

It is estimated that these two works will require—

55,000 tons of rubble-stone, which, at a probable cost of 90 cents per ton, placed in position, will amount to.....	\$49,500 00
Adding for contingencies, say.....	5,500 00
Total estimated cost.....	55,000 00

In the excavation of an interior basin for this harbor, the area and depth are points in which opinion may differ, and upon which will depend the cost of the proposed harbor. If projected for the largest class of sailing vessels, a depth of not less than 15 feet at mean low-water would be required; but if for coasters and fishing vessels (by which it would be for the most part used), a depth 10 feet at mean low-water is, in my opinion, sufficient.

On the accompanying map the part shaded in red between the inner breakwater and the line *a-a* shows a basin 1,500' x 700', with an area of about 24 acres, and a depth of 10 feet at mean low-water; the part shaded in red between the line *b-b* and the wharves of the town, shows an area of 7½ acres, with a depth of 3 feet at mean low-water; and the part between the lines *b-b* and *a-a* shows an area of 5 acres, with a depth increasing from 3 to 10 feet at mean low-water. The extension of the harbor above the line *b-b* serves not only to increase the facilities of the commerce of the town of Scituate, but also as affording a refuge for fishing and other vessels of light draught, which would otherwise require anchorage in the deeper basin. The red-shaded area eastward of the inner breakwater, shows an entrance channel 10 feet in depth at mean low-water, with a width of 200 feet, opening out at its outer end, for the greater facility of ingress and egress.

The estimated quantity of dredging that would be required for excavating this harbor and the entrance, as above projected, is as follows, viz:

	Measured <i>in situ</i> .
1. Area of entrance channel below the inner breakwater.....	53,500 cub. yds.
2. Area of basin 10 feet in depth.....	317,000 cub. yds.
3. Area of slope 3 to 10 feet in depth.....	50,000 cub. yds.
4. Area of upper portion 3 feet in depth.....	56,500 cub. yds.
Total.....	480,000 cub. yds.
Adding ¼ for scow measurement and excess in depth.....	60,000 cub. yds.
Total.....	540,000 cub. yds.

The borings made in numerous places in the harbor show that the material is of a character to be easily dredged—

The estimated cost of which, at 20 cents per cubic yard, is.....	\$103,000 00
Adding for engineering expenses, superintendence, and other contingencies.....	12,000 00
Total estimated cost of dredging.....	120,000 00
Total estimated cost of two breakwaters, as above.....	55,000 00
Total.....	175,000 00

Owing to the absence of a tidal basin, or other supply of water, above this harbor, requisite for a scouring effect, it is not improbable that there would be a tendency to shoaling both in the harbor and the entrance channel from the effects of easterly storms, in which event occasional dredging may be found necessary.

An increase in the depth of the harbor and entrance to 15 feet, as thought advisable by some, would increase the quantity of dredging about 70 per cent., and add to its cost about \$80,000.

In order to show the importance that is given to the subject of making this a "harbor of refuge," and the benefit that would thereby result to the navigation and commerce of this coast, I append hereto a letter received from Hon. George Lunt, of Scituate, who has kindly furnished the valuable information therein given; also a copy of a report recently made to the Board of Trade of Boston, Mass., by a committee of that board appointed to make an investigation and report on the matter.

Respectfully submitted.

GEO. THOM,

Lieut. Col. of Engineers, Bvt. Brig. Gen., U. S. A.

Brig. Gen. A. A. HUMPHREYS,

Chief of Engineers, U. S. A.

LETTER OF THE HON. GEORGE LUNT.

SCITUATE, MASS., November 8, 1878.

SIR: The town of Scituate, of the harbor of which your survey has recently been made, was the earliest settlement, but one in the territory of Massachusetts. On or about A. D. 1628, a company which had arrived at Plymouth from the county of Kent, in England, removed to this place, then called "Satait" by the Indians; one motive being its convenience as a fishing station. Up to this day the fishing business has been carried on extensively at the place, both along the shore and at sea, for the supply of the neighborhood; and no small quantities of fish are sent to Boston and to southern ports.

To cite from the History of Scituate, by Rev. Samuel Deane, published A. D. 1831: "The ship William set up a fishing station at Scituate in 1633. This was doubtless the cod fishery, and mackerel were taken at that time, principally for bait." And further: "The first account which we have gathered of enterprise in navigation was in 1633, when the ship William, Captain Trevere, traded to Hudson's River, probably exchanging goods for fish. In 1646 there appears to have been several vessels at the harbor, which carried on a coasting trade with the natives and to Europe and Jamaica." In addition the history tells us: "From the harbor 35 vessels are fitted out for the mackerel fishing, some of them being 100 tons burden and upward, and employed also in winter in the southern coasting, carrying lumber, fish, &c., and bringing grain and flour. Two regular packets from the harbor carry on an almost daily intercourse with Boston. From the river" (the North River, I suppose, two or three miles distant, where there is now no navigation) "four regular coasters sail, principally to Boston, but making an occasional voyage to Maine."

The commerce of all places within convenient distance of large commercial cities has been comparatively small of late years. On the Massachusetts coast almost all voyages for foreign trade begin and terminate in Boston. For example, during many years, New England commerce with the East Indies was almost monopolized at Salem, that of the West Indies by Newburyport, though both ports employed ships in other foreign trade. Now, a vessel engaged in either business is rarely, if ever, seen in those harbors. The introduction of railways has brought about this state of things, by affording easy means of transportation for cargoes, and the great business connected with commerce and navigation is more readily transacted at some common center.

Accordingly, the commerce of Scituate, lying only 26 miles from Boston, has declined much within the memory of its present inhabitants, owing mainly, doubtless, to the causes specified. It has been more or less, however, engaged in navigation from a very early period in the history of Plymouth Colony, is still a port of entry, and has always remained an excellent nursery for good seamen, many of whom have served for a long course of years as masters and officers of the finest ships bound from Boston on various foreign voyages. The inadequate depth of water on the bar and within the harbor has always been an obstacle to the entrance and accommodation of large vessels, to which it might otherwise be useful. I learn from the deputy collector that "twelve vessels have been licensed for fishing and coasting during the present season; that four vessels have unloaded coal, and four have unloaded lumber; that one has unloaded corn weekly; that two steamboats have come in and anchored, and that some ten or fifteen other vessels have also come in and anchored in the harbor." The vessel bringing corn, weekly, would be equivalent to fifty-two a year, and the rest would make up the count to eighty-four, in all comprehending, probably, not far from five hundred lives, that is to say, supposing the crew of the packet to continue the same, at an average of five, and the same men to constitute the crew for the season,

there would be the marine risk of these seamen fifty-two times, while in the case of fishing vessels, coasters, and coal vessels of an average crew of eight persons in each of thirty-two vessels, there would be two hundred and fifty-six exposed to the perils of the sea.

It is by no means, however, in reference to the navigation of Scituate itself that application has been now made to Congress for the improvement of its harbor. The object in view is much more extended and beneficial, in the interests of common humanity wherever it exists, and for saving both lives and property from destruction. A fair consideration of the case will show that this object is one of truly national concern, as has often been remarked by those whose observation and experience best qualified them to judge. As in the remarkable instance of *Boulogne-sur-Mer*, it has been strangely neglected. At that important port, the French Government, after many thousands of disasters in the channel, during centuries past, has recently determined to construct a basin with massive walls into the sea, so as to constitute it a harbor of refuge, at a cost of \$3,400,000, the great work to be completed in fifteen years. Scituate lies nearly midway between Boston and Cape Cod, being the only harbor on a dangerous coast line of about 50 miles between those points of which any valuable use could be made, except possibly at vast expense. Nature has here provided the easy means of accomplishing a most useful work. All that is needed could be finished in a single season with comparatively insignificant expenditure.

During the stormy season frequent wrecks occur on the beaches near or but a few miles distant from Scituate Harbor, most or all of which could probably have been prevented had the harbor been put into a proper condition and been known to be accessible. During the month of February last, no less than eight vessels were totally lost on the beaches not far distant, and their crews of thirty-two perished, comprising in one case a father and his whole family of sons. On one morning in the spring I saw a schooner, which proved to be a Nantucket packet, which ought to have known the coast, on the very top of the beach, not half a mile from my house, the sea breaking over her.

It is surely a point worthy of the highest consideration that all the commercial marine of Boston from the Eastern World, and from our own eastern and southern ports, including foreign steamers, comes within view of Scituate but a few miles distant. They generally make a point in a southwesterly course nearly opposite this harbor before changing that course northerly or northwesterly in order to sail up the bay toward Boston. I have taken the pains to ascertain from the marine reporter of one of the leading Boston newspapers the number of vessels of all classes arriving at Boston in the course of the year. During the year 1877, there were 6,403, including 1,485 steamers, and up to this period of the present year there were 7,624, including 1,387 steamers.

In illustration of the fact that these vessels run near Scituate, I have seen a British mail steamer pass opposite the cliffs of Scituate, apparently not more than one-third of a mile distant, she having somewhat diverged from the regular course in a misty day. This fact also illustrates the important consideration, that there is deep water not far from the line of the shore in this vicinity.

Notwithstanding obstructions of whatever nature, a fleet of from 60 to 70 vessels of moderate tonnage, some of as much as 150 tons burden, have been owned in Scituate within the memory of its people, and I have been credibly informed by living persons that they have counted as many as 60 of this class of vessels at anchor within the harbor, at one time.

To show the actual convenience of the harbor for vessels in distress, many noted instances are recollected here of ships and other craft of considerable tonnage being saved by running in, while a storm or gale prevailed; some of them suffering more or less damage by striking on the bar; others, happening to reach the entrance at a favorable time of tide, escaped without injury. Of well-remembered cases, it may be proper to cite a few of vessels which have found refuge here, in the course of not many years past, when caught in a northeasterly snow-storm, or a violent gale under which it was useless to attempt headway, viz:

Ship Ashland, bound from Boston to New Orleans, drawing 12 feet of water.

A ship (name forgotten) from Charleston, S. C., bound to Boston, drawing 12 feet.

Bark Lexington, loaded with cotton (Capt. John Tilden, still surviving here), drawing 10 feet.

Bark Good Hope, from Cape Town, loaded with wool (Capt. H. F. Vinal, still surviving here), drawing 12 feet.

A ship from Cadiz (name forgotten), loaded with salt, drawing 12 feet.

Brig Judge Hathaway, loaded with logwood, drawing 12 feet.

Besides many schooners, each drawing from 10 to 12 feet.

And those in the above list, which doubtless could be increased by inquiry, were repaired, when necessary, and proceeded on their several voyages. The narratives given of the frequent narrow escapes of such vessels into the harbor, often after long struggling vainly in the bay, the crews sometimes blinded by a furious snow-storm,

rendering the shore invisible at a very short distance, and the difficulties finally surmounted only by consummate vigilance and skill, are often of the most heart-thrilling character. A most striking instance of the insuperable obstacles to gaining safe anchorage in Boston Harbor, in the face of such a storm, is that of the bark *Zephyrine* early in the present year. She had long been a regular trader between Boston and Demerara, but finding it impossible to make progress, though noted for a fast sailer, she dropped anchors near Hull, in Boston Harbor, in the night, but broke her fastenings, drifted upon the rocks close by, and became a total wreck. Undoubtedly she passed opposite Scituate, only a few miles away, and would have had a sufficiently fair wind to run in and might have been saved, like the other vessels mentioned above. She was probably deterred by the erroneous account of the bar and harbor, given in "Bowditch's Navigator," as has doubtless occurred in many other cases, and Congress has now the opportunity to correct that error and effectually to remove such obstacles as actually exist.

In a word, nature itself seems to have pointed out Scituate as the most appropriate place for a harbor of refuge in Massachusetts Bay. Half-way between its difficult headland, Cape Cod, and the important commercial city of Boston, it presents unsurpassed advantages for such a purpose. Make it a safe and convenient port, and its light-house, established in 1811 and discontinued when Minot's Ledge light-house was built, would be reilluminated. The apprehension seems to have been that Scituate light might interfere with Minot's. But as their lanterns would be entirely different and easily distinguishable, and being 6 miles apart could neither be observed in a fog or snow-storm, half a mile away, the objection seems scarcely tenable. With a good harbor Scituate would at once become a pilot station, and vessels in distress, becalmed, wind-bound, or in a storm would no longer have to wait for assistance from Boston, for it would be found close at hand.

Historically considered, Scituate is a town of much interesting association. Its natural features in many respects are impressive and sometimes beautiful. In consequence of its early settlement, and by persons of uncommon character, its early citizens have been the ancestors of many of the most distinguished families of New England and other parts of the United States. Among them may be named, Bryants, Chittendens, Curtises, Cushings, Gannetts, Hoars, Lowells, Otises, Ticknors, Tildens, Vassalls, Webbs, Winslows, Humphreys, and Mellens, and the enumeration could be made much more complete.

I will only observe, in conclusion, that my attention was directed to the subject in question during a casual residence of several years in the town, and in view of the sea, by observing the natural advantages of the harbor for the purpose indicated, and by the frequent occurrence of distressing wrecks on the coast.

I remain, sir, with much respect, your obedient servant,

GEORGE LUNT.

General GEORGE THOM,
Engineer Corps, U. S. A.

NOTE.—The following parties have forwarded memorials to Congress in favor of improvement in Scituate Harbor, namely: the principal inhabitants of Scituate in large numbers, the Boston Board of Underwriters, the New York Board of Underwriters, the Massachusetts Harbor Commissioners, the Boston Branch Pilots, the Boston and Eastern Yacht Clubs; and the Boston Board of Trade, which has adopted an exceedingly favorable report of its committee on the subject, will do the same.

REPORT OF COMMITTEE OF BOARD OF TRADE OF BOSTON, MASSACHUSETTS.

The committee appointed by your Board on the 29th of March last, to report as to the expediency and desirableness of dredging and otherwise improving Scituate Harbor so as to make it a harbor of refuge, would respectfully state:

That in order to a proper understanding of a subject so important, they thought it necessary first to visit the harbor, and accordingly did so on June 5, 1878, in the tug *Elsie*, generously placed at their disposal for the purpose by the Boston Towboat Company. Approaching the entrance, soundings were taken from about 1 mile outside till over the bar, which were found to closely agree with the depths given at the last survey. The situation of the harbor, its proximity to Minot's light, its size, and the readiness with which it could be entered during dangerous on-shore winds, were there the necessary depth of water, are doubtless sufficiently well known to the Board to need no further notice. It is equally well known that there are few days in the year, however boisterous the weather, when there are not many vessels, coasters, fishermen, and others, bound in and out of Boston Bay. With strong winds from northward and the northeastern quarters, vessels making for this port often fall to leeward of the

harbor, and there is then nothing for them but to drift helplessly and hopelessly into the bay. There is no harbor open to them, the entrance to Plymouth Roadstead, known as the Cow Yard, being so narrow and difficult of approach for a stranger as to render it almost wholly useless. During the winter, and in fact for about eight months of the year, the winds referred to are accompanied by thick weather, rain, sleet, or snow, sometimes by all together, and oftentimes by intense cold, rendering it at such times very difficult, if not impossible, to work or manage a vessel, so that, failing to reach Boston Harbor, she is virtually at the mercy of the elements and in a situation of the utmost peril.

Your committee therefore recommend that the bar and harbor of Scituate be dredged to a depth of 15 feet at low-water, so as to render it available as a harbor of refuge at all times for vessels of small and medium size. They recommend that a breakwater from the northern point of the harbor be thrown out in such direction and to such extent as the engineers employed may think proper, to break the force of heavy seas from the northeastern quarter and give smooth riding to vessels seeking shelter, as well as to prevent the sand from again setting up the bar, to the detriment of the harbor; that a light-house be properly placed and lighted as a guide to the entrance at night, and that a steam-whistle be likewise placed upon, or an automatic buoy at proper distance outside, the breakwater, as a guide when approaching in thick weather.

They believe such improvement of this harbor would unquestionably be in the interest of economy, as in a few years the amount of property saved thereby would far exceed the needed outlay, with the cost of keeping all in proper condition; and in the interests of humanity its value could be scarcely overestimated or overstated.

They, therefore, ask that your Board earnestly and forcibly press upon Congress and the proper branch or branches of the Federal Government the importance of this scheme, inviting, if it be thought expedient, the harbor commission and such other local influences as may have weight and value, to co-operate with and support them in their efforts.

* * * * *

J. EDWARD BURTT.
NATHANIEL SPOONER.
EBENR. HOWES.
MOSES B. TOWER.
ALFRED NASH.

A 19.

SURVEY OF CHARLES RIVER, MASSACHUSETTS.

UNITED STATES ENGINEER OFFICE,
Portland, Me., December 17, 1878.

GENERAL: I have the honor to submit the following report on the survey of Charles River, Massachusetts, to the head of tide-water, made with a view to its improvement, in compliance with the act of Congress approved June 18, 1878, "making appropriations for the construction, repair, preservation, and completion of certain public works on rivers and harbors, and for other purposes."

This river, from its confluence with Mystic River up to the head of tide-water at the Watertown Dam, has a length along its channel of about 9½ miles. It separates the city of Boston, Brookline, Brighton (a part of the city of Boston), and the city of Newton on its south, from Charlestown (a part of the city of Boston), the city of Cambridge, and Watertown on its north.

A very elaborate survey of this river, from its mouth up to Western Avenue Bridge, a distance of 4½ miles, with a map on a scale of 200 feet to 1 inch, was made in 1861, for the use of the United States commissioners by the city government of Boston, which map I was permitted to copy in the office of the board of harbor commissioners, by which I was spared the necessity of a resurvey of this part of the river. A copy of the map accompanies this report.

From Western Avenue Bridge up to the Watertown Dam, at the head of tide-water, a distance of about 5 miles, an accurate hydrographic survey of the river has been made, under my direction, by Mr. Robert

A. Shailer, assistant engineer, whose report and map of the same are also herewith submitted.

On referring to the accompanying maps it is seen that, from the mouth of the river up to a point about midway between Canal Bridge and West Boston Bridge (a distance of about 1½ miles), there is a channel having not less than 20 feet of water at mean low-water; and thence up to Western Avenue Bridge, the channel has not less than 7 feet of water at mean low-water, except in several places, covering about 1¼ miles in extent below Brookline Bridge, where the depth ranges from 4½ to 7 feet.

From the Western Avenue Bridge up to the Arsenal Street Bridge (a distance of 2½ miles), there is a depth of 4 feet at mean low-water (14 feet at mean high-water); thence to Market Street Bridge (an additional distance of about ¾ of a mile), a depth of 2½ feet at mean low-water; and thence to the dam at the head of tide-water (an additional distance of about 1¾ miles) a depth varying from 0 to 9½ feet above mean low-water—the mean rise and fall of the tides being here about 10 feet.

The general width of the river above Western Avenue Bridge ranges from an average of about 200 feet at mean low-water to an average of about 250 feet at mean high-water.

In order to understand fully the character and extent of the commerce and navigation on this river, as well as the object and extent of the desired improvement, I have had interviews and correspondence with several prominent persons residing in the cities and towns through which it passes, including many of those most interested in its commerce. From the information thus obtained it appears that, in order to meet the wants of the present and prospective commerce on this river, it would be necessary to straighten, widen, and deepen its channel in manner as follows, viz:

1. From the mouth of the river up to Western Avenue Bridge, so as to have, for a width of 200 feet, not less than 7 feet of water at mean low-water, giving 17 feet at mean high-water. This would require 60,000 cubic yards of dredging, the estimated cost of which, at 20 cents per cubic yard, measured <i>in situ</i> , is	\$12,000 00
2. From Western Avenue Bridge up to Market Street Bridge, so as to have, for a width of 100 feet, not less than 6 feet of water at mean low-water, giving 16 feet at mean high-water, with side slopes of 2 feet base to 1 perpendicular. This would require 97,000 cubic yards of dredging, the estimated cost of which, at 20 cents per cubic yard, measured <i>in situ</i> , is ..	19,400 00
3. From Market Street Bridge up to the dam at the head of tide-water, the channel to have a depth of 3 feet at mean low-water, giving 13 feet at mean high-water, and a width of 75 feet, with side slopes as above. This would require 216,000 cubic yards of dredging, the estimated cost of which, at 20 cents per cubic yard, measured <i>in situ</i> , is	43,200 00
Adding for engineering expenses, superintendence, and other contingencies ..	10,400 00
Total	85,000 00

The foregoing estimate of the cost of the dredging above Western Avenue Bridge is based upon the fact that the material, although not easy to be dredged, is nearly all gravel (as found by numerous borings), which itself has a value of probably not less than 10 cents per cubic yard.

The information contained in the accompanying letters, marked "A," "B," and "C," in regard to the commerce and navigation on this river, and the extent to which they would be benefited by the improvement herein projected, has been furnished me in compliance with my request.

Respectfully submitted.

GEO. THOM,

Lieut. Col. of Engineers, Bvt. Brig. Gen., U. S. A.

Brig. Gen. A. A. HUMPHREYS,

Chief of Engineers, U. S. A.

REPORT OF MR. ROBERT A. SHAILER, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Portland, Me., December 17, 1878.

GENERAL: I have the honor to submit the following report on the survey of Charles River, Massachusetts, from the dam at the head of tide-water down to Western Avenue Bridge, made, with a view to the improvement of the river, in November, 1878, in obedience to your instructions; together with a drawing of the same, on a scale of 200 feet to 1 inch (1:2400), showing the improvements proposed by you.

The dam at the head of tide-water is situated in Watertown, 1,080 feet above Watertown Bridge, so called, which forms the main connection between Newton and Watertown.

The Western Avenue Bridge crosses the river 25,900 feet (measured along the bank of the river) below the above-named dam, and connects Brighton with Cambridge.

All the principal stations of this survey, as well as all the wharves, bridges, and other prominent points, were determined by triangulation; and the banks of the river were located by offsets from transit lines following the course of the stream as near as practicable.

At intervals of 100 feet along the banks a cord, marked off in divisions of 10 feet, was stretched across from shore to shore at right angles to transit lines; and the soundings, about 10,030 in all, were made at each of the divisions with a lead and chain, read in feet and tenths. About one-fourth only of the above soundings appear on accompanying map.

TIDE-GAUGES.

Three tide-gauges were established on the river, viz, at Brighton Street, Market Street, and Watertown bridges; the first two of which, with the tide-gauge established by the Massachusetts harbor commissioners at the Charlestown navy-yard, were observed day and night at high and low waters, throughout one lunation, from November 5 to December 3, inclusive, with the following results:

	Mean high-water.	Mean low-water.
Navy-yard gauge	9.89	0.38
Brighton Street gauge	9.98	0.18
Market Street gauge	10.29	0.29

Four successive high-waters observed at the Watertown Bridge gauge show a mean of 0.13 above the same high-waters at Market Street gauge, and 0.44 above those at the navy-yard gauge.

For a distance of 2,000 feet or more below Watertown bridge the current was, during the survey, down-stream whatever the stage of the tide.

All soundings are referred to the plane of mean high-water at the Charlestown navy-yard.

BENCHES.

For future reference the following benches were established:

Bench 13.93 feet (above mean low-water), on southwest corner of Stone street-bound in C. E. Willard's horse-shed on North Harvard Street, near Brighton Street Bridge.

Bench 16.29 feet is a chisel-cut in masonry 8 feet from southeast face of Market Street abutment.

Bench 13.23 feet is a chisel-cut in top of river wall, southerly side, about 60 feet below Watertown Bridge.

BORINGS.

Borings were made at intervals of from 300 to 400 feet, which showed the bed of the river to be coarse gravel throughout the entire length of the section surveyed.

PROPOSED IMPROVEMENTS.

The proposed improvements are shown in red on the accompanying map, and are as follows, viz:

1. For dredging a channel, 100 feet wide, 16 feet deep, at mean high-water (6 feet at mean low-water) from Western Avenue Bridge to Market Street Bridge, a distance of 16,920 feet.... 97,000 cubic yards.
 2. For dredging a channel 75 feet wide, 13 feet deep (3 feet at mean low-water) from Market Street Bridge to the head of tide-water, a distance of 8,980 feet..... 216,000 cubic yards.
- Total 313,000 cubic yards.

The estimated cost of which, at 20 cents per cubic yard, is \$62,600
Adding for contingencies and engineering expenses 7,400

Total cost of improvement 70,000

Very respectfully, your obedient servant,

ROBERT A. SHAILER,
Assistant Engineer.

Bvt. Brig. Gen. GEORGE THOM,
Lieut. Col. of Engineers, U. S. A.

A.

LETTER OF MR. MILES PRATT.

WALKER AND PRATT MANUFACTURING COMPANY,
Boston, December 7, 1878.

SIR: I inclose herewith a letter from Mr. A. Brackett, containing statistics of the city of Newton, which may aid you in the report you propose, relating to the expediency of dredging Charles River, and I add below such as I have been able to collect for the town of Watertown.

There is about 15,000 tons of material used in the manufactories of Watertown which could better come by water, and, say, 5,000 tons of domestic coal, also lumber, lime, sand, cement, &c. It would also be cheaper for manufacturers, and dealers in coal supplying the town of Waltham to land at Watertown, which I estimate would add 50,000 tons.

I estimate that the gravel could be disposed of, delivered at convenient points along the river banks, at from 10 to 15 cents per cubic yard; the nearer Boston the greater the value.

If the manufacturing interests in the valley increase for twenty years at the same ratio as in the last twenty, I think it is fair to assume that we shall be seriously inconvenienced by the delays consequent upon the want of facilities (sufficient water) of the railroads to discharge cargoes promptly. Even in these dull times there are occasional delays which are expensive and vexatious. Much of the freight over the Boston and Albany and our Northern roads could be better accommodated by receiving cargoes on the river, the Boston and Albany as far up as Newton, and the Fitchburg at Watertown.

Respectfully,

MILES PRATT.

Brig. Gen. GEORGE THOM.

B.

LETTER OF MR. A. BRACKETT.

NEWTON, December 3, 1878.

DEAR SIR: In response to your inquiry as to the amount of freight now received at this place I would say, I am now receiving myself some 10,000 tons of coal annually; also, some 20,000 tons more are sold by other parties, the natural and cheapest route of transportation for which would be likely to be the Charles River, with a proper

depth of water. Other articles, such as wood, lumber, bricks, lime, cement, &c., which enter largely into the consumption and building up of a city, now numbering some 18,000 inhabitants, would naturally seek the same route, thereby avoiding teaming long distances or transportation by rail, both of which are comparatively *expensive* and tending largely to *waste* in extra handling.

In regard to the value of the gravel taken from the river, it would be somewhat difficult to come at. I should think what might be delivered on this side of the river, in Newton, would bring some 10 cents per cubic yard, and might bring as much at other points on the river where it might be used to advantage in making land for building or wharf purposes. It would seem to be a quick and cheap way for parties owning marsh lands on the river to improve the same by using the material. There can be no doubt but that this growing city would be largely benefited by the improvement of this natural highway.

Yours, truly,

MILES PRATT, Esq.

A. BRACKETT.

C.

LETTER FROM MR. JOSHUA G. GOOCH.

BRIGHTON, December 11, 1878.

DEAR SIR: I have attempted to furnish *exact* statistics of the amount of business on Charles River the past year, but, for lack of time since you spoke to me and other pressing engagements, have failed to do so, but have succeeded in collecting the statement for 1877, annexed, which I think is substantially correct.

The average of lumber received annually in the ten years previous to 1875 was more than double the amount received last year, owing to the temporary depression in that department of business.

The number of vessels that passed up the Charles River to points above and beyond "Cragie's Bridge" (East Cambridge), in 1877, was over 1,300, carrying (besides other freight not enumerated) as follows, estimated in tons weight:

	Tons.
Coal	140,000
Lumber	23,000
Gravel	120,000
Stone	206,000
Wood	12,000
Lime	5,000
Bricks	6,000
Piling	800
Fence-posts	140
Hay	370
Iron	1,500
Sulphur	190
	520,000

Of this amount there was landed between "Brookline Bridge" and the old Cambridge Great Bridge, so called, about 53,000 tons; above the Great Bridge and below the United States Arsenal Bridge, 20,000 tons.

Very truly, yours,

MILES PRATT, Esq.

JOSHUA G. GOOCH.

APPENDIX B.

ANNUAL REPORT OF LIEUTENANT-COLONEL G. K. WARREN, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

ENGINEER OFFICE, U. S. ARMY,
Newport, R. I., July 26, 1879.

GENERAL: I have the honor to transmit herewith my annual reports upon the works of river and harbor improvements and surveys under my charge during the fiscal year ending June 30, 1879.

Very respectfully,

G. K. WARREN,

Lieut. Col. of Engineers & Bvt. Maj. Gen., U. S. A.

Brig. Gen. H. G. WRIGHT,

Chief of Engineers, U. S. A.

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IMPROVEMENT OF HYANNIS HARBOR, MASSACHUSETTS.

LOCATION AND DESCRIPTION.

This harbor is the area sheltered by a breakwater about 1,170 feet long, having a depth of 12 to 15 feet at mean low-water. The rise of tide is about 3 feet. It is on the south side of Cape Cod, and is a part of Nantucket Sound.

HISTORY OF THE IMPROVEMENT.

The breakwater was commenced in 1828 and completed in 1837. The amount expended upon it up to that time was \$70,931.82. In 1853 some repairs were made at the east end under an appropriation of \$5,000. From that time to 1870 no repairs were made upon it. It was originally built of the bowlders found in the vicinity, which, by reason of their rounded character, are not suitable for such work. The slopes of the foundation below low-water were very steep, so steep that it did not withstand the action of the waves, but was gradually thrown by the displacement of the stones in the foundation.

In 1870, repairs were begun upon it. There has been expended since 1870, up to the date of my last annual report, \$37,000 in rebuilding it.

WORK DURING THE FISCAL YEAR.

With the \$3,000 appropriated by act approved June 18, 1878, we have somewhat strengthened the work by increasing the slope on the outside below low-water. Advertisement was made August 5, 1878, inviting proposals for furnishing riprap granite and putting it in place on the