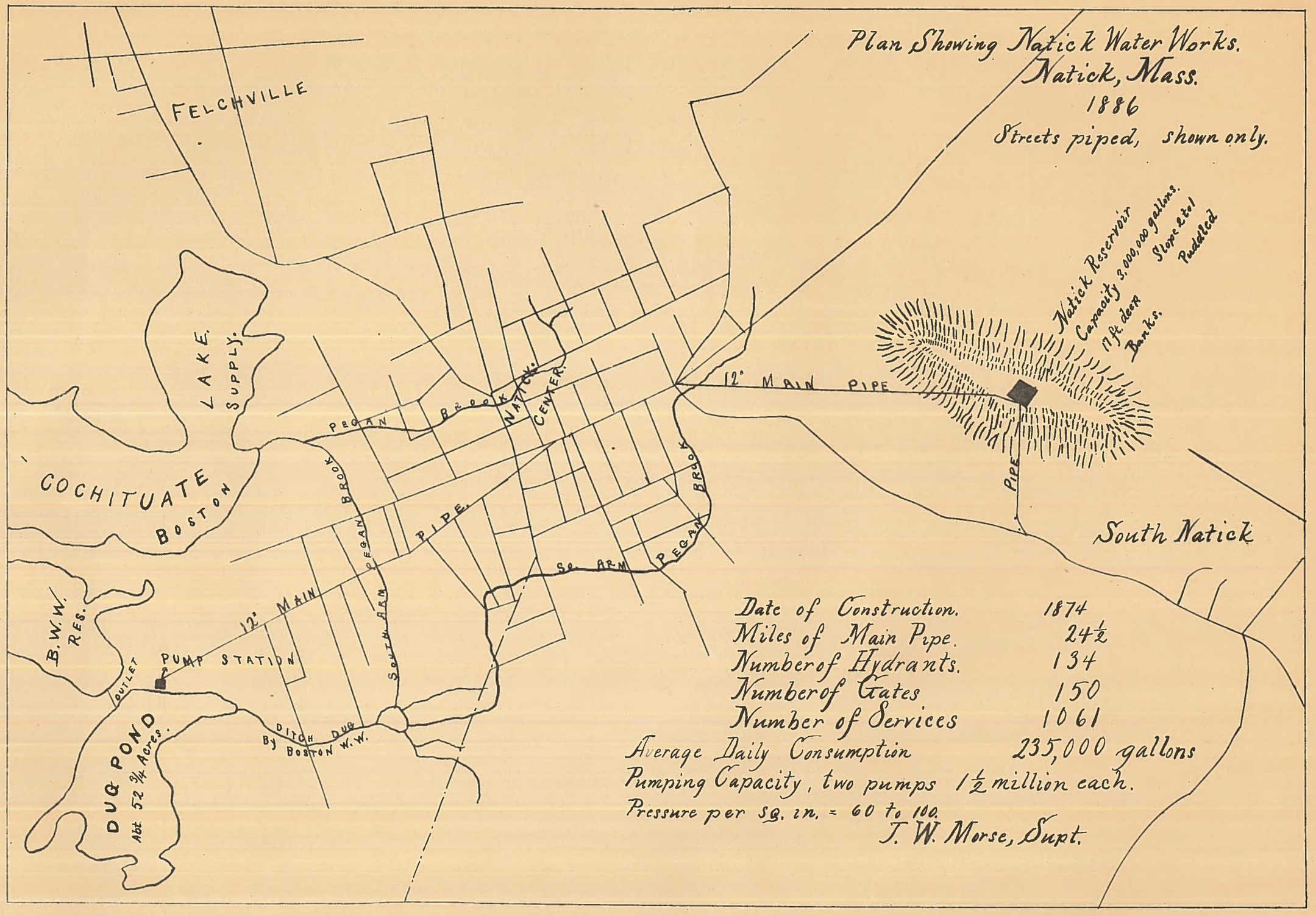

Plan Showing Natick Water Works.
Natick, Mass.
1886
Streets piped, shown only.
FELCHVILLE
LAKE SUPPLY.
COCHITUATE
BOSTON
PEGAN BROOK
NATICK CENTER
12" MAIN PIPE
Natick Reservoir
Capacity 3,000,000 gallons.
17 ft. deep
Stone & tol
Puddled
Banks.
PEGAN BROOK
PIPE
South Natick
SOUTH ARM PEGAN BROOK PIPE
SE. ARM PEGAN
12" MAIN
B.W.W. RES.
PUMP STATION
OUTLET
DITCH DUG By BOSTON W.W.
DUG POND
Abt. 52 3/4 Acres.
Date of Construction. 1874
Miles of Main Pipe. 24½
Number of Hydrants. 134
Number of Gates 150
Number of Services 1061
Average Daily Consumption 235,000 gallons
Pumping Capacity, two pumps 1½ million each.
Pressure per sq. in. = 60 to 100.
J. W. Morse, Supt.

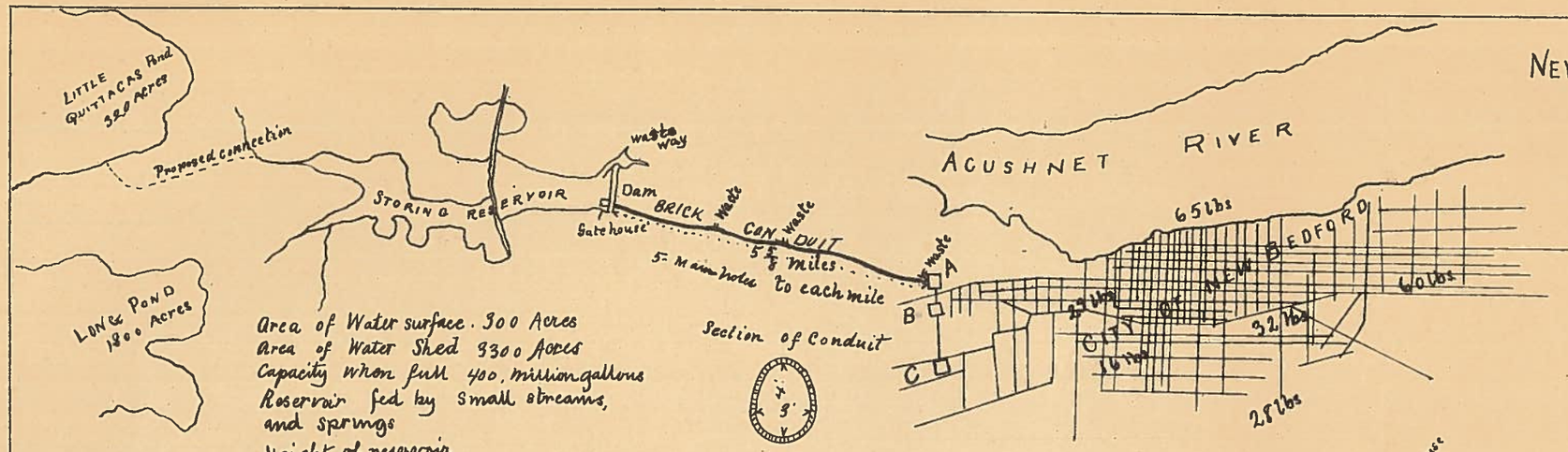
PLATE XIII.

NEW BEDFORD WATER WORKS

GENERAL PLAN

R. C. R Coggeshall Supt.

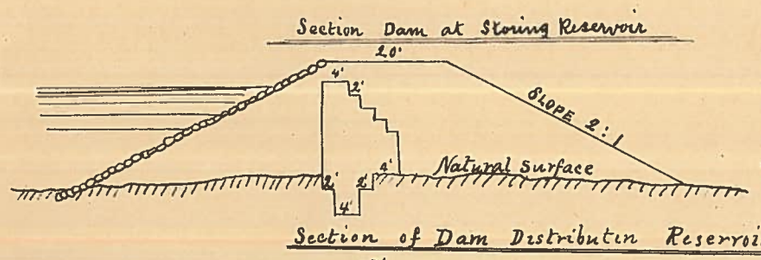
Population 1885 = 33392
Date of Construction 1866 to 1869
Owned by the City of New Bedford
By whom designed
W. J. McAlpine Consulting Eng.
Geo A. Briggs Chf. Eng.

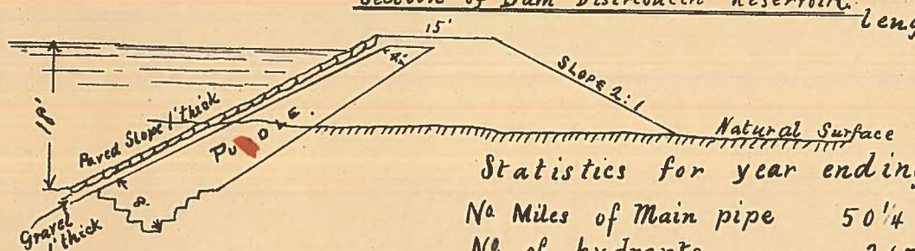


Area of Water surface. 300 Acres
Area of Water Shed 3300 Acres
Capacity when full 400 million gallons
Reservoir fed by small streams and springs
Height of reservoir above tide water = 40 feet

Section of Conduit

Grade of Conduit
0.58' per mile



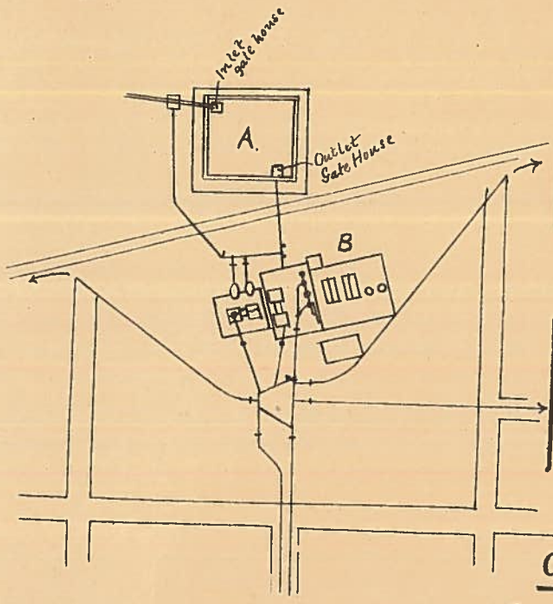


There are two force mains leading from the pumping station to the distributing Reservoir:
one 16" diameter
one 30" "
length of each about 1900 feet

Statistics for year ending November 30, 1885

No Miles of Main pipe	50 1/4 miles
No. of hydrants	367
No. of gates	475
No. of Services	4965
No of Meters	67

There is a regular system of sewer
Area of thickly settled portion of City about 1300 Acres



A = Receiving Reservoir

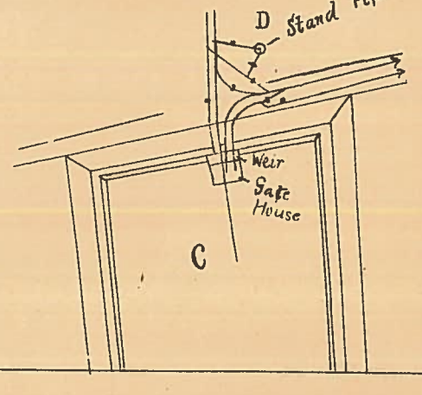
Depth when full = 12'
When full height above tide — 30'
Capacity 3 million gallons

B = Pumping Station

containing
1 - 3 Million Mc Alpine Engine
1 - 3 " Worthington "
1 - 5 " " " "
4 horizontal tubular boilers
2 Vertical " "

C = Distributing Reservoir

Depth when full = 18'
Heighth when full above tide = 154.8
Water Area when full = 3 1/2 Acres
Capacity 15 Million gallons



D = Stand Pipe

Diameter = 5 ft
Height of top above tide 187'

PLATE XIV.

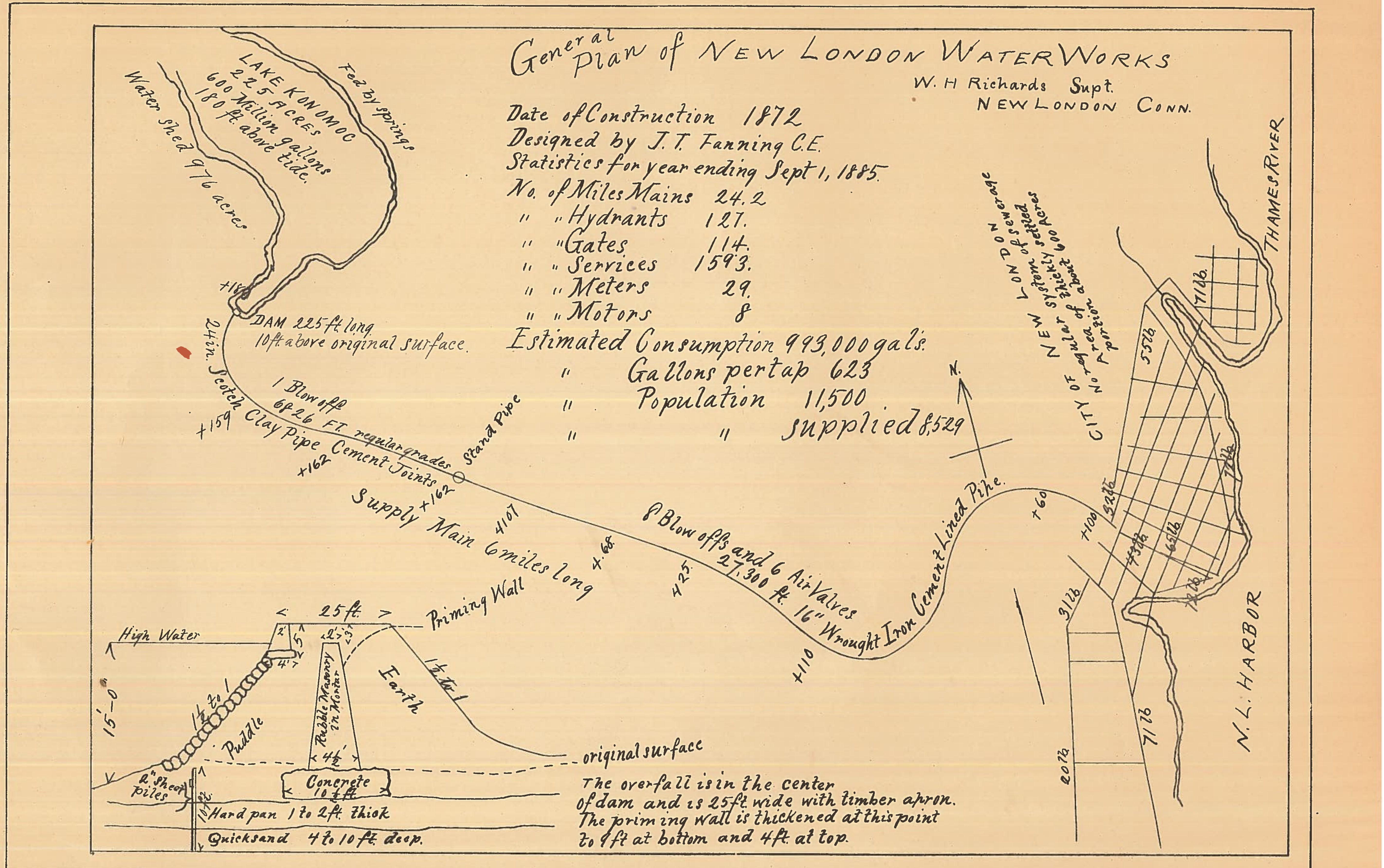
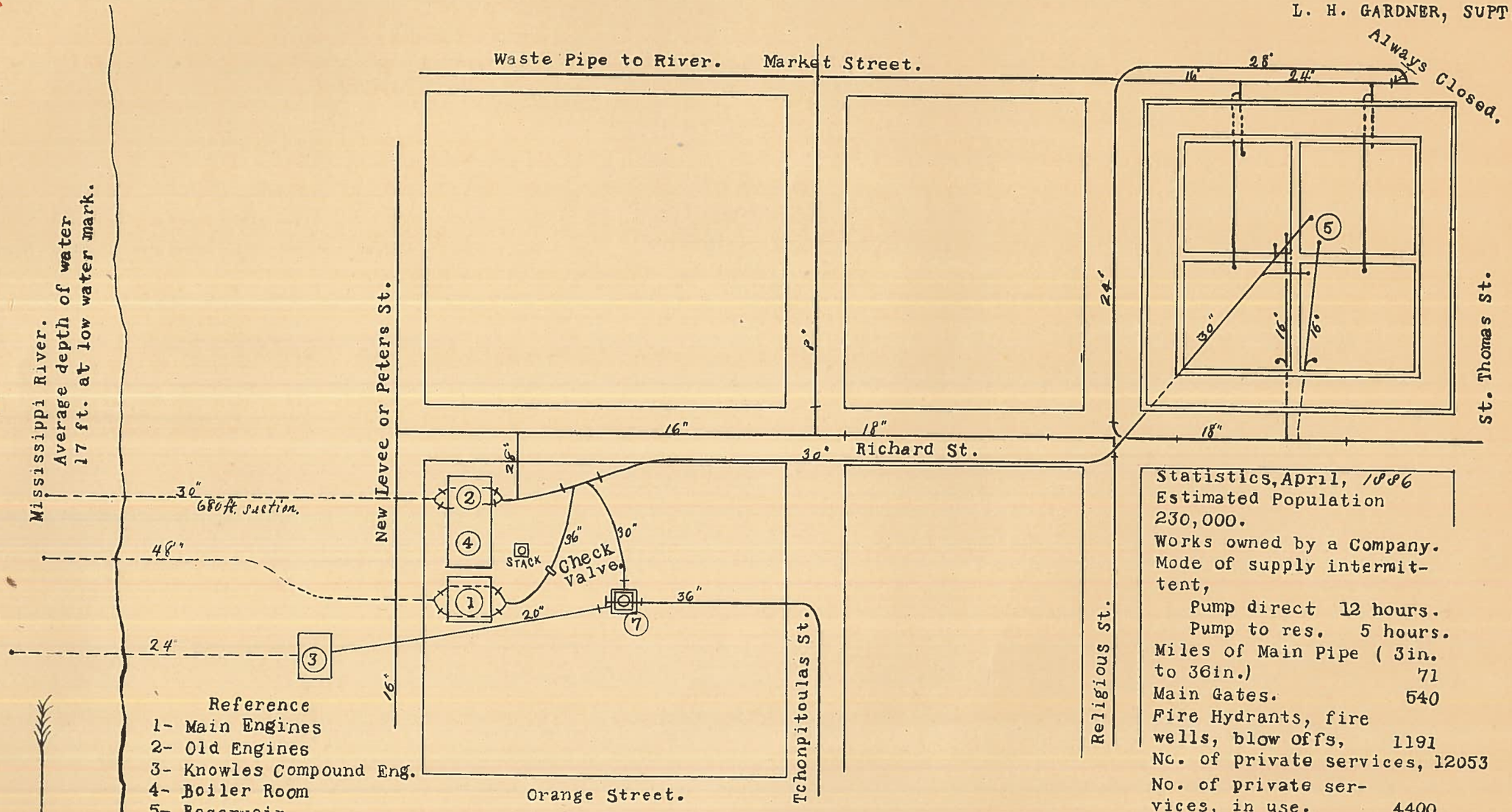

General Plan of New London Water Works
W. H Richards Supt.
New London Conn.
Date of Construction 1872
Designed by J. T. Fanning C.E.
Statistics for year ending Sept 1, 1885.
No. of Miles Mains 24.2
" " Hydrants 127.
" " Gates 114.
" " Services 1593.
" " Meters 29.
" " Motors 8
Estimated Consumption 993,000 gals.
" Gallons per tap 623
" Population 11,500
" " supplied 8,529
Lake Konomoc 225 acres 600 Million gallons 180 ft. above tide.
Fed by springs
Water shed 976 acres
DAM 225 ft. long 10 ft. above original surface.
24 in. Scotch Clay Pipe Cement Joints
1 Blow off
6826 FT. regular grades
Stand Pipe
Supply Main 6 miles long
8 Blow offs and 6 Air Valves
27,300 ft. 16" Wrought Iron Cement Lined Pipe.
N.
City of New London
New system of sewerage
No regular thickly settled portion about 600 acres
Thames River
N. L. Harbor
25 ft.
Priming Wall
High Water
15'-0"
1½ to 1
Puddle
Rubble Masonry in Mortar
Earth
Concrete 10 ft.
original surface
2" Sheet piles
Hard pan 1 to 2 ft. thick
Quicksand 4 to 10 ft. deep.
The overfall is in the center of dam and is 25 ft wide with timber apron.
The priming wall is thickened at this point to 9 ft at bottom and 4 ft. at top.

PLATE XV.

GENERAL PLAN NEW ORLEANS WATER WORKS

NEW ORLEANS, LOUISIANA.

L. H. GARDNER, SUPT.



Reference
1- Main Engines
2- Old Engines
3- Knowles Compound Eng.
4- Boiler Room
5- Reservoir
7- Stand Pipe
6 ft. diameter at Base
4 ft. diameter at Top.
150 ft. high, boiler iron double riveted.

Statistics, April, 1886
Estimated Population 230,000.
Works owned by a Company.
Mode of supply intermittent,
Pump direct 12 hours.
Pump to res. 5 hours.
Miles of Main Pipe (3in. to 36in.) 71
Main Gates. 540
Fire Hydrants, fire wells, blow offs, 1191
No. of private services, 12053
No. of private services, in use. 4400

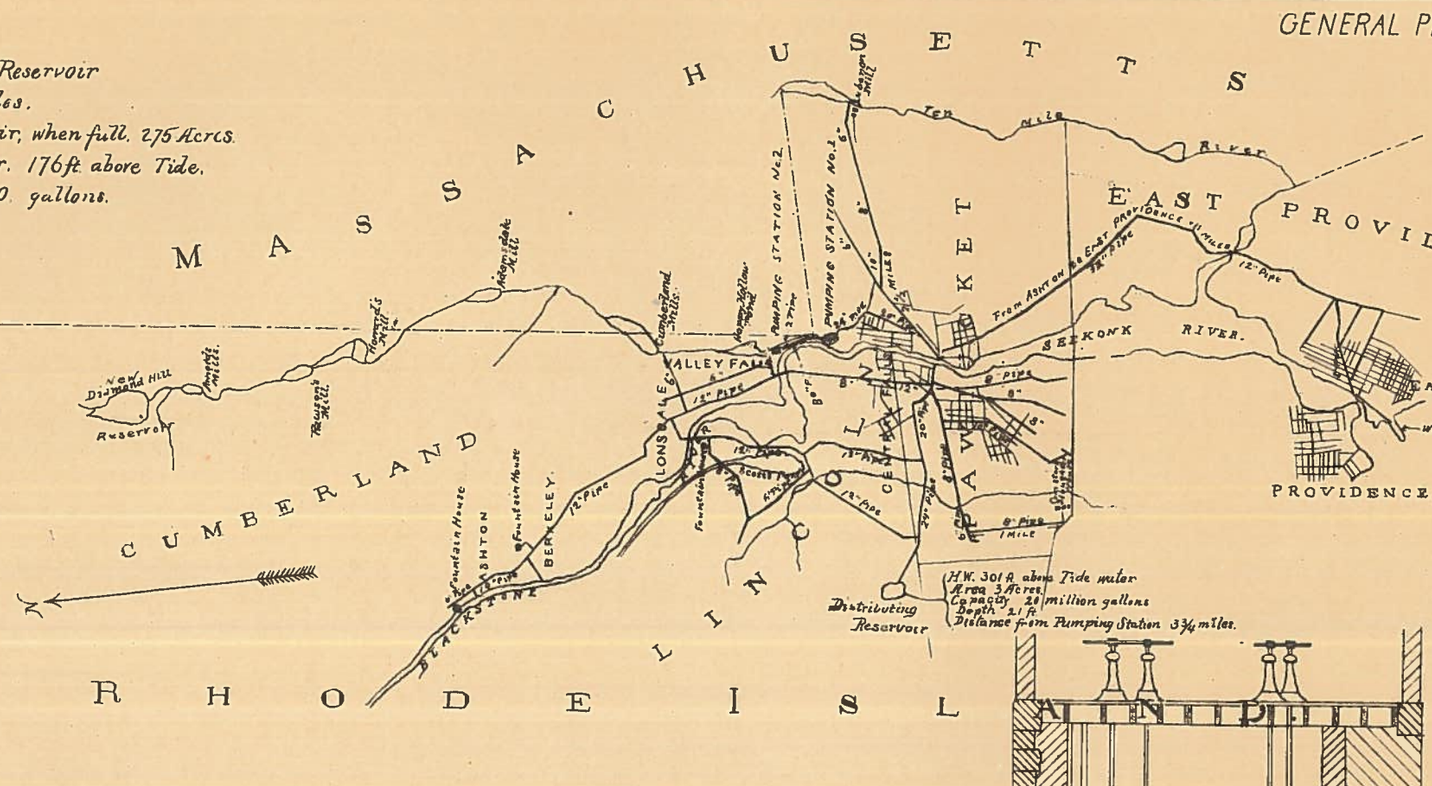
1-Pair Beam Condensing Engines
Allaire Works, N. Y. 1847.
10 million capacity in 24 hours.
1-Pair Beam Condensing Engines
Novelty Works N.Y. 1860.
20 Million capacity in 24 hours.
1-Knowles Compound Engine,
4Million capacity in 24 hours.

PLATE XVI.

GENERAL PLAN PAWTUCKET W. W.

EDWIN DARLING SUPT.
PAWTUCKET, R.I.

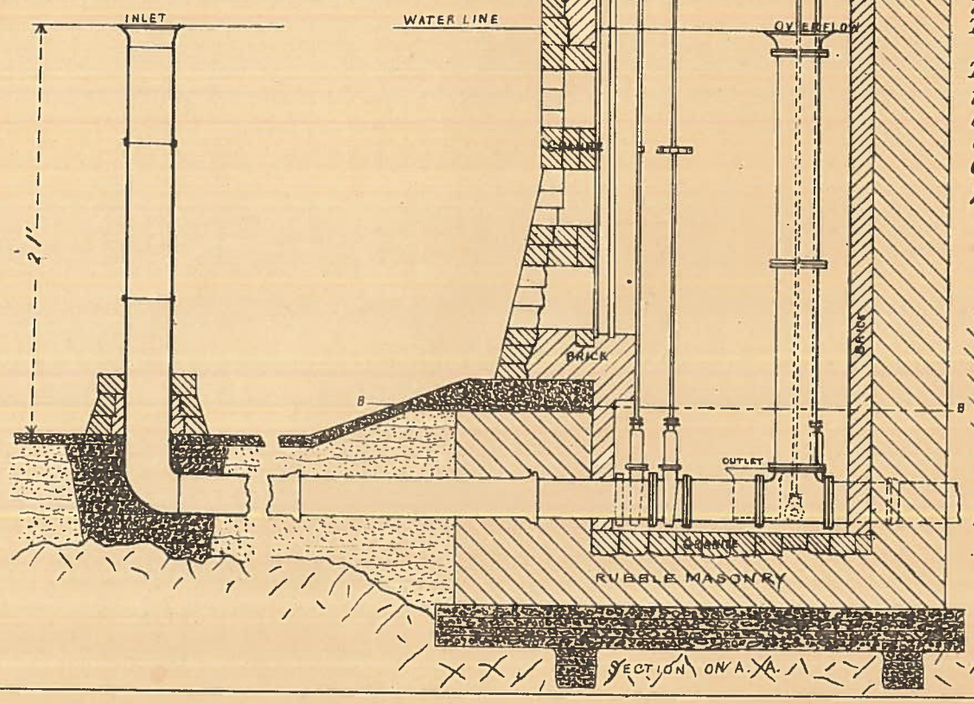
Diamond Hill Reservoir
Water Shed 7½ Sq. miles.
Water area of Reservoir, when full. 275 Acres.
High Water in Reservoir. 176 ft. above Tide.
Capacity 1,600,000,000 gallons.

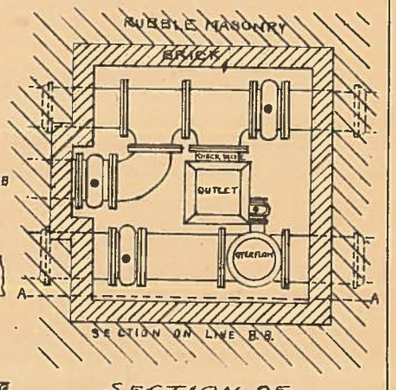


Pumping Station No. 1
contains 2- 3 million engine hor. com'pd built by Geo H. Corliss.
3 upright tubular boilers.

Pumping Station No. 2.
contains hor. steam jacketed condensing mill engine driving 2 pairs of geared pumps built by Geo H. Corliss.
Two upright tubular boilers.

These pumps are arranged to run by water line shaft being connected to 2 turbine wheels 50 and 75 H.P.
Capacity of pumps each pair 1½ million gals.





SECTION OF GATE CHAMBER DIST. RES.

This system of water works was constructed in 1877 and embraces five divisions, viz:

1. Pawtucket	24,000	Pop.
2. East Providence	8,000	"
3. Central Falls 4. Lonsdale and Valley Falls. 5. Berkeley and Ashton.	16,000	"
	48,000	Pop.
Total supplied	40,000	"

Statistics for year ending Dec 1st 1886.

Number of miles of main pipe		95
" " gates		
" " hydrants		753
" " meters	½" 166, ⅝" 757, ¾" 61, 1" 70, 1½" 14, 2" 27, 4" 1	2596
" " services, principally wrot iron		4452
" " motors		10
Average daily consumption in gals.		2,256,281
Maximum " " " July 7th "		4,000,000
Minimum " " " May 31st "		1,000,000

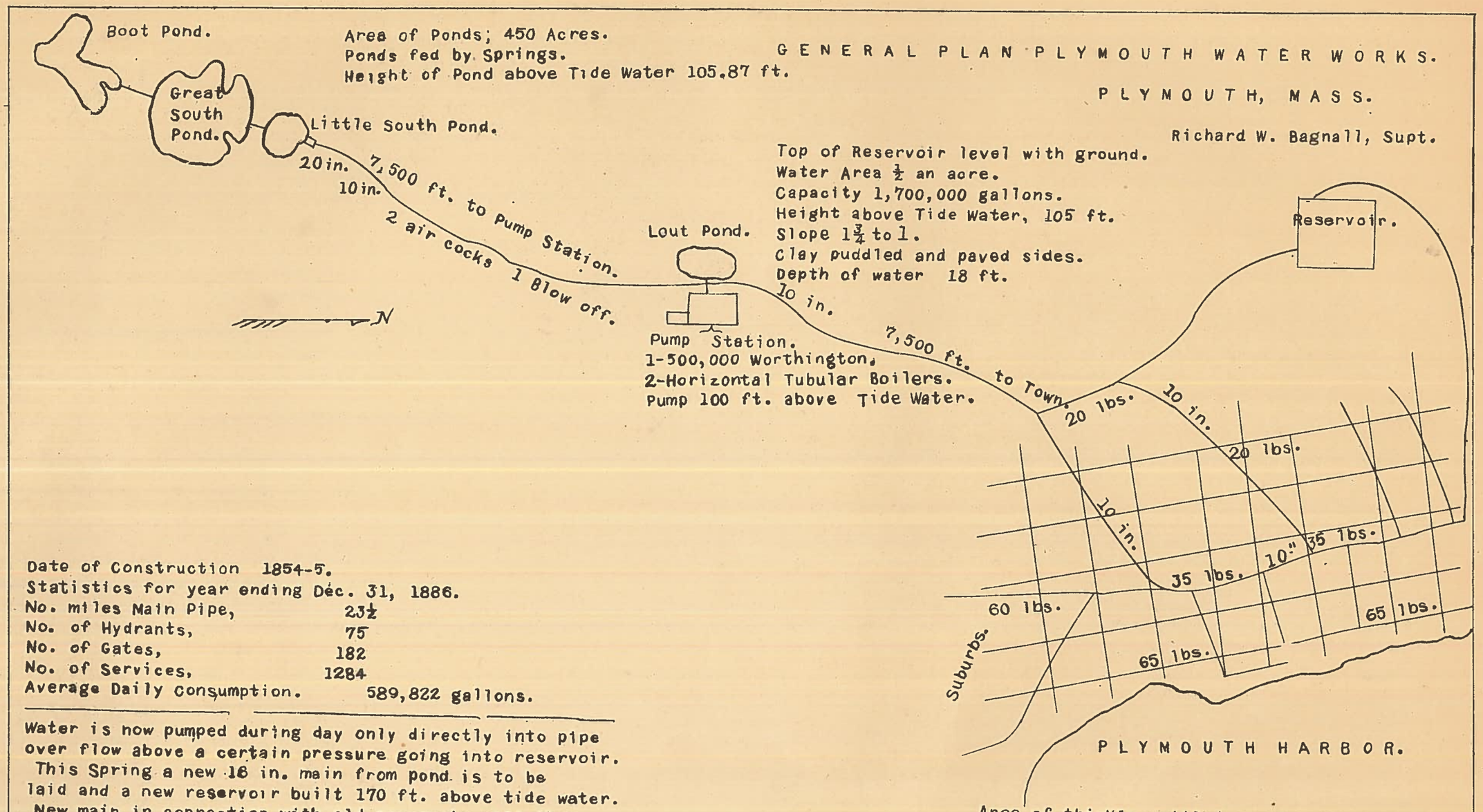
The city has a regular system of sewerage

PLATE XVII.

GENERAL PLAN PLYMOUTH WATER WORKS.

PLYMOUTH, MASS.

Richard W. Bagnall, Supt.



Date of Construction 1854-5.
Statistics for year ending Dec. 31, 1886.

No. miles Main Pipe,	23½
No. of Hydrants,	75
No. of Gates,	182
No. of Services,	1284
Average Daily Consumption.	589,822 gallons.

Water is now pumped during day only directly into pipe over flow above a certain pressure going into reservoir. This Spring a new 16 in. main from pond is to be laid and a new reservoir built 170 ft. above tide water. New main in connection with old reservoir will then be used to supply the greater part of town by gravity; and old main in connection with new reservoir and pump will supply the higher parts.

Area of thickly settled portion 100 acres.
Sewerage mostly into harbor.

Quincy Water Company
Frank E. Hall Supt.
Quincy Mass.

No. Miles Main Pipe	23.5
No. Hydrants	89
No. Gates	75
No. Services	600
No. Blow Offs	6

1-2 Million Deane Compound Pump
1-2 Million Deane Duplex Pump High Pressure

Average Daily Consumption 200,000 gallons
Population 12500
No System of Sewerage.
Cast Iron and Wrought Iron
Kalameine Pipe

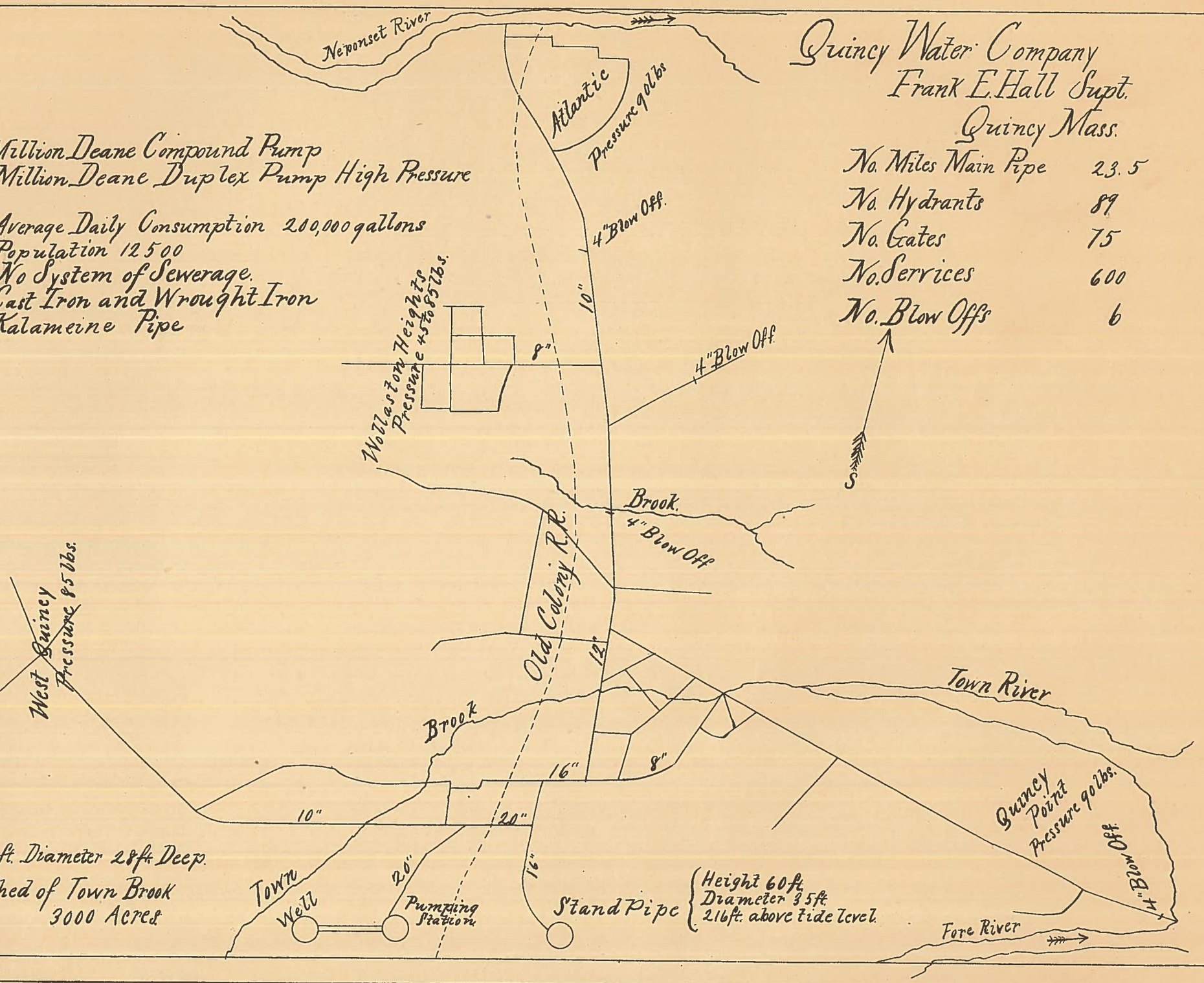
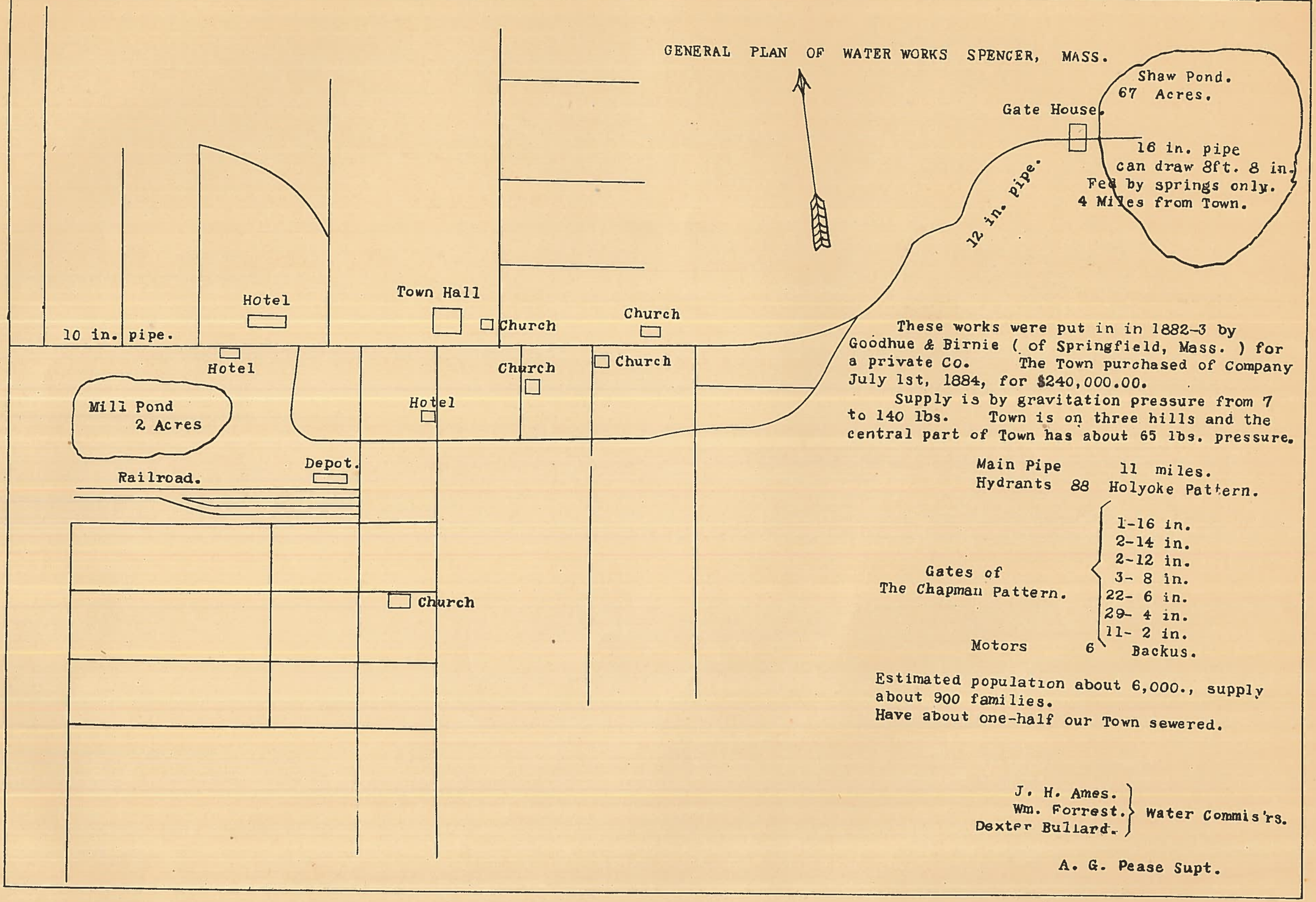


PLATE XIX.

GENERAL PLAN OF WATER WORKS SPENCER, MASS.



These works were put in in 1882-3 by Goodhue & Birnie (of Springfield, Mass.) for a private Co. The Town purchased of Company July 1st, 1884, for $240,000.00.

Supply is by gravitation pressure from 7 to 140 lbs. Town is on three hills and the central part of Town has about 65 lbs. pressure.

Main Pipe 11 miles.
Hydrants 88 Holyoke Pattern.

Gates of The Chapman Pattern.
- 1-16 in.
- 2-14 in.
- 2-12 in.
- 3- 8 in.
- 22- 6 in.
- 29- 4 in.
- 11- 2 in.

Motors 6 Backus.

Estimated population about 6,000., supply about 900 families.
Have about one-half our Town sewered.

J. H. Ames.
Wm. Forrest.
Dexter Bullard. } Water Commis'rs.

A. G. Pease Supt.

PLATE XX.

Springfield Water Works — General Plan

J. C. Hancock Supt.

Springfield, Mass.

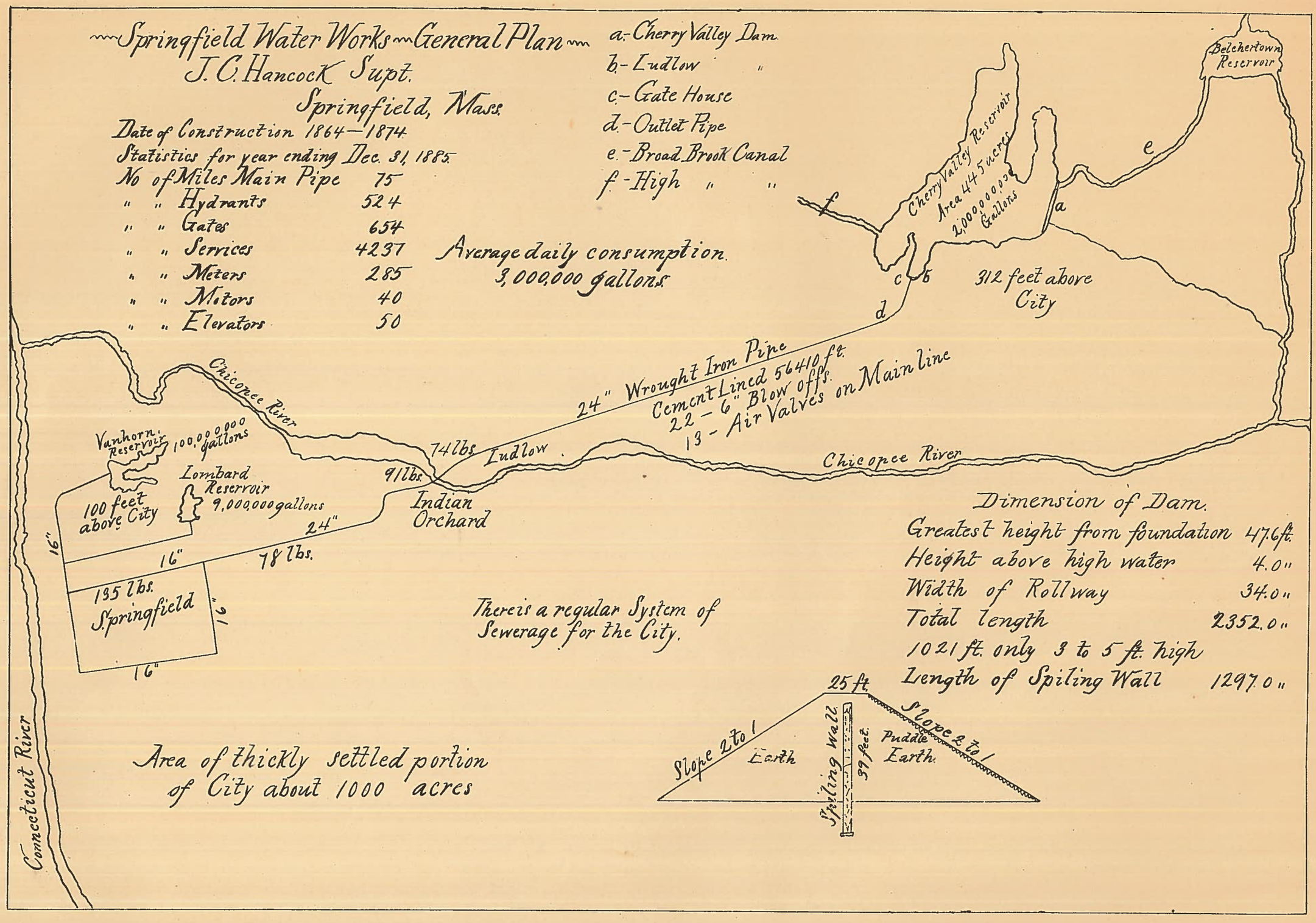
Date of Construction 1864—1874

Statistics for year ending Dec. 31, 1885.

No of Miles Main Pipe	75
" " Hydrants	524
" " Gates	654
" " Services	4237
" " Meters	285
" " Motors	40
" " Elevators	50

a.- Cherry Valley Dam.
b.- Ludlow "
c.- Gate House
d.- Outlet Pipe
e.- Broad Brook Canal
f.- High " "

Average daily consumption.
3,000,000 gallons.



There is a regular System of Sewerage for the City.

Area of thickly settled portion of City about 1000 acres

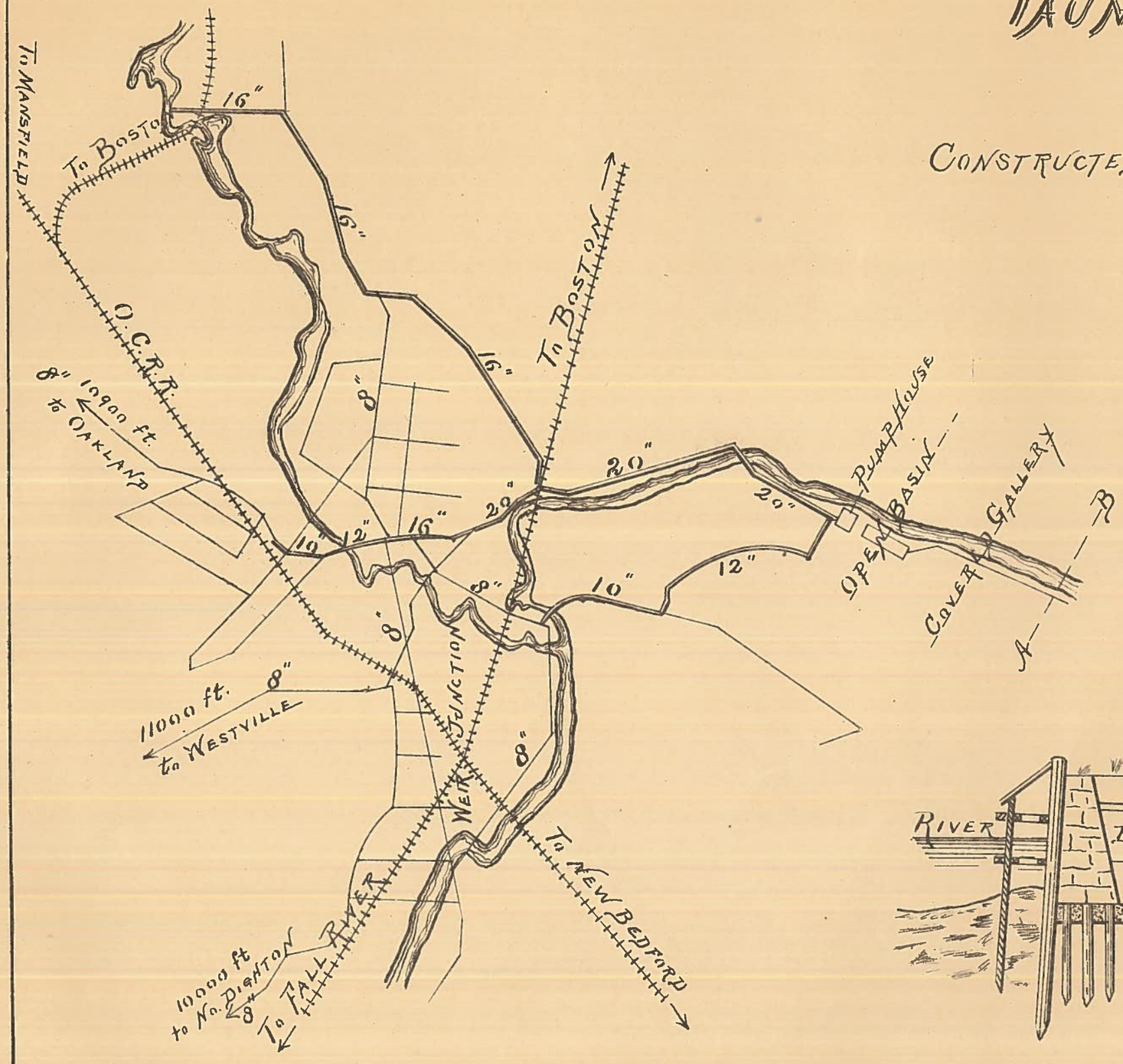
Dimension of Dam.

Greatest height from foundation	47.6 ft.
Height above high water	4.0 "
Width of Rollway	34.0 "
Total length	2352.0 "
1021 ft. only 3 to 5 ft. high	
Length of Spiling Wall	1297.0 "

PLATE XXI.

TAUNTON WATER WORKS.

TAUNTON, MASS.



CONSTRUCTED BY CITY IN 1876

SYSTEM — DIRECT PUMPING

ONE QUAD. HOLLY PUMP. 2 MILLION

ON ROTARY " " 1½ "

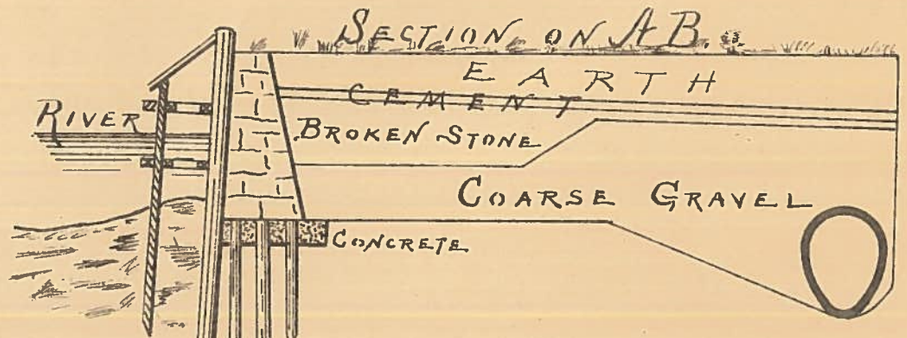
THREE HOR. BOILERS 16'x 5'

55 MILES CAST IRON MAINS

2935 CEMENT LINED SERVICES

AVE. DAILY CONSUMP. IN 1886 - 773531g.

ABOUT 10 MILES OF SEWERS. No SYSTEM



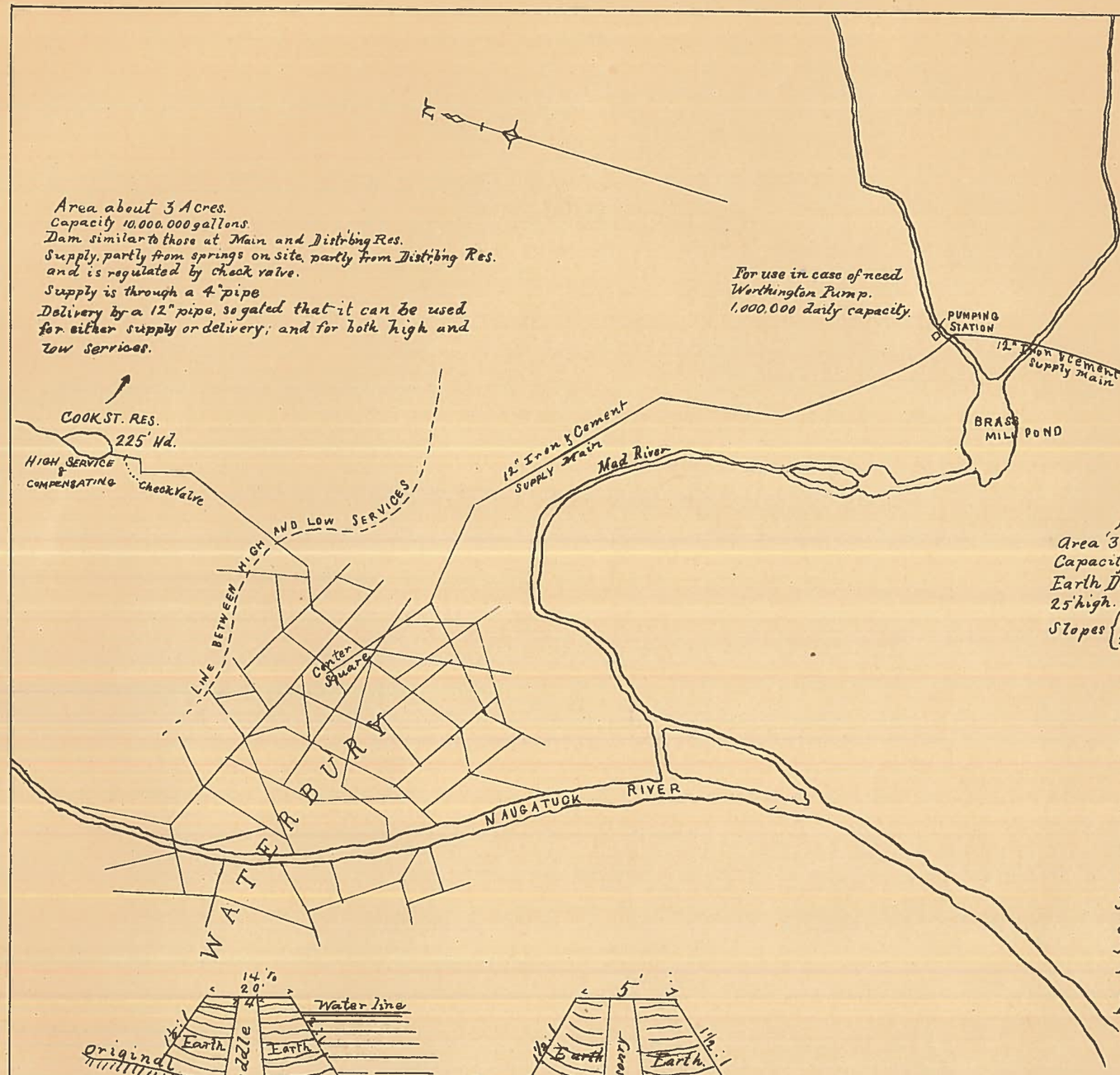
Wm. R. Billings
Supt.

PLATE XXII.

GENERAL PLAN WATERBURY WATER WORKS.

E.W. WHITLOCK ASS'T ENG'R.
WATERBURY, CONN.

Welton & Bonnett Engineers.



Section of Dams at Main, Distributing, and Cook St. Reservoirs.

Section of Dam Prospect Res.

General Statistics.

Pipe - 12" main and original portions of Distribution system of wrot iron and cement - new work cast iron
Sizes 4" to 12" - Iron 81,114 ft.
Cement 98,102 "

No Gates	254
No. Hydrants	219
No. Services	2630
No. Meters	112
No Motors	4
Highest pressure	120 lbs.
Average daily consumption	1,500,000 gals.

Total cost $416,235.68. Receipts for 1885 $41,192.17

Heads given are elevations above Center Sq.

PLATE XXIII.

Clarendon Water Works Co.—General Plan—
Wilmington, North Carolina
John C. Chase,
Supt. & Engineer.

Built 1881
Designed by contractor

—Statistics— Sept. 30, 1885—

Miles Pipe	12½
Hydrants	105
Meters	87
Motors	18
Services	467
Gates	48
Blow Offs	3

Daily consumption 285,000 gallons
—No system of sewerage.—
Thickly settled area about 600 acres

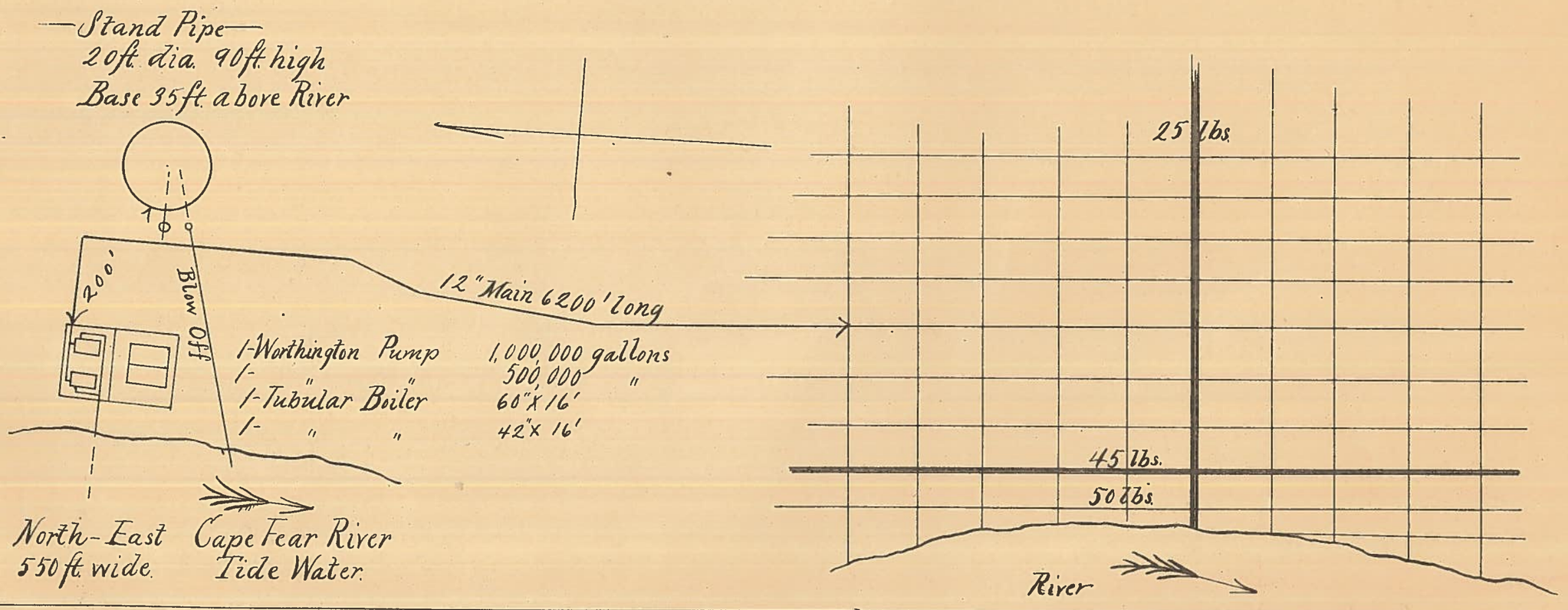


PLATE XXIV.

Woonsocket Water Works, General Plan

Willard Kent Supt,
Woonsocket, R.I.

Supplied by Crook Falls Brook

Reservoir No. 2 Area 8¾ Acres Capacity 75 Million Gallons

Elevation of Surface of water 136.83'

Assumed Base of Elevations
About 54' above mean low water
at Providence.

Abbotts Crook Falls Brook

TOTAL WATER SHED of CROOK FALLS BROOK
Estimated at 7 Square Miles

Reservoir No. 1 Area 10 & 10 Acres Capacity 96 Million Gallons

Elevation of Surface 118.83'
16" Suction pipe — 1 – 1 Million Gallon Worthington Compound Independent Condenser
Pumping Station — 1 – 1 Million " " High Pressure " "
Elev. of pumps 118.92 — 2 Horizontal Tubular Boilers

Date of Construction 1884

Statistics for year ending April 1886
No. of Miles Main Pipe 13 266/1000
No. of Hydrants 270
No. of Gates 204
No. of Services 425
Average Daily Consumption 149000 Gallons.

Pressure from 120 lbs of River to
60 lbs. on hillsides

Manville Road

Providence and Worcester Railroad

Manville Pond

Apart of BLACKSTONE RIVER

Elev 55.00'

12" Cast Iron Force Main to Tank 1¼ miles

Elev. 70.00'

4 Blow offs
10 Air Cocks
3 Gates
} On this line

Elev. of surface of Water in Tank 559.40'

14" Supply Main to center of Town 1 mile

Elev. 193.50'

Wrt Iron Tank 50' Diameter 30' High Capacity 440 000 Gallons

Distributing Pipe Cast Iron
3124 of 12"
10352' of 8"
34965' of 6"
34229' of 4"

Lead Service Pipe to Curb 6902 feet.

BERNON POND

Bernon Dam

Woon. Dam. X

MARKET SQUARE
Elev. 96.70

WOONSOCKET

NORTH

RIVER

Hamlet Dam

BLACKSTONE

Elev. 65.00'

Area of thickly settled portion of Town about
1000 Acres
There is no regular system of Sewerage

SECTION OF DAM
RESERVOIR No. 1.

20'
Pitch 2 to 1
Clay
Gravel
Puddle
Pitch 1 to 1
12 Sand Puddle
44'
35'
Original Surface
Rubblein Cem.
Rubblein Concrete Core
Rubblein Cem.

PLAN of Pumping Station

Sitting Room
Hall
2 Story
Dwelling
Kitchen
Pantry
Worthington Pump
Basement Pump Room
Boiler
Boiler
Fire Room
80 ft. Brick Stack
Basement
Coal Bunker
1 Story & Basement

PLATE XXV.

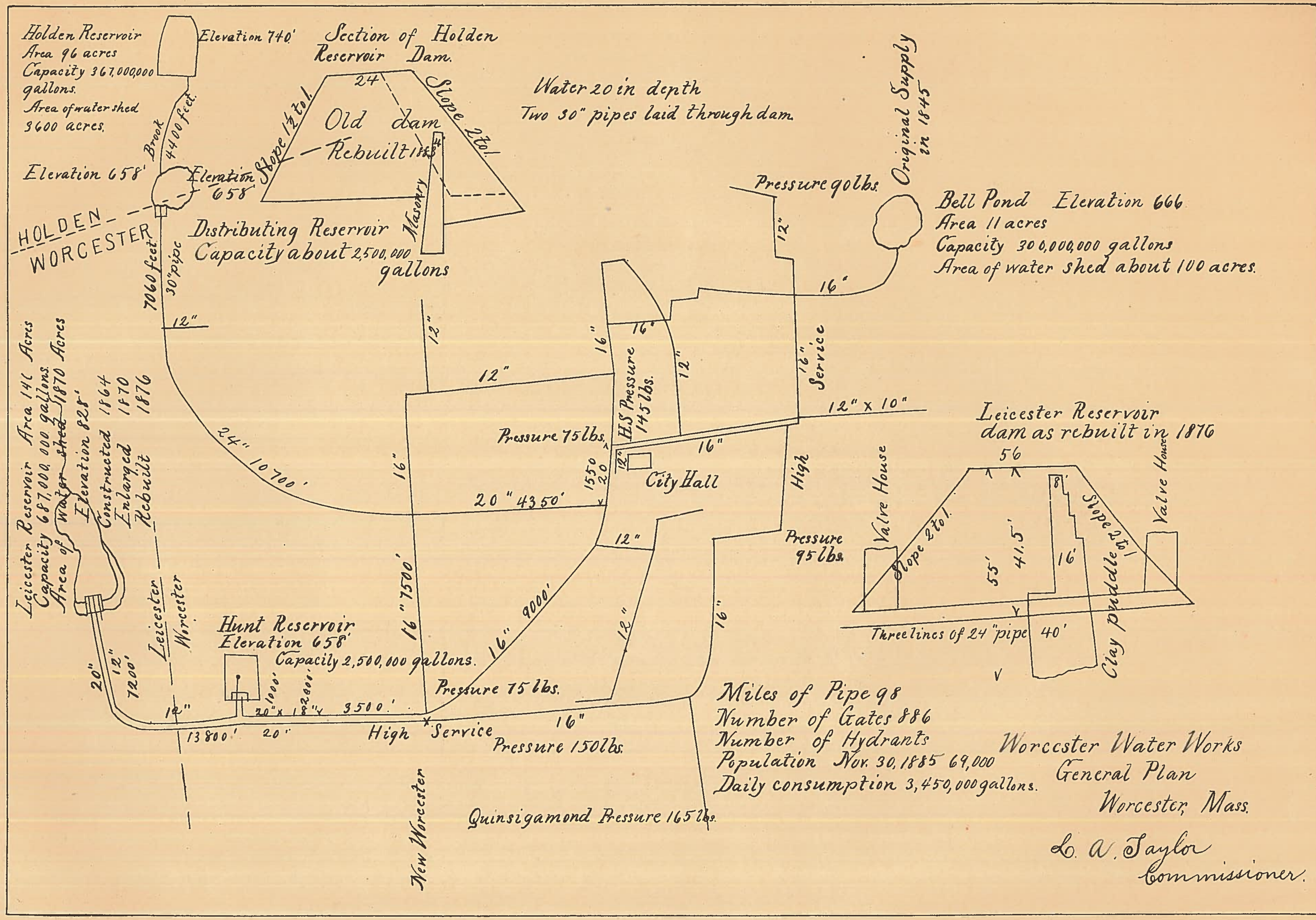

Holden Reservoir
Area 96 acres
Capacity 367,000,000 gallons.
Area of water shed 3600 acres.
Elevation 740'
Section of Holden Reservoir Dam.
24
Old dam Rebuilt 1883
Slope 1½ to 1.
Slope 2 to 1.
Masonry
Water 20 in depth
Two 30" pipes laid through dam.
Original Supply in 1845
Brook 4400 feet.
Elevation 658'
Elevation 658
HOLDEN
WORCESTER
7060 feet
30" pipe
Distributing Reservoir
Capacity about 2,500,000 gallons
Pressure 90 lbs.
Bell Pond Elevation 666
Area 11 acres
Capacity 300,000,000 gallons
Area of water shed about 100 acres.
12"
16"
16"
16"
12"
12"
12"
16" Service
12" x 10"
H.S. Pressure 145 lbs.
Pressure 75 lbs.
1550 20
City Hall
16"
High
24" 10700'
20" 4350'
Leicester Reservoir
dam as rebuilt in 1876
56
Valve House
Slope 2 to 1.
55'
41.5'
16'
8'
Slope 2 to 1
Clay puddle
Valve House
Three lines of 24" pipe
40'
Pressure 95 lbs.
Leicester Reservoir Area 141 Acres
Capacity 687,000,000 gallons
Area of water shed 1870 Acres
Elevation 828'
Constructed 1864
Enlarged 1870
Rebuilt 1876
Leicester
Worcester
16" 7500'
16" 9000'
12"
12"
16"
Hunt Reservoir
Elevation 658'
Capacity 2,500,000 gallons.
Pressure 75 lbs.
20"
12"
7200'
12"
1000'
2000'
20" x 18"
3500'
13800'
20"
High Service
16"
Pressure 150 lbs.
Miles of Pipe 98
Number of Gates 886
Number of Hydrants
Population Nov. 30, 1885 69,000
Daily consumption 3,450,000 gallons.
New Worcester
Quinsigamond Pressure 165 lbs.
Worcester Water Works
General Plan
Worcester, Mass.
L. A. Taylor
Commissioner.

PLATE XXVI.

THE SIXTEENTH VOLUME

OF

THE ENGINEERING AND BUILDING RECORD

AND

THE SANITARY ENGINEER.

(June 4, 1887—November 26, 1887.)

Aside from the weekly record of events of special interest to Engineers, Architects, Municipal Officers, Mechanics, and Contractors, the following of the numerous special articles are mentioned as of permanent interest.

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SOME DETAILS
OF
WATER-WORKS CONSTRUCTION.

By W. R. BILLINGS,

Superintendent of Water-Works at Taunton, Mass.

WITH

Illustrations from Sketches by the Author.

INTRODUCTORY NOTE.

Some questions addressed to the Editor of *The Engineering and Building Record and The Sanitary Engineer* by persons in the employ of new water-works indicated that a short series of practical articles on the Details of Constructing a Water-Works Plant would be of value; and, at the suggestion of the Editor, the preparation of these papers was undertaken for the columns of that journal. The task has been an easy and agreeable one, and now, in a more convenient form than is afforded by the columns of the paper, these notes of acutal experience are offered to the water-works fraternity, with the belief that they may be of assistance to beginners and of some interest to all.

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WATER-WASTE PREVENTION:

Its Importance and the Evils Due to Its Neglect.

With an Account of the Methods Adopted in Various Cities in Great Britain and the United States.

BY HENRY C. MEYER, Editor of THE ENGINEERING AND BUILDING RECORD.

With an Appendix.

EXTRACT FROM PREFACE.

During the summer of 1882 the Editor of THE ENGINEERING AND BUILDING RECORD carefully investigated the methods employed in various cities in Great Britain for curtailing the waste of water without subjecting the respective communities to either inconvenience or a limited allowance. The results of this investigation appeared in a series of articles entitled "New York's Water-Supply," the purpose being to present to the readers of THE ENGINEERING AND BUILDING RECORD such facts as would stimulate public sentiment in support of the enforcement of measures tending to prevent the excessive waste of water so prevalent in American cities, and especially the city of New York, which was then suffering from a short supply. Numerous requests for information, together with the recent popular agitation in connection with a proposition to increase the powers of the Water Department of New York City with a view to enabling it to restrict the waste of water, have suggested the desirability of reprinting these articles in a more convenient and accessible form, with data giving the results of efforts in this direction in American cities since the articles first appeared, so far as they have come to the author's notice.

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