

APPENDIX C.

ANNUAL REPORT OF MAJOR J. W. BARLOW, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,  
New London, Conn., July 14, 1879.

GENERAL: I have the honor to transmit the annual reports of river and harbor works in my charge for the fiscal year ending June 30, 1879.

Very respectfully, your obedient servant,

J. W. BARLOW,  
Major of Engineers.

Brig. Gen. H. G. WRIGHT,  
Chief of Engineers, U. S. A.

C I.

IMPROVEMENT OF STONINGTON HARBOR, CONNECTICUT.

By act of Congress approved June 18, 1878, the sum of \$40,000 was appropriated for continuing the breakwater off Wamphassuck Point.

Proposals for furnishing and delivering stone for this work were invited.

Following is an abstract of the bids received:

Name.	Address.	Per ton.	To com- mence—	To com- plete—
Isaac A. Sylvester .....	Quincy, Mass. ....	\$0 85½	Aug. 10, 1878	June 30, 1879
Ingerson & Molthrop .....	New London, Conn. ....	88	Aug. 15, 1878	June 30, 1879
Francis H. Smith* .....	New York .....	88	At once.	June 30, 1879
Charles F. Stoll .....	New London, Conn. ....	91	Aug. 10, 1878	June 30, 1879
John Beattie .....	Guilford, Conn. ....	93	Aug. 10, 1878	June 30, 1879
Derry & Edwards .....	Boston, Mass. ....	96	Aug. 10, 1878	June 30, 1879
R. F. Loper, jr. ....	Stonington, Conn. ....	1 18	Aug. 10, 1878	June 30, 1879
Asa C. Palmer .....	Boston, Mass. ....	1 22	Aug. 10, 1878	June 30, 1879

\*Signatures to proposals not witnessed.

The contract was awarded to the lowest bidder, Isaac A. Sylvester, at the price named, and work was begun October 3, 1878.

Little progress was made until November, since which time the construction of the work has progressed satisfactorily.

For a detailed history of the operations of the past year attention is invited to the accompanying report of Mr. G. C. Almy, the inspector who has had the immediate charge of the work.

The original estimates for the breakwater provided for a work to cost \$213,000, upwards of \$100 per linear foot. By omitting the coping, which does not appear to be necessary, and by obtaining material at



prices somewhat less than those estimated, the work is now costing but \$50 per linear foot, the average price, including that over the shoal, being \$40 per foot.

The entire cost of the breakwater will therefore not greatly exceed \$100,000, and the appropriation of \$37,500, made at the last session of Congress, will probably suffice for its completion.

In view of the national importance of this harbor as one of refuge for a very large class of vessels, the immediate application of the present appropriation is urgently recommended.

I would ask special consideration of the subject discussed by Mr. Almy of providing further protection by means of a breakwater at the east side of the harbor. That very troublesome seas come in from that direction is unquestionable, as well as the fact that a breakwater constructed either at Stonington Point or Bartlett's Reef would effectually shut them off, making this a perfect harbor of refuge under all conditions of weather. I should recommend for preference the position at the north end of Bartlett's Reef as affording a larger anchorage, and, being nearer the highway of commerce, it is more accessible. The character of such an improvement, though local to the extent of preventing the ocean roll from entering Stonington Harbor, to the serious injury of vessels lying at the docks, from its position and accessibility from the high seas, may be considered essentially national.

At the present prices for this class of work its cost would be about \$150,000, which, added to the cost of the one now building, will but little exceed the original estimate for the protection of this harbor.

Owing to the increased anchorage gained by such a work the item for dredging Penguin Shoal might properly be omitted.

Following are the several amounts heretofore appropriated:

March 3, 1873, dredging.....	\$25,000 00
June 23, 1874, dredging.....	20,000 00
March 3, 1875.....	25,000 00
June 18, 1878.....	40,000 00
Estimate (1875) for executing project for breakwater and dredging Penguin Shoal.....	231,000 00
The west breakwater (exclusive of coping) can be completed for.....	37,500 00
Estimated cost of a breakwater at Bartlett's Reef, 3,000 feet in length, at \$50 per foot.....	150,000 00
Amount that can be profitably expended during the next fiscal year....	75,000 00

Stonington is the port of entry for the Stonington collection district. There is a light-house on Stonington Point, and a light-ship two miles southwest of Wamphassuck Point. Fort Trumbull, the nearest work of defense, is 12 miles distant.

#### HISTORY OF THE IMPROVEMENT TO 1879.

Stonington is a village in the eastern part of New London County, Conn., and in 1870 had a population of 1,561 inhabitants. It is important as having the first harbor west of Newport, R. I., and the only one between New London, Conn., and Newport, R. I.

It is the terminus of the Stonington and Providence Railroad, and has a daily line of large steamers to and from New York in connection with the railroad from Boston.

The mean rise and fall of tide is 2.7 feet.

By act of Congress of March 2, 1827, \$200 was appropriated for "making a survey and examination to ascertain the expediency and expense of erecting a pier at Stonington Harbor, in the State of Connecticut."

This survey was placed in charge of Lieut. Col. John Anderson, U. S. Topographical Engineers, and, in the fall of 1827, Lieut. J. Prescott,

First Artillery, made the survey, and submitted a map with plans and estimates for the construction of a pier.

The pier to be 740 feet long with a width on top of 20 feet, a batter on the sea face of 1 on 3, and on the harbor face 3 on 1; 44,426 perches of stone to be used, at an estimated cost of 95 cents per perch, or a total expense of \$44,337.

By act of Congress of May 23, 1828, \$20,000 was appropriated "towards erecting piers or other works at or near Stonington Harbor, in the State of Connecticut, for the purpose of making the same a good and secure harbor."

By act of Congress of April 23, 1830, \$16,491.67 was appropriated "for erecting piers or other works at or near Stonington Harbor, Connecticut."

Under these appropriations the pier was built, substantially as recommended by Lieutenant Prescott, the width on top being made but 12 feet, instead of 20 feet, as first proposed. The records at hand do not show what amount of material was used or its cost.

By act of Congress of June 27, 1834, \$262.16 was appropriated "for balance due Gurdon Trumbull, superintendent of the public works at Stonington Harbor, Connecticut."

By act of Congress of March 3, 1871, the Secretary of War was directed to cause a survey to be made of Stonington Harbor, Connecticut. An allotment of \$1,000 (afterwards increased to \$1,166) was made from the general appropriation and the work placed in charge of Maj. G. K. Warren, Corps of Engineers.

During the summer of 1871 the survey was made by Mr. J. H. Dager, civil engineer, and a report with map and estimates for improvements was submitted under date of December 1, 1871. The following plans were recommended:

A breakwater from Stonington Point, 100,000 tons riprap granite, at \$2..	\$200,000 00
6,000 cubic yards dimension stone, at \$25 .....	150,000 00
For sea-wall at Wamphassuck Point, 20,000 tons riprap granite, at \$2 ...	40,000 00
Contingencies .....	30,000 00

Total ..... 420,000 00

For dredging, the estimates varied from \$139,205 to \$21,186, according to the location of the work to be done. The depth was to be made 15 feet at mean low-water at all points where dredging was recommended.

By act of Congress of March 3, 1873, \$25,000 was appropriated "for the improvement of Stonington Harbor, Connecticut, by deepening and dredging the same, and its approaches."

With this appropriation it was considered desirable that the space bounded north by the steamboat wharf, south by the breakwater, east by the docks, and west by the line drawn from the head of the breakwater to the head of the steamboat wharf, should be made 12 feet deep at mean low-water.

The contract was awarded to Mr. Sidney F. Shelburne, of New York, at the rate of 20 cents per cubic yard for material removed. Work was commenced October 2, 1873, and completed June, 1874. During the time 91,087 cubic yards of mud and sand were removed, making the depth 12 feet at mean low-water over the area bounded by the snubbing-pier below the steamboat wharf, east to the docks, a line drawn 30 feet out from the pier-heads, the breakwater, and a line uniting the head of the breakwater to steamboat wharf.

The charge of this work was transferred to Maj. J. W. Barlow, Corps of Engineers, in July, 1874.

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



continuing the improvement. With this sum it was proposed to remove that portion of Penguin Shoal lying north of a line produced through the axis of the breakwater, making a depth of 12 feet at mean low-water.

A contract was made with Mr. M. F. Brainard, of Albany, N. Y., at the rate of 16½ cents per cubic yard for material removed. Work was commenced in October, 1874, and completed in September, 1875, during which time 118,422 cubic yards of sand and mud were removed, making the depth 12 feet at mean low-water over an area of about 22 acres.

By act of Congress of March 3, 1875, \$25,000 was appropriated for continuing the improvement. With this it was proposed to build a breakwater across the lower end of Penguin Shoal on a line nearly east and west, and opposite the old pier or breakwater; this plan was adopted because of its costing less than any other proposed. It met with much opposition from the citizens of Stonington, and in June, 1875, by direction of the Chief of Engineers, a Board of Engineer Officers met at Stonington to consider the subject. The Board recommended the building of the breakwater from Wamphassuck Point "in a general south-easterly direction," and this line was finally adopted. The estimated cost of the project, including the removal of the remainder of Penguin Shoal, was \$231,536.

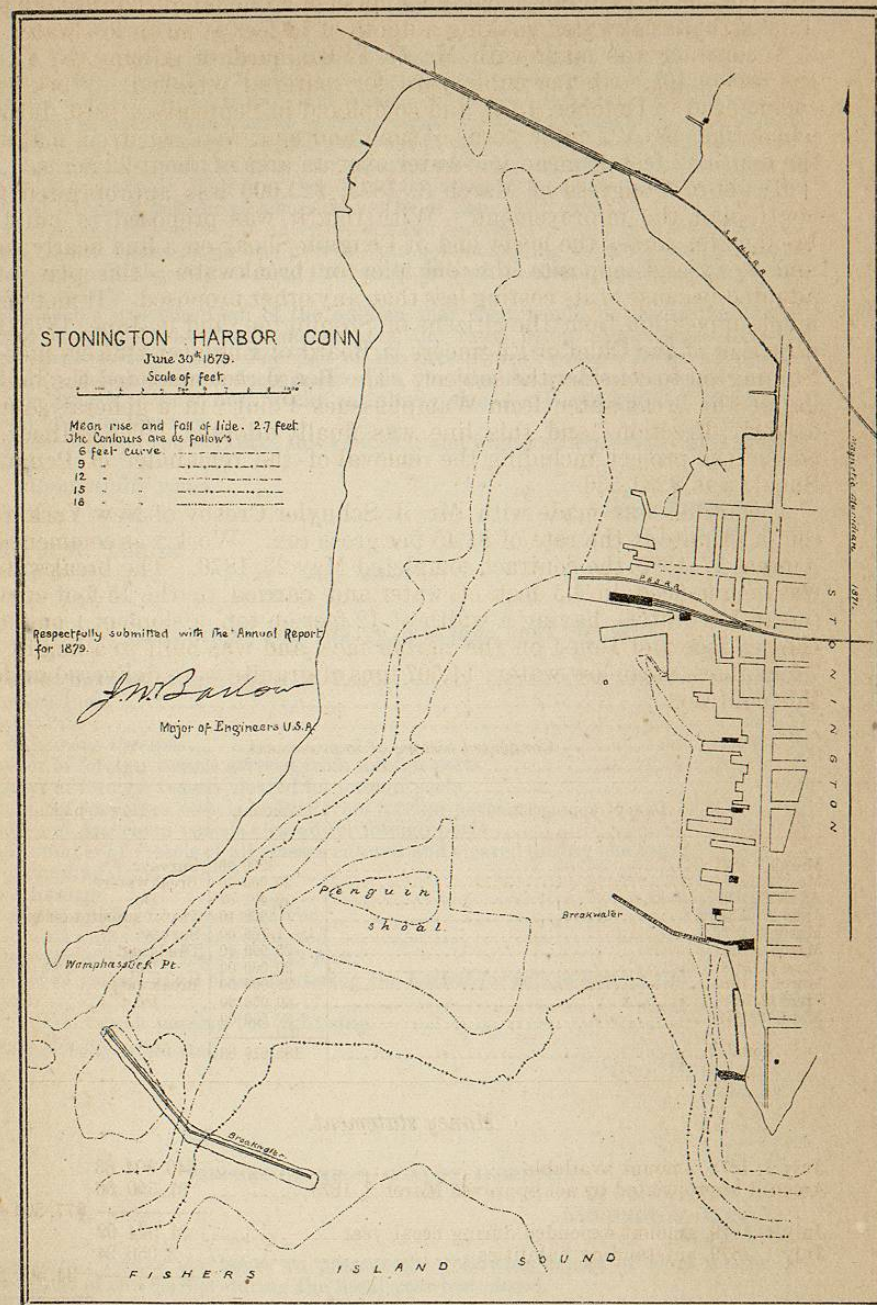
A contract was made with Mr. J. Schuyler Crosby of New York for rough granite at the rate of \$1.45 per gross ton. Work was commenced August 17, 1875, the contract completed May 23, 1876. The breakwater was commenced in 4.5 feet of water and carried to the 15-foot curve (mean low-water), having a width of 12 feet on top, a slope of 1 on 2 on the sea face and 1 on 1 on the harbor face, and was built to a height of 7 feet above mean low-water; 14,507 tons of granite were delivered under this contract.

*Condensed history of improvement.*

Date of appropriation.	Amount.	How applied.
March 2, 1827 .....	\$200 00	Survey.
May 23, 1828 .....	20,000 00	Breakwater.
April 23, 1830 .....	16,491 67	Do.
June 27, 1834 .....	262 16	Pay of superintendent.
March 3, 1871 .....	1,166 00	Survey.
March 3, 1873 .....	25,000 00	Dredging.
June 23, 1874 .....	20,000 00	Do.
March 3, 1875 .....	25,000 00	Breakwater
June 18, 1878 .....	40,000 00	Do.
March 3, 1879 .....	37,500 00	
<b>Total .....</b>	<b>185,619 83</b>	

*Money statement.*

July 1, 1878, amount available .....	\$40,004 63	
Amount appropriated by act approved March 3, 1879 .....	37,500 00	
		<b>\$77,504 63</b>
July 1, 1879, amount expended during fiscal year .....	31,504 02	
July 1, 1879, outstanding liabilities .....	3,056 24	
		<b>34,560 26</b>
July 1, 1879, amount available .....	42,944 37	
Amount (estimated) required for completion of existing project .....	150,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881 .....	75,000 00	



A.M. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS.)



## COMMERCIAL STATISTICS.

CUSTOM-HOUSE, STONINGTON, CONN.,  
Collector's Office, July 3, 1879.

DEAR SIR: In reply to yours of the 2d instant, I would say that the effect of a further improvement of our harbor would be of incalculable value; it will greatly increase the capacity of the harbor, and what is of the most importance, it will make it perfectly safe, in fact would make nearly a *perfect harbor*, and completely and effectually put a stop to the heavy sea that now rolls in when a storm comes from the south-east, east, or south, and also make our wharves perfectly safe and as smooth lying at them as if in a canal. This is of the utmost importance, as now in storms our wharves are much exposed, and the steamers cannot lie at them with safety.

By all means, if possible, an outer breakwater should be built, which would accommodate vessels bound either east or west, and not compelling them to seek the inner harbor, when in the early morning they could proceed on their passage, making quite a saving in time.

With such a structure I am of the opinion that there would be nearly double the number of vessels that would anchor here, and those bound east be some 15 miles nearer their eastern port. The fact of the present work being built for about one-half of its expected cost reflects credit upon you, and the government would not be out over \$30,000 to finish both works, and thus give us a splendid harbor. Much will depend upon its location.

I sincerely hope you will take this view of it and urge its completion. It is greatly needed.

Respectfully yours,

GEO. HUBBARD,  
Collector.

Maj. J. W. BARLOW.

## COLLECTIONS FOR THE YEAR ENDING JUNE 30, 1879.

Duties on imports .....	\$7 70
Tonnage dues .....	152 70
Hospital tax .....	826 11
Miscellaneous receipts .....	824 98
Number of foreign vessels arrived from foreign ports .....	1
Number of foreign vessels cleared for foreign ports .....	0
Number of American vessels arrived from foreign ports .....	1
Number of American vessels cleared for foreign ports .....	2
Total number of vessels of all classes entered and cleared during the fiscal year ending June 30, 1879 .....	633
Total tonnage .....	1, 079, 185
Estimated value of cargoes received .....	\$22 378, 440
Estimated value of cargoes exported .....	\$21, 940, 000
Draught of vessels from 10 to 13 feet.	
Number of vessels of all classes entering the harbor for refuge during the year .....	1, 800
Number of vessels passing the light-ship .....	15, 015

Respectfully submitted.

GEO. HUBBARD,  
Collector

## REPORT OF MR. G. C. ALMY, INSPECTOR

STONINGTON, CONN.,  
July 1, 1879.

COLONEL: I have the honor to present the following report of work for the improvement of this harbor during the fiscal year just closed.

The appropriation of \$40,000 provided for by the river and harbor act of June 18, 1878, has been nearly expended in the extension of the west breakwater under a contract with Mr. Isaac A. Sylvester, of Quincy, Mass. The work is progressing favorably, and all contemplated under the above contract will be completed by the 31st of August, 1879.

The delivery of the stone began on the 3d of October, 1878. The material was obtained from a quarry on Wamphassuck Point, and forwarded by means of a tramway and cars over a bridge constructed for the purpose, to the breakwater.



This plan proved unsatisfactory in every particular. The quarry failed to afford suitable material in sufficient quantity and at reasonable cost; the moving of the stone to the desired point was expensive and difficult; it was also found that the placing of stone in the breakwater by dumping from cars involved an extravagant consumption of material and made it impossible to give the structure the form and proportions required by the specifications.

The work proceeded slowly until the 23d of October, at which time it was completely stopped by the destruction of the bridge during a severe southeast storm.

The average daily receipt of stone before this disaster was 54½ tons.

On the 7th of November, operations were resumed by the arrival of stone brought in vessels from New London. The first cargo of 200 tons was discharged and placed in the work in a satisfactory manner in two hours. Since then nothing has occurred to cause delay. The present method of conducting the work is certainly more economical for the government and profitable for the contractor than the plan at first pursued, admitting as it does of more and better work, with less material and greater progress. The weather throughout the winter was generally favorable.

Five vessels have been employed freighting stone from different points until recently, when owing to the failure of the quarry on Powder Island, two of the number have ceased work. Since the early part of April, a large portion of the stone used has been brought from quarries near Mystic and Stonington; some material has also been obtained from the vicinity of Westerly, R. I.

Soon after the commencement of work under this contract a change was made in the direction of the breakwater. The part previously built (1875-76) began at a point 450 feet distant from the shore of Wamphassuck Point, and extended for 750 feet in a course south 51° 30' east, direct for Napatree Point. The direction of the work constructed during the past year is south 76° 30' east, along a line varying in depth from 16 to 18 feet at mean low-water. The bottom is stiff mud for a depth of 12 or 15 inches, underlaid with coarse sand and gravel.

Thirty-five thousand seven hundred and forty-six tons of granite have been used, giving an increased length of 662 feet to the breakwater. The total length of the work on the 30th day of June was 1,412 feet, sufficient to afford valuable protection to shipping during storms from the southwest.

It is expected that the new appropriation (\$37,500) for the continuance of the work during the ensuing year will carry the structure to the full length originally designed (2,000 feet), though this cannot be definitely known in advance of future contracts.

The sum of all the appropriations for this improvement so far made is \$102,500; if, as anticipated, the work can be finished for this figure, the cost will fall far short of the first estimate (upwards of \$100,000); which balance can be advantageously expended in the construction of a similar work on the opposite side of the harbor, where it is seriously needed as a protection against the sea from the southeast, unquestionably the worst to which this port is exposed, especially since the removal of Penguin Shoal by dredging.

The removal of the shoal referred to, which was necessary for reasons well understood before the dredging was decided upon, has the natural effect of admitting the swell from the southeast in greater volume and power than formerly, so much so at times as to cause great inconvenience to the large steamers of the New York line and other vessels, while loading or discharging freight. In a recent instance, one of the steamers mentioned, upon her arrival from New York, with a valuable cargo, was, on this account, unable to unload at all, and compelled to leave the harbor and proceed to New London for that purpose during a severe storm. The wharf at which the steamer was lying was badly damaged, and the railroad track leading to the landing made impassable. The heaviest hawsers used for securing the steamers to the docks are frequently parted, the vessels exposed to injury, and the business of the line to interruption and delay.

For the reasons above suggested, and many others that might properly be stated, the importance of some measures for the greater security of this harbor, and the more effectual protection of the shipping which is constantly seeking shelter here, is perfectly evident. The prevailing opinion is that the object could be attained by the construction of a riprap breakwater at some point on the east side of the harbor; and I think that this impression is probably correct. The question of location for such a work, should it be decided upon, will require further consideration and possibly a survey before the best position can be determined; the following places are suggested as some of the points whose features it will be expedient to examine whenever a final decision may become necessary:

First. A straight line from the point below the light-house at the south end of the town, southwestwardly towards the east end of the work now under construction, leaving a space of about 400 feet between the ends of the 2 piers for the free passage of vessels.

Second. A curved line, starting near the northern end of Bartlett's Reef, and extending southwest for a distance of 1,500 feet, thence west, or slightly north of west,

to a point due south of the east end of the breakwater now building. The distance between the ends of the breakwaters would be about 900 feet.

Third. A line on nearly the same courses as the last, but farther seaward, starting from or near the south end of Bartlett's Reef.

Perhaps upon a thorough examination of the vicinity, some still better location may be found; each of the positions above named has some advantage of its own, either on the score of cost, or of the character and extent of the shelter it would afford.

My own observations of the action of the sea in this harbor during the past 4 years leads me to believe that the trouble now experienced can be more fully overcome by the building of a riprap work on the second line than by any other means. Such a work would need to be at least 3,000 feet in length, and at present prices for material would cost about \$150,000.

Respectfully submitted,

G. C. ALMY.

Col. J. W. BARLOW,

Major Corps of Engineers, U. S. A.

C 2.

IMPROVEMENT OF THAMES RIVER, CONNECTICUT.

By act of Congress of June 18, 1878, the sum of \$10,000 was appropriated for the improvement of this river. The project undertaken contemplated the restoration of the channel between the city of Norwich and Indian Point, 3 miles below, dredged in 1872 to 11 feet deep at mean low-water, and 100 feet wide. Bids for doing the work were solicited, and the following proposals were received and opened August 6, 1878:

Names.	Address.	Price per cubic yard.	To commence.	To complete.	Remarks.
Morris & Cumings Dredging Company	New York .....	15 cents .....	Aug. 15, 1878	Dec. 31, 1878	Signature to proposals not witnessed; guaranty not certified.
John M. Seward .....	Albany, N. Y. ....	22 cents .....	Aug. 15, 1878	Dec. 31, 1878	
S. A. Hammond .....	Bridgeport, Conn.	24 cents .....	Aug. 15, 1878	Dec. 31, 1878	
Henry D. Dennison .....	Syracuse, N. Y. ..	25 cents .....	Aug. 15, 1878	Dec. 31, 1878	
Morris F. Brainard .....	Albany, N. Y. ....	28½ cents and 32½ cents.			28½ cents if allowed to dump at any time; 32½ cents to dump by daylight only.
Atlantic Dredging Company.	.....do .....	37 cents .....	No date .....	June 30, 1879	
Edgar M. Payn .....	.....do .....	49 cents .....	Aug. 15, 1878	Dec. 31, 1878	

The contract was awarded to the Morris & Cumings Dredging Company, theirs being the lowest bid.

The dredging was commenced on the 16th of August, and continued until the 23d of November, 1878, when the full amount of 55,000 cubic yards of material required by the contract having been removed, the work was discontinued. The machinery furnished was of excellent quality and the method of carrying on the work was most satisfactory; the material was all deposited as required by the contract, in deep water outside the mouth of the river. The channel through the shoals was made 11 feet deep at mean low-water, and 100 feet wide at the greater number of places; the funds were not sufficient to complete the entire channel to that width, it was consequently left but 60 feet wide a portion of the way.



The plan pursued was, beginning at the lowest shoal, the Hay Coeks, to work up stream excavating a channel about 68 feet wide to the city; then, returning, the channel was widened to 100 feet at such places as were deemed most essential. A width of 100 feet was thus made nearly continuous. Nothing was done upon the west side of the middle ground at Norwich, nor was any part of the middle ground itself removed.

The history of the improvement of this river would seem to demonstrate that a resort to dredging must be had at intervals more or less frequent, depending upon the recurrence of freshets. It is probable that no system of jetties or dikes would suffice to cause the current to carry below Indian Point the mass of sand, gravel, &c., which is brought down from the tributaries of this river. Between the confluence, at Norwich of the Yantic and Shetucket Rivers, and Indian Point, there are few pockets or deep places in the Thames in which material can be deposited; the greater part, therefore, brought from the streams above, must accumulate and form bars, as has repeatedly occurred in previous years. To maintain a channel through this part of the river it appears necessary to rely upon dredging whenever the shoals become troublesome. A modification in the lengths or directions of some of the piers would change the location of these bars, but it is questionable if any real benefit would be derived by such means. Since the close of work last November, shoaling has occurred at several points so as seriously to impede the passage of vessels. It is probable that some of the material of these shoals came in from the sides of the cuts, as the current acts most forcibly on the sides of a narrow channel. Widening the excavations would lessen this difficulty. It is represented that 100 feet is insufficient to permit vessels and tows to pass each other in safety, and that the width should be made at least 200 feet; such width would also be less liable to refill. In consideration of these facts, I deem it expedient to recommend an increased width for the excavated channel, and to present in accordance therewith the following estimates.

I would respectfully refer to the statistical information contained in last year's report, which clearly shows the importance of this river as a highway of commerce and the necessity of its being kept free from obstructions. I would also refer to my report of last year in regard to the shoal near the dock of the New London and Northern Railroad, and would again recommend that a sum sufficient for its removal be included in the next appropriation for this river.

Estimated amount of material necessary for removal to make a channel 200 feet wide and 14 feet deep at mean low-water from Indian Point to the city of Norwich.

819,630 cubic yards, at 20 cents .....	\$163,926 00
To make a channel 100 feet wide and 14 feet deep at mean low-water,	
290,000 cubic yards, at 20 cents .....	58,000 00

To remove shoal near New London and Northern Railroad Dock to 16 feet at mean low-water as per estimate of last year, \$6,800.

Of the total amount required, the sum of \$75,000 could be profitably expended during the next fiscal year.

The sum of \$12,000 appropriated for the improvement of this river by act of Congress of March 3, 1879, should at once be applied as specified in the act to secure a 14-foot channel. With this amount the present serious obstructions can be removed, and increased width, so much desired, given to the entire dredged channel.

New London, near the mouth of the Thames River, is a port of entry. The amount of revenue collected during the last fiscal year was \$59,295.41.

Forts Trumbull and Griswold, near the mouth of the river, command the harbor of

