

advertisement, the crib-work to be built by hired labor and purchase of material in open market.

The locality is remote, it being on the north shore of Lake Superior, and the season for working short. Nevertheless, it is thought that the appropriation can be profitably expended during the season of 1879. The sum appropriated is very small with which to inaugurate a harbor improvement.

This work is in the collection-district of Duluth. Duluth, Minn., is the nearest port of entry, at which place the revenues collected during the fiscal year ending June 30, 1879, amounted to \$7,764.51.

*Money statement.*

Amount appropriated by act approved March 3, 1879.....	\$10,000 00
July 1, 1879, amount available.....	10,000 00
Amount (estimated) required for completion of existing project.....	129,669 40
Amount that can be profitably expended in fiscal year ending June 30, 1881, to be used in dredging and construction of piers.....	40,000 00

*Exhibit of business done in the year 1878 at Grand Marais, Cook County, Minnesota, furnished by Mr. H. Mayhew.*

Name of vessel.	Home port.	Tonnage.	Times arrived at Grand Marais.
Tug Nellie Cotton.....	Duluth.....	50	14
Tug Sisquet.....	do.....	50	1
Tug.....	Prince Arthur's Landing.....	30	1
Tug Amethyst.....	Duluth.....	40	1
Schooner Charlie.....	Beaver Bay.....	50	1
Schooner Mary Ann.....	Bayfield.....	40	4
Schooner Northern Belle.....	do.....	40	1
Schooner.....	La Point.....	30	1
Schooner Marco Polo.....	Bayfield.....	30	1

Tons freight received, 40; character, general merchandise; value, \$4,000.

Tons freight shipped, —; character, fur; value, \$2,000.

Grand Marais is the terminus of the United States mail-route, and in the winter months the point of distribution of the Canada mail.

APPENDIX Z.

ANNUAL REPORT OF MAJOR HENRY M. ROBERT, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,  
Milwaukee, Wis., July 13, 1879.

SIR: Herewith I have the honor to transmit my annual report of operations at the several works in my charge during the fiscal year ending June 30, 1879.

Very respectfully, your obedient servant,

HENRY M. ROBERT,  
Major of Engineers.

The CHIEF OF ENGINEERS, U. S. A.

Z 1.

IMPROVEMENT OF ONTONAGON HARBOR, MICHIGAN.

The estimated cost of completing the improvement (consisting of two piers, each about 2,500 feet long, and dredging between them) was.....	\$363,770
Appropriated since.....	202,600
Leaving to be appropriated.....	161,170
Amount that can be profitably expended in fiscal year 1880-'81.....	60,000

The work already done consists of about 750 linear feet of pile pier and revetment and 2,430 feet of crib-work.

The operations during the past fiscal year consisted of refilling with brush and stone 112 linear feet of pile revetment and riprapping on shore side 200 linear feet; refilling and replanking cribs Nos. 1, 2, 36, 37, 39, and 41 east pier, and riprapping along inside of 116 linear feet of east pier. These repairs were done by hired labor. Six cribs were built and sunk in continuation of east pier under contract with C. P. Macdougall. After the necessary repairs had been made, and the 6 cribs for the extension of the east pier paid for, there remained funds available for building 3 more cribs, and the contract with Mr. Macdougall was extended for their construction.

The operations of the present season will consist in placing of 3 additional crib structures, under present contract; and under new contracts, the building of superstructures over 9 cribs, together with the sinking of 4 additional cribs (more or less), and dredging to the extent of about 10,000 cubic yards.

Continuation of the pier extension is the work contemplated during 1880-'81.

The requirements of the lake commerce, and the availability of this point as a harbor of refuge, justify a renewal of previous recommendations concerning liberal appropriations for the prosecution of this work.

Money statement.

July 1, 1878, amount available .....	\$19,008 18	
Amount appropriated by act approved March 3, 1879.....	17,000 00	\$36,008 18
July 1, 1879, amount expended during fiscal year .....	11,521 37	
July 1, 1879, outstanding liabilities, 10 per cent. due contractor.....	992 15	12,513 52
July 1, 1879, amount available.....	23,494 66	
Amount (estimated) required for completion of present project .....	161,170 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	60,000 00	

List of materials and labor used at Ontonagon Harbor, Michigan, in repairs of piers and construction of 6 cribs 50 feet by 20 feet by 13½ feet during the fiscal year 1878-79.

Articles.	Quantity.	Price.	Repairs of piers and extension of east pier.	
			East pier repairs.	West pier repairs.
Stone.....cords..	37.28	\$8 25	\$231 82	\$75 73
Brush.....do..	32	2 50	15 00	65 00
Plank.....feet, b. m..	480	10 00	4 80	.....
Cut spikes.....pounds..	57	05	2 85	.....
Labor.....			6 20	6 40
Total cost of repairs by hired labor .....			260 67	147 13

Articles.	Quantity.	Price.	Extension.
12 inches by 18 inches pine timber, framed.....linear feet..	600	\$0 18	\$108 00
12 inches by 12 inches pine timber, framed.....do..	19,121	18	3,441 78
12 inches by 12 inches oak timber, framed.....feet, b. m..	360	28 00	10 08
Stone filling.....cords..	639.36	8 45	5,402 59
Brush.....do..	37	2 75	101 75
Drift-bolts.....pounds..	27,853.06	52½	800 78
Screw-bolts and washers.....do..	942.8	06	56 56
Total cost of six cribs by contract.....			9,921 54
Average cost per crib .....			1,653 59
Cost per linear foot.....			33 07
Cost per cubic foot.....			124

Abstract of proposals opened July 30, 1878, by Maj. Henry M. Robert, Corps of Engineers, U. S. A., for improving harbor at Ontonagon, Mich.

Materials.	Quantities.	Archibald McArthur, Chicago, Ill.	Horace H. Rich, Ontonagon, Mich.	Hiram J. Lutes, Marquette, Mich.	Chicago Dredging and Dock Company, Chicago, Ill.	Coll. P. Macdougall, Duluth, Minn.
		Rate.	Rate.	Rate.	Rate.	Rate.
Pine timber, 12 inches by 18 inches, linear feet.....	600	\$0 56	\$0 31	\$0 30	\$0 55	\$0 18
Pine timber, 12 inches by 12 inches, linear feet.....	19,000	36	23	23	26	18
White-oak timber, 12 inches by 12 inches, feet, board-measure .....	8,500	40 00	40 00	10 50	40 00	28 00
White-oak or Norway-pine piles, linear feet.....	2,100	15	06	01	08	25
Pine plank, laid, 3 inches by 12 inches, feet, board-measure .....	1,000	30 00	12 00	7 50	15 00	13 00
Iron drift-bolts, 1½ inch square .. pounds.	26,000	03½	03	03	03	02½
Iron screw-bolts, 1½ inch round ..do..	500	07	06	05	04½	06
Chain and fittings, as required ..do..	10,000	06	06	03	05	06
Spikes, 9-inch, wrought ..do..	100	06	04	05	03	06
Stone.....cords..	600	8 50	9 25	9 00	6 00	8 45
Brush.....do..	50	3 00	3 00	1 50	7 00	2 75
Driving piles, as required.....number.	72	3 00	2 25	1 00	3 00	2 75
Total approximate value.....		14,878 00	12,310 00	11,324 75	11,264 50	11,093 00

COMMERCIAL STATISTICS, 1878.

Name of harbor, Ontonagon, Mich.; collection-district, Superior, Michigan; nearest light-house, Ontonagon, Mich.

Arrivals and departures of vessels during the year ending December 31, 1878.

	Arrivals.			Departures.		
	No.	Tonnage.	Crews.	No.	Tonnage.	Crews.
Steamers .....	123	76,260	2,798	123	76,260	2,798
Sailing-vessels .....	6	770	25	6	770	25
Total .....	129	77,030	2,823	129	77,030	2,823

Exports for the year ending December 31, 1878.

Copper, mass .....	pounds.. 300,120	Hides .....	pounds.. 11,400
Copper, barrel.....	do... 1,217,880	Lumber .....	feet.. 4,000,000
Fish .....	do... 1,000	Miscellaneous.....	pounds.. 120,500
Hay .....	tons.. 142	Shingles.....	M.. 3,000,000

Imports for the year ending December 31, 1878.

Apples .....	barrels.. 554	Grain .....	pounds.. 571,200
Lime and cement.....	do... 135	Salt.....	do... 57,190
Cattle and sheep .....	number.. 124	Hogs.....	number.. 81
Miscellaneous.....	pounds.. 1,462,960	Sugar.....	barrels.. 350
Coal .....	tons.. 52	Horses .....	number.. 11
Pork .....	barrels.. 512	Whisky.....	barrels.. 39
Flour .....	do... 3,305	Lumber.....	feet.. 24,000
Powder and other explosives, pounds .....	21,000		

This information was obtained from James Mercer and C. Y. Osburn.

Z 2.

IMPROVEMENT OF EAGLE HARBOR, MICHIGAN.

The total estimate for the present plan was ..... \$273,362 36  
 Amount appropriated..... 97,000 00

Leaving to be appropriated..... 176,362 36

No funds are required for the fiscal year 1880-'81.  
 (For history of previous plans see Report of Chief of Engineers for 1874, page 135.)

The removal of the rock obstructing the entrance to the harbor was completed in September, 1877.

The work done during the past fiscal year was the placing of guiding cribs on each side of the excavated channel, which are intended to define the channel, and also to guard passing vessels from the danger of striking on the edges of the rocky ledge. One crib 48 feet in length was placed on the east side and two contiguous cribs, each 49 feet in length, were placed on the west side of the channel. They were sunk through the ice during the months of March and April, 1879, and were provided with superstructure to a height of about 6 feet above average stage of water during the season of navigation. For the details of the work I would refer to the report of Mr. L. Y. Schermerhorn, assistant engineer, hereto appended.

The appropriation on hand will meet any anticipated work of repairs. Neither the demands of the lake commerce nor the local business of the harbor seem to require, for the present at least, any further improvement.

Money statement.

July 1, 1878, amount available..... \$10,397 11  
 Amount appropriated by act approved March 3, 1879..... 2,000 00  
 -----  
 July 1, 1879, amount expended during fiscal year ..... 8,300 13  
 July 1, 1879, outstanding liabilities ..... 82 25  
 -----  
 8,382 38

July 1, 1879, amount available..... 4,014 73  
 -----  
 Amount (estimated) required for completion of existing project..... 176,362 36

Abstract of proposals opened August 15, 1878, by Major Henry M. Robert, Corps of Engineers, U. S. A., for improving Eagle Harbor, Michigan.

Materials.	Quantities.	A. McArthur, Chi- cago, Ill.	Raley & Shapley, Ea- gle Harbor, Mich.	Hiram J. Lutes, Mar- quette, Mich.	Col. P. Macdougall, Duluth, Minn.
		Rate.	Rate.	Rate.	Rate.
Pine timber, 12 inches by 18 inches.....lin. ft..	300	\$0 66	\$0 42	\$0 30	\$0 25
Pine timber, 12 inches by 12 inches.....do...	13,400	40	25	23	23
White-oak timber, 12 inches by 12 inches.....ft., b. m..	1,440	50 00	25 00	12 00	23 00
Pine plank, laid, 4 inches by 12 inches.....do...	12,000	30 00	15 00	13 00	14 00
Iron drift-bolts, 1½-inch, square.....lbs..	20,000	04	04	03	02½
Iron screw-bolts 1½-inch, round.....do...	5,000	06	05	06	06
Spikes, 9-inch, wrought.....do...	400	06	05½	05	06
Stone.....cords..	275	9 00	5 00	7 00	5 99
Brush.....do...	10	4 00	3 00	2 00	2 75
Amount to be added if work is postponed until spring of 1879.....		300 00	500 00	50 00	175 00
Total approximate value.....		9,929 00	6,669 00	6,260 28	6,114 07

List of materials and work used in constructing and placing guiding cribs at Eagle Harbor, Mich., under contract dated August 22, 1878, with Mr. C. P. Macdougall.

Materials.	Quantity.	Price.	Amount.
Pine timber, framed, 12 inches by 18 inches lin. ft.	292	25 cents per linear foot..	\$73 00
Pine timber, framed, 12 inches by 12 inches...do..	13,289	23 cents per linear foot..	3,056 47
Oak timber, framed.....feet, b. m.	2,160	\$28 per M feet.....	60 48
Plank laid.....do..	11,008	\$14 per M feet.....	154 11
Drift-bolts.....pounds.	19,649.55	2½ cents per pound.....	564 92
Screw-bolts.....do..	7,817.75	6 cents per pound.....	469 04
Spike, wrought.....do..	622	6 cents per pound.....	37 32
Stone.....cords.	352.25	\$5.99 per cord.....	2,110 64
Total.....			6,525 98

REPORT OF MR. L. Y. SCHERMERHORN, ASSISTANT ENGINEER.

MAY 1, 1879.

SIR: In accordance with the plan of operations, as set forth in the report of Chief of Engineers, 1877, I, p. 93, II, p. 845, and in report for 1878, contracts were entered into with Mr. C. P. Macdougall, on August 22, 1878, for the construction of the guiding cribs at Eagle Harbor, Michigan.

The contract provided for 3 cribs with superstructure; one upon the east side of the channel, with a length of 48 feet; and two (placed in juxtaposition) on the west side of the channel, with a length in the aggregate of 98 feet.

The cribs were to rest upon a bottom consisting of solid rock, or bowlders superposed on rock, and hence no precaution had to be taken against undermining, and only such provision made for foundation as would result from the stone passing through a grillage bottom.

Since the cribs will be exposed to heavy seas and ice, it was necessary to provide a maximum of holding-down weight; consequently the cribs were built with grillage bottoms, having openings 2 feet 2 inches by 2 feet 9 inches.

Under the contract the cribs were to be sunk during the winter of 1879, if the ice was sufficiently stable over the area to be occupied by the cribs; this provision was made with the feeling that the work could be more economically done during the winter; and again, the cribs being outside of the channel excavated through the rock, it was desirable that they should be placed as closely as possible to the sides of the channel, so as to ward vessels from the edges of the cut; added to this was the fact that the cribs rested upon the crest of the ledge, with a steep incline on either side, making it necessary to fit the cribs quite accurately to this uneven bottom; all of which could be better accomplished from the ice than in open water.

The contractor was required to have all his material on the ground before the close of navigation in 1878.

Early in March, 1879, the ice became sufficiently permanent to justify the commencement of operations, which from that time were rapidly pushed to completion early in April.

The cribs were fitted to the uneven bottom by superposing the crib proper, on a built-up foundation of 12-inch by 12-inch timbers, stepped off in proper lengths, to closely approximate the surface of the rock upon which they rested.

The difference in elevation of the bottom amounted to 4 feet under two of the cribs; yet these cribs, when sunk and resting firmly on the bottom, were only a few inches out of level. The cribs were placed with their side walls 4 feet outside of the channel, and since these side walls rested fully upon the bottom, the ballast was prevented from passing under the crib into the channel alongside.

As a protection against ice, a solid bulkhead of 12 inches by 12 inches was firmly screw-bolted to the end walls, and the cribs were further stiffened by oak posts placed in each interior angle. A riprap of very heavy stone was placed at the ends and back of the cribs as a further protection against ice, and fender-walls bolted along the channel sides to guard against colliding vessels.

Two of the cribs were 13½ feet, and the third 15½ feet in height, exclusive of the leveling courses on bottom. Their aggregate contract price was \$6,542.48.

With the completion of this work the harbor has a safe and commodious entrance with a depth of 14 feet for a width of 130 feet, and I do not consider that the general requirements of the lake commerce or the local interests of the vicinity demand further expenditures.

Very respectfully, your obedient servant,

L. Y. SCHERMERHORN,  
 Assistant Engineer.

Maj. H. M. ROBERT,  
 Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

Name of harbor, Eagle, Mich.; collection district, Superior, Mich.; nearest light-house, Eagle Harbor, Mich.

Exports for the year ending December 31, 1878.

Copper, mass .....	pounds.. 1,244,894	Iron, scrap .....	pounds.. 10,638
Copper, barrel .....	do.... 2,367,338	Merchandise .....	M..... 39,786
Fish .....	do.... 10,100	Miscellaneous .....	do.... 56,551
Fuse .....	do.... 891	Posts .....	number.. 645
Hides .....	do.... 38,671	Rags .....	pounds.. 10,812
Household goods .....	do.... 66,570	Sacks and bags .....	number.. 4,300

Imports for the year ending December 31, 1878.

Apples .....	barrels.. 1,128	Doors .....	number.. 147
Hardware .....	pounds.. 108,056	Lath .....	M..... 35
Nails .....	do.... 28,938	Shingles .....	do.... 57
Blinds .....	number.. 108	Dry goods .....	pounds.. 43,996
Hay .....	tons.. 65	Leather .....	do.... 3,777
Oil .....	barrels.. 147	Stoves .....	number.. 11
Boots and shoes .....	pounds.. 10,698	Feed .....	pounds.. 553,864
Hogs .....	number.. 198	Lime and cement .....	barrels.. 374
Provisions .....	pounds.. 223,332	Vegetables .....	pounds.. 84,425
Candles .....	do.... 52,885	Flour .....	barrels.. 2,192
Horses .....	number.. 3	Machinery .....	pounds.. 126,902
Potatoes .....	pounds.. 80,019	Whisky .....	barrels.. 18
Cattle and sheep .....	number.. 522	Groceries .....	pounds.. 331,575
Iron, bar and steel .....	pounds.. 96,522	Miscellaneous .....	do.... 98,603
Sash .....	number.. 302	Windows .....	number.. 144
Coal .....	tons.. 220	Grain .....	pounds.. 901,770
Lumber and timber .....	feet.. 207,940	Moldings .....	number.. 3,207
Salt .....	pounds.. 72,820	Wine and beer .....	barrels.. 359

This information was obtained from Messrs. Raley & Shapley, and Mr. C. Y. Osburn.

Z 3.

IMPROVEMENT OF MARQUETTE HARBOR, MICHIGAN.

Original estimate (Report of Chief of Engineers for 1866, Part III, page 8, IV, page 81) .....	\$385,129 58
Appropriated (including act of March 3, 1879) .....	297,230 00

The breakwater at this harbor has been extended to a length of 2,010 feet, or 10 feet longer than originally intended. Its cost, including repairs to date, has been about \$92,000 less than estimated.

A re-examination of the work in 1878 showed no appreciable increase in the settlement of crib filling, and since the integrity of the work seemed in no way threatened by the present condition of the stone filling, and as the present planking would be largely destroyed by being taken up, it was deemed best to defer the work of refilling until the available appropriations would enable a thorough refilling and replanking of the entire breakwater. The exposed position of the work makes it desirable to always have on hand available funds for its prompt repair.

The breakwater should eventually be extended 400 linear feet further, at an estimated cost of \$68,000.

Money statement.

July 1, 1878, amount available .....	\$2,958 31
Amount appropriated by act approved March 3, 1879 .....	1,500 00
July 1, 1879, amount expended during fiscal year .....	\$4,458 31
July 1, 1879, amount available .....	422 27
Amount that can be profitably expended on repairs in fiscal year ending June 30, 1881 .....	4,036 04
	1,000 00

COMMERCIAL STATISTICS.

Name of harbor, Marquette, Mich.; collection-district, Superior, Mich.; nearest light-house, Marquette, Mich.

Arrivals and departures of vessels during the year ending December 31, 1878.

	Arrivals.			Departures.		
	No.	Tonnage.	Crews.	No.	Tonnage.	Crews.
Steamers .....	412	393,401	9,051	410	392,264	9,046
Sailing-vessels .....	369	216,444	2,947	375	221,074	3,001
Total .....	781	609,845	11,998	785	613,338	12,047

Exports for the year ending December 31, 1878.

Barrels .....	empty beer.. 410	Iron, bar .....	pounds.. 20,365
Grain .....	pounds.. 328,220	Rags .....	do.... 1,322,958
Merchandise .....	do.... 141,540	Copper, barrel .....	do.... 4,000
Barrels .....	empty oil.. 873	Iron ore .....	gross tons.. 552,127
Hair .....	barrels.. 2	Rail, old .....	do.... 590
Miscellaneous .....	pounds.. 410,270	Fish .....	pounds.. 220,240
Berries .....	bushels.. 1,220	Iron, pig .....	gross tons.. 8,586
Hardware .....	pounds.. 35,865	Salt .....	barrels.. 25
Nails .....	kegs.. 27	Flour .....	do.... 21
Apples, dried .....	pounds.. 350	Iron, scrap .....	pounds.. 981,556
Hay .....	tons.. 2	Stone .....	tons.. 2,512
Oil .....	barrels.. 47	Furniture .....	pounds.. 7,850
Apples, green .....	do.... 11	Lime .....	barrels.. 1,641
Hides .....	pounds.. 53,820	Stoves .....	number.. 30
Provisions .....	do.... 33,050	Furs .....	pounds.. 1,950
Butter .....	do.... 850	Leather .....	do.... 4,600
Horses .....	number.. 6	Tallow .....	do.... 49,728
Potatoes .....	bushels.. 187	Fuse .....	do.... 2,400
Carboys, empty .....	number.. 1,400	Lumber .....	feet.. 2,869,816
Household goods .....	pounds.. 170,280	Timber, hewn .....	cubic feet.. 800,380
Powder and other explosives, pounds .....	413,700	Gannister .....	tons.. 3,700
Carriers, egg .....	number.. 658	Machinery .....	pounds.. 32,245
		Whisky .....	barrels.. 51

Imports for the year ending December 31, 1878.

Apples .....	barrels.. 6,202	Lumber .....	feet.. 1,450
Fuse .....	pounds.. 18,000	Slabs .....	cords.. 250
Leather .....	do.... 1,380	Boots and shoes .....	pounds.. 25,300
Sand .....	do.... 200,000	Grain .....	do.... 347,122
Bark .....	cords.. 83	Machinery .....	do.... 859,630
Brimstone .....	pounds.. 45,000	Splices, railroad .....	do.... 11,950
Lime and cement .....	barrels.. 2,012	Brick .....	M..... 34
Soda, nitrate of .....	pounds.. 600,000	Groceries .....	pounds.. 5,268,773
Blinds .....	number.. 92	Malt .....	do.... 35,800
Gas-pipe .....	pounds.. 63,680	Steel .....	do.... 71,695

Car-wheels .....	pounds..	198,570	Whisky .....	barrels..	427
Hay .....	tons..	1,866	Dry goods .....	pounds..	498,527
Miscellaneous .....	pounds..	222,810	Iron, bar .....	do.....	480,967
Stone .....	do.....	91,970	Potatoes .....	do.....	51,660
Cattle and sheep .....	number..	344	Wine and beer .....	barrels..	650
Hardware .....	pounds..	120,140	Feed .....	pounds..	891,748
Moldings .....	do.....	1,710	Iron, railroad .....	tons..	150
Stoves .....	number..	168	Provisions .....	pounds..	311,360
Cider .....	barrels..	120	Wood .....	cords..	450
Hogs .....	number..	186	Flour .....	barrels..	3,243
Nails .....	pounds..	179,962	Iron, scrap .....	pounds..	80,000
Vegetables .....	do.....	133,197	Powder and other explosives		
Coal .....	tons..	16,987		pounds..	477,590
Horses .....	number..	26	Fruit .....	pounds..	12,240
Oil .....	barrels..	1,918	Kegs .....	number..	2,000
Wagons .....	number..	7	Salt .....	pounds..	321,900
Doors .....	do.....	18	Furniture .....	do.....	39,340
Household goods .....	pounds..	33,100	Copper in barrels .....	do.....	2,500
Pitch .....	do.....	15,000	Sash .....	do.....	1,270

This information was obtained from C. Y. Osburn, collector of customs.

Z 4.

IMPROVEMENT OF MENOMONEE HARBOR, MICHIGAN AND WISCONSIN.

Estimated cost of present plan of improvement .....	\$212,000
Appropriated to date .....	153,000
Leaving to be appropriated .....	59,000
Amount that can be profitably expended in fiscal year 1880-'81 .....	40,000

The operations during the past fiscal year comprised building superstructures over the 5 cribs sunk in 1877, and the sinking of 3 additional cribs in extension of the north pier. The work was done by contract with the Green Bay Dredge and Pile-driver Company, 1,588 cubic yards of material were removed from the bar at entrance to the harbor by hire of dredge and outfit at a cost of \$216.58, or 13<sup>63</sup>/<sub>100</sub> cents per cubic yard, the rate being \$70 per day.

The operations contemplated during the present season are the sinking of 3 cribs, more or less, in extension of the piers; and the building of superstructures over the 3 cribs sunk during the past fiscal year; and such dredging, refilling of cribs, and repairs as may be necessary.

A continuation of the pier extension is the work contemplated during the season of 1880-'81.

Money statement.

July 1, 1878, amount available .....	\$10,099 07
Amount appropriated by act approved March 3, 1879 .....	10,000 00
	-----
July 1, 1879, amount expended during fiscal year .....	\$20,099 07
	7,668 46
July 1, 1879, amount available .....	12,430 61
Amount (estimated) required for completion of existing project .....	59,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881 .....	40,000 00

List of materials and labor used at Menomonee Harbor, Michigan and Wisconsin, during the fiscal year 1878-'79.

Articles.	Quantity.	Price.	Superstructure.			Dredging.
			Cribs 1, 2, and 3, north pier.	Cribs 1 and 2, south pier.	Three cribs on north pier.	
12 inches by 12 inches pine timber, framed, linear feet .....	14,660	\$0 18	\$605 16	\$371 52	\$1,662 12	.....
12 inches by 18 inches pine timber, framed, linear feet .....	300	25	.....	.....	75 00	.....
Oak timber, framed .....	4,032	30 00	.....	.....	120 96	.....
Drift-bolts .....	20,834 1	02 <sup>3</sup> / <sub>4</sub>	158 36	91 45	323 13	.....
Screw-bolts and washers .....	370 6	04	.....	6 76	8 06	.....
Brush .....	43	2 00	.....	.....	86 00	.....
Stone filling .....	471 35	4 50	335 25	157 86	1,627 96	.....
Piles .....	1,089	06	.....	.....	64 80	.....
Driving piles .....	36	3 00	.....	.....	108 00	.....
Spikes .....	20	03 <sup>1</sup> / <sub>2</sub>	.....	.....	70	.....
Chain .....	5,760	04 <sup>1</sup> / <sub>2</sub>	.....	.....	259 20	.....
Dredging .....	1,588 4	13 63	.....	.....	.....	\$216 58
Total .....	.....	.....	1,098 77	627 59	4,335 93	216 58

Abstract of proposals opened July 30, 1878, by Maj. Henry M. Robert, Corps of Engineers, for improving harbor at Menomonee, Michigan and Wisconsin.

Materials.	Quantity.	Contractors.					
		S. V. D. & J. L. Philbrook, Marinette, Wis.	Archibald McArthur, Chicago, Ill.	Knapp & Gillen, Racine, Wis.	B. E. Locklin, Sheboygan, Wis.	Truman & Schröder, Manitowoc, Wis.	Green Bay Dredge and Driver Company, Green Bay, Wis.
		Rate.	Rate.	Rate.	Rate.	Rate.	Rate.
Pine timber, 12 inches by 18 inches .....	300	\$0 40	\$0 45	\$0 33	\$0 34	\$0 30	\$0 25
Pine timber, 12 inches by 12 inches .....	17,200	25	24	25	26	22	18
White-oak timber, 12 inches by 12 inches ..ft., board measure .....	4,300	40 00	20 00	45 00	30 00	25 00	30 00
White-oak or Norway-pine piles .....	1,100	08	12	10	12	06	06
Pine plank, laid, 3 inches by 12 inches ..ft., board measure .....	12,000	15 00	20 00	9 00	15 00	10 50	10 00
Iron drift-bolts, 1 <sup>1</sup> / <sub>2</sub> -inch, square, pounds .....	25,800	05	03	03	03	02 <sup>3</sup> / <sub>4</sub>	02 <sup>3</sup> / <sub>4</sub>
Iron screw-bolts, nuts and washers, 1 <sup>1</sup> / <sub>2</sub> -inch, round ..pounds..	300	08	05	04	06 <sup>3</sup> / <sub>4</sub>	04	04
Chain and fittings .....	5,700	10	05	07	04 <sup>3</sup> / <sub>4</sub>	04 <sup>3</sup> / <sub>4</sub>	04 <sup>3</sup> / <sub>4</sub>
Spikes, 9-inch, wrought ..do....	600	05	05	03 <sup>1</sup> / <sub>2</sub>	04 <sup>3</sup> / <sub>4</sub>	03 <sup>1</sup> / <sub>2</sub>	03 <sup>1</sup> / <sub>2</sub>
Stone .....	600	4 70	5 50	5 00	4 50	4 75	4 50
Brush .....	50	4 00	3 00	3 00	2 50	2 50	2 00
Driving piles .....	36	3 00	3 00	2 00	3 00	2 50	3 00
Total approximate value .....	.....	9,902 00	9,383 00	9,238 50	9,010 75	8,237 50	7,393 00

COMMERCIAL STATISTICS.

Name of harbor, Menomonee, Mich. and Wis.; collection-district, Superior, Mich.; nearest light-house, Menomonee, Mich.

Arrivals and departures of vessels during the year ending December 31, 1878.

	Arrivals.			Departures.		
	No.	Tonnage.	Crews.	No.	Tonnage.	Crews.
Steamers .....	175	61,255	2,625	171	59,855	2,565
Sailing-vessels .....	480	134,000	2,440	470	131,250	2,820
Total .....	655	195,255	5,065	641	191,105	5,385

Exports for the year ending December 31, 1878.

Bark .....	cords..	10,000	Lath .....	number..	4,250,000
Posts .....	number..	450,000	Lumber .....	feet, b. m..	160,000,000
Fish .....	packages..	10,000	Machinery .....	value of..	\$50,000
Shingles .....	number.	30,000,000	Pickets .....	number..	2,500,000
Ties .....	do .....	200,000	Pig-iron .....	tons..	3,450

Imports for the year ending December 31, 1878.

Beef .....	barrels..	3,000	Stone .....	cords..	1,200
Pork .....	do .....	5,000	General merchandise .....	tons..	1,500
Brick .....	M..	900	Wood .....	cords..	10,000
Potatoes .....	bushels..	1,000	Grain .....	bushels..	150,000
Feed .....	tons..	1,000	Hay .....	tons..	1,000
Salt .....	barrels..	750	Lime .....	barrels..	1,700
Flour .....	do .....	9,500			

The above information was obtained from Mr. C. E. Aiken, deputy collector.

Z 5.

IMPROVEMENT OF GREEN BAY HARBOR, WISCONSIN.

Estimated cost of present plan (1872 and 1874), with small annual appropriations for preserving the harbor .....	\$75,000
Appropriated since .....	57,000
Leaving to be appropriated .....	18,000
Amount that can be profitably expended in the fiscal year 1880-'81 .....	15,000

The operations at this harbor during the past fiscal year consisted of dredging on lines of rectification, so as to make the channel (from the mouth of Fox River) through the cut at Grassy Island as direct as possible.

The survey of February, 1878, developed the true condition of the channel, and the subsequent dredging was so applied as to remove material from the points giving the least depth. The dredging was carried to a depth rather in excess of the permanent depth desired; experience indicating the economy of so doing. The work was done under contract with the Green Bay Dredge and Pile-driver Company, at 22 cents per cubic yard, in scows. The contractors began work on August 9, completing their contract on September 26, removing, between these dates, 19,335 cubic yards, being to the full extent of available funds. The

work began at a point about 2,500 feet south of the cut through Grassy Island, and extended from thence about 4,300 feet to deep water near the mouth of Fox River. The width of the deepened cut was about 55 feet.

The sudden, frequent, and great variations in the water level at this locality, frequently mentioned in previous reports, are still, at times, the cause of serious detention of vessels. Experience having demonstrated that the datum plane to which dredging is referred was too high, it was lowered 1 foot, bringing it 2 feet below the lower face of the wale timber on the west face of the east pile revetment pier at its south end, at Grassy Island, instead of 1 foot below, as established several years ago.

During the present season dredging, in continuation of the improvement, will be carried on to the extent of available funds. Continuation of the same work is contemplated during 1880-'81, so as to ultimately connect the mouth of the river with the deep water of the bay by a channel 200 feet wide and 14 feet deep.

The importance of this work can perhaps be best understood by remembering that it forms the entrance to the Fox River, which, besides leading to the large local interests of Green Bay and Fort Howard, must also serve as an outlet to the commerce likely to result from the improvement of the Fox and Wisconsin rivers.

Money statement.

July 1, 1878, amount available .....	\$5,058 83
Amount appropriated by act approved March 3, 1879 .....	4,000 00
July 1, 1879, amount expended during fiscal year .....	\$9,058 83
July 1, 1879, amount available .....	5,008 31
July 1, 1879, amount available .....	4,050 52
Amount (estimated) required for completion of existing project .....	18,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	15,000 00

Abstract of bids opened July 30, 1878, by Maj. Henry M. Robert, Corps of Engineers, for dredging at Green Bay Harbor, Wisconsin.

Bidders names and residences.	Dredging 25,000 cubic yards, more or less, scow measurement.
Green Bay Dredge and Pile-driver Company, Green Bay, Wis .....	22 cents per cubic yard.

Table showing cost of dredging at Green Bay Harbor, Wisconsin, per cubic yard, scow measurement.

Date.	1866.	1867.	1868.	1869.a	1869.b	1870.c	1873.	1874.	1875.	1877.	1878.	Average cost.
Cost in cents .....	50	50	30	28 $\frac{1}{2}$	27 $\frac{1}{2}$	29 $\frac{3}{4}$	35	24	20	12	22	29 $\frac{7}{16}$

a \$140 per day for dredge, tug, and scows.  
 b \$120 per day for dredge, tug, and scows.  
 c \$120 per day for dredge, tug, and scows.