

All the work projected for the preservation and improvement of this harbor is now completed, with the exception of the stone bulkhead on Long Point.

The amount expended during the fiscal year ending June 30, 1879, has been applied to extending the stone bulkhead on Long Point, and to planting beach-grass at Cove Section.

The sum of \$1,000 appropriated by act of March 3, 1879, is to be applied to the repairs of the works where necessary, including some additional work for extending the stone bulkhead on Long Point.

These works and all the others built for the preservation and protection of this harbor will require continuous watching and repairs, for which the additional sum of \$1,000 is asked for the next fiscal year.

July 1, 1878, amount available.....	\$1,107 29
Amount appropriated by act approved March 3, 1879.....	1,000 00
	\$2,107 29
July 1, 1879, amount expended during fiscal year.....	851 32
	1,255 97
Amount (estimated) required for completion of existing project.....	1,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	1,000 00

(See Appendix A 14.)

EXAMINATIONS AND SURVEYS FOR IMPROVEMENT.

To comply with provisions of the river and harbor act of June 18, 1878, Lieutenant-Colonel Thom was charged with and has completed the following examinations and surveys:

1. *Lincolnton Harbor, Maine.* (See Appendix A 15.)
2. *Lubec Channel, Maine.* (See Appendix A 16.)
3. *Portsmouth Harbor, New Hampshire.* (See Appendix A 17.)
4. *Scituate Harbor, Massachusetts, with a view to its adaptability as a harbor of refuge.* (See Appendix A 18.)
5. *Charles River, Massachusetts, to the head of tide-water.* (See Appendix A 19.)

The several reports upon these surveys have been transmitted to Congress and printed in Ex. Doc. No. 29, Senate, Forty-fifth Congress, third session.

And, to comply with provisions of the river and harbor act of March 3, 1879, he has been charged with and is now engaged upon the following, the results of which will be duly submitted when received:

1. *Cathance, Maine.*
2. *Aroostook River, Maine, from boundary line to Masardis.*
3. *Moosebec Bar, Jonesport, Maine.*
4. *The outlet of Lake Winnepesaukee, New Hampshire.*

IMPROVEMENT OF HARBORS AND RIVERS ON THE SOUTHERN COAST OF MASSACHUSETTS AND IN RHODE ISLAND—IMPROVEMENT OF CONNECTICUT RIVER.

Officer in charge, Lieut. Col. G. K. Warren, Corps of Engineers, with Capt. D. P. Heap, Corps of Engineers, under his immediate orders.

1. *Improvement of Hyannis Harbor, Massachusetts.*—The appropriation of June 18, 1878, has been expended in strengthening the breakwater by depositing stone about its base. There have been used during the year 1,674.89 tons of riprap for this purpose.

By the act of March 3, 1879, \$2,500 was appropriated for this improvement, of which \$500, or so much of it as necessary, was for the removal of a wreck in the harbor. A contract has been made for its removal, and the work commenced.

The remainder of the appropriation will be expended in strengthening the breakwater by increasing the slopes of the foundation. To complete this will require an additional appropriation of \$5,000, which it is desirable should be had for the next year. There is great need of a light on the east end of the breakwater.

July 1, 1878, amount available.....	\$3,000 00
Amount appropriated by act approved March 3, 1879.....	2,500 00
	\$5,500 00
July 1, 1879, amount expended during fiscal year.....	2,970 88
	2,529 12
Amount (estimated) required for completion of existing project.....	5,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	5,000 00

(See Appendix B 1.)

2. *Improvement of Woods Holl Harbor, Massachusetts.*—The survey of this harbor made in 1873 was supplemented by an examination and survey made last year. With the appropriation of March 3, 1879, it is proposed to increase the depth of channel at the entrance to Little Harbor, and to remove some of the more dangerous bowlders from the strait known as Woods Holl, which connects Buzzard's Bay and Vineyard Sound. The officer in charge deems it desirable that an appropriation of \$50,000 be made for this improvement for the next fiscal year. This is an important water communication, and in its present state navigation is dangerous, because of its swift tidal currents and restricted channel width.

Amount appropriated by act approved March 3, 1879.....	\$15,000 00
July 1, 1879, amount available.....	15,000 00
	435,000 00
Amount (estimated) required for completion of existing project.....	435,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	50,000 00

(See Appendix B 2.)

3. *Improvement of Wareham Harbor, Massachusetts.*—A portion of the unexpended balance of the appropriation made in 1875 was used in 1877 in building a brush fence loaded with stone, to act as a sand-catcher and prevent the sand being washed over Long Beach into the inner harbor, where the channel had been dredged. This sand-catcher was partially destroyed in a severe storm October 5, 1877. It was rebuilt, but again washed away November 2, 1877.

During the summer of 1878 the part washed away was again rebuilt and has since stood well, and has collected sand for the greater part of its length. To make the beach permanent will probably require the inside of it to be ripped up to prevent washing away on that side, and sand-catchers to be built on the seaward side.

July 1, 1878, amount available.....	\$904 36
July 1, 1879, amount expended during fiscal year.....	691 07

July 1, 1879, amount available.....	213 29
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(See Appendix B 3.)

4. *Improvement of New Bedford Harbor, Massachusetts.*—Nothing was done here during the past fiscal year. The small amount of money available is reserved to remove any accidental obstruction or make any examination or surveys that may be necessary.

July 1, 1878, amount available	\$801 82
July 1, 1879, amount expended during fiscal year	278 50

July 1, 1879, amount available	523 32
(See Appendix B 4.)	

5. *Improvement of Taunton River, Massachusetts.*—During the year 232,400 cubic yards of bowlders were removed from the bottom and sides of the channel. The channel is now completed as originally designed (with the exception of Berkeley Shoal), and there is a width of 60 feet and depth in the lower part of 10 feet, and 9 feet at mean high-water in the upper part.

With the appropriation of March 3, 1879, it is contemplated to remove bowlders from the sides of the channel, particularly at the bends, to allow of the free passage of the long barges used. It is proposed to leave Berkeley Shoal with its depth of 9½ feet at high-water for the present as the limiting depth that can be carried up the river, and no estimate is submitted for continuing the improvement.

July 1, 1878, amount available	\$2,000 00
Amount appropriated by act approved March 3, 1879	1,000 00
	<hr/>
	\$3,000 00
July 1, 1879, amount expended during fiscal year	1,973 79

July 1, 1879, amount available	1,026 21
(See Appendix B 5.)	

6. *Improvement of Pawtucket River, Rhode Island.*—Nothing was done on this improvement during the past year, except the making of some tidal observations. Some of the shoals are reported as re-forming; these will be surveyed and additional tidal observations made during the ensuing year.

July 1, 1878, amount available	\$1,383 53
July 1, 1879, amount expended during fiscal year	281 73

July 1, 1879, amount available	1,101 80
(See Appendix B 6.)	

7. *Improvement of Providence River and Narraganset Bay, Rhode Island.*—The object of the work now being done is to increase the channel depth in the estuary at the head of the bay, so as to enable large ocean steamers to reach the wharves of Providence City. Previous improvements, made since 1853, had increased the ruling depth from 4½ feet to 14 feet at mean low-water. It is now proposed to increase this to 20 feet, and finally to 23 feet. The mean rise of the tide is about 4¾ feet. A contract has been made to dredge the required depth, which has been only partially executed.

Preliminary steps have been taken to commence the removal of Bulkhead Rock.

The whole improvement is estimated to cost \$500,000, of which \$110,000 has been appropriated. It is desirable for economical execution to have \$100,000 per annum as long as it is being prosecuted.

<i>Improvement of Providence River and Narraganset Bay:</i>	
July 1, 1878, amount available	\$50,000 00
Amount appropriated by act approved March 3, 1879	60,000 00
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	\$110,000 00
July 1, 1879, amount expended during fiscal year	10,532 69
July 1, 1879, outstanding liabilities	831 62
	<hr/>
	11,364 31

July 1, 1879, amount available	98,635 69
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Amount (estimated) required for completion of existing project	390,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881	100,000 00

Improvement of Providence River, removal of Bulkhead Rock:

July 1, 1878, amount available	\$5,000 00
July 1, 1879, amount expended during fiscal year	5 20

July 1, 1879, amount available	4,994 80
(See Appendix B 7.)	

8. *Improvement of Block Island Harbor, Rhode Island.*—This harbor, which is an enlarged modification of the original design of a harbor for local purposes, was completed during the fiscal year. The first plan was to build it of riprap granite up to low-water and surmount this with a cut-stone parapet. The design was changed, and the present structure is built of riprap granite only. The change permitted the enlargement of the area and a reduction of cost. There was deposited last year in the breakwater 2,927 tons of granite to fill up places that had settled during the storms of the previous winter. The lighting of the entrance to the harbor was assumed by the Light House Department in the early part of 1879. No further appropriation is asked for this work.

July 1, 1878, amount available	\$5,554 72
July 1, 1879, amount expended during fiscal year	5,209 19

July 1, 1879, amount available	345 53
(See Appendix B 8.)	

9. *Improvement of Little Narraganset Bay, Rhode Island and Connecticut.*—A channel about 900 feet long, 185 feet wide, and 7½ feet deep at mean low-water, extending around Pawcatuck Point, has been completed during the past year. The work already done is believed to include all the difficult excavation that will be encountered, and the improvement could be completed in one season if the necessary funds were provided. The ruling depth in this bay is now 4½ feet at mean low-water; with the proposed improvement it will be 7½ feet. The rise of tide is 2.6 feet. The completed improvement will be of great benefit to the commerce of Westerly. Watch Hill, a summer resort, where large numbers of people are landed from steamboats, has its only landing in this bay, and the shoal water often causes tedious delays, which would be avoided if the new channel could be used.

July 1, 1878, amount available	\$10,679 38
Amount appropriated by act approved March 3, 1879	5,000 00
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	\$15,679 38
July 1, 1879, amount expended during fiscal year	8,156 81
July 1, 1879, outstanding liabilities	828 60
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	8,985 41

July 1, 1879, amount available	6,693 97
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Amount (estimated) required for completion of existing project	31,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881 (as revised in this office)	10,000 00
(See Appendix B 9.)	

10. *Improvement of Connecticut River, below Hartford, Connecticut.*—The shoals between Hartford and Middletown were dredged during the past year to obtain a channel of 9 feet draught at low-water; 22,629 cubic yards of material were removed by a dredge employed by the day. A survey, including the most troublesome of these shoals, is in progress, and it is hoped that a plan may be devised of keeping the channel open without the expensive recourse of annual dredging.

A channel 1,700 feet long, 35 feet wide, and 7 feet deep at low-water was dredged through the bar in Salmon River, near its mouth. This is considered sufficient for the wants of its commerce.

The east jetty at the mouth of the Connecticut River at Saybrook has been extended 220 feet. It is expected that on the completion of the work already contracted for these jetties will be extended as far as it is at present desirable to have them. Some building up in parts that have settled will be required, and probably some dredging between the jetties to break up the hard material of the old bar. A contingent appropriation, for removing wrecks on the bar, of about \$1,000 should be made. Vessels are nearly every year lost on this bar, and should be promptly moved out of the way.

July 1, 1878, amount available.....	\$32,144 68	
Amount appropriated by act approved March 3, 1879	10,000 00	
		\$42,144 68
July 1, 1879, amount expended during fiscal year.....	16,756 52	
July 1, 1879, outstanding liabilities	142 76	
		16,899 28
July 1, 1879, amount available.....	25,245 40	
Amount that can be profitably expended in fiscal year ending June 30, 1881. (See Appendix B 10.)	16,000 00	

11. *Improvement of Connecticut River above Hartford, Connecticut, and below Holyoke, Massachusetts.*—The two wing-dams at Barber's Landing Bar, one 500 and the other 550 feet, were completed during the past year; they contain 2,099.37 cubic yards of stone. The wing-dam opposite Farmington River, which was built in 1871, having settled in some of its parts, was repaired. It required 334 cubic yards of stone. These works are to aid the navigation by the small vessels that are capable of passing through the locks of the Enfield Canal.

Above Hartford and below Enfield Falls:

July 1, 1878, amount available.....	\$14,932 76
July 1, 1879, amount expended during fiscal year.....	986 87
July 1, 1879, amount available.....	13,945 89

On or above Enfield Falls, Connecticut, and below Holyoke, Massachusetts:

July 1, 1878, amount available.....	\$10,702 92
July 1, 1879, amount available.....	10,702 92
Amount (estimated) required for completion of existing project	835,801 00
(See Appendix B 11.)	

EXAMINATIONS AND SURVEYS FOR IMPROVEMENT.

To comply with provisions of the river and harbor act of June 18, 1878, Lieutenant-Colonel Warren was charged with the examination and survey of—

1. *Westport Harbor, Massachusetts.* (See Appendix B 12.)
2. *Wood's Holl, Massachusetts.* (See Appendix B 2.)

The reports of the results of which have been transmitted to Congress and printed in Senate Ex. Doc. No. 22, Forty-fifth Congress, third session.

And to comply with provisions of river and harbor act of March 3, 1879, he has been charged with and is now engaged upon an examination of *Nantucket Harbor, Massachusetts*, the results of which will be duly submitted when received.

IMPROVEMENT OF HARBORS ON LONG ISLAND SOUND.

Officer in charge, Maj. J. W. Barlow, Corps of Engineers.

1. *Improvement of Stonington Harbor, Connecticut.*—The work of ex-

tending the breakwater at Wamphassuck Shoal has continued during the year. Six hundred and sixty-two linear feet have been added, making the present length 1,412 feet; with the appropriation of March 3, 1879, the structure (exclusive of the coping, now believed to be unnecessary) can probably be completed to 2,000 feet, the length originally proposed.

The officer in charge submits a project for a breakwater at Bartlett's Reef as a protection against easterly storms, at an estimated cost of \$150,000.

July 1, 1878, amount available.....	\$40,004 63	
Amount appropriated by act approved March 3, 1879.....	37,500 00	
		\$77,504 63
July 1, 1879, amount expended during fiscal year.....	31,504 02	
July 1, 1879, outstanding liabilities	3,056 24	
		34,560 26
July 1, 1879, amount available.....	42,944 37	
(See Appendix C 1.)		

2. *Improvement of Thames River, Connecticut.*—Dredging between the city of Norwich and Indian Point has been carried on during the year to the extent of the appropriation, and an aggregate of 55,000 cubic yards of material removed.

The channel was dredged to a depth of 11 feet at mean low-water, the width being made 60 to 100 feet. The appropriation of March 3, 1879, will be used to remove the shoals formed during the past winter and to deepen to 14 feet at mean low-water the main channel of the river from Indian Point to Norwich.

The officer in charge suggests that the dredged channel be made 200 feet wide and 14 feet deep at mean low-water, which he estimates will cost about \$164,000.

July 1, 1878, amount available.....	\$10,000 00	
Amount appropriated by act approved March 3, 1879.....	12,000 00	
		\$22,000 00
July 1, 1879, amount expended during fiscal year.....	9,589 63	
July 1, 1879, amount available.....	12,410 37	
Amount (estimated) required for completion of existing project	70,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	25,000 00	
(See Appendix C 2.)		

3. *Improvement of New Haven Harbor, Connecticut.*—During the fiscal year 250,000 cubic yards of material were dredged from the main ship channel above Fort Hale. The channel was excavated to a width of 300 feet, and depth of 16 feet at mean low-water.

The commercial importance of New Haven is represented as justifying increased harbor facilities, the present ship channel not being adequate to the growing commerce of the city. The officer in charge, with that view, has submitted the following estimate:

To deepen the channel from Long Wharf to the steamboat dock from 12 to 16 feet.....	\$30,000 00
To widen the 16-foot channel below Long Wharf to 400 feet.....	25,600 00
To make a channel through Fort Hale Bar 500 feet wide and 16 feet deep.....	35,000 00
In all.....	90,600 00

And he estimates that \$150,000 can be profitably expended during

the next fiscal year for this dredging, and for continuing the construction of the breakwater authorized by act of March 3, 1879, as follows:

For dredging in ship channel	\$50,000 00
For continuing breakwater	100,000 00
July 1, 1878, amount available	\$26,944 62
Amount appropriated by act approved March 3, 1879	45,000 00
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	71,944 62
July 1, 1879, amount expended during fiscal year	24,132 12
July 1, 1879 amount available	47,812 50
Amount that can be profitably expended in fiscal year ending June 30, 1881, for breakwater, as revised in this office	75,000 00
(See Appendix C 3.)	

4. *Improvement of Milford Harbor, Connecticut.*—With the appropriation of June 18, 1878, the project of extending the channel to the town wharf was commenced, and 12,261 cubic yards of material removed by dredging; 2,406 cubic yards have been removed below the jetty to widen the entrance to the lower harbor. The work is progressing satisfactorily; 61 tons of stone have been added to the coping of the long jetty. An auxiliary jetty at the west side is needed to modify the direction of the ebb, and could be built for about \$900.

The sum of \$5,000 will be required to complete the improvements now in progress.

The officer in charge refers to previous recommendations and estimates for a substantial jetty off Welch's Point to protect the bluffs from erosion, and to provide a desirable harbor of refuge. This jetty will cost about \$45,000.

July 1, 1878, amount available	\$10,132 77
July 1, 1879, amount expended during fiscal year	\$2,736 00
July 1, 1879, outstanding liabilities	189 97
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	2,925 97
July 1, 1879, amount available	7,206 80
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office	5,000 00
(See Appendix C 4.)	

5. *Improvement of Housatonic River, Connecticut.*—The work during the past year upon this river consisted in the removal by dredging of the several shoals formed since previous operations. An aggregate of 26,222 cubic yards of material were removed, making the depth 6 to 7 feet at mean low-water.

The appropriation of a small sum yearly for the removal of recurring bars is considered necessary to maintain a navigable channel throughout this river. The construction of a low jetty at the mouth of the river for the purpose of improving the bar is recommended by the officer in charge, at a cost of \$12,000.

July 1, 1878, amount available	\$5,017 73
July 1, 1879, amount expended during fiscal year	4,839 55
July 1, 1879, amount available	178 18
Amount that can be profitably expended in fiscal year ending June 30, 1881.	5,000 00
(See Appendix C 5.)	

6. *Improvement of Bridgeport Harbor, Connecticut.*—The operations at this harbor during the last year have consisted in dredging, as follows:

From between the lower wagon-bridge and the horse-railroad bridge, a distance of 3,000 feet, 71,345 cubic yards of material were removed, making the channel 100 feet wide and 9 feet deep at mean low-water. From the outer bar, 13,682 cubic yards were removed, widening the 12-foot channel to 160 feet. The officer in charge estimates that \$25,000 will be required to complete the widening of the 12-foot channel to 300 feet from the sound to the city wharves.

July 1, 1878, amount available	\$10,132 73
Amount appropriated by act approved March 3, 1879	10,000 00
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	\$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
(See Appendix C 6.)	

7. *Improvement of Southport Harbor, Connecticut.*—No work has been done at this harbor during the last fiscal, year there being no available appropriation.

The officer in charge recommends that the channel dredged in 1878 be widened to 100 feet and extended 800 feet farther up the harbor; this improvement, which is represented as essential to the commerce of the village, he estimates would cost \$5,000.

July 1, 1878, amount available	\$652 69
July 1, 1879, amount expended during fiscal year	631 09
July 1, 1879, amount available	21 60
Amount (estimated) required for completion of existing project	5,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	5,000 00
(See Appendix C 7.)	

8. *Improvement of Port Jefferson Harbor, New York.*—The work of extending the stone jetties at the entrance to the harbor has been continued during the year; 4,713 tons of granite were used in lengthening the west jetty 450 feet, and 2,427 tons in repairing and carrying out the east jetty 70 feet.

The jetties have protected the narrow cut made through the bar in 1877 from filling, and it is now recommended that this channel be sufficiently widened by dredging to permit the use of the bay as a harbor of refuge. A dike could be built from the inner end of the east jetty to the crest of the beach at a cost of about \$600, which would prevent the passage of sand into the channel between the jetties.

July 1, 1878, amount available	\$8,954 88
Amount appropriated by act approved March 3, 1879	5,000 00
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	\$13,954 88
July 1, 1879, amount expended during fiscal year	8,882 05
July 1, 1879, amount available	5,072 83
Amount (estimated) required for completion of existing project	15,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	15,000 00
(See Appendix C 8.)	

9. *Improvement of Norwalk Harbor, Connecticut.*—Dredging to the amount of the available appropriation was done in this river as follows: From the middle ground at Norwalk 6,307 cubic yards of sand and gravel were removed, and at the several bends below where shoaling had occurred an aggregate of 19,713 cubic yards of mud were excavated, making a depth of 6 feet at mean low-water.

With the appropriation of March 3, 1879, this work will be continued,

and the sum of \$20,000 is estimated by the officer in charge as required for its completion.

July 1, 1878, amount available	\$6,000 00
Amount appropriated by Act approved March 3, 1879	10,000 00
	\$16,000 00
July 1, 1879, amount expended during fiscal year	5,916 91
July 1, 1879, amount available	10,083 09
	20,000 00
Amount (estimated) required for completion of existing project	20,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	10,000 00

(See Appendix C 9.)

IMPROVEMENT OF THE HUDSON RIVER—REMOVAL OF OBSTRUCTIONS IN EAST RIVER, INCLUDING HELL GATE—IMPROVEMENT OF FLUSHING BAY AND OF HARLEM RIVER AND EAST CHESTER CREEK; OF ECHO HARBOR AND THE HARBORS OF PORT CHESTER AND RONDOUT, NEW YORK; PASSAIC AND RARITAN RIVERS AND THE CHANNEL BETWEEN STATEN ISLAND AND NEW JERSEY; HARBORS ON LAKE CHAMPLAIN AND OTTER CREEK, VERMONT.

Officer in charge, Col. John Newton, Corps of Engineers, who has under his immediate orders Capt. James Mercur and Lieut. J. H. Willard, Corps of Engineers.

1. *Improvement of Hudson River, New York.*—The following work was done during the fiscal year: From July to October, 1878, hydrographic surveys were made from Troy to Bath; at Cuyler's Bar, overslaugh to Van Wie's Point, Austin's Rock, Mulls, Coeymans, to New Baltimore, and New Baltimore west channel.

In June, 1879, the same districts, excepting Cuyler's. Maps of both seasons' work made on a scale $\frac{1}{5000}$. Maps of Austin's Rock, on a scale of $\frac{1}{1000}$, prepared and in progress.

Removal of first, second, and part of third cross dikes on the east side of the overslaugh. Closing intervals in main dikes on same and piling along front of Shad Island, in all about 50,000 linear feet of piling.

Partial construction of 1,000 feet full pile dike at Douw's Point.

Repairs at Douw's, Van Wie's, Parda Hook, Coeymans, and New Baltimore, and renewing rubble filling of same.

Removal of wrecks from channel below Douw's Point.

Dredging under New York State appropriation:

	Cubic yards.
Between Albany and Troy	3,003
Between Albany and New Baltimore	208,651
Total amount removed	211,654

July 1, 1878, amount available	\$70,000 00
Amount appropriated by act approved March 3, 1879	30,000 00
	\$100,000 00
July 1, 1879, amount expended during fiscal year	13,410 89
July 1, 1879, outstanding liabilities	34,000 00
	47,410 89

July 1, 1879, amount available	52,589 11
	65,016 47
Amount (estimated) required for completion of existing project	65,016 47
Amount that can be profitably expended in fiscal year ending June 30, 1881.	65,000 00

(See Appendix D 1.)

2. *Improvement of harbor at Rondout, New York.*—The south dike was extended 1,800 feet in a westwardly direction, the work being completed in December, 1878.

During the fall of 1878 the channel between the north and south dikes was dredged, the amount of material removed being 59,800 cubic yards.

Repairs have been made to the dikes to repair injuries caused by a violent storm in the fall of 1878.

The upper end of the south dike has been connected with the canal-boat basin by a single row of piling, and fender piles have been driven along the face of this dike from the light-house to the canal basin.

There is a depth over the bar up to the wharves of Rondout of $12\frac{1}{2}$ feet at mean low-water, and a well-defined channel, which bids fair to be permanent.

July 1, 1878, amount available	\$34,503 53
July 1, 1879, amount expended during fiscal year	24,095 13

July 1, 1879, amount available	10,408 40
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(See Appendix D 2.)

Removing obstructions in East River and Hell Gate, New York (Hallett's Point).—Under contract with the Atlantic Dredging Company for removal of broken rock from this reef 19,706 tons of rock were removed. Their contract was completed May 31, 1879, and when the grappling-machines were removed and examination of the reef was made, the shoalest point found was 14.7 feet below mean low-water, while over that part of the reef where the dredging has been principally conducted the depths vary from 21 feet to 28 feet.

On June 9 1879, after due public notice, contract was made with the Atlantic Dredging Company for the removal of 25,000 tons of broken rock, or so much more or less as may be required to clear the entire reef to the depth of 26 feet mean low-water.

Flood Rock.—At the beginning of the year the excavation was full of water, work having been stopped on December 31, 1876, and the pumps were put to work to clear it; this being done, it was found that numerous seams had opened in the roof and side walls, which made it necessary to timber them to prevent the rock from falling.

Drilling was commenced in September and with some little interruptions continued until the close of the year.

The broken rock taken from the excavation was used principally in extending the area of the rock, so as to provide room for the boilers and machinery for carrying on the work.

In addition to the work done in the mine, the permanent plant for the work has been selected, bought, and a large part put in position.

The following work was done during the year:

Length of galleries driven	1,306.78 feet.
Previously	558.00 feet.
Total to date	1,864.78 feet.
Total number of blasts made	13,389
Total number of drills sharpened	16,682
Cubic yards of rock removed	5,115.36
Average drilling per cubic yard	10.86 feet.
Average pounds explosive per cubic yard	2.16 pounds.

Ways and Coenties Reefs.—These reefs have been examined by going over them with a sweep; and after some surface blasting on Ways Reef, nothing less than 26 feet at mean low-water was found; on Coenties reef nothing less than $25\frac{1}{2}$ feet mean low-water was found.

Steam-drilling scow.—This machine was placed on Diamond Reef on September 10, 1878, and on examination showed the whole northeastern portion of the reef to be composed of stiff clay and cemented sand filled