

HISTORY  
OF THE  
BANGOR WATER WORKS,

*With the respects of the Water  
Board of 1875 and '76.*

WHILE UNDER THE CHARGE OF THE  
  
FIRST BOARD OF COMMISSIONERS.

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BANGOR:  
BURR & ROBINSON, PRINTERS.  
1877.

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## TO THE CITIZENS OF BANGOR.

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Feeling it due that a more connected and comprehensive relation of the acts and doings of the Water Board, appointed by the act of the legislature, approved Feb. 22, 1875, and subsequently endorsed and confirmed by you at the municipal election of the March following, and again at the March election of 1876, the said Water Board herewith submit the following history of the Works while under their charge, embracing an account of the moneys expended in their construction, during that time; which it was expected would have been authorized and published by the City Council. Their failure to do so has induced the Board to prepare and publish the following compilation of the legislative bills, of their various reports, and the action of the City Council upon them from time to time, until the expiration of their term of service.

It may not be improper to state here, that the Board was constituted without conference with the individual members of it, and without their knowledge, and the situations and duties accepted on the part of a portion of them, greatly to the sacrifice of their time and business interests.

GEO. STETSON.  
WM. T. PEARSON.  
L. H. EATON.

Bangor, Sept. 20th, 1877.

# STATE OF MAINE.

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In the Year of our Lord, One Thousand Eight Hundred and Seventy-Five.

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## AN ACT FOR SUPPLYING THE CITY OF BANGOR WITH WATER.

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Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows :

Section 1. The city of Bangor is hereby authorized to take, hold, and convey into, about and through the city of Bangor, from any point in Penobscot river that may be deemed expedient, between the foot of Treat's falls, in Bangor, and the head of McMahon's falls, in Veazie, water sufficient for the use of said city and the inhabitants thereof, for the extinguishment of fires, domestic uses and creating steam ; and may flow, take and hold, by purchase or otherwise, any lands or real estate for laying and maintaining aqueducts or pipes for conducting, discharging, disposing of and distributing water, and for constructing and maintaining reservoirs, dams and such other works as may be deemed necessary or proper for raising, forcing, retaining, distributing, discharging or disposing of said water, and for the erection of any works for said purposes, and for sinking wells or making excavations for the filtration of water.

Section 2. Said city may erect and forever maintain, at said point, a dam across said river, for the retention of water for said specified purposes, not exceeding twelve feet in height above mean high tide, and purchase any franchises or the right to operate



under any franchises required for said purposes, or may purchase and forever maintain any dam erected or to be erected across said river at said point, for the retention of said water, or may purchase the privilege and right forever to draw and take from said river, at said point, a sufficient quantity of water for all said purposes, and sufficient water power to pump and raise, force and distribute the same to any required places in said city. May make, build, lay down and maintain aqueducts and pipes, from said river at said point, to, into, through and about said city, and secure and maintain the same by any works suitable therefor; may make and establish such public fountains and hydrants in such places as may from time to time be deemed proper, and prescribe the purposes for which the same may be used, and may change or discontinue the same; may distribute water throughout the city, and for this purpose may lay down pipes to any house or building in said city, the owner or owners thereof having notice and not objecting thereto; may regulate the use of said water within said city, and establish, receive and collect the prices or rents to be paid therefor; and the said city may, for the purposes aforesaid, carry and conduct and maintain any aqueducts, pipes or other works by them to be made, laid down or conducted over, under, through or across any water-course or river, street, bridge, railroad, highway, or other way, in such manner as not to obstruct the travel or free use thereof; may enter upon and dig up any such road, street or way, for the purpose of laying down pipes beneath the surface thereof, and for maintaining and repairing the same, and, in general, may do any other acts and things necessary or convenient and proper for carrying out the purposes of this act.

Section 3. If said city shall elect to erect or purchase a dam as aforesaid, for said purposes, and there shall be a surplus of water after supplying at present all of said purposes, said city may sell or lease any surplus power created by said dam.

Section 4. Said city shall be liable to pay all damages that shall be sustained by any persons or corporations in their property, by the taking of any land or by flowage, or excavating through any land, for the purpose of laying down pipes, building dams or constructing reservoirs, or making excavations. And if any person or corporation, sustaining damage as aforesaid, and said city shall not mutually agree upon the sum to be paid therefor, such person or corporation may cause said damages to be ascertained and determined in the same manner and under the same

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conditions, restrictions and limitations as are by law prescribed in the case of damage by the laying out of highways.

Section 5. The rights, powers and authorities given to the city of Bangor by this act, shall be exercised by said city, subject to the restrictions, duties and liabilities herein contained, by a Board of Commissioners consisting of three persons, called the Water Board, and George Stetson, Gorham L. Boynton and Luther H. Eaton, all of said Bangor, shall constitute said Board at first; the said Stetson, Boynton and Eaton to hold office for three, four and five years respectively, from acceptance of this act, and as each term of office expires the vacancy shall be filled by the election of a new member of said Board, to hold office for the term of three years; said election to be by the City Council of the city of Bangor, in joint convention of both Boards of said Council. In case of any vacancy in said Board by death, resignation or otherwise, the election to fill the vacancy for the unexpired term shall be in the same manner. The compensation of said Water Board shall be fixed by the municipal officers of the city of Bangor.

Section 6. For the purpose of defraying the expenses which may be incurred by said city, in carrying into effect the powers herein granted to said city of Bangor, said city is authorized to raise money by issuing and selling its bonds or script, from time to time, as the same shall be needful, not exceeding, however, in all, the amount of three hundred and fifty thousand dollars. Said bonds shall be designated and marked City of Bangor Water Loan Bonds, and shall all bear date of the first issue of said bonds, be made payable to the holder thereof in thirty years from date, and in such sums and at such places as the City Council may determine, with coupons for interest attached, reckoned at the rate of six per centum per annum, payable semi-annually, and shall be signed by the Treasurer and countersigned by the Mayor of said city and by the members of the Water Board.

Section 7. The City Council of said city is authorized to establish, assess, collect and receive, annually, and as much oftener as may be deemed expedient, such prices, rents and tolls for water, of the water takers, as shall pay, as the same shall become due, a part or the whole of the interest on said bonds, the expenses of carrying on or running said works, and repairing the same. And said City Council is authorized, from time to time to grant, assess, collect and appropriate in the same manner as other money is

18 granted, assessed, collected and appropriated for other city purposes, such sums of money as shall be necessary to pay any deficiency in the amount assessed and collected, as aforesaid, of said water-takers, to pay said interest and expenses.

Section 8. In order to create a sinking fund to pay and extinguish said bonds at maturity, and as compensation for the use of water for municipal purposes, said city is authorized, annually, after the expiration of five years from the issue of said bonds, to grant, assess, collect and appropriate in the same manner as other money is granted, assessed and appropriated for other city purposes, a sum not exceeding ten thousand dollars, and for such a number of years that said fund thus created, with accumulated interest or income thereof, shall be sufficient in amount to redeem and extinguish all of said bonds at maturity; said money thus raised shall be invested in the purchase of bonds of said city or of municipal bonds of other cities in New England of a population of not less than twenty thousand inhabitants, or of county or state bonds of New England.

Section 9. If any person shall use any of said water within said city, without the consent of said city, an action of tort may be maintained by said city for the recovery of the damages sustained.

Section 10. If any person shall wantonly or maliciously divert the water from, or corrupt the water in, or destroy or injure any aqueduct, reservoir, pipe, conduit, hydrant, machine or other works or property held, owned or used by said city of Bangor, by the authority and for the purposes of this act, every such person or persons shall forfeit and pay to said city, three times the amount of damages that shall be assessed therefor, to be recovered by an action of the case; and every such person or persons may, moreover, on indictment for and conviction of either of the wanton or malicious acts aforesaid, be punished by a fine not exceeding one thousand dollars, and imprisonment not exceeding one year.

Section 11. This act shall not take effect or be of any force until the legal voters of the city, in ward meetings, and the legal voters of the city in legal ward meetings shall, by a vote of two-thirds of all the votes thrown in the city at such meetings, adopt the same. But if within six months from the approval of this act, said city shall accept said act by vote of said legal voters as aforesaid, then said act shall be in force thereafter, but not other-

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wise. The adoption of this act shall first be submitted to the legal voters of said city of Bangor, at the municipal election on the second Monday in March, in the year of our Lord eighteen hundred and seventy-five, in pursuance of an article to be inserted therefor in the warrant for said election; and if not then adopted may be afterwards, at any time during said six months, submitted to said legal voters, by a vote of a majority of the members of the City Council present and voting in joint convention; and such submission may be at special ward meetings notified and warned, held, returns made, declared and recorded, agreeably to the provisions of the city charter of said city for calling and holding ward meetings for the choice of city officers and returns thereof.

Section 12. The Bangor Water Company, or any person or persons named in the act incorporating said company, may petition the supreme court for the county of Penobscot, setting forth that said company, person or persons have a claim growing out of moneys advanced or services performed to secure the introduction of water into said city, and after notice, a hearing shall be had of the parties, and the court shall determine whether the petitioners have any legal or equitable claim upon said city (for a reimbursement of said moneys in case this act is accepted by the city;) and in case said court shall determine that such claim exists, then, and not otherwise, the court shall appoint three suitable men to determine the amount of such claim, and the same proceedings shall be had as in case of a reference of an action in court under the laws of this state. In any dam, erected under this charter, shall be constructed and maintained suitable locks or sluices for the passage of boats, rafts, logs and other lumber. The determination of said court and referees shall be made and published in the Bangor Daily Whig and Courier and in the Bangor Daily Commercial, at least one week prior to the second Monday in March, eighteen hundred and seventy-five, and a judge in chambers is authorized to act if the court is not in session. The Mayor and City Solicitor of the city of Bangor shall have seasonable notice of both said hearings. All the provisions of this act, so far as the service and supply of water are concerned and the laying down of aqueducts, conduits, pipes, reservoirs and other useful or necessary appurtenances for the purposes of said service and supply of water, shall have the same application to the town and inhabitants of Brewer, as therein granted to the city



and citizens of Bangor; provided that at any legally called meeting the inhabitants of Brewer shall give their consent.

Section 13. This act shall take effect when approved.

Approved.

FEBRUARY 22, 1875.

NELSON DINGLEY, JR.,  
Governor.

The bill was submitted to a vote of the citizens, March 8, 1875, with the following result:

Yeas—2776.

Nays—79.

March 16th, a request was made by the Water Board for an appropriation for a preliminary survey—as follows:

TO THE CITY COUNCIL OF BANGOR:

By an act of the legislature passed at its last session, authorizing the city of Bangor to take water from the Penobscot river for the use of said city, the undersigned were named in said act Commissioners, styled the "Water Board," authorized to do and construct the necessary works in conformity with said act.

Before the Water Board can properly commence operations in making surveys, etc., it will be needful that funds be furnished them for that purpose. We would therefore respectfully request that an early appropriation be made by the City Council to pay the expenses attending the same.

GEO. STETSON.  
G. L. BOYNTON.  
L. H. EATON.

Bangor, March 16, 1875.

March 16th, a resolve was passed by a unanimous vote, in accordance with request of Water Board therefor, for an appropriation of \$1000, for a preliminary survey of the locality for the proposed dam, as follows:

## CITY OF BANGOR.

*Resolve appropriating \$1,000 for preliminary survey of site for proposed Dam and Water Works.*

IN CITY COUNCIL—

*Resolved:* That a sum not exceeding one thousand dollars, is hereby appropriated for the use of the Commissioners, styled the Water Board, for the purpose of making a preliminary survey of the locality in the Penobscot River, designated by the "Act for Supplying the City of Bangor with Water," and recently adopted by the legal voters of said city, with the view of locating the site for the proposed dam, and the construction of the Water Works, in accordance with said act. And the Mayor is hereby authorized to draw his order on the Treasurer for the same.

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IN BOARD OF ALDERMEN,

March 16, 1875.

This resolve, under suspension of the rules, having had two several readings, passed to be engrossed. Sent down for concurrence.

JOHN H. HAYES,

*City Clerk.*

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IN COMMON COUNCIL, Mar. 22, 1875.

Read twice, under a suspension of the rules, and passed to be engrossed, in concurrence.

F. V. WOOSTER,

*Clerk.*

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IN BOARD OF ALDERMEN,

March 22, 1875.

This resolve, certified correctly engrossed, finally passed. Sent down for concurrence.

JOHN H. HAYES.

*City Clerk.*

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IN COMMON COUNCIL, Mar. 22, 1875.

This resolve, certified correctly engrossed, finally passed in concurrence.

FRED V. WOOSTER,

*Clerk.*



May 4th, Gorham L. Boynton resigned his position as member of the Water Board, in the following communication, which was referred to a special committee:

*To the City Council:—*

Having become satisfied by a short experience as one of the members of the Water Board, that I am not qualified for the position, and that my action in that capacity would not meet public expectation, I hereby respectfully resign it.

G. L. BOYNTON.

BANGOR, May 4, 1875.

May 10th, the resignation of Mr. Boynton was accepted, and on the same day the City Council, in convention, by a unanimous vote, chose William T. Pearson to fill the vacancy.

At a special meeting of the Council, held June 3d, the Water Board presented the following report of their doings, embracing the report of the Engineer, L. H. Eaton, Esq., which papers were referred to a special committee:

## REPORT OF THE WATER BOARD.

*TO THE CITY COUNCIL—*

An act of the last Legislature was passed authorizing the City of Bangor to construct a dam across the Penobscot river at any point between the foot of Treat's Falls and the head of McMahon's Falls in the town of Veazie, for the purpose of introducing pure water into said city for certain purposes named in said act; also authorizing the city to loan its credit to the extent of \$350,000 for that purpose; giving the city authority and the right to take and hold by purchase or appraisal any property required for flowage, in the erection of the dam, and for other purposes, in the construction and completion of the proposed object; or for the purchase of any dam or mills now erected; also granting authority to said city to sell or lease any surplus power for other purposes created in the erection of said dam.

The act also provides for a Board of Commissioners to be called the "Water Board," granting them ample authority to construct said dam and water works, make all necessary purchases, settle damages, and to do and perform all that would be required to complete the objects named in said act.



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The persons named in the act for the Water Board are George Stetson, Gorham L. Boynton and Luther H. Eaton, and in case of death or resignation of either or all of them, their places are to be filled by the City Council.

The act also provides that it shall be accepted by a two-thirds vote of the citizens of said city.

At the annual municipal election held on the second Monday of March last, a vote was taken on the question, resulting in the almost unanimous vote in favor of the acceptance of the act. The vote was 2,776 yeas, 79 noes.

With this decided expression of the views of the citizens, and the strong assurance it gave to the Water Board of the desire of the inhabitants for an ample supply of pure water to be introduced into the city, as well as to utilize any additional power which might be created in the building of the dam, for other purposes, the Water Board deemed it their duty, although they were not consulted or apprised of their appointment for such an arduous and responsible position, to proceed at once to investigate the subject.

The first step taken was to ask the City Council for a small appropriation for the purpose of making a preliminary survey, and taking soundings through the ice to ascertain the character of the bed of the river at various points within the limits prescribed by the act. A special meeting of the City Council was called by Mr. Blake, the then acting Mayor, and an appropriation of \$1000 was made for the purpose.

Mr. Eaton, Civil Engineer, one of the Water Board, was engaged to employ the necessary force, and proceed at once on the work of taking soundings of the bottom of the river, and elevations of the tide, of the shores of the river as to flowage, and an examination of any other obstructions in building the proposed dam. His report as Engineer, of the surveys made by him, combining other valuable statistics in relation to the capacity and utilization of the water power of our noble river, is herewith offered as a part of this report.

Our next plan was to obtain by actual demonstration, what effect the spring freshet might have with the ordinary and spring tides, as to the flowage of the banks of the river, and more especially as to the damage which might arise in the elevation of the dam, upon the Veazie or Corporation mills. Owing to the absence of the usual heavy rains at that season of the year, there



was not as great a rise in the river by the flowing of the upper waters of the Penobscot and its tributaries as usual, causing considerable delay in our investigations.

We regret to say, that about this time, Mr. Boynton, one of the most reliable and efficient members of the Water Board, deemed it necessary from personal sacrifice or other causes, to retire from the Board, sending his resignation to the City Council. His place was filled by the choice of Mr. William T. Pearson. It is, however, gratifying to learn from Mr. Boynton, that his leaving the Board was from no personal feeling towards the other members.

In the meantime active efforts were being made in getting information as to the best location for the dam, its mode of construction and expense, as well as to the manner and expense of introducing water into the city.

On learning that the city proposed to erect water works, Col. J. T. Fanning, Hydraulic Engineer, who had been employed to put in water works for the city of Manchester, N. H., visited our city, before we had commenced any of our operations, for the purpose of offering his services in the work; subsequently he was employed to assist in making plans and estimates as to the expense of piping and machinery, as an hydraulic engineer, and his practical experience was of great service in making an estimate of the expense, and for laying the pipes, etc. His estimates will hereafter appear in this report.

One of our Board visited Waterville for the purpose of examining the construction of the wooden dam at that place, also for the purpose of meeting Mr. Lockwood, of Providence, R. I., who is largely engaged in the manufacture of cotton and woolen. He subsequently engaged to come to Bangor on Monday, the 24th ultimo, to consult more particularly as to the best site for the dam. Unfortunately, he was prevented by sickness, so that after waiting so long a time, we were deprived of his valuable experience. Mr. Emery, a practical dam builder, who built the dam at Waterville and rebuilt that at Augusta, was employed to come to Bangor for the purpose of getting his opinion for the best mode of constructing the dam, and to estimate the expense. His estimate also appears in this report.

We have thus far made this lengthy statement of our proceedings more in order to explain the seemingly unnecessary delay in making our report, than for any important facts presented.

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## LOCATION OF THE PROPOSED DAM.

The site for a dam at Treat's Falls or at Spratt's Point has some advantages over one higher up the river, mainly on account of its near proximity to the business centre of the city, making some \$8,000 or \$9,000 saving in the main piping, and the site for a pumping house may be a little more eligible than at a point farther up the river. The cost of building the dam at either of these places would be some more, on account of the greater distance across the river, the depth of water, and the banks of the river being not so high nor so well protected by ledge formation, especially on the southern or eastern side of the river.

The soundings of the bottom of the river at these places, as taken by the engineer, indicate quite as good a bottom for the dam as elsewhere; but there are serious objections for the dam at either Treat's Falls or Spratt's Point, in the opinion of some of those best informed, and of your Water Board.

There is not sufficient distance on the shore below these places to utilize the great volume of water of the river for manufacturing in the future. The banks of the river about high tide, at these places and for a short distance above, are not so elevated as at the Webster farm; should the proposed dam be raised to the height contemplated in the future, or at the present for manufacturing purposes, it would materially interfere by flowage with the railway, as well as the travelled road.

The next point of soundings taken of the bottom of the river, was at or near the point of ledge at the Daniel Webster farm. Here the soundings were found equally as good as at Treat's Falls, or Spratt's Point. And at the shores, on both sides of the river, there are ledge elevations of sufficient height for dam connections. From the best information obtainable, the same ledge formation extends entirely across the river.

The distance across the river is some less than at points below. The elevation of the railway at this place is some feet higher than at Treat's Falls. The site at this place (the Webster farm) for the Water Works, was considered by Mr. Holly, and Mr. Flagler, the President of the Holly Manufacturing Company, as ample and convenient. In placing the dam at this place, more than twice the distance will be had on the shore of the river, for utilizing the water for manufacturing. Soundings were made further up the river; the bottom was found equally as good as at

the other points named, but in most other respects there were serious objections, so much so that the Water Board gave the places but little consideration.

The Water Board, after giving the subject of the location of the dam this most thorough examination, do not hesitate to offer as their most decided opinion, under all contingencies, that the site at the Webster farm is the most eligible.

Mr. Emery's estimate of the cost of the dam at this latter place, made in accordance with his proposed plan, is \$85,050.97; this does not include the shore connections, wing-dams, head-gates, flumes, nor fish-ways.

Mr. Eaton has made a plan similar in construction and materials to that of Mr. Emery's, estimating the cost at \$150,000, which embraces all the above items not included in Mr. Emery's estimate. Both of these plans contemplate a dam built of timber, filled entirely with stones, making a solid mass of timber and stone, with boiler plate iron on top for protection against ice and other drift, and constructed in a most thorough manner for strength and durability, having stone and masonry at the shore connections, where exposed to decay.

These estimates were intended to fully cover all expenses, trusting something might be saved from the sums named.

These estimates were based upon the plan of erecting the dam for the present, eight feet above mean high tide, but so constructed with ample base at the bottom that it can be readily and safely carried up to four or eight feet higher, should it be required in the future.

#### FLOWAGE.

By the elevations taken by the engineer, we find that a dam erected as proposed, eight feet above mean high tide, as indicated by the engineer, but little if any damage will ensue by flowage. For a short time, in a high spring freshet, for some minor distances, the highway or road on the southern or eastern side of the river, may be slightly flooded. The lowest point found in the road was ten feet above mean high tide. The apron of the Veazie or Corporation mills was found to be twelve feet three inches above mean high tide at the Webster farm. And upon close examination at different times since the spring freshet, at this point (the apron of the mills) the height of water was not affected by the rise and fall of the tide; and although the erection of the dam at the proposed height of eight feet may cause some little hindrance



to the operation of these mills, it will be for only a short period of time, and that during the highest water of spring freshet, and at a time when these mills are not usually in operation, on account of the want of logs to saw, or perhaps other causes.

Should it be deemed advisable to carry the dam up to the highest point proposed, fourteen to sixteen feet above mean high tide, no doubt but some satisfactory arrangement may be made with the owners of the mills for that purpose. We have not as yet been able to get a proposition from them; they say they would be glad to sell at a moderate price, or would make an arrangement to move their mills, or a part of them, in connection with the proposed dam; either of the plans, we have no doubt, would be greatly for their interest. These mills, from their appearance and their history, indicate "threescore years and ten." Much of their former value has been greatly deteriorated.

#### CONSTRUCTION OF THE WATER WORKS.

Colonel Fanning, heretofore referred to in this report, in connection with Mr. Eaton, made special examination of the site for the proposed dam, and of the streets of the city for laying pipes, and the placing of hydrants for fire purposes; and have made plans and estimates for the amount of piping, hydrants, etc., together with all necessary arrangements for pumping and filtering. On making the examination for piping the streets, it was deemed advisable and needful, at the present time, to be able to supply all, or nearly all who would be likely to take the water for family use, even if it should extend in some cases to the more sparsely occupied streets; also to furnish the needful supply of water for fire purposes. In deciding this question of piping, more especially for the extinguishment of fires, Mr. Low, Chief Engineer of the Fire Department, with some of his assistants, were consulted, and gave their approval as to the location of the hydrants. Mr. Fanning estimates for the whole expense of pumping, filtering, piping and all other things required for the introduction of the water, with the exception of the dam, or the power of operating the pumps, to be \$270,000.

This estimate of Mr. Fanning includes about seventeen miles of main and street piping, making use, in his estimate, of prices of cement and iron pipes which were obtained of the American Water and Gas Pipe Company, of Jersey City.



Mr. Flagler, the President, Mr. Richardson, the Agent, of the Holly Manufacturing Company, and also Mr. Holly of the same Company, have given the subject their careful investigation. They have taken measurements of the streets, number of hydrants &c., corresponding and in accordance with the plans of Col. Fanning and Mr. Eaton; reducing, however, the length of piping some over two miles, in the manner of laying the pipes, rather than a reduction of the territory to be piped, preserving in nearly all cases the location and number of hydrants, using in their estimate cast iron pipes, which they consider preferable, and which cost but little more than the wrought iron and cement pipes. They have offered by a written proposition, explicitly drawn, to furnish all that will be required to introduce the water through the city, including a very favorable plan of filtration, with the exception of the dam or power for working the pumps, for the sum of \$195,000. They are very anxious for the opportunity to introduce their works and put them into operation in our city; and they give the strongest assurance that the whole job shall be done and completed in the most thorough manner to give entire satisfaction to the city, and will furnish sufficient bonds for the faithful performance of the same.

#### QUALITY OF THE RIVER WATER.

We have not deemed it of great importance to give this subject much further investigation.

Analysis of the water of Penobscot river has repeatedly been made, and always resulted, as we are informed, satisfactorily, as to its purity for drinking purposes. We have, however, this spring, taken samples from the river to ascertain its purity as to the silt or muddy substance which might be contained in the water; and after standing some ten days or more, hardly any dirt was perceptible in the bottom of the vessel.

Having made these examinations and others of minor importance, we have come to the following results as to the cost of the proposed dam, and of supplying the city with water for culinary and domestic uses, for fire, sanitary and other purposes too numerous to give stretch to our imagination here to particularize;

Estimate of the cost of the dam, with sluice and fishway,	\$150,000
For water works for distributing water through the streets,	195,000
Add for damages and other contingencies,	55,000
	<hr/>
	\$400,000
One year's interest on this amount,	24,000
Engineering, superintending, etc.,	10,000
Add for further possible contingencies,	16,000
	<hr/>
	\$450,000

To meet this large expenditure for so needful a purpose, we take the liberty of offering our opinion, based upon facts of our own observation, the valuable opinions of others, as well as the results published by other cities, which have been more fortunate than our own in the introduction of pure water, so indispensable to the convenience, health, and luxury of all.

We would here add as our estimate and opinion that a sum of not exceeding \$40,000 to \$50,000 additional to the foregoing estimate would raise the dam to the desired height for manufacturing, viz: sixteen feet above mean high tide, including any additional damages which might be caused by flowage.

#### ESTIMATED RECEIPTS (PRESENT POPULATION.)

Families which would probably take the water in the course of one or two years after the works are in operation :

1,500 families, averaging	\$5.00	\$7,500
300 " "	10.00	3,000
200 shops and offices,	5.00	1,000
6 hotels, averaging,	50.00	300
10 livery stables,	20.00	200
For various other uses, say		3,000
		<hr/>
		\$15,000
For reduction of expense in fire department,	\$8,000	
For sewerage and sanitary uses,	2,000	
	<hr/>	\$10,000
		<hr/>
		\$25,000
Deduct yearly expenses and repairs,		5,000
		<hr/>
		\$20,000



If the foregoing estimate of receipts in any particular should be deemed too large for the first year, the average receipts for the first three or four years would unquestionably greatly exceed it. As instance the city of Portland. The receipts or incomes from the use of water in that city for the first four years after its introduction, was as follows:—

Income for the year 1870,	\$16,960.51
1871,	35,953.88
1872,	47,415.77
1873,	57,000.00
Total,	<u>\$157,330.16</u>

Average \$39,332.54 a year, with a population less than double that of the city of Bangor.

These actual receipts or incomes of the city of Portland do not embrace anything for fire or sewerage purposes. By comparing the actual population of the city of Portland with that of Bangor, taking the census of 1870, it would give the average of \$22,931.68 as the annual receipts of water rates for Bangor for four years, instead of \$15,000, our present estimate. To this sum of \$22,931.68, add our estimate for use of fire department, sewerage and sanitary purposes, \$10,000, and deducting the sum of \$5,000 for yearly expenses and repairs, it would leave \$27,931.68 as the average annual receipts from water rates for four years. This would pay 6 1-5 per cent. on the estimated sum of the construction amount of \$450,000 for the dam, water works, engineering, damages and contingent expenses.

There is another element of benefit not to be taken into account as income directly to the city, but it will inure to the citizens individually, that is the amount saved in the rates of insurance. This we would estimate at \$10,000; also a large amount now paid for street sprinkling might be saved; some \$3000 or \$4000, we are informed, are paid yearly for the limited number of streets sprinkled. If this latter item would be considered but a luxury, it is what some of our most prudent housewives delight to honor.

The owners of a large portion of the shores and adjacent grounds on both sides of the river, where the proposed dam may be located, have donated and transferred to the city of Bangor all necessary lands and shores which may be required for the erection

of the dam, the proposed water-works, and for any purposes in the future which may be required for canals, for sites and ample grounds for manufacturers of cotton and woolen goods.

The owners of the Water Power Company have agreed to transfer the franchise of said company to the city of Bangor.

In making these estimates of the cost of introducing pure water into our city, and the probable receipts and benefits as compensation we have endeavored to not fall short of the actual expense, but rather hope something handsome in amount may be saved.

In estimating the present yearly receipts and benefits, we have endeavored not to exaggerate; still they are in part but mere opinions formed from the best proof attainable.

The introduction of pure water into our city, passing by every man's door, where the pipe has been laid, and with a small outlay it may be introduced into and over his whole premises, cannot be fully estimated nor appreciated until he is in actual possession of the water.

Many of us feel well satisfied with our present condition, being well supplied with cisterns, and in some cases with wells of good water. But the poor, who "ye have always with you," constitute no small part of your population; they are very differently situated. Comparatively destitute, they cannot afford the outlay for cisterns, nor are they situated nor in condition to procure good water in other ways, but live from year to year in needful want and suffering, when by the payment of say \$5 a year, they may have an abundant supply of one of the greatest blessings which the God of nature has bountifully bestowed.

As to the question of expected benefits in the use of the surplus power in the future, for manufacturing purposes, in which our whole population is so vitally interested, for the growth and prosperity not only of our city, but of the surrounding country, we make no figures nor conjectures. But it must be self-apparent to every hopeful mind, that if we wish to retain our present population and increase the growth of our city, this is an opportunity which ought not to be neglected.

GEO. STETSON,  
WM. T. PEARSON, } Water Board.  
L. H. EATON,



## ENGINEER'S REPORT.

BANGOR, June 3d, 1875.

*To the Hon. Board of Commissioners of the Bangor Water Works:*

GENTLEMEN—In presenting a report of engineering operations to accompany your preliminary report, your Engineer will be necessarily restricted to a very incomplete presentation of the matters that will require examination in the further prosecution of the work.

By direction of the Board, he proceeded, on the seventeenth of March last, with a corps of assistants and laborers, to make such examination of the bed of the river and its shores in the section authorized by the bill of the legislature, as were deemed necessary at that time, which will give you a quite thorough knowledge of the features of the river, with its availability for damming and creating a water power of a sufficient capacity for supplying the city with water, with a view to its farther extension to meet the necessities of a manufacturing power.

These examinations embraced five separate and distinct points, namely: At Treat's Falls; at Spratt's Point, so called; at Webster's Point; at Howard's Ledge, and at the Orcutt Pitch, so called. The three first were made thoroughly, embracing quite a large area of the river bottom. The two last to a more limited extent. The results of these surveys have been presented to you in the form of plans and profiles for your consideration. An examination by a line of proved levels was made of the height of the apron of the Veazie mills above mean high tide at Webster's Point, and was found to be twelve feet and three inches. This height of mean tides may be found upon a more extended observation, to vary somewhat from that assumed at this time, but not largely. The height of the water in the mill pond was found to be twenty-four feet above mean high tides; this was previous to any rise having taken place in the river from spring rains or melting snows. The height of the track of the E. & N. A. Railway, at Webster's Point, was found to be seventeen feet

and four inches ; at Treat's Falls, nineteen feet and four inches above the mean high tides. The elevation of Mount Hope cemetery, near the soldier's monument, was found to be thirty-seven feet, and the travelled road in Brewer, across the flats, from eighteen feet and nine inches to twenty-three feet above mean high tides, with but a short distance of the lowest elevation ; not taking into consideration a distance of about one hundred feet, where a small brook crosses—in that it was found to average about ten feet.

In view of these ascertained facts, it is the opinion of your Engineer that a dam may be erected eight feet above the indicated mean high tide, without sensibly injuring the power at the Veazie mills, or flowing to an injurious extent, the land of proprietors upon the river above the dam.

The Engineer was unable to ascertain the rapidity of the current at the time of making the survey, as the ice rendered an attempt of that kind of no avail, and consequently he is unable to give you the volume of the river at that time ; and as the river has been at a much greater than an ordinary pitch since then, a measurement would not show a fair result ; that, however, can be reached approximately from other sources, as will be shown below.

The next subject that engaged the attention of the Engineer, was the comparison of the sites surveyed, as to their availability for the erection of a dam.

At Treat's Falls, two hundred and seventy-seven soundings were taken below high water mark. Of these, two hundred and thirteen were upon ledge bottom, and the remainder (sixty-four) upon loose rocks or hard, gravelly bottom, with ledge probably near the surface.

At Spratt's Point, five hundred and seventy-three soundings were taken below high water mark. Of these, three hundred and fifty-four were upon ledge bottom, and two hundred and nineteen upon loose rocks, hard gravel, with a little clay upon one line of soundings, and occasional deposits of refuse from mills.

At Webster's, six hundred and four soundings were taken below high water mark. Of these, three hundred and forty-eight were upon ledge, and in two hundred and fifty-six the ledge was not reached, although the character of the bottom gave evidence of the close proximity of it to the surface in the majority of instances.



The shore upon the southern side of the river is here much better for fastening a dam than at the points below, and equally as good upon the northern shore.

The surveys at the two other points examined, viz: Howard's Ledge and the Orcutt Pitch, show about the same character of bottom, but were thought too far from the city, and would necessitate too great an expense for piping, with a proximity to the Veazie mills undesirable, as it would so very materially lessen the pond room.

Hence, taking into consideration the relative practicability of fastening the dam to shores, the increased length of overfall, and the additional room for canal purposes, which in event of the further development of the power may become necessary, your Engineer is forced to the conclusion that Webster's Point presents the best physical features for a site for a dam. Again, with a dam at Treat's Falls or at Spratt's Point, in the event of further development, there would be available thirteen and one-quarter acres of land, including the road and the right of way of the Railroad, while by constructing the dam at Webster's Point, there would be available twenty-three and three-quarters acres, including the same items of roadways as above.

It is estimated that a dam can be erected, including head-gates, sluice and fish-way, with race-way for pumping house, at an expense of one hundred and fifty thousand dollars (\$150,000.)

The drainage of the Penobscot above Treat's Falls is from an area, in round numbers, of some seven thousand two hundred square miles, including approximately four hundred square miles of lake surface. The annual rainfall is estimated from observation and measurement, to be forty-two inches. Allowing three-fifths of this amount to pass off by evaporation, we have by computation, an amount flowing by Treat's Falls, annually, of two hundred and eighty-one billion fourteen millions two hundred and seventy-two thousand (281,014,272,000) cubic feet—equivalent to five hundred and thirty-four thousand seven hundred and twenty-two cubic feet per minute,—but as the value of the power will be governed largely by the minimum amount flowing, we must deduct very largely from that quantity.

Mr. Hiram F. Mills, who needs no commendations to a Bangor public, in his examinations of the river in the spring of 1866, found that there were actually used in the driest season of the year, at the mill sites upon the river above Bangor, nineteen

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hundred and fifty cubic feet of water per second, exclusive of that used at the sluice for passing rafts and logs; this amount used at the sluice he estimates at from twenty-five to fifty per cent. in addition. Your Engineer believes that the larger per centage is still lower than the real quantity diverted from the mill power. Assuming that Mr. Mills' larger estimate is correct, it would give one hundred and seventy-five thousand cubic feet per minute, which, with eight feet head, would be equal to seventeen hundred and fifty-horse power, constant; or for a working day of eleven hours, three thousand eight hundred and sixteen horse powers, equal to two hundred twenty-eight thousand nine hundred and sixty spindles. By a farther development of this power by a head of fifteen feet above high water mark, a force would be acquired thirty-two hundred and eighty-one horse power constant, or for a working day of eleven hours, seventy-one hundred and fifty nine horse power, equal to four hundred and twenty-nine thousand five hundred and forty spindles. This, it must be borne in mind, is for the natural flow of the river at its lowest summer drouth, and would undoubtedly be largely increased by a tight dam holding the water to its crest at its minimum flow, and increased by sufficient head in the morning to accommodate the flow of the river over it.

The estimates of Mr. J. T. Fanning, Hydraulic Engineer, of Manchester, N. H., do not vary materially from this, being slightly in excess of Mr. Mills' calculations. Mr. Fanning's estimates were made up principally from tabular statistics of other river basins, where the amount due to evaporation from their natural features, is in excess of that due to the same cause in this locality.

Mr. S. F. Harrison, Civil Engineer, from a survey made in August and September (dry months) in 1868, of the water powers of Oldtown, Milford and Bradley, gives a volume of water at the lowest summer run, equivalent (with present dams) to six thousand horse power. This is excluding the very considerable amount that passes around the westerly side of Marsh Island, and forms what is known as the "Stillwater branch."

Such examination as your Engineer has been enabled to make from the very limited data at his command, show, also, a slight increase over Mr. Mills' calculations.

Mr. Mills further states that with a dam of fifteen feet above mean high tide, with two feet flash boards, in the extreme drouth, a power of nine thousand horses for eleven hours in the day may be reached.



Your Engineer has not examined carefully the difference in expense of water power and steam power equipments, or the difference of expense in the use of the two motors; he, however, finds that the expense of pumping water by steam and by water power at the Philadelphia Water Works, where both powers are employed, is as seven to one in favor of the water wheels, coal costing five and one-half dollars per ton.

The expense of raising one million gallons of water at the Brooklyn Water Works, New York, with coal at seven and eleven one-hundredths dollars per ton at the works, one hundred and sixty-three feet high, was a fraction over thirteen cents per foot in height, nearly sixteen times that of the Fair Mount Water Works, where water wheels are used.

The cost of steam power at Brooklyn Water Works, averages about ninety-two dollars per year for each horse power. In Maine, New Hampshire and Massachusetts, the expense is considerably larger, from the greater price of coal.

Messrs. Charles Staples & Son, formerly carrying on a large machine shop and foundry in Portland, Maine, estimate for a twenty horse power engine, run ten hours per day, a cost of one hundred and fifty dollars per annum for each horse power. The cost of operating the wheels at the Fair Mount Water Works, in 1852, was two and three-quarters cents per day for each horse power; while the steam pumping engines of the water works at Hartford and at Cambridge, coal at six dollars per ton, cost to run, twenty-two and one-half cents per day for each horse power, showing a difference of nineteen and three-quarters cents per day in favor of water wheels.

The cost of fitting for machinery for the different motors has been found to vary so materially from physical accidents or peculiarities of locations, that a comparison of the two would be of little use in determining the relative cheapness in this locality; and the Engineer will only say that the features of this location warrant the belief that the power can be applied at a very much less expense than at a very large majority of localities where water powers have been constructed, around which have grown up large communities.

Your Engineer has not touched upon the question of retaining water for use in drouth by means of dams at the foot of lakes, etc., as that will suggest itself to the observations of almost every one. He will simply give the area of some of the more important

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bodies of water as follows :—Chesuncook lake, 22 square miles ; Baskahegan lake, 18 square miles ; Nicatou, 10 square miles ; Schoodic lake, 16 square miles ; Sebois lake, 12 square miles ; Sebec lake, 14 square miles ; Passadumcook lake, 16 square miles ; Millinokett lake, 18 square miles ; Conquongamock lake, 10 square miles. Quite a head can be obtained upon these lakes and upon others of less surface, by dams which may readily be constructed where they do not already exist, which will greatly facilitate the driving of logs, and supply a much more uniform run of water at the mills above Bangor.

Very respectfully,

Your obedient servant,

L. H. EATON,

Engineer.

Bangor, May 29, 1875.

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June 5. The Special Committee to whom the reports of the Water Board and Engineer were referred, presented the following report which was accepted :—

#### CITY OF BANGOR.

BANGOR, June 5, 1875.

#### TO THE CITY COUNCIL :

The Joint Special Committee to whom was referred the Report of the Water Board of the City of Bangor, with the Engineer's report to said Board, have considered the subject matter of said report, and herewith submit the following report thereon : That the City Council pass the following :

*Resolved*, That the thanks of the City Council are due, and they are hereby tendered to the Water Board for their faithful investigation into, and their very full and instructive report upon the subject matter committed to them. And that we hereby pledge to them in the prosecution of their work, such aid and assistance by our vote or otherwise, as they may require, and we may have the power to give.



*Resolved*, That the Water Board be requested to proceed as soon as practicable, to the construction of the dam and water works, as contemplated by the act of the Legislature passed at its last session, authorizing the City of Bangor to erect a dam across the Penobscot river for the purpose of introducing water into said city.

J. C. WHITE,	}	Committee.
JAMES TOBIN,		
WILLIAM CONNERS,		
F. M. LAUGHTON,		
JOHN S. RICKER,		
O. M. SHAW,		
JAMES ADAMS,		
C. A. BABCOCK,		
G. W. MERRILL,		
M. G. TRASK,		
E. W. CORSON,		

IN BOARD OF ALDERMEN,  
June 5, 1875.

Report accepted and resolves passed. Sent down for concurrence.

JOHN H. HAYES,  
*City Clerk.*

IN COMMON COUNCIL,  
June 5, 1875.

Concurred.

CHAS. E. FIELD,  
*Clerk.*

At the same meeting resolves authorizing a loan of \$350,000, and an appropriation of \$1000 for further prosecution of the survey, were unanimously passed in both boards, as follows:

### CITY OF BANGOR.

IN CITY COUNCIL.

*Resolved*, That for the purpose of raising money to defray the expenses which may be incurred by the city in carrying into effect the powers granted to the city under and by virtue of an Act of the Legislature, entitled, "An Act for supplying the city of Bangor with Water," approved February 22d, 1875, the Treasurer is hereby directed to issue and sell bonds or scrip of the city, from

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time to time, as the same shall be needful, not exceeding, however, in all, the amount of three hundred and fifty thousand dollars; said Bonds to be designated and marked "City of Bangor Water Loan Bonds," all to bear date of the first issue, to be made payable to the holder thereof in thirty years from their date, in sums, at his option, of one hundred dollars, five hundred dollars, and one thousand dollars, with coupons for interest attached, reckoned at the rate of six per centum per annum, payable semi-annually. Said bonds and coupons to be signed by the Treasurer and countersigned by the Mayor and by the members of the Water Board created by said Act, and to be payable in the city of Boston.

And the City Clerk is hereby directed to deliver to the City Treasurer and said Water Board a certified copy of this resolve.

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IN BOARD OF ALDERMEN,  
June 5, 1875.

This resolve, having had two several readings under suspension of the rules, passed to be engrossed by a unanimous vote, sent down for concurrence.

JOHN H. HAYES,  
*City Clerk.*

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IN COMMON COUNCIL, June 5, 1875.

This resolve, having had two several readings under suspension of the rules, passed to be engrossed by unanimous vote in concurrence.

CHAS. E. FIELD,  
*Clerk.*

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IN BOARD OF ALDERMEN,  
June 5, 1875.

This resolve, certified correctly engrossed, finally passed, sent down for concurrence by a unanimous vote.

JOHN H. HAYES,  
*City Clerk.*



IN COMMON COUNCIL, June 5, 1875.

This resolve, correctly engrossed and finally passed by following vote—yeas, Councilmen Colton, Ricker, Burke, Shaw, McCann, Adams, Hight, Brown, Cowan, Getchell, Merrill, Wilson, Trask, Pond, Watson, Corson and Phillips. Nays, none—in concurrence.

CHAS. E. FIELD,  
*Clerk.*

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CITY OF BANGOR.

IN CITY COUNCIL.

*Resolved*, That an additional appropriation of one thousand dollars is hereby made for the use of the Commissioners styled the Water Board, for the purpose of further prosecuting the work of making the necessary surveys for locating the proposed dam across the Penobscot river, and for locating the building for containing the pumps and machinery for pumping the water, and for the necessary adjuncts to said building, agreeable to an act of the Legislature recently adopted by the legal voters of the City of Bangor, and for such other necessary expenses as may be incurred by said Commissioners.

And the Mayor is hereby authorized to draw his order on the Treasurer for the same.

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IN BOARD OF ALDERMEN,

June 5, 1875.

This resolve, certified correctly engrossed, finally passed, sent down for concurrence.

JOHN H. HAYES,  
*City Clerk.*

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IN COMMON COUNCIL,

June 5, 1875.

This resolve, certified correctly engrossed, finally passed in concurrence.

CHAS. E. FIELD,  
*Clerk.*

*To the Honorable Mayor and Council of the City of Bangor :*

GENTLEMEN—In conformity with the expressed wish of your honorable body, and in conformity with their own judgment of the proper course to pursue, that the Board of Commissioners for the Bangor Water Works, should make a journey of enquiry and observation into the working of the different methods of water supply of cities, a majority of said Board, accompanied by one of the Aldermen of the city, left home on the tenth day of June instant, for the purpose indicated above, and at various points, examined as thoroughly as was considered needful, the two systems, by gravitation and by direct force, obtained the opinions of hydraulic engineers of eminence in their profession, and of other intelligent men connected with water works, in order to gain knowledge of the comparative efficiency, reliability and economy of the two methods.

And having made such examination, respectfully submit this report :

We find very generally, in fact universally, so far as came under our observation, cities very strongly in favor of such methods as they chance to have adopted. In Massachusetts and the Eastern States generally a decided opposition to the direct forcing system, known as the Holly, the result, as we are compelled to believe, more of conservative adherence to an old and long tried method, than to a fair and unbiased comparison of merits and demerits.

The objection to the direct forcing system expressed by engineers and others consulted, who favored the gravitation method, we found to be comprehensively as follows :

1st. There is no supply held in reserve, so that in case of accident to machinery or force main, the entire supply would be cut off, to the inconvenience of the water takers, and danger to the city from fire until repairs could be effected.

2d. The complicated machinery of the Holly system making it expensive to run and keep in repair, when steam is used as a motor.



3d. The heavy strain of fire pressure is the same on all the pipes, including service pipes, endangering the bursting of service pipes and consequent flooding of houses.

To these objections the following answers are made:

1st. It would cost much less to duplicate the exposed portions of the works, say the pumps and the force main to its first branch, than to build an expensive reservoir, and provide the pipe leading to it. Again, the rarity of accident, as tested by the service in many cities, shows the danger from this source to be almost inappreciable. And again, there is nearly if not quite as much danger of an accident to a reservoir and to the supply main to it, as to the pumps and pipes of the direct forcing method; ordinarily it would be safe, as tested as above stated, by many cities, to depend upon the direct service of a single set of pumps and mains; and if in the future, to accommodate the increased growth of the community, or to make assurance doubly sure, the resort may be had, if localities are favorable, to either a reservoir or to duplicating machinery.

2d. The Holly machinery, as now constructed with automatic pressure regulators, works well and safely, as we ascertained from cities where it is used, and also from our own observation and examination. With water power it costs comparatively nothing to use it. With steam it shows as high a duty as other reliable pumps. With the rotary pump, and with the old system of gang pumps, it is not claimed by the inventor himself, as we understood him, that so high a duty was attained.

In the city of Auburn, New York, they have the gang pump arrangement, supplemented both by rotary and reciprocating pumps, the two latter not in use except upon extraordinary occasions. The gang pumps are single acting vertical cylinders, geared in such a manner as to take and discharge water at separate points of revolution. They have worked eleven years successfully, and are very efficient, needing but little care.

We could not perceive but that Holly's latest improved pumps worked as well as any pumps we saw.

3d. This objection, excepting the danger to service pipes, which upon testimony of parties, we conclude to be small, seems to us to be really an argument in favor of the direct forcing system

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as follows: Here we have a pressure available at all times in all places, at high points as well as low, and capable of being increased to meet the wants at fires, or upon other extra occasions. Whereas, by the gravitation system, the flow must necessarily be the same at all times in the same place, without the power of increasing it in cases as above stated, and with the very important exception that with the increased use of water, as at fires when most is needed, the pressure is lessened from the increased number of opening of hydrants. With each additional hydrant opened the pressure upon the others must necessarily be reduced, and consequently an inferior flow of water when it is of the utmost importance to maintain the force of the streams; having by the gravitation system, a reserve of water with constantly diminishing force, and in the direct forcing system a plentiful supply of water with a sufficient reserve of force to meet all contingencies.

Again, those portions of the district served, laying at an elevation of not more than fifty feet below the reservoir, cannot avail themselves of hydrant streams of sufficient force to be of service in case of fire, without the intermediate use of fire engines; and in cities where the reservoir or stand pipe system is in use, large and expensive fire departments have to be maintained. The Holly system furnishes the necessary increase of force to meet the demand for fires, far beyond the heights usually found in cities; and in no place have we learned that the full capacity of the works have been called for in this direction.

Another very material point in favor of the direct forcing system, is its low cost as compared with the gravitation system.

We have therefore come to the conclusion that the method of supplying cities with water by the direct forcing system, is preferable to the method of supply by gravitation; and we are the more convinced of the fact by observing that in many cities where they have adopted the gravitation method, they have supplemented their works with forcing apparatus, as in the case of Lawrence, Massachusetts; Manchester, New Hampshire; Troy, New York, and other cities.

The delay in making this report has arisen mainly from the fact that the question of the validity of the act for supplying the city with water was to be submitted to the court, and as they have



dismissed the case without a hearing, and without prejudice, we are prepared, if after a conference with your body it is deemed best, to proceed to the construction of the works, upon being furnished with the means to do so.

GEO. STETSON.  
WM. T. PEARSON.  
L. H. EATON.

Bangor, June 30th, 1875.

IN BOARD OF ALDERMEN,  
June 30th, 1875.

Accepted, sent down for concurrence.

JOHN H. HAYES,  
*City Clerk.*

IN COMMON COUNCIL,  
June 30th, 1875.

Concurred.

CHAS. E. FIELD,  
*Clerk.*

### CITY OF BANGOR.

IN CITY COUNCIL.

*Resolved*, That it is the sense of the City Council of Bangor, that the Water Commissioners proceed at once to contract for a system of water works, and also for the erection of a dam, not to exceed twelve feet above mean high tide, and do all other things necessary to be done for the purpose of supplying the city with water for municipal purposes.

IN BOARD OF ALDERMEN,  
June 30th, 1875.

Passed—sent down for concurrence.

JOHN H. HAYES,  
*City Clerk.*

IN COMMON COUNCIL,  
June 30th, 1875.

Concurred.

CHAS. E. FIELD,  
*Clerk.*

The Water Board, immediately upon receiving a copy of this resolve, placed themselves in communication with the Holly Manufacturing Company, of Lockport, New York, and on July 13th, 1875, concluded a contract with them for buildings, machinery, piping, etc., in accordance with above resolve.

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CITY OF BANGOR.

IN CITY COUNCIL.

*Resolved*, That the City Council of Bangor hereby recommend that the Water Board execute forthwith the contract with the Holly Manufacturing Company, as submitted to a convention of both branches of the City Council this day.

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IN BOARD OF ALDERMEN,

July 13th, 1875.

Unanimously passed—sent down for concurrence.

JOHN H. HAYES,

*City Clerk.*

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IN COMMON COUNCIL,

July 13th, 1875.

Unanimously passed in concurrence.

CHAS. E. FIELD,

*Clerk.*

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TO THE CITY COUNCIL OF BANGOR:

The undersigned, Water Board of the City of Bangor, would respectfully offer the following brief statement of the progress and expenditures that have been made for the introduction of water into our city under contract with the Holly Manufacturing Company, of Lockport, New York, which was signed after receiving the approval of the City Council, by the President, Mr. Flagler, on the part of the Holly Company, and by the Water Board on the part of the City of Bangor.

Immediately after the ratification of the contract, Mr. Flagler, the President of the Company, proceeded to Philadelphia, and made contract with one of the largest manufactories of that city, Messrs. Wood & Co., for the full amount of pipe required at that



time by the contract, to be delivered in Bangor, the last delivery to be by the 15th of October following; but unfortunately for the Holly Company, and the inconvenience imposed upon the travel of the streets, and to our citizens, it did not arrive until late in the month of November.

Not long after the signing of the contract, the Company's Agent, H. F. Gaskill, and G. W. Pearson, Engineer, arrived in Bangor, and immediately commenced operations for the site of the buildings at Treat's Falls; and on the arrival of the first cargo of pipe, operations were commenced trenching the streets and laying the pipe.

The work on the erection of the buildings, the engine and pumping machinery, together with the laying the pipe in the streets, has been pushed forward with great diligence, and with a liberality in some cases not required by the contract, or by the Water Board, and much to the credit of the Holly Company. They have made good their assurance at the time of making the contract, that they would employ our citizens as laborers in the construction of the works. Perhaps in some cases they have done so largely against their own interest.

The Holly Company have laid seventy-six thousand six hundred and seventy-two feet of mains and pipes of the seventy-six thousand nine hundred and fifty-one feet specified in the contract, leaving only two hundred and seventy-nine feet still to be put down. Deeming it important, we ordered some two miles or more additional pipe to be laid, (14,450 feet) of which the Holly Company have already laid eleven thousand three hundred and forty-nine feet, leaving only three thousand one hundred and one feet to be put down; this with the two hundred and seventy-nine feet of the first requirement, will when laid, complete the contract for laying the pipes and mains. We shall then have about seventeen and one-third miles of street pipes, including hydrant connections.

Had the pipes been furnished agreeable to the contract of Messrs. Wood & Co., they would have been all laid in good season, before the freezing up of the ground, thereby making a great saving in expense to the Holly Company, and much inconvenience to our citizens, as well as to the travel of our streets.

Soon after closing the contract with the Holly Company, we decided to make a commencement in the building of the dam;



fearing the impracticability of obtaining but a small supply of timber suitable for the purpose, we did not contemplate doing but a small portion of the work the past season. Timber and other material being obtained more readily than was expected, the work was pushed forward to such extent that one-half or more of the dam and shore approaches are fully completed, with the exception of the gravelling of the dam. Of the whole length of the dam (900 feet of overfall) six hundred and eighty-eight feet of the bottom has been put in, leaving only two hundred and twelve feet more of the bottom work; of the six hundred and eighty-eight feet, about one hundred feet is raised to a little above low water mark, and is planked over, and intended to so remain, to serve for the passage of rafts, and the run of the water, until the remainder of the dam is fully completed, when a coffer dam will be put in the open space, and the one hundred feet finished.

The shore approaches, which are built of heavy stone masonry, are nearly completed on both sides of the river.

We were very fortunate in the commencement of the work on the dam, to obtain the services of Mr. A. P. Richardson, of Turner's Falls, Massachusetts; his practical ability and experience as a dam builder, has been of great value. He returns at the proper time the coming season for the completion of the dam.

The act of the Legislature authorizing the erection of a dam by the city, requires the building of "suitable locks or sluices for the passage of boats, rafts, logs or other lumber." After consultation with, and taking the advice and opinions of many of the most practical lumbermen on the river, as to the necessity and wants of a sluice or locks, and the manner of construction, we decided to build a sluice or roll way, and have so constructed it that we deem it will, for the present, at least, serve all the purposes required for the travel and business of the river.

Should, at some period in the future, locks be required for the greater wants of navigating the river at this point, such as sea going vessels, or for other business that is not now apparent, they can be built with as much convenience and at no greater expense than at the present time.

The cost of suitable locks for sea-going vessels of only small tonnage, would be not much less than from fifty thousand to sixty thousand dollars, the yearly interest of which, together with the probable annual repairs, and the labour of opening and shutting



the locks at all times, and other attendance, would not be much less than six thousand dollars per annum, if not even a greater sum.

There is another serious objection to building locks at the present time, arising from the fact that if the dam is raised, as proposed, some time in the future, for manufacturing purposes, it might require, and probably would, a very different arrangement in the construction of the locks.

We deem it of great importance to have an opportunity after the dam is completed to its present contemplated height of eight feet above mean high tide, to test the work and determine what effect the water and ice may have in a spring freshet upon the dam, and flowage on the shores of the river.

The Water Works, with the four plunge pumps, are now in successful operation, both night and day, by steam. The engine is compound working, or may be worked at high pressure alone if desired; the former is considered much more economical. Both the engine and pumps are first class work, highly finished, run smoothly and with great accuracy.

The rotary pump is in place, but will not be connected for use until the water wheels are attached, when the whole works will be run by water power, and at much less expense than by steam.

By the contract with the Holly Company, the engine and boilers are to be retained for use until the water wheels are ready, and water is applied to them, after which time it is to be optional with the city to keep them or not; nothing to be paid for them until that time; if kept, the city is to pay a fair price for them; if taken out by the Holly Company, the city is to pay \$3,000 for their use, and the extra expense of buildings, etc.

To meet any emergency which may possibly occur, such as "anchor ice," or any other impediment in the working of the water wheels, it may be desirable to retain the steam power, the cost of which, including the \$3,000 to be paid if they are taken out, will not exceed \$10,000, as now offered by the Holly Company.

We have notified Mr. Low, Chief Engineer of the Fire Department, that the works are now ready for the extinguishment of fires, and it is presumed it will meet the approval of the City Government. We would recommend that the Fire Department have the control of the hydrants for that purpose.

The Water  
Treasurer:  
Amount of  
From sale  
From sale  
Due John  
wheel  
Due Daniel

Preliminary  
same  
Engineer  
Incident  
Boats, rig  
Trenching  
Construct  
Excavati  
Holly M  
Service  
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Other in  
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benefit  
of the  
city

The Water Board has received of John L. Crosby, City  
 Treasurer:  
 Amount of special appropriations,  
 From sale of city bonds,  
 From sale of stone,

\$2,000.00

285,000.00

1.00

Due John Shannon, reserved for work on  
 wheel pit,

\$287,001.00

Due Daniel Webster, on account,

\$87,27

1 60

\$88 87

\$287,089 87

## STATEMENT OF AMOUNT EXPENDED.

Preliminary survey and expenses attending

same, previous to July 9, 1875,

\$778 14

Engineering from July 9, 1875, to Jan. 17, 1876, 908 62

Incidental expenses " " " 857 61

Boats, rigging and tools, 1,934 80

Trenching and extra on Holly contract, 6,641 14

Construction of filter crib, 1,754 96

Excavation of wheel pit, 2,914 73

Holly Manufacturing Company on contract, 180,036 72

Service piping account, 2,269 19

Thos. Gilbert, raising road in Brewer, flow-

age account, 500 00

Construction of dam account, 75,136 50

L. H. Eaton, on account, 1,814 35

Other items on account, 101 65

On hand, deposit in First National Bank, 12,441 46

\$287,089 87

Our former estimate, as reported to the City Council in the month of June last, for the Water Works and building of the dam, sluice-way, fish-way, etc., as stated, was four hundred and fifty thousand dollars. The estimate did not embrace ledge excavation in trenching, or for laying the street pipes at a greater depth than six feet in some places where exposed to more than ordinary freezing, or for a portion of the service piping, (the city lays the service pipes from the mains to curb-stone, or outer side of the side-walk, where a stop-cock is placed to regulate the use of the



water,) or for a suction filter crib for draft of water below the dam, for the pumps for present use, also for piers and booms above the dam for the guidance of rafts through the sluice or roll-way, and many other small necessary expenditures for which no very accurate estimate can well be made.

It is not, perhaps, in our province to advise or even suggest to the City Council how the additional sum needed for the completion of the Water Works and dam shall be raised; the amount which will be required will not be far from fifty thousand dollars in all. However, we trust we shall be pardoned if we do suggest that an application be made at an early day to the present Legislature for an additional act, authorizing the city to increase the loan in the sum of one hundred and fifty thousand dollars. No more of the bonds need be sold than is sufficient for the purposes of completing the works, and should a greater sum be required it should be raised by taxation, or by a temporary loan on short time. We have no doubt but that the five hundred thousand dollars will be ample for the whole work, and hope that something may be saved from that sum.

BANGOR, January 18th, 1876.

GEO. STETSON,	} Bangor	
WM. T. PEARSON,		Water
L. H. EATON,		Board.

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IN BOARD OF ALDERMEN,  
January 18th, 1876.

Referred to joint special committee, and Aldermen Strickland and Egery, with the Mayor and City Solicitor, appointed on part of this Board. Sent down for concurrence.

JOHN L. CROSBY,  
*City Clerk, pro tem.*

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IN COMMON COUNCIL,  
January 18th, 1876.

Concurred, and Councilmen Merrill, Ricker and Drummond, were appointed, to which by vote was added President Trask.

CHAS. E. FIELD,  
*Clerk.*

CITY OF BANGOR.

January 20th, 1876.

To THE CITY COUNCIL:

The joint special committee to whom was referred the report of the Board of Water Commissioners, have considered the subject matter of said report, and herewith submit the following report thereon.

They recommend that the report be accepted and placed on file, and that application be made to the present Legislature for the passage of amendments to the "act entitled an act for supplying the city of Bangor with water," approved February 22d, 1875, in accordance with the suggestion embraced in said report; and they recommend the passage of the accompanying order.

Signed,

F. M. LAUGHTON, ISAAC STRICKLAND, THOS. N. EGERY, JOHN S. RICKER, M. G. TRASK, T. W. VOSE, City Solicitor, F. H. DRUMMOND,	} Committee.
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IN BOARD OF ALDERMEN,

January 20, 1876.

Accepted, sent down for concurrence.

JOHN L. CROSBY,  
*City Clerk, pro tem.*

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IN COMMON COUNCIL,

January 20th, 1876.

CHAS. E. FIELD,  
*Clerk.*

Concurred.



In compliance with the recommendation, or suggestion of the Water Board, in their report of January 18th, 1876, the following amendments to the act approved Feb. 22d, 1875, were presented to the Legislature, were subsequently passed, and became a part of the new bill:

*To the Hon. Senate and House of Representatives in Legislature assembled:*

The undersigned, by an unanimous vote of both branches of the City Council of the City of Bangor, are directed to petition the Legislature, now in session, to amend the one hundred and sixty-eighth chapter of the Private and Special Acts of 1875, in manner and form as set out in the following Bill: an act entitled "an act to amend an act for supplying the City of Bangor with water," approved February 22, 1875.

And thus in duty bound will ever pray.

BANGOR, Jan'y 22, 1876.

IN THE YEAR  
An act to  
of Bangor v

Be it enacted  
Legislat

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water.

## STATE OF MAINE.

IN THE YEAR OF OUR LORD ONE THOUSAND EIGHT HUNDRED  
AND SEVENTY-SIX.

An act to amend an act entitled "an act for supplying the City of Bangor with water," approved February 22, 1875.

*Be it enacted by the Senate and House of Representatives in  
Legislature assembled, as follows:*

SECTION 1. Section one, of chapter one hundred and sixty-eight of the private and special laws of eighteen hundred and seventy-five, is hereby amended by striking out in the sixth and seventh lines thereof, the words "for the extinguishment of fires, domestic uses and creating steam;" and inserting in the place thereof the words 'for all municipal and domestic uses,' so that said section, as amended, shall read as follows:

'SEC. 1. The city of Bangor is hereby authorized to take, hold, and convey into, about and through the city of Bangor, from any point in Penobscot river that may be deemed expedient, between the foot of Treat's falls, in Bangor, and the head of McMahon's falls, in Veazie, water sufficient for the use of said city and the inhabitants thereof, for all municipal and domestic uses; and may flow, take and hold, by purchase or otherwise, any lands or real estate for laying and maintaining aqueducts or pipes for conducting, discharging, disposing of and distributing water, and for constructing and maintaining reservoirs, dams and such other works as may be deemed necessary or proper for raising, forcing, retaining, distributing, discharging or disposing of said water, and for the erection of any works for said purposes, and for sinking wells or making excavations for the filtration of water.



SEC. 2. Section two of said chapter is hereby amended, by striking out in the second, fifth and seventh lines thereof, the word "said," and inserting in the places thereof the word "any;" and by inserting in the fourth line thereof after the word "and" the following words, 'take by gift or,' and by adding to said section the following words: 'said city shall construct and maintain from time to time, in such dam, such suitable locks or sluice for the passage of boats, rafts, logs and other lumber, as the public necessity may require;' so that said section as amended, shall read as follows:

'SEC. 2. Said city may erect and forever maintain, at any point, a dam across said river, for the retention of water for said specified purposes, not exceeding twelve feet in height above mean high tide; and take by gift or purchase, any franchises or the right to operate under any franchises required for said purposes, or may purchase and forever maintain any dam erected or to be erected across said river at any point, for the retention of said water, or may purchase the privilege and right forever to draw and take from said river, at any point, a sufficient quantity of water for all said purposes, and sufficient water power to pump and raise, force and distribute the same to any required places in said city; may make, build, lay down and maintain aqueducts and pipes, from said river, at said point, to, into, through and about said city, and secure and maintain the same by any works suitable therefor; may make and establish such public fountains and hydrants in such places as may from time to time be deemed proper, and prescribe the purposes for which the same may be used, and may change or discontinue the same; may distribute water throughout the city, and for this purpose may lay down pipes to any house or building in said city, the owner or owners thereof having notice and not objecting thereto; may regulate the use of said water within said city, and establish, receive and collect the prices or rents to be paid therefor; and the said city may, for the purpose aforesaid, carry and conduct and maintain any aqueducts, pipes or other works by them to be made, laid down or conducted, over, under, through or across any water-course or river, street, bridge, railroad, highway or other way, in such manner as not to obstruct the travel or free use thereof; may enter upon and dig up any such road, street or way, for the purpose of laying down pipes beneath the surface thereof, and for



maintaining and repairing the same, and, in general, may do any other acts and things necessary or convenient and proper for carrying out the purposes of this act. Said city shall construct and maintain, from time to time, in such dam, such suitable locks or sluice for the passage of boats, rafts, logs and other lumber, as the public necessity may require.'

SEC. 3. Section three of said chapter is hereby amended by inserting in the third line thereof, after the word "water," the following words 'or of power,' and in the fourth line thereof, after the word "surplus," the following words, 'water or,' so that said section as amended shall read as follows:

'SEC. 3. If said city shall elect to erect or purchase a dam as aforesaid, for said purposes, and there shall be a surplus of water or of power, after supplying at present all of said purposes, said city may sell or lease any surplus water or power created by said dam.'

SEC. 4. Section four of said chapter is hereby amended by inserting in the seventh line thereof, after the word "therefor," the following words, 'said city or,' so that said section as amended shall read as follows:

'SEC. 4. Said city shall be liable to pay all damages that shall be sustained by any persons or corporations in their property, by the taking of any land or by flowage, or excavating through any land for the purpose of laying down pipes, building dams or constructing reservoirs, or making excavations. And if any person or corporation sustaining damage as aforesaid, and said city, shall not mutually agree upon the sum to be paid therefor, said city, or such person or corporation, may cause said damages to be ascertained and determined in the same manner and under the same conditions, restrictions and limitations as are by law prescribed in the case of damage by the laying out of highways.'

SEC. 5. Section five of said chapter is hereby amended by striking out all of said section after the figure "five," and inserting in place thereof the following words, so that said section as amended shall read as follows:

'SEC. 5. The rights, powers and authorities given to the city of Bangor by this act shall be exercised by the said city, subject to the restrictions, duties and liabilities herein contained, in such



manner and by such commissioners, officers, agents and servants, chosen at such times, and for such terms of office, as the city council shall from time to time ordain, appoint and direct. *Provided, however,* that until the first day of January, eighteen hundred and seventy-seven, there shall be three commissioners, called a water board, whose compensation shall be fixed from time to time by the city council, and George Stetson, William T. Pearson and Luther H. Eaton, all of said Bangor, shall constitute said board from the acceptance of this act, unless sooner removed, as hereinafter provided. In case of any vacancy in said board, by death, resignation or otherwise, such vacancy shall be filled by the election of a new member by the city council, in joint convention, which said city council may, at any time, by a vote of two-thirds of each board, remove either or all of the members of said water board.'

SEC. 6. Section six of said chapter is hereby amended by striking out in the sixth line thereof, the words "three hundred and fifty," and inserting in place thereof the words 'five hundred;' and by adding to said section, the following words: 'and the signatures of such officers shall be binding upon said city, notwithstanding such officials may not be in office at the issuing of such bonds, or at the date of said first issue,' so that said section as amended, shall read as follows:

'SEC. 6. For the purpose of defraying the expenses which may be incurred by said city, in carrying into effect the powers herein granted to said city of Bangor, said city is authorized to raise money by issuing and selling its bonds or scrip, from time to time, as the same shall be needful, not exceeding, however, in all, the amount of five hundred thousand dollars. Said bonds shall be designated and marked City of Bangor Water Loan Bonds, and shall all bear date of the first issue of said bonds, be made payable to the holder thereof in thirty years from date, and in such sums, and at such places as the city council may determine, with coupons for interest attached, reckoned at the rate of six per centum per annum, payable semi-annually, and shall be signed by the treasurer and countersigned by the mayor of said city, and by the members of the water board; and the signatures of such officers, shall be binding upon said city, notwithstanding such officials may not be in office at the issuing of such bonds, or at the date of said first issue.'



SEC. 7. Section seven of said chapter is hereby amended by inserting in the seventh line thereof, after the word "same," the following words: 'and for the creation of a sinking fund as hereinafter provided;' and by adding to said section the following words: 'and for the creation of said sinking fund,' so that said section as amended, shall read as follows:

'SEC. 7. The city council of said city is authorized to establish, assess, collect and receive, annually, and as much oftener as may be deemed expedient, such prices, rents and tolls for water, of the water-takers, as shall pay, as the same shall become due, a part or the whole of the interest on said bonds, the expenses of carrying on or running said works, and repairing the same, and for the creation of a sinking fund as hereinafter provided. And said city council is authorized, from time to time, to grant, assess, collect and appropriate in the same manner as other money is granted, assessed, collected and appropriated for other city purposes, such sums of money as shall be necessary to pay any deficiency in the amount assessed and collected, as aforesaid, of said water-takers, to pay said interest and expenses, and for the creation of said sinking fund.'

SEC. 8. Section eight of said chapter is hereby amended by striking out in the second and third lines thereof, the following words, "and as compensation for the use of water for municipal purposes," so that said section as amended shall read as follows:

'SEC. 8. In order to create a sinking fund to pay and extinguish said bonds at maturity, said city is authorized, annually, after the expiration of five years from the issue of said bonds, to grant, assess, collect and appropriate in the same manner as other money is granted, assessed and appropriated for other city purposes, a sum not exceeding ten thousand dollars, and for such a number of years that said fund thus created, with accumulated interest or income thereof, shall be sufficient in amount to redeem and extinguish all of said bonds at maturity; said money thus raised shall be invested in the purchase of bonds of said city, or of municipal bonds of other cities in New England of a population of not less than twenty thousand inhabitants, or of county or state bonds of New England.'

SEC. 9. Section twelve of said chapter is hereby repealed.



SEC. 10. Before this act is submitted to the legal voters of said city, the city council of said city, at a legal meeting, shall accept the provisions of an act passed by the present Legislature, entitled "an act to amend and extend the charter of the Bangor Water Power Company," approved February nineteen, eighteen hundred and sixty-seven, and said city council are hereby authorized to so accept the same.

SEC. 11. The Bangor Water Company, or any person or persons named in the act incorporating said company, may petition the supreme court for the county of Penobscot, setting forth that said company, person or persons have a claim growing out of moneys advanced, or services performed to secure the introduction of water into said city, and after notice, a hearing shall be had of the parties, and the court shall determine whether the petitioners have any legal or equitable claim upon said city for a reimbursement of said moneys, in case this act is accepted by the city; and in case said court shall determine that such claim exists, then, and not otherwise, the court shall appoint three suitable men to determine the amount of such claim, and the same proceedings shall be had as in case of a reference of an action in court under the laws of this State. And all rights under this section shall be claimed within one year from the passage of this act.

SEC. 12. This act shall not take effect or be of any force until the legal voters of the city, in the legal ward meetings, shall, by a vote of two-thirds of all the votes thrown for and against said act at such meetings, adopt the same.

SEC. 13. This act shall take effect when approved.

Approved February 11, 1876.

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This amended bill was voted upon at the following March election, with the result below :

Yeas, 2449.

Nays, 129.

# REPORT

OF THE

## BOARD OF WATER COMMISSIONERS.

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BANGOR, Jan'y 1st, 1877.

TO THE CITY COUNCIL:

The term of office of the Bangor Water Board having expired by limitation, they lay before your body and the tax payers of the city this report of their doings, the amount of monies expended by them, and what has been accomplished by that expenditure.

The works contemplated at the outset, viz: the supplying of the city with water through a series of pipes by means of direct pumping, has been accomplished, and tested to a strain on the entire system equal to a gravitation pressure of four hundred and sixty feet in height, and has now been in operation for a year, driven by the steam engine purchased of the Holly Manufacturing Company as a reserve in case of accident to the water wheels, or that from clogging with anchor ice they may be rendered temporarily inefficient. The dam has been completed with the exception of the fish-way now in process of construction on the Brewer end; this will require some six weeks more to complete. The sluice or roll way provided for the passage of rafts and lumber, was found from defective plan to work badly, and in the high freshet of last fall was injured to such an extent, that it has been found necessary to reconstruct a large portion of it. This work is now about to be commenced, and it is hoped that the repairs will be completed before the rise of the river consequent upon the spring rains. The Board of Commissioners found themselves unable to agree upon the proper manner to construct this roll way, and called to aid them at arriving at the best plan upon which to build it, such of our citizens and others as were supposed to have practical knowledge of sluices, mainly lumber merchants, millmen and raftsmen, together with the master workman upon the dam;



and after listening to the various propositions, instructed the master workman or dam builder, to construct the roll way as in his judgment, after giving due consideration to the various suggestions of the persons consulted, would best serve the purpose for which it was intended. This resulted as above stated, unsatisfactorily.

The fish-way is being built on plans furnished by the State Commissioners under authority vested in them by the statutes of the State, and is believed to be well adapted to the very important interest it is intended to subserve. The expense of the structure has been very materially increased in consequence of being obliged to construct it at the inclement season of the year in which it is being built, resulting in a large degree from delays forced upon the Board of Commissioners by action of parties beyond their control, delaying the resumption of work upon the dam some four to six weeks after the proper season had arrived to recommence; since the resumption of the work it has been pushed vigorously with all the force that could be economically employed.

The pump room is now being prepared for heating by steam, which will be accomplished in a few days, when the use of steam as a motor will be dispensed with, and the water wheels, which are now ready, will be used instead; a low pressure of steam will be maintained upon one of the boilers sufficient for heating purposes only.

Under a head of five feet, which is the smallest we shall probably ever have, and that at but short and infrequent intervals, the tabulated power of each of the three wheels is fifty-seven and three-tenths horse power. There is probably a considerable greater loss of power by friction than is allowed for in the tables; but it is believed that one wheel will be ample to drive the pumps for the ordinary domestic service, now amounting to about eight hundred thousands of gallons per day of twenty-four hours, leaving the full power of two wheels for any emergencies, or for supplying any increased demand for the consumption of water.

This minimum head is of but short duration, occurring only upon exceptionally high tides; and when the river is at its lowest stage, the head at mean high tide is eight feet, with the water at summer drouth, and runs from that to fourteen feet at lower stages of the tide, which is the head under which the wheels work for about three-fourths of the time.



In building the dam to the height necessary to get a head and fall sufficient to furnish power to drive the wheels for the Water Works at all times, a power has been created from the entire flow of the Penobscot River, an insignificant portion of which is necessary for the use of the Water Works, and there remains to be disposed of a vast power, which must sooner or later be of immense benefit to the city for manufacturing purposes, as the shores below the dam are available for sites of mills, at an expense, to say the least, not in excess of those sites upon which have grown up large manufacturing communities, with sufficient depth of water to admit vessels of light draft to reach the immediate vicinity of the dam, and a railroad passing in its front, so that transportation may be secured for products without intermediate drayage of any extent.

The power thus created is, at mean high tide, with the river at its lowest summer drouth, of nominally four thousand five hundred horse power, equal to an effective power of three thousand six hundred horse, constant; and at low tides, with the river at the same stage, of eight thousand seven hundred nominal horse power, effective about seven thousand, constant. While the amount necessary to drive the pumping engines is only about fifty horse power for domestic service, this will increase somewhat with increased consumption of water. It will be borne in mind that these estimates are made upon the lowest stages of the river, and that there is at other stages and for much the larger portion of the time a very much greater power. This power can be very materially increased in the summer and winter drouths by placing flash boards upon the dam. Should a large increase of power be demanded, the dam is so constructed that at a comparatively small expense, it can be built up eight or ten feet higher; this would subject the city, however, to heavy expenditures for flowage. The crest of the dam, as constructed, is about four feet below the apron of the mills at Veazie, and is not thought by the Commissioners to affect materially the value of these mills, as when the water is sufficiently high in the river to back onto their wheels, they will have a corresponding increase of head in their own pond. The practical operation, however, will have to be determined experimentally. Besides the benefits derived from building of the dam above described, there are the advantages to the harbor of the city in lessening the rapidity of the current by the wharves to



an appreciable extent, from the fact that now the tide can flow back only to the dam; whereas, before its construction, the basin lying above it as far as Eddington Bend, was filled and emptied twice in twenty-four hours, and whatever water flowed or backed in upon the flow of the tide, had to pass out on the ebb, giving a very considerable increase to the flow and current through the harbor. It is also thought that the long and deep pond consequent upon the building of the dam, will to a very great extent stop the running of anchor ice in the fall, and for that reason the river will remain open longer, and the ice, from not being so heavy, will leave earlier in the spring; beside, the pond will catch and hold a large amount of the waste from the mills upon the river above, thus preventing the filling of the channel of the river to the obstruction of navigation.

It is not thought necessary to give a detailed description of the Works in this report, as they are already familiar to the most of our citizens; and we would only say that the Holly Manufacturing Company have fully and faithfully performed their contract obligations, and given us a system of water supply, we believe, superior to almost any in New England, and equally as good as any. The Company used every effort to guard against accident from opening trenches while the work was in prosecution, by fencing and lighting the trenches, and were careful to place as few obstructions in the streets as possible, removing the debris and material and replacing the streets in a safe condition at the earliest possible hour. Such accidents as have occurred, have been settled for by them in the most liberal manner, saving the city free from any expense in consequence thereof; and we can confidently recommend, both them as contractors, and their system as a means of water supply, to any city desiring an efficient and reliable water service.

The capacity of the cylinder pumps are three million gallons in twenty-four hours, though they may be driven to a much larger performance than that in case of exceptional demand for water. The capacity of the rotary pump is sixteen gallons per revolution, and with the wheels running at a rate of speed to supply with the cylinder pumps three million gallons per day, this would give about two million five hundred thousand gallons in twenty-four hours additional, or in other words it has a capacity of about five-sixths of the cylinder pumps.



The pressure maintained at the pumps when the wheels are attached, will be ordinarily one hundred and ten pounds per square inch, which is sufficient for domestic service upon the highest ground in the city, and affords abundant pressure for fire purposes in the lower and business portions of the city. There has been found no lack of power at any time to meet the sudden emergencies from fires; and in no instance has fire been allowed to spread from the building in which it has taken, and in only one instance has a building been burned to the ground. This (Warren's barn) was so situated, that it could be reached from only one hydrant, and was completely enveloped in flames when the alarm was given. In addition to the work originally designed to be done, and upon which the estimate of the cost of the works were based, the pipes have been extended by the Holly Company two and one-tenth miles, and by the Commissioners under direction of the City Council, four and eight hundred and sixty-seven one thousandths miles, making instead of fourteen and five hundred and sixty-seven one thousandths miles originally estimated for, a total of twenty and five hundred and forty-one one-thousandths miles now laid. Also twenty-two (22) more hydrants have been set than at first proposed. There remains on hand for future extension of mains, quite a lot of pipe, as will be seen by reference to tables and schedules of property herewith submitted. There have also been built above the dam four piers, not originally estimated for, three for holding booms guiding into the sluice, and one for protection to fish way, at an expense of about six thousand dollars.

The filter, originally designed to be a single chamber fifteen feet wide by one hundred and fifty feet long, was enlarged to one of two chambers, each twelve and one-half feet wide, by one hundred and fifty feet long, with a separate room for suction chamber of twelve and one-half feet wide by forty feet long, and so arranged that one chamber may be closed and drained for cleansing, leaving the other in service; so that there need be no resort to unfiltered water. This entailed an additional expense of about three thousand dollars.

Much greater difficulty and expense has been encountered in constructing the wheel-pit and tail-race than was expected, from the amount of ledge excavation met with.



Drinking fountains have been purchased by order of City Council; and one set on southerly approach to Custom House. Two for horses and men are now on hand, not set. It is thought by the Commissioners that these should be set at an early day, in localities frequented by market men and others, now unfurnished with facilities for water.

The cost of the various portions of the work, to the present date has been as follows:

The dam, including the sluice, fish way, piers, head race, abutments, coffer, and all expenses connected with the dam.....	\$154,408 40
Paid Holly Manufacturing Co., contract and extra, .....	196,126 58
Trenching and piping, outside Holly contract	33,022 11
For putting in services, and materials.....	13,267 44
Construction of wheel house and dwelling, and excavating wheel-pit and tail-race,..	7,561 29
Construction of filter crib .....	1,763 90
Tools and incidental expenses.....	6,898 99
Engineering expenses.....	1,658 99
Salaries and office expenses.....	5,504 39
Paid for drinking fountains... ..	437 57
“ “ flowage, road in Brewer .....	600 00
“ James B. Francis.....	400 00
	<hr/>
	\$421,649 66
There has been paid for fuel, oil, tools con- nected with engine, and employees in run- ning the pumping works.....	<hr/>
	5,525 99
	<hr/>
Total disbursements to Jan. 1st, '77.....	\$427,175 65
There has been received and paid by the City Treasurer .....	\$426,770 15
Rec'd for filling cisterns.....	405 50
	<hr/>
Total am't received and paid to Jan. 1, 1877,.....	\$427,175 65
The original estimate for the construction of the works was.....	450,000 00
Of this sum there has been expended to date and paid for. ....	421,649 66
Bills unpaid, balance Holly contract.....	\$18,273 00
Flowage E. & N. A. Railway, say.....	5,100 00
Other bills material, say. ....	2,000 00
	<hr/>
	25,373 00
	<hr/>
Making cost of work up to date.. ..	\$447,022 66

In this amount there is included for items not included in the original estimate, the following sums :

Building four piers above the dam.....	\$6,000 00
Six miles additional street mains with ledge excavation connected therewith, say .....	35,000 00
Extra for widening and enlarging filter ....	2,800 00
Service piping and cost of connections.....	13,267 44
Material on hand, say.....	5,000 00
	<hr/>
	\$62,067 44

It is thought by the Commissioners that the expense of finishing the work, for flowage, etc., will amount to some forty thousand (40,000) dollars.

There have been received and paid into the City Treasury for rates collected to January 1st, 1877, \$4,325.00.

The expense for running the works will now be greatly reduced, as it will need but one engineer and one assistant; and the fuel bill, which has been very large, will be nearly dispensed with.

The dwelling, which is being finished off over the machinery room of the wheel-house, for the occupancy of the engineer and his assistant, will be ready to be occupied about the first of April, and will afford a commodious tenement. It will be economical to have the system of heating by steam, now being placed in the pump room, extended into it, as no greater outlay for fuel will be needed than in heating the pump room alone.

The Commissioners would recommend that the grounds between the buildings and railroad track be graded off the ensuing summer, and that a suitable fence be placed around them.

For the amount of pipe laid by the Holly Manufacturing Co., in 1875, and its location, you are referred to the accompanying table marked "A."

For the amount of pipe laid by the City in 1876, and its location, you are referred to table "B."

For a list of and the location of hydrants set by the Holly Manufacturing Co., in 1875, you are referred to table "C."

For a list of and the location of hydrants set by the City in 1876, you are referred to table "D."



the Works  
street

Adams  
Broadway  
Broad street  
Town street.

Ford street  
 Boynton street  
 Centre street  
 ... street

Cedar street  
Clinton street  
Charles street  
Court street  
Hia street

Columbian  
Camberlan  
East Summ  
ex stre

Essex  
High street  
Exchange  
Warrett st

Fern street  
French st  
Franklin  
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Front st  
Fourth s  
Fifth stre  
Garland

Grove 8  
Harlow  
Hazel st

High St.  
Hudson  
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## Amount of Pipe laid and Gates Set by the Holly Manufacturing Co.

LOCALITIES.	SIZES OF PIPE—INCHES.						GATES—IN.				
	16	12	8	6	4	2	16	12	8	6	4
At the Works.....	210.										
Adams street.....											
Broadway.....					421.		.1				.1
Broad street.....				1,941.6							.1
Brown street.....			974.5			302.					.1
Boyd street.....						34.2					.1
Boynton street.....					477.5	263.5					.1
Centre street.....				2,100.		350.					.1
Cedar street.....				2,023.5		300.					.1
Clinton street.....			369.		750.5						.1
Charles street.....					949.5						.1
Court street.....				2,637.5							
Columbia street.....						306.5					
Cumberland street.....					1,801.	382.					
East Summer street.....					709.2						
Essex street.....				3,428.5	525.						.1
Elm street.....						854.6					.1
Exchange street.....			651.	435.5							.1
Everett street.....				316.5	323.	149.5					.1
Fern street.....				1,076.6							.1
French street.....				1,134.5		1,129.5					.1
Franklin street.....					238.						.1
Front street.....				650.							.1
Fourth street.....					998.5	482.5					
Fifth street.....					527.5						
Garland street.....				2,861.6							.1
Grove street.....					768.	627.2					.1
Harlow street.....			2,346.5								.1
Hazel street.....					243.						.1
High street, Patten court						464.5					.1
Hudson street.....						285.					.1
Hayward street.....						384.5					.1
Hammond street.....		1,689.	1,032.5								.1
Hancock street.....			2,604.			252.1					.1
Hydrants (to).....					2,056.8						.1
Independent street.....			358.								.1
Jefferson street.....					464.5						.1
Kenduskeag Avenue.....				1,425.	455.						.1
Kenduskeag Bridge.....	584.6										.1
Lime street.....				1,552.							.1
Maple street.....				1,312.							.1
Madison street.....				1,174.5							.1
Main street.....		202.	3,041.5	2,062.							.1
Newbury street.....			989.7								.1
Ohio street.....				1,582.							.1
Palm street.....						398.5					.1
Pearl street.....					350.5						.1
Parker street.....					357.						.1
Penobscot street.....					249.5	107.5					.1
Pine street.....					367.5	1,451.					.1
Pond street.....					344.5						.1
Pickering Square.....						208.5					.1
Park street.....					316.	200.					.1
Prospect street.....					237.5	178.					.1
Railroad street.....				636.							.1
State street.....	5,316.	2,456.5					.1	.2	.1	.5	.3
School house, new.....					165.						.1
Somerset street.....				2,019.6							.1
Spring street.....					379.5	236.					.1
Summer street.....				1,243.		440.					.1
Second street.....											.1
Third street.....			1,971.5								.1
Union street.....			88.	3,266.							.1
Washington street.....					1,311.						.1
West Broadway.....				748.							.1
York street.....					1,347.5	591.					.1
	6,110.6	4,347.5	14,426.2	35,625.9	17,132.5	10,398.1	2	3	10	33	19



## Amount of Pipe laid and Gates set by the City in 1877.

LOCALITIES.	SIZES OF PIPE—INCHES.						GATES—IN.				
	16	12	8	6	4	2	16	12	8	6	4
Birch street.....					1,175.						
Blackstone street .....						475.					
Broad street.....					225.						
Broadway .....				1,366.	12.						
Cedar street.....						159.					
Columbia street.....					398.						
Charles street.....					300.						
City stables. ....					198.						
Congress street.....					643.						.1
Centre street.....					527.						
Central street, E. side....					248.						
Central street, W. side...					332.	125.					
Cobb's lane.....						206.					
Davis street.....					500.						
Division street.....					677.						
Franklin street.....					87.						
First street.....					696.						.1
Fountain street.....					505.						
George street.....					442.						
Garland street.....				885.						.1	
Hay Market Square.....					358.	139.					
High street.....					406.						
Hammond street.....			2,221.		48.				.1		
Jefferson street.....					50.						
Kenduskeag Avenue.....					670.						
Middle street.....						117.					
Montgomery street.....						484.					
Main street.....				1,256.							
Ohio street.....			3,050.	432.	73.					.1	
Prospect court .....						165.					
Pleasant street.....					260.						
Pickering Square.....					190.						
Prentiss street.....					400.						
Poor House street.....					250.						
Pearl street.....					968.						
Railroad street.....				100.							
South street.....					302.						
Sixth street.....					564.						
Thaxter's lane .....					375.						
Valley Avenue.....					539.						
Warren street.....						350.					
Union court.....						180.					
Union street.....					360.						
Water street.....					450.						.1
Lime street.....				750.	10.						
.....			5,271.	4,789.	13,238.	2,400.			1	2	3



# Number and Location of Fire Hydrants in the City of Bangor, January 1st, 1877.

## List of Hydrants set by the Holly Manufacturing Company.

At the Works. ....	No.
State street, corner of Howard street .....	1
State street, corner of Pearl street .....	2
State street, corner of Birch street .....	3
State street, corner of Maple street .....	4
State street, corner of Lime street .....	5
State street, in front of E. Clark's .....	6
State street, in front of Capt. Rich's .....	7
State street, corner Broadway .....	8
State street, corner of French street .....	9
State street, corner of E. M. Place .....	10
Pearl street, south of State street .....	11
Fern street, corner of Garland street .....	12
Fern street, between State and Garland streets .....	13
East Summer street, corner of Hancock street .....	14
Maple street, between State and Garland streets .....	15
Garland street, at end of Maple street .....	16
Newbury street, at head of York street .....	17
Hazel lane, off of Newbury street .....	18
Hancock street, corner of Newbury street .....	19
Hancock street, corner of Boyd street .....	20
Hancock street, corner of Carr street .....	21
Hancock street, corner of Essex street .....	22
Hancock street, corner of Oak street .....	23
Hancock street, corner of Exchange street .....	24
Exchange street, between Hancock and Washington streets .....	25
Washington street, corner of Exchange street .....	26
Washington street, corner of Oak street .....	27
Washington street, at crossing of R. R. ....	28
York street, corner of Boyd street .....	29
York street, corner of Adams street .....	30
York street, corner of Essex street .....	31
York street, corner of Broadway .....	32
York street, corner of French street .....	33
York street, corner of Exchange street .....	34
Lime street, corner of Somerset street .....	35
Lime street, at City Common .....	36
Elm street, corner of Garland street .....	37
Grove street, opposite J. B. Fiske's .....	38
Grove street, between Somerset and Garland streets .....	39
Essex street, at head of Penobscot street .....	40
Essex street, corner of Somerset street .....	41
Essex street, head of Cumberla street .....	42
Essex street, corner of Garland street .....	43
Essex street, 400 feet north of Garland street .....	44
Essex street, opposite J. M. Harris' .....	45
Essex street, corner Stillwater Avenue .....	46
Broadway, corner of Penobscot street .....	47
Broadway, corner of Somerset street .....	48
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## C—continued.

Broadway, corner of Cumberland street .....	50
Broadway, corner of Garland street.....	51
French street, corner of Penobscot street.....	52
French street, corner of Somerset street.....	53
French street, corner of Cumberland street.....	54
French street, corner of Garland street.....	55
East Market Square, opposite engine house.....	56
Park street, at Darling's shoe factory.....	57
Centre street, corner of Somerset street.....	58
Centre street, corner of Cumberland street.....	59
Centre street, corner of Garland street.....	60
Centre street, head of Jefferson street..	61
Centre street, head of Madison street.....	62
Jefferson street, corner of Norfolk street.....	63
Madison street, corner of Norfolk street.....	64
Harlow street, corner at Baptist church.....	65
Harlow street, corner of Cumberland street.....	66
Harlow street, corner of Kenduskeag Avenue.....	67
Kenduskeag Avenue, opposite Division street.....	68
Kenduskeag Avenue, opposite Jefferson street.....	69
Kenduskeag Avenue, corner of Madison street.....	70
Kenduskeag Avenue, corner of Congress street.....	71
Cumberland street, corner of Market street.....	72
Spring street, between Harlow and Centre streets.....	73
Prospect street, between Harlow and Centre streets.....	74
Franklin street, opposite New England House stable.....	75
Kenduskeag Bridge, opposite Bowler & Merrill's.....	76
Kenduskeag Bridge, opposite Osgood & Lyford's.....	77
West Market Place, at Circular Block .....	78
West Market Place, at Mercantile Block.....	79
Broad street, corner of Independent street.....	80
Broad street, corner of Union street.....	81
Front street, opposite foot of May street.....	82
Railroad street, opposite Dole & Fogg's mill .....	83
Railroad street, opposite depot grounds.....	84
Summer street, corner Cedar street.....	85
Summer street, corner Union street .....	86
Main street, opposite A. H. Roberts & Co's store.....	87
Main street, corner of Middle street.....	88
Main street, corner of Union street.....	89
Main street, corner of Davenport Square.....	90
Main street, near Parkhurst's factory.....	91
Main street, head of Railroad street.....	92
Main street, corner of Patten street.....	93
Main street, corner of Sidney street.....	94
Main street, corner of Lincoln street .....	95
Main street, corner of Buck street .....	96
Franklin street, corner Hammond street.....	97
Court street, corner Hammond street.....	98
Court street, opposite C. A. Nealley's. ....	99
Court street, corner Boynton street.....	100
Court street, near E. S. Coe's house.....	101
Everett street, corner Bower street.....	102
Ohio street, corner Hammond street.....	103



## C—continued.

Ohio street, front Mrs. Pitman's house.....	104
Ohio street, corner Hudson street.....	105
Ohio street, head of Everett street.....	106
Ohio street, corner Bower street.....	107
Thomas street, corner Charles street.....	108
High street, opposite S. F. Hersey's house.....	109
Union street, corner High street.....	110
Union street, corner of Clinton street.....	111
Union street, corner of Hudson street.....	112
Union street, corner of George street.....	113
West Broadway, corner of Union street.....	114
West Broadway, corner of Cedar street.....	115
Pond street, corner of Hayward street.....	116
Hammond street, corner of Union street.....	117
Hammond street, opposite Fifth street.....	118
Hammond street, corner of Cedar street.....	119
Cedar street, corner of First street.....	120
Cedar street, corner of Second street.....	121
Cedar street, corner of Third street.....	122
Cedar street, corner of Fourth street.....	123
Fifth street, between Cedar and Warren streets.....	124
Fourth street, between Cedar and Warren streets.....	125
Third street, corner Warren street.....	126
Parker street, near Stoddard & Hellier's factory.....	127

## D.

## List of Hydrants Set by the City of Bangor.

	No.
Railroad street, between State and Garland streets.....	1
Buck street, between State and Garland streets.....	2
Lime street, north of Garland street.....	3
Broadway, near Brown's new houses.....	4
Centre street, corner of Congress street.....	5
Kenduskeag Avenue, near G. F. Godfrey's house.....	6
Valley Avenue, at Morse & Co.'s mill.....	7
Thaxter's Lane, near the foot.....	8
Columbia street, opposite Second Baptist church.....	9
Central street, opposite Thompson & Kellogg's.....	10
Central street, opposite Nichols' stable.....	11
Pickering Square, corner of Water street.....	12
Hammond street, east of West Broadway.....	13
Hammond street, corner of Webster Road.....	14
Ohio street, opposite foot of Highland street.....	15
Ohio street, corner of Fremont street.....	16
Ohio street, off Fourteenth street.....	17
Sixth street, between Cedar and Warren streets.....	18
Davis street, corner First street.....	19
Main street, near lower entrance to Poor Farm.....	20
In yard of Poor House.....	21
At City Stable and County Buildings.....	22



11

**Account of Tools belonging to the Bangor Water Works, January  
1st, 1877.**

**TOOLS AT THE DAM.**

13 striking hammers,  
8 top mauls,  
4 stone hammers,  
22 pick axes,  
7 small oars,  
6 large oars,  
2 paddles,  
5 lumber cabs,  
30 augers,  
40 shovels,  
3 hoes,  
7 ice chisels,  
2 carpenters' levels,  
2 squares,  
2 planes,  
15 good axes,  
27 old axes,  
19 lanterns,  
8 saws,  
1 wood saw,  
3 chisels,  
13 pick poles,  
44 adzes,  
3 pickaroons,  
56 cant dogs,

1 shackle bar,  
1 claw bar,  
2 stoves,  
2 batteaux,  
2 punts,  
1 scow,  
1 vise, in carpenter's shop,  
3 grind stones,  
9 tool boxes,  
5 wheel barrows,  
1 stove in office,  
1 stool in office,  
1 broom in office,  
5 bars,  
28 drills,  
5 spoons,  
22 steel points,  
23 steel drills,  
4 steel chisels,  
2 steel sets,  
9 chains,  
3 sets small blocks,  
1 set large blocks,  
2 derricks and rigging,  
lot rope for blocks.

**IN BLACKSMITH SHOP.**

1 anvil,  
1 forge,  
1 bellows,  
1 vise,  
1 tuyere iron,  
5 cold chisels,  
2 sledges,

4 small punches,  
3 heading tools,  
14 pairs tongs,  
1 shovel,  
1 poker,  
1 scraper.

**AT ENGINE HOUSE.**

1 vise,  
2 20 inch monkey wrenches,  
1 12 inch monkey wrench,  
3 S wrenches,  
1 oil cabinet,  
1 coal shovel,  
3 steel bars,  
2 steel hammers,  
1 hoe,  
lot of waste,  
1 rubber valve for air pump,  
1 piece of rubber packing,  
1½ pounds hemp packing,  
50 cords wood,

1 wood barrow,  
6 pieces canvas hose,  
4 pieces leather hose,  
1 hydrant wrench,  
2 spare pulleys, 6 and 12 inch,  
1 valve wrench,  
4 followers for pump,  
2 pieces of 2 inch pipe,  
3 finished wrenches,  
6 draft keys,  
2 small pieces rubber packing,  
2 pieces copper, 2 lbs. each,  
3 balls wicking.

## E-continued.

IN WORK SHOP ON EXCHANGE STREET.

2 pairs of 16 inch pipe tongs,  
 2 pairs of 22 inch pipe tongs,  
 1 pair of No. 2 chain tongs,  
 1 pair of No. 3 chain tongs,  
 1 pair blacksmith tongs,  
 1 large pipe cutter,  
 1 small pipe cutter,  
 1 pipe vise,  
 1 die plate for pipe,  
 1 1 1-4 inch right hand die,  
 1 1 inch right hand die,  
 2 3-4 inch right hand dies,  
 1 1-2 inch right hand die,  
 1 1 inch left hand die,  
 1 3-4 inch left hand die,  
 1 1-2 inch left hand die,  
 1 1 inch bushing for die plate,  
 1 3-4 inch bushing for die plate,  
 1 1-2 inch bushing for die plate,  
 1 tapping machine,  
 5 rubber packings for same,  
 5 iron rings for same,  
 1 ratchet for same,  
 1 5-8 inch stopcock for same,  
 1 1-2 inch stopcock for same,  
 2 1 inch gas taps for same,  
 3 3-4 inch gas taps for same,  
 2 5-8 inch gas taps for same,  
 3 1-2 inch gas taps for same,  
 3 1 inch drills for same,  
 2 3-4 inch drills for same,  
 1 5-8 inch drill for same,  
 2 1-2 inch drills for same,  
 1 ratchet brace,  
 1 ratchet,  
 1 valve wrench,  
 2 service wrenches,  
 1 22 inch monkey wrench,  
 1 small monkey wrench,  
 2 hydrant wrenches,  
 1 bitt-stock,  
 1 3-4 inch bitt,  
 1 5-8 inch bitt,  
 1 nail hammer,  
 2 hand saws,  
 2 hatchets,  
 1 2 inch chisel,  
 1 fore plane,  
 1 draw shave,  
 1 oil stone,  
 2 axes,  
 75 picks,

64 pick handles,  
 86 long handled shovels,  
 40 long handled shovels, old,  
 9 short handled shovels,  
 11 wooden earth pounders,  
 2 wooden snow shovels,  
 1 2 inch tunnelling auger,  
 1 3-4 inch tunnelling auger,  
 1 tunnelling scoop,  
 2 tunnelling chisels,  
 8 steel bars, 138 pounds,  
 3 steel points, 12 pounds,  
 18 steel drills, 199 pounds,  
 1 stone hammer, 10 pounds,  
 1 stone hammer, 7 pounds,  
 2 9 pound striking hammers,  
 3 8 pound striking hammers,  
 6 7 pound striking hammers,  
 1 3 1-2 pound caulking hammer,  
 5 caulking tools,  
 4 cold chisels,  
 1 pipe chisel with handle,  
 1 lead chisel with handle,  
 1 furnace for melting lead,  
 1 kettle for melting lead,  
 2 kettles,  
 1 ladle,  
 1 hydrant pump,  
 1 trench pump,  
 1 set of 10 inch blocks and fall,  
 1 set of small blocks and fall for  
     hydrants,  
 5 pipe ropes,  
 2 tape lines,  
 7 wooden pails,  
 2 tin pails,  
 2 tin dippers,  
 1 tin horn,  
 3 tin funnels,  
 2 tin powder cans,  
 1 small oil can,  
 2 1 gallon oil cans,  
 1 2 quart oil can,  
 25 lanterns,  
 2 old lanterns,  
 1 wheel-barrow,  
 5 tool boxes,  
 1 powder box,  
 3 chains, 84 pounds,  
 13 feet small hydrant chain,  
 624 pounds of old chains,  
 2 shop benches,



**E-continued.**

1 stock rack,	2 hand basins,
1 shop desk,	1 large cast iron nozzle for 3 inch
1 hanging lamp,	stream,
1 hand lamp,	1 horse,
1 marking iron,	1 express wagon,
1 shop stove,	1 sled,
1 sprinkler,	1 harness,
1 pressure water gauge,	2 horse blankets,
1 shop faucet,	1 hay fork,
2 chairs,	1 head stall,
1 broom,	1 buffalo robe.
3 towels,	

**F****Account of Stock on hand belonging to the Bangor Water Works,  
January 1st, 1877.****SERVICE PIPE IN WORK SHOP, EXCHANGE STREET.**

343 feet 2 inch enameled pipe,  
 304 feet 1 1-4 inch enameled pipe,  
 271 feet 1 inch enameled pipe,  
 1,099 1-2 feet 3-4 inch enameled pipe,  
 393 feet 1-2 inch enameled pipe,

**IN M'LAUGHLIN'S STORE HOUSE, FRONT STREET.**

1,962 feet 1 1-4 inch rubber coated pipe, (44 bundles, 122 bars.)					
4,947 feet 1 inch	"	"	"	69	345 "
7,770 feet 3-4 inch	"	"	"	78	546 "
3,119 feet 1-2 "	"	"	"	19	228 "

**ON SANFORD'S STEAM BOAT WHARF.**

7 bars of 16 inch cast iron pipe, 12 feet.  
 18 " 12 " "  
 76 " 8 " "  
 378 " 6 " "  
 8 " 6 " " (cracked.)  
 1 special for branch 8 inch cross,  
 1 special for branch 8x4 inch T,  
 1 " " " 12x4 inch T,  
 2 4x6 reducers.

**IN WORK SHOP, EXCHANGE STREET.**

2 R. D. Wood & Co. hydrants,  
 3 hydrant bottoms,  
 2 " heads,  
 8 " leather valve seats,  
 11 " caps (cast iron,)  
 2 " valve rods,  
 1 " stuffing box,  
 7 " bolts,  
 1 inside shell for hydrant,

## F-continued.

3 4 inch cast iron plugs,  
 1 6 " " " sleeve,  
 1 8 " " " collar,  
 1-2 keg powder,  
 520 feet of water proof fuse,  
 200 feet of cotton fuse,  
 36 2 inch quarter turns, malleable,  
 123 1 " " " "  
 100 3-4 inch quarter turns, malleable,  
 55 1-2 " " " "  
 8 3-8 " " " "  
 2 1-4 " " " "  
 2 1 1-2 " " " "  
 16 1 1-4 " " " "  
 7 3-4 inch quarter turns, right and left, malleable,  
 13 1-2 " " " " "  
 2 2 inch Ts,  
 1 1 1-2 inch T,  
 11 1 " "  
 2 3-4 " "  
 3 1-2 " "  
 7 3-8 " "  
 5 1-4 " "  
 22 1x2 inch Ts,  
 1 1x1 1-4 inch T,  
 6 1-2x3-4 " "  
 4 1 inch crosses,  
 6 3-4 inch crosses,  
 4 1-2 " "  
 1 3-4x3-8 inch cross,  
 325 1 inch rubber washers,  
 256 5-8 " " "  
 43 lbs. board nails,  
 13 cast iron clamps for 2 inch pipe,  
 2 quarts lard oil,  
 2 lbs. red lead,  
 3 lbs. white lead,  
 1 3-4 inch angle valve, brass,  
 2 6 inch iron valves,  
 5 4 " " "  
 1 can of patent enamel,  
 15 lbs small rope,  
 5 " jute packing,  
 6 3-4 inch flange bolts,  
 6 bars pig lead, 590 lbs,  
 1 3 inch wrought iron shaft, 3 feet long,  
 4 1 inch bolts and nuts, 40 pounds,  
 1 1-2 bbls pipe clay,  
 1 lot fencing for trenches,  
 12 service boxes with caps,  
 20 " " without caps,  
 467 " " not made,  
 223 service box caps,  
 1 1 1-4 inch connection lead finished,



## F-continued.

9	1	inch connection lead finished,				
69	3-4	"	"	"	"	
46	5-8	"	"	"	"	
21	1-2	"	"	"	"	
1	1	"	"	"	one end wiped,	
1	3-4	"	"	"	"	"
5	5-8	"	"	"	"	"
16	1	"	service stops, composition,			
86	3-4	"	"	"	"	
101	5-8	"	"	"	"	
105	1-2	"	"	"	"	
63	3-8	"	"	"	"	
19	1 1-4	inch stop and valve cocks,				
77	1	"	"	"	"	
48	3-4	"	"	"	"	
94	1-2	"	"	"	"	
17	1 1-4	inch composition soldering nipples,				
50	3-4	"	"	"	"	
21	3-4	"	"	"	"	union,
30	1-2	"	"	"	"	
10	3-8	"	"	"	"	union,
1	coil 1 1-4	inch lead pipe 261 lbs.,				
1	" 1	"	"	"	386 lbs.,	
1	" 3-4	"	"	"	211 lbs.,	
1	" 1-2	"	"	"	106 1-2 lbs.	

## SERVICE PIPE FITTINGS.

54	2	inch wrought couplings for iron pipe,				
116	1 1-4	inch wrought couplings for iron pipe,				
144	1	"	"	"	"	"
7	3-4	"	"	"	"	"
109	1-2	"	"	"	"	"
11	2	inch right and left malleable couplings for iron pipe,				
20	3-4	"	"	"	"	"
3	1-2	"	"	"	"	"
2	3-8	"	"	"	"	"
3	1 1-2x1 1-2	inch couplings for iron pipe,				
1	1 1-4x1 1-4	"	"	"	"	"
38	2x1 1-2	"	"	"	"	"
5	1x3-4	"	"	"	"	"
2	2	" iron bushings				
5	1 1-2	"	"	"		
12	1	"	"	"		
11	3-4	"	"	"		
1	1-2	"	"	"		
11	3-8	"	"	"		
5	1-4	brass bushings,				
1	2x1 1-4	" iron	"			
1	1 1-2x3-4	"	"	"		
10	2	" iron nipples,				
7	1 1-2	"	"	"		
4	1	"	"	"		
9	3-4	"	"	"		
9	1-2	"	"	"		

**F—continued.**

5 3-8          inch iron nipples,  
 3 1-4          "          "          "  
 4          1 inch right and left iron nipples,  
 4 3-4          "          "          "          "          "  
 6 1-2          "          "          "          "          "  
 8 2          "          plugs,  
 2 1 1-4          "          "  
 4 1          "          "  
 16 3-4          "          "  
 5 3-8          "          "  
 2 1          "          caps,  
 22 3-4          "          "  
 5 3-4          "          unions,  
 3 1-2          "          "  
 10 45 degree bends, cast iron 2 inch,  
 2 drinking fountains for men and horses, at Getchell, Leighton & Co's.

**G**

**Account of Office Furniture belonging to the Bangor Water Works,  
January 1, 1877.**

1 steam fire proof safe,	1 water jug,
1 desk with drawers,	Lot of field and time books,
1 office desk,	Lot of plans,
1 table desk,	Lot of stationery,
2 office tables,	1 match safe,
1 drawing table,	3 ink stands,
1 copying press,	2 tin folders,
6 office chairs,	5 letter and bill files,
3 office stools,	1 ton coal,
1 office coal stove,	1 City Directory,
1 office air-tight stove,	Lot of reports of Water Works,
1 coal hod,	various towns and cities,
1 poker,	2 50 feet Chisterman's tapes,
2 waste baskets,	2 lining plans.

**H**

**Schedule of the number of Service Pipes Set to January 1, 1877,  
with Connections, as follows :**

Families supplied .....	702
Stores          "          .....	97
Offices          "          .....	38
Boarding houses supplied.....	9
Hotels supplied.....	7
Meat markets supplied.....	17
Eating saloons          "          .....	6
Drug stores          "          .....	6
Barber shops          "          .....	8
Livery stables          "          .....	8
Private stables          "          .....	14



## H--continued.

Mechanic shops supplied, .....	18
Foundries supplied.....	3
Halls .....	5
Photograph saloons supplied.....	3
Steam boilers .....	19
Motors supplied.....	23
Bakeries .....	2
Dye houses supplied .....	2
Laundries .....	1
United States Custom House.....	1
2 green houses.....	2
1 wool factory.....	1
Grammar School house.....	1
Home for Aged Women .....	1
Children's Home.....	1
Maine Central R. R.....	2
City Alms House .....	1
3 tanks for sprinkling streets.....	3
City Stables.....	1
City Hall.....	1
1 drinking fountain (city) .....	1
1 city watering trough .....	1
Fire Steamers house.....	1
Union Hose .....	1
Hook and Ladder house.....	1
Holly Hose .....	1

## CITY OF BANGOR.

CLERK'S OFFICE, Jan. 16th, 1877.

*Resolved*, That the thanks of the City Council are due and are hereby rendered to the late Water Board, Hon. Geo. Stetson, Wm. T. Pearson, Esq., and L. H. Eaton, Esq., for their faithful and efficient services in the construction of the Water Works.

IN COMMON COUNCIL,  
January 16, 1877.

Passed and sent up for concurrence.

IN BOARD OF ALDERMEN,  
Jan. 16th, 1877.

Passed in concurrence.

T. W. VOSE,  
*City Clerk, pro tem.*