

stones, probably washed into the river by the brook; some of it was difficult to remove.

At this point 2,103 cubic yards were removed. Fifteen hundred cubic yards of the material taken from these two bars were dumped behind Two Mile Island, 5,333 cubic yards just below the island near the west bank of the river, and the balance, 2,200 cubic yards, just above Drew's Rock near the east shore. It was impossible to dump behind Two Mile Island except at the highest stage of the tide, and I do not think that this place will be available in the future as a dumping-ground during the summer or fall. I think the dredging on the Housatonic can be done to the most advantage early in the season, just after the spring floods, for the water is then high, and all the dumping-grounds that have been used heretofore could then be used to great advantage.

The dredging at Two Mile Island was finished May 21, and the dredges were removed to Drew's Rock and a channel was dredged through the bar between Drew's Rock and the point of rocks below. The channel was also excavated to a depth of 7 feet below mean low tide and a width of 60 feet. The west side of this channel is on a line drawn 20 feet east of Drew's Rock and 15 feet east of the point of rocks, at low tide. The material dredged here was fine sand, and the contractor was obliged to put sods in the bottom of the scows to keep it from leaking out; 10,077 cubic yards of sand were excavated here and dumped near the east bank of the river above the jetty.

The tide at Drew's Rock runs so strong and the sand is so fine and mobile that I fear it will run into and fill up any channel that may be dredged, as long as the rock is there. The bar is evidently caused by the existence of the rock, and thus far the building of the jetty seems to have failed to permanently improve the channel. The jetty has been there 7 years, and has had, I think, a fair trial. If any further dredging is necessary at this point, I believe it would be economy to remove both the rock and the jetty. The work here was completed June 3, and dredging begun at Mill Bar. This channel was only dredged 6 feet deep at mean low tide and 40 feet in width, owing to the fact that the appropriation was nearly expended, and it was deemed advisable to use some of it in deepening the channel in "The Bend" below Stratford.

The material at Mill Bar is sand mixed with loam; 2,907 cubic yards were taken out and dumped in the deep hole between the two islands just below the bar. The tide at this point flows at an angle of about 40 degrees with the course of the channel; this is accounted for by the fact that the river is very wide here, but the channel is narrow and winding, following the eastern bank of the river closely for some distance below the bar. Dredging here was completed June 7, and the dredges were removed to "The Bend" below Stratford. There are two channels at this place, the eastern and the western, nearly parallel, and about 200 feet apart at the nearest point. The bar between them is called "the Middle Ground," and it blocks up the eastern channel below the point of rocks, and the western channel at a point more than 1/4 of a mile farther down.

The best plan would have been to open up the eastern channel, but the appropriation was insufficient on account of the length of the bar. A cutting was therefore made through "the Middle Ground" obliquely to the course of the two channels, and connecting them at the point where they were nearest each other.

The cutting was 75 feet wide and about 350 feet long; 50 feet of the width was made 7 feet below mean low tide and the remaining 25 feet 6 feet below.

Forty-two hundred and five cubic yards of sand mixed with loam were excavated here and deposited in Long Island Sound, south of the light-house, in 4 fathoms of water. The total amount excavated in the Housatonic River during the season is 26,222 cubic yards. The work was completed June 14.

If another appropriation is made it could be expended to advantage in widening the cuts already made except at "the Bend" below Stratford where the eastern channel should be opened as indicated in the inspector's tracing with which I was furnished. Crofut's Bar also seems to be filling up, and will probably need attention. The bar at the mouth of the river is a serious obstacle to navigation, but I have nothing to suggest on that subject except the old project of a breakwater first and dredging afterwards.

Very respectfully, your obedient servant,

J. W. BARLOW,  
Major of Engineers, Brevet Lieutenant-Colonel, U. S. A.

GEO. H. BIRNIE.

C 6.

IMPROVEMENT OF BRIDGEPORT HARBOR, CONNECTICUT.

By act of Congress of June 18, 1878, \$10,000 was appropriated for continuing the improvement of this harbor. By the terms of the act at least \$5,000 was to be spent between the lower bridge and the horse-railroad bridge. Proposals were invited for making the channel 100 feet wide and 9 feet deep at mean low-water between the lower bridge and the horse-railroad bridge, and for widening the 12-foot channel from Long Island Sound to the outer beacon. Bids were opened August 6, 1878. The following is an abstract of proposals received:

Name of bidder.	Address.	Price per cubic yard.		At the prices named the appropriation would remove—
		Long Island Sound to outer beacon.	Lower bridge to horse railroad bridge.	
George C. Fobes & Co .....	Baltimore, Md .....	Cents. 14	Cents. 10	Cub. yds. 85,714
H. N. & A. J. Beardsley .....	Bridgeport, Conn .....	22	09	78,282
S. A. Hammond .....	do .....	16	12	72,916
Henry D. Dennison .....	Syracuse, N. Y. ....	20	12	66,636
John M. Seward .....	Albany, N. Y. ....	18	13	66,238
Morris F. Brainard .....	do .....	17 1/2	12	70,238
P. W. Myers .....	New York, N. Y. ....	25	18	47,777

The contract was awarded to Messrs. Geo. C. Fobes & Co., of Baltimore, Md., at their prices given in the abstract, they being the lowest bidders.

Work was commenced above the lower bridge October 11, and continued until December 21, 1878, when work was stopped for the winter. The channel from the lower bridge to the horse-railroad bridge, a distance of about 3,000 feet, was made 100 feet wide and 9 feet deep at mean low-water. April 14, 1879, work was commenced upon the outer bar and continued until May 17, when the appropriation was exhausted. The channel through the bar was made 160 feet wide and 12 deep at mean low-water.

The amount of material removed during the year is as follows:

	Cubic yards.
From between the lower bridge and the horse-railroad bridge .....	71,345
From between Long Island Sound and the outer beacon (outer bar) .....	13,682

It was deemed best to complete the work between the bridges rather than to leave it in an unfinished condition, and for this reason the largest portion of the appropriation was spent upon that part of the work.

A survey of the harbor from the lower bridge to the horse-railroad bridge and an examination of the channel from the lower bridge to Long Island Sound were made during the month of July, 1878, and a map made during the fall. A copy of this map is transmitted with this report. The contours have been adjusted to the present condition of the channel, but the areas dredged during the past season are shown in blue. It will be seen that the bars have not shoaled since the construction of the breakwater from Long Beach.

By act of Congress of March 3, 1879, \$10,000 was appropriated for continuing the improvement of this harbor.

It is proposed to spend this sum in widening the 12-foot channel from Long Island Sound to the wharves. Estimates have heretofore been submitted and approved for making the channel 300 feet wide and 12 feet deep at mean low-water. To do this it will be necessary to remove about 180,000 cubic yards of material in addition to what can be done under the appropriation of 1879. This will cost, including superintendence and contingencies, at 14 cents per cubic yard, \$25,200.

It is recommended that an appropriation of \$25,000 be made for the fiscal year ending June 30, 1881.

Plans for improving the harbor, at an estimated cost of \$196,000, were recommended in 1871. These provided for the construction of a jetty from the east shore, and for dredging a channel 200 feet wide and 14 feet deep at mean low-water. The jetty was partially built, but the plan for dredging has been modified, the present project being to make the channel 300 feet wide and 12 feet deep at mean low-water. This modification does not materially change the amount of the estimates as to cost, and is believed to give a more convenient harbor. By reason of the rapid accumulation of material in the angle formed by the east side of the jetty with the shore, it may soon be necessary to extend the jetty to the 6-foot curve, as contemplated in the original estimates. It is also possible that the rapidly increasing commerce of the place may demand an increased depth of water. When such contingencies shall arise, additional estimates will be submitted.

The following sums have been appropriated since 1860:

March 3, 1871 .....	\$20,000 00
June 10, 1872 .....	40,000 00
March 3, 1873 .....	30,000 00
June 23, 1874 .....	20,000 00
March 3, 1875 .....	15,000 00
August 14, 1876 .....	10,000 00
June 18, 1878 .....	10,000 00
March 3, 1879 .....	10,000 00
Total .....	155,000 00

Bridgeport is in the Fairfield collection-district, and is the port of entry. The amount of revenue collected during the fiscal year ending June 30, 1879, is \$5,436.20. The nearest light-house is at the entrance to the harbor, and the nearest work of defense is Fort Hale, New Haven Harbor, Connecticut, 18 miles east.

#### HISTORY OF THE IMPROVEMENT TO 1879.

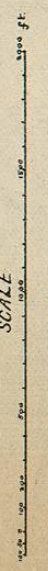
The city of Bridgeport, the county seat of Fairfield County, Connecticut, is located on Long Island Sound, at the mouth of the Pequannock River, in the southwestern part of the State, 60 miles east of New York City. It is on the line of the New York, New Haven and Hartford Railroad, is the southern terminus of the Housatonic and Naugatuck Railroads, and has a daily line of steamers to and from New York City. At the docks, large quantities of coal and raw materials are transferred from water-craft to the railroads, supplying the extensive manufacturing industries of the Naugatuck and Housatonic Valleys. Bridgeport is largely engaged in the manufacture of fire-arms and ammunition, sewing-machines, carriages, cutlery, &c. The population is about 27,000.

The mean rise and fall of tide is 6.55 feet.

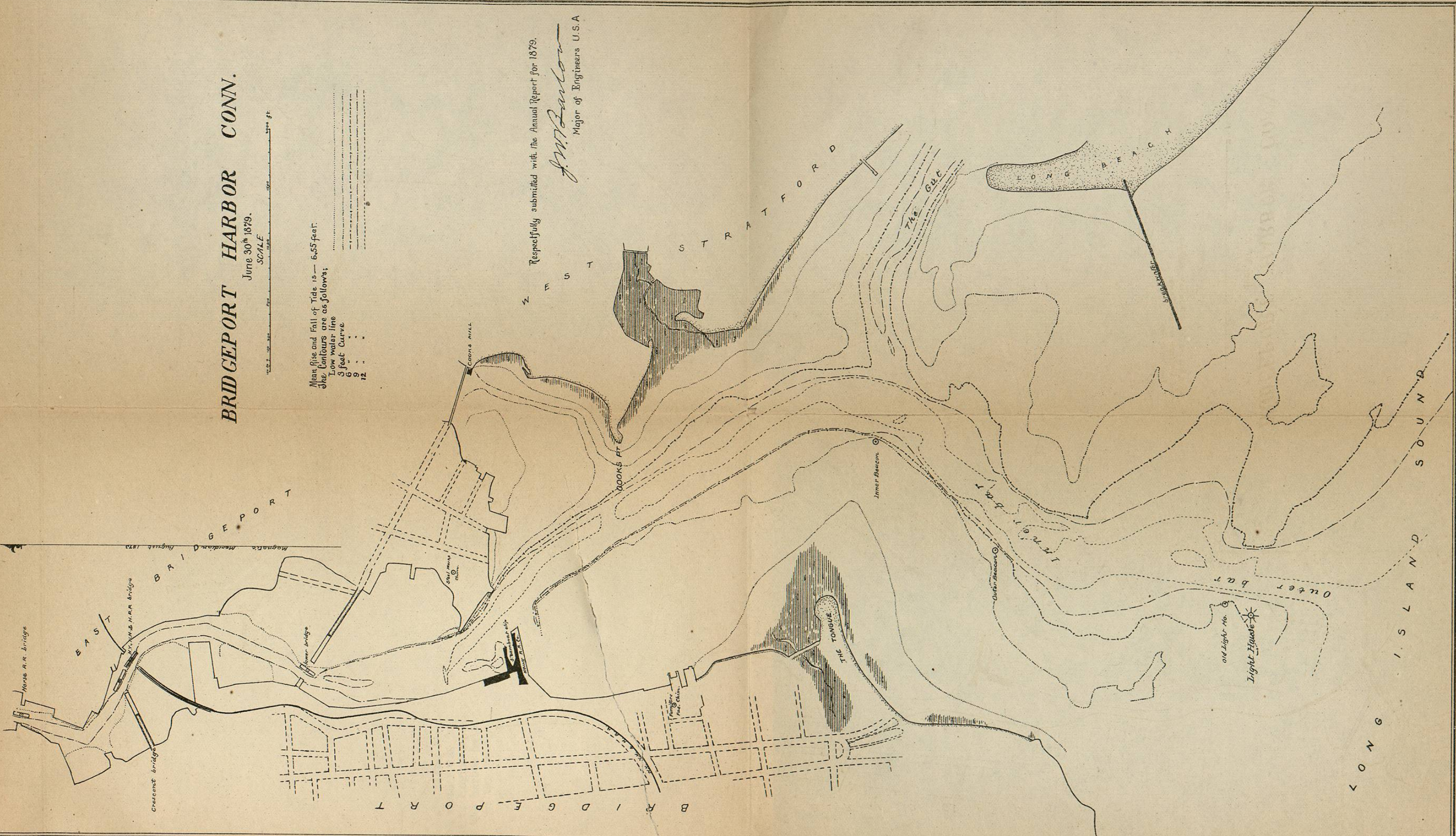
The first map of the harbor of which we have any record is one made by Lieutenant Blake, United States Navy, for the Coast Survey, in 1835. This showed a depth of 5 feet over the outer bar, and from 4 to 6 feet over the inner bar.

# BRIDGEPORT HARBOR CONN.

June 30<sup>th</sup> 1879.  
SCALE



Mean Rise and Fall of Tide is — 6.55 feet.  
The Contours are as follows;  
Low water line  
3 feet Curve  
6  
9  
12



Respectfully submitted with the Annual Report for 1879.  
*J. M. Boulton*  
Major of Engineers U.S.A.

A breakwater from Long Beach, to arrest the littoral movement of sand and drift from the eastward, would cost, according to the length adopted, from \$360,888 to \$566,922; or, in lieu of the breakwater, a jetty built from extreme high-water mark to extreme low-water mark, followed by a line of dolphins, placed 8 feet apart, to the 6-foot curve, "to check the motion of the tide and cause the sand to be deposited near them," would cost, including superintendence, \$58,000.

By act of Congress of March 3, 1871, \$20,000 was appropriated for the improvement of the harbor. It was decided to expend a portion of this sum in building a riprap sea-wall from the east shore, to test its effect in arresting the movement of the drift along the beach, and the remainder to be expended in dredging on the bars. The contract for granite was given to Messrs. C. C. Campbell & Co., of New York City, at the rate of \$2.84 per ton of 2,240 pounds placed in the jetty, and for dredging to Mr. Francis H. Smith, of New York City, at the rate of 23.4 cents per cubic yard. During the season of 1871 there were removed from the outer bar 3,020 cubic yards of material, from the inner bar 10,280 cubic yards of material, and from the east side of the channel, opposite Cook's Point, 11,194 cubic yards of material. The channel through the outer bar was made 25 feet wide and 12 feet deep at mean low-water, through the inner bar 80 feet wide and 13 feet deep, and opposite Cook's Point 50 feet wide and 12 feet deep. During the same season, 3,924 tons of granite were placed in a jetty built to a height of 9 feet above mean low-water, extending into the sound 521 feet from extreme high-water line on Long Beach. During the summer of 1871 a survey of the harbor was made by Capt. W. S. Edwards, assistant engineer.

By act of Congress of June 10, 1872, \$40,000 was appropriated for continuing the improvement. Proposals were invited for 8,000 tons of riprap granite for the jetty and for dredging on the outer and inner bars and between the inner bar and the wharves. Bids were opened July 30, 1872, and a contract awarded to Mr. D. V. Howell, of New York City, for granite, at the rate of \$2.37 per ton, and to Mr. Sidney F. Shelbourne, of New York City, for dredging, at the rate of 21½ cents per cubic yard. Under these contracts 9,523 tons of stone were placed in the breakwater, extending it 859 feet, making the total length 1,380 feet; 5,313 cubic yards of material were removed from the outer bar, making the channel 140 feet wide and 9 feet deep at mean low-water; 11,902 cubic yards from the inner bar, making the channel 200 feet wide and 9 feet deep at mean low-water, and 28,303 cubic yards from between the inner bar and the wharves, making the channel about 200 feet wide and 9 feet deep at mean low-water.

By act of Congress of March 3, 1873, \$30,000 was appropriated for continuing the improvement. Proposals were invited for dredging and bids were opened May 6, 1873. The contract was awarded to Mr. Emory R. Seward, of Albany, N. Y., at the rate of 18 cents per cubic yard, who, not commencing at the time agreed upon, the work was given to Messrs. H. N. & A. J. Beardsley, of Bridgeport, Conn., at the same price. During the season 165,751 cubic yards of material were removed as follows: From the inner bar 38,919 cubic yards, making the channel 350 feet wide and at least 9 feet deep at mean low-water; a point on the west side of the channel below the Naugatuck Railroad pier, covering an area of 75,000 square feet, was removed, making the depth 9 feet at mean low-water, and the channel opposite the wharves was made 250 to 300 feet wide with a depth of 9 feet at mean low-water; 126,832 cubic yards of mud were removed from these two points.

The map of Mr. Edwards, assistant engineer, made in 1871, being found unreliable, Major Warren directed that a resurvey of the harbor be made. This was done during the summer of 1873 by Mr. William W. Starr, jr., assistant engineer, while superintending the improvement.

In January, 1874, estimates were submitted as follows:

To make the channel 500 feet wide and 9 feet deep through the outer bar would require the removal of 70,000 cubic yards of material. To make the channel 600 feet wide and 9 feet deep through the inner bar would require the removal of 64,000 cubic yards of material; and to make the channel 500 feet wide and 9 feet deep at mean low-water from the inner bar to the wharves would require the removal of 297,000 cubic yards of material.

By act of Congress of June 23, 1874, \$20,000 was appropriated for continuing the improvement of the harbor.

In July, 1874, the charge of the work was transferred to Maj. J. W. Barlow, Corps of Engineers. In July proposals were invited for dredging between Long Island Sound and the wharves, and bids were opened August 26, 1874. The contract was awarded to Mr. Emory R. Seward, of Albany, N. Y., at the rate of 14½ cents per cubic yard. Under this contract 145,243 cubic yards of material were removed, as follows:

From the outer bar, 36,648 cubic yards, making the channel 350 feet wide and at least 9 feet deep at mean low-water; from the inner bar 36,186 cubic yards, making the channel 450 feet wide and 9 feet deep at mean low-water; from between the inner bar and the wharves, 72,409 cubic yards, making the channel about 300 feet wide and 9 feet deep at mean low-water.

In the annual report of the Chief of Engineers for the fiscal year ending June 30, 1875, estimates were submitted as follows:

To make a channel 300 feet wide and 12 feet deep at mean low-water, from Long Island Sound to the wharves, would require the removal of 367,253 cubic yards of material, and to make the same channel 15 feet deep at mean low-water would require the removal of 789,000 cubic yards of material.

By act of Congress of March 3, 1875, \$15,000 was appropriated for the further improvement of this harbor. Proposals were invited for dredging a channel 100 feet wide and 12 feet deep from Long Island Sound to the wharves. Bids were opened June 22, 1875, and the contract awarded to Mr. Emory R. Seward, of Albany, N. Y., at the rate of 16 cents per cubic yard for material removed from the outer bar, 15 cents per cubic yard for material removed from the inner bar, and 10 cents per cubic yard for material removed from between the inner bar and the wharves. Under this contract, 34,913 cubic yards of material were removed from the outer bar, 16,794 cubic yards of material from the inner bar, and 47,657 cubic yards of material from between the inner bar and the wharves, making the channel 105 feet wide and 12 feet deep at mean low-water.

By act of Congress approved August 14, 1876, \$10,000 was appropriated for continuing the improvement. In view of the limited amount of the appropriation it was deemed advisable to use it in widening the 9-foot channel opposite the wharves and below the Naugatuck Railroad pier. A contract was made with Messrs. H. N. and A. J. Beardsley, of Bridgeport, Conn., to dredge at the rate of 8½ cents per cubic yard. Under this contract 85,603 cubic yards of material were removed, making the channel opposite the wharves at least 350 feet wide and 9 feet deep at mean low-water, and below the railroad pier 350 feet wide and 9 feet deep at mean low-water.

By act of Congress approved June 18, 1878, \$10,000 was appropriated for continuing the improvement, \$5,000 of which should be expended in deepening the channel between the lower bridge and the horse-railroad bridge.

*Money statement.*

July 1, 1878, amount available .....	\$10,132 73	
Amount appropriated by act approved March 3, 1879 .....	10,000 00	\$20,132 73
July 1, 1879, amount expended during fiscal year .....		10,074 15
July 1, 1879, amount available .....		10,058 58
Amount (estimated) required for completion of existing project .....	25,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881 .....	25,000 00	

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, BRIDGEPORT, CONN.,  
Collector's Office, July 8, 1879.

SIR: I have the honor to acknowledge the receipt of your letter of the 2d instant, and inclose herewith statistics relating to the commerce of this port as requested. I have to say in addition that the improvements already made in the harbor of Bridgeport have most materially increased its use both as a harbor of refuge and every other way. I believe that an annual appropriation judiciously expended for a few years would make Bridgeport one of the most easily accessible and desirable harbors for the carrying on of foreign trade, as well as for a refuge for coasting vessels, of any between New York and Boston; and, as I said in my last year's report, I think there should, and probably the time is not far distant when there will be an extensive foreign trade carried on here. I would respectfully refer you to my report of last year as containing other suggestions pertaining to the subject.

Very respectfully, your obedient servant,

J. D. HANOVER,  
Collector.

Col. J. W. BARLOW, U. S. A.

COLLECTIONS.	
Duties on imports .....	\$2,282 19
Tonnage dues .....	354 00
Hospital-tax .....	\$1,488 65
Miscellaneous receipts .....	\$1,310 36
Number of foreign vessels arrived from foreign ports .....	32
Number of foreign vessels cleared for foreign ports .....	28
American vessels arrived from foreign ports .....	2
American vessels cleared for foreign ports .....	0
Total number of vessels of all classes entered and cleared during the fiscal year ending June 30, 1879 .....	6,738
Total tonnage .....	1,288,432
Estimated value of cargoes received .....	\$25,672,600 00
Estimated value of cargoes exported .....	\$27,310,000 00
Number of vessels of all classes entering the harbor for refuge during the year .....	1,200 to 1,500

NOTE.—The above are necessarily approximate estimates, but are as nearly correct as can be made at this date.

C 7.

IMPROVEMENT OF SOUTHPORT HARBOR, CONNECTICUT.

No appropriation since that of August 14, 1876, has been made for the improvement of this harbor. As stated in the last annual report, a channel 60 feet wide and 4 feet deep at mean low-water was dredged from the outer beacon to above the end of the breakwater.

This is a valuable improvement, but, as heretofore recommended, the channel should be made 100 feet wide, and should be extended about 800 feet farther up the harbor. This additional work accomplished, it is believed the commercial interests of Southport would be entirely satisfied for an indefinite period. The sum of \$5,000 is recommended to complete the improvement. This could be profitably expended during the next fiscal year.

Following are the amounts appropriated for the harbor since 1838:

March 3, 1875 .....	\$5,000
August 14, 1876 .....	5,000

Southport is in the Fairfield collection district of which Bridgeport is the port of entry. The amount of revenue collected there for the fiscal year ending June 30, 1879, was \$5,436.20. The nearest light-house is on Penfield Reef,  $3\frac{1}{2}$  miles from the harbor. Fort Hale, New Haven Harbor, the nearest work of defense, is 24 miles distant.

HISTORY OF THE IMPROVEMENT TO 1879.

In 1826, by direction of Major-General Macomb, Chief Engineer, Lieut. Col. John Anderson, United States Engineers, made a survey of Mill River for the purpose of ascertaining the "expediency of removing the obstructions to navigation thereof and of protecting the same." Under date of February 19, 1827, Colonel Anderson submitted a report recommending a breakwater of stone running southward from the high-water line on the sand-spit opposite Southport to the low-water line, a distance of about 1,420 feet; a dike of earth, 1,450 feet long, extending northward from the sand-spit along the edge of the "sunken ground," and the excavation of about 11,000 cubic yards of earth from the channel. The whole work was estimated to cost \$6,096.18.

By act of Congress of March 2, 1829, \$6,097 was appropriated "for improving the navigation of Mill River by removing obstructions in the said river, and constructing such works as will prevent the sand from filling up the channel of the same." The plans for the improvement of the harbor as recommended by Colonels Anderson and Totten were substantially carried out during the summer of 1829, and were as follows:

First, the construction of a breakwater 1,320 feet long. This was built of long and large stones, quarried on the neighboring shore, laid as headers, the interior filled with stone of all sizes compactly laid, and the whole capped with large stones reaching entirely across the breakwater. The dimensions were 14 feet wide at bottom, 8 feet at top, and  $8\frac{1}{2}$  feet high above common low-water.

Second, the construction of a dike 1,350 feet long. This was built of marsh sods laid with a batter of about 1 to 1, the interior being formed of alternate thin layers of brush and mud. Where the bottom was soft and low a foundation was secured by laying fascines until the level of the adjacent marsh was reached. The width of the dike at top was 5 feet.

In 1830 Colonel Totten reported that "both the dike and breakwater have been finished to the altitude first determined upon, and seem well to fulfill their object. The channel has been deepened by dredging throughout its whole length, and the improvement of the navigation is universally acknowledged to be very great."

By act of Congress of July 3, 1832, \$4,490.23 was appropriated "for completing the breakwater and dike, and deepening the channel in the harbor of Mill River, Connecticut." By act of Congress of July 4, 1836, \$1,500 was appropriated "for securing the public works at Southport, Conn.," and by the act of March 3, 1837, \$1,000 was appropriated "for