

Z 10.

IMPROVEMENT OF SHEBOYGAN HARBOR, WISCONSIN.

Estimated cost of improvement, exclusive of repairs and maintenance .. \$147,598 83
 Appropriated to date..... 163,448 91

The work at this harbor was completed within the amount estimated, and the excess of appropriations over estimated cost arises from the additional expenditures rendered necessary by reason of dredging and restoration of the superstructure.

During the past fiscal year the superstructure was renewed to the extent of 358 linear feet of pier, varying from 4 to 6 courses in height. This work was upon the south pier, and completed the timber repair for this pier. The only repair work remaining unfinished is about 60 linear feet of superstructure in north pier and now in progress, the completion of which will place the timber work of both piers in excellent condition.

During the present season dredging will be done by the United States dredge, and the refilling of superstructure carried to the extent of available funds. About 800 cords of stone are required to completely refill the work, after which the deck planking should be replaced throughout.

During the fiscal year 1880-'81, it is proposed to continue refilling the cribs and reflagging them; also doing such further dredging as may be necessary.

Money statement.

July 1, 1878, amount available..... \$4,011 58
 Amount appropriated by act approved March 3, 1879..... 3,000 00
 July 1, 1879, amount expended during fiscal year \$7,011 58
 July 1, 1879, amount available 1,948 63
 July 1, 1879, amount available 5,062 95
 Amount (estimated) required for completion of existing project 7,000 00
 Amount that can be profitably expended in fiscal year ending June 30, 1881. 7,000 00

COMMERCIAL STATISTICS, 1878.

Name of harbor, Sheboygan, Wis.; collection district, Milwaukee, Wis.; nearest light-house, Sheboygan, Wis.

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

	Arrivals.			Departures.		
	No.	Tonnage.	Crews.	No.	Tonnage.	Crews.
Steamers.....	843	580,573	20,057	843	580,664	19,864
Sailing-vessels.....	349	22,714	1,124	358	24,538	1,203
Total.....	1,192	603,287	21,181	1,201	605,202	21,067

Exports for the year ending December 31, 1878.

Brick..... number..	1,400,000	Lime..... barrels..	7,790
Cattle..... head..	1,002	Pork, barrels..... number..	51,380
Cheese..... tons..	670	Potatoes..... bushels..	2,610
Feed..... do.....	575	Stone..... cords..	200
Flour..... barrels..	9,357	Wheat..... bushels..	368,979
Fish..... packages..	298	General merchandise.... tons..	9,045
Hay..... tons..	500		

Imports for the year ending December 31, 1878.

Bark..... cords..	5,250	Posts..... number..	9,300
Cement..... barrels..	785	Plaster rock..... cords..	600
Coal..... tons..	13,465	Salt..... barrels..	9,669
Laths..... number..	1,650,000	Shingles..... M..	8,500,000
Lumber..... feet, b. m..	12,050,000	Wood..... cords..	2,180
Pickets..... number..	85,000	General merchandise.... tons..	12,392

The above information was obtained from Messrs. E. P. Ewer, W. E. Tallmadge, J. L. Mallory, deputy collector of customs, and George Marsh.

Z 11.

IMPROVEMENT OF PORT WASHINGTON HARBOR, WISCONSIN.

Original estimate..... \$154,527 17
 Appropriated since..... 100,500 00
 Leaving to be appropriated..... 54,027 17
 Amount that can be profitably expended in fiscal year 1880-'81..... 40,000 00

The area of this harbor will be doubled without any increase in the estimate under the modification of the plan which I proposed (see Report of the Chief of Engineers, 1876, part II, page 379), and which was approved by the Chief of Engineers June 7, 1877.

During the past fiscal year the excavation of the north basin was continued by the United States dredge; also dredging to a limited extent in the channel between the piers. The north basin has now an area of about 131,000 square feet (or 3 acres) with an available depth of about 10 feet below extreme low-water, or 11½ feet below average stage during the season of navigation of 1878. The excavation has not been carried fully up to the ultimate bounding lines from want of funds and because owners of property fronting on the basin were not prepared to protect their fronts by docking, without which a considerable caving of the banks would ensue, inconveniencing, if not endangering, adjacent property.

About one-half of the west side of the basin was docked by owners during 1878. As the occasion for increased dock room arises, owners will probably continue the docking, after which the dredging can be fully carried up to the ultimate lines. The town of Port Washington has assumed the obligation of docking at street ends. A detailed survey made in November, 1878, determines that about 75,000 cubic yards of material in place have been removed from the basin by the United States dredge during the seasons of 1877 and 1878. The excavation in a larger part of the basin was exceedingly hard, consisting of a deposit of bowlder clay, irregularly occurring in isolated deposits, surrounded by gravel and soft mud. At one time it was thought that blasting would have to be resorted to, but by providing the dredge-dipper with powerful steel teeth, it was able to remove the deposit. In addition to the foregoing work, the United States dredge removed 7,962 cubic yards of material from the outer harbor, of which 4,700 cubic yards were removed during the past fiscal year.

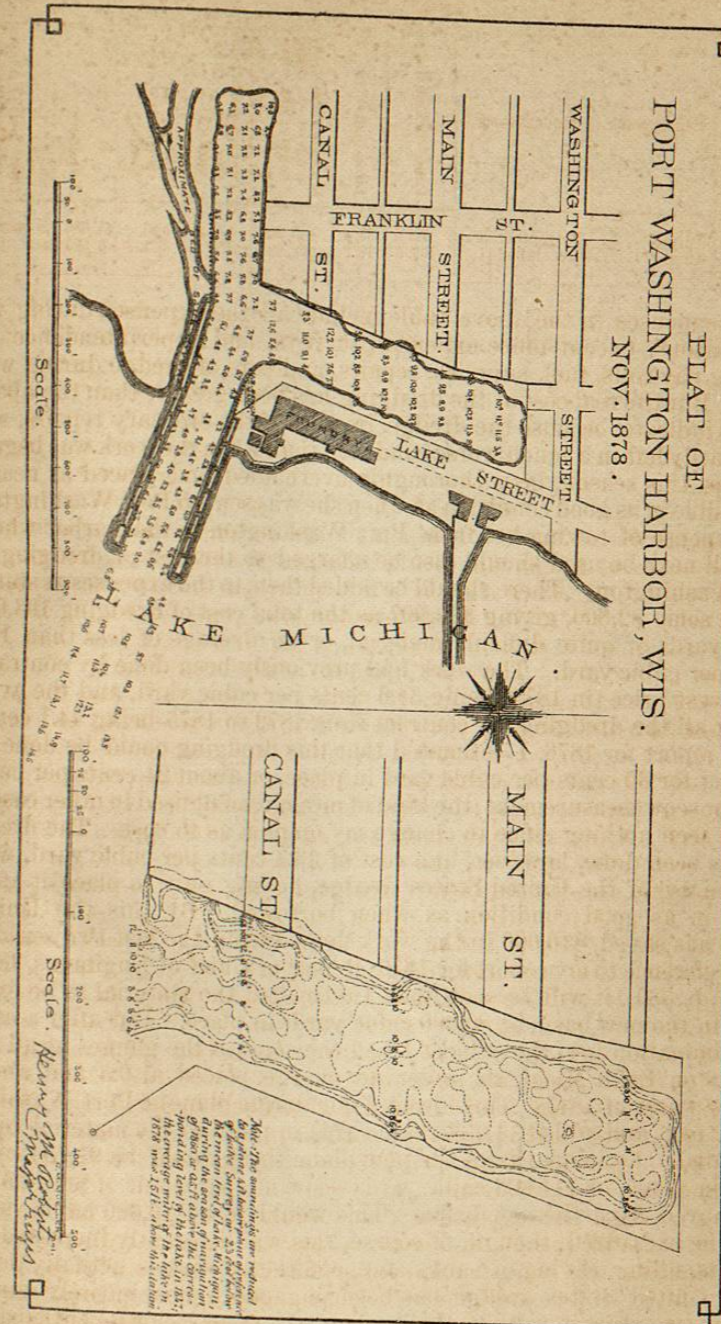
The following statement shows the details of dredge work during the season of 1877-78:

Year.	Began work.	Ended work.	Time worked, days.	Time lost, days.	Material removed, cubic yards, scow measurement.	Average per working day, cubic yards.	Average per day worked, cubic yards.	Expenses.	Cost per cubic yard, scow measurement.
1877.....	July 23	November 30 ..	72.6	39.4	45,232	403.8	623	\$5,586 52	\$0 12.35
1878.....	June 17	December 11 ..	109.8	47.2	58,393	371.9	531.8	6,520 84	11.17

The expenses in the above table include all the expenses during the two seasons, except office expenses, surveys, and superintendence (including pay-rolls, fuel, supplies, repairs, and care of dredge during winters). But the real cost of the dredging has been greater than the above figures indicate, because the dredge, in spite of the ordinary repairs, was necessarily left in a much worse condition than when the work was begun. She has, this season, been thoroughly overhauled and placed as nearly as possible in as good condition as when she was sent to Port Washington. The expense of towing her from Port Washington to the harbor where she will next be used should also be charged to the cost of dredging at Port Washington. There should be added then, to the expenses as stated above, some \$2,800, giving \$14,907 as the total cost of dredging 103,625 cubic yards of quite difficult material, or an average of less than 14.4 cents per cubic yard. The work had previously been done by contract, the lowest price (in 1875) being 34.6 cents per cubic yard, and the average for all the dredging by contract from 1872 to 1875 being 44.1 cents. In my report for 1876, I estimated that this dredging could be done by contract for 30 cents per cubic yard in place, or about 24 cents per cubic yard for scow measurement (the kind of measurement used in other cases). I have seen nothing since to change my opinion as to cost. The dredging has been done, however, at a cost of 14.4 cents per cubic yard, with the free use of the United States dredge, having only to place it afterwards in as good condition as when borrowed. By this the United States has saved \$10,000 in the work done during the last two seasons.

By reference to my report for 1876 (Report of Chief of Engineers, 1876, vol. II, p. 380), it will be seen that I estimated the material to be excavated in the new basin at 80,000 cubic yards in place. But after a careful examination into the subject I had the zeros of the gauges at all the harbors on Lake Michigan, under my charge, placed at 0.5 foot above the low-water of 1847. This lowered our datum plane at Port Washington 2.2 feet, and added 11,733 cubic yards in place to the material to be excavated. Estimated from the new plane there would be 91,733 cubic yards in place, or 114,666 cubic yards scow measurement of material to be removed from the new basin. This would leave 19,000 cubic yards yet to be excavated, though, of course, this will be greatly increased by deposits, filling, caving of banks, &c., before the work is actually done.

The United States dredge has been engaged almost entirely during the past two years in work on this harbor. In preparation for anticipated work at Two Rivers, Ahnepee, and elsewhere during the present season, it became necessary to thoroughly overhaul and repair the dredge, and at the same time make such changes in its machinery as would materially increase its efficiency. These repairs were made at a cost of about \$2,000 in the month of June, 1879, and will all be charged to the appropriation



for this harbor, which has not paid any part of the original cost of the dredge.

During the present season it is proposed to place 2 cribs in extension of the south pier and to make such repairs and do such dredging between the piers as available funds will permit. Bids were received and opened June 30 for the construction of the 2 cribs proposed.

During the fiscal year 1880-'81 it is contemplated to continue dredging in outer and inner basin and to continue the pier extension.

Money statement.

July 1, 1878, amount available.....	\$5,284 82	
Amount appropriated by act approved March 3, 1879.....	7,500 00	
		\$12,784 82
July 1, 1879, amount expended during fiscal year.....	6,673 75	
July 1, 1879, outstanding liabilities.....	1,811 07	
		8,484 82
July 1, 1879, amount available.....		4,300 00
Amount (estimated) required for completion of existing project.....		54,027 17
Amount that can be profitably expended in fiscal year ending June 30, 1881.....		40 000 00

Abstract of bids opened June 30, 1879, by Maj. Henry M. Robert, Corps of Engineers, U. S. A., for improving harbor at Port Washington, Wis., by building and sinking two cribs in extension of the piers, each 50 by 20 by 16½ feet.

Materials.	Quantities.	B. B. & J. E. Lock-	C. H. Starke, Mil-	Knapp & Gillen,
		in, Sheboygan, Wis.	waukee, Wis.	Racine, Wis.
		Rates.	Rates.	Rates.
Pine timber, 12 by 18 inches, framed.....linear feet..	200	\$0 38	\$0 40	\$0 23½
Pine timber, 12 by 12 inches, framed.....do.....	6,300	27	26½	21
Oak timber, 12 by 12 inches, framed.....feet, b. m.	2,400	30 00	35 00	25 00
Pine plank, 3 by 12 inches, laid.....do.....	1,000	14 50	18 00	13 00
White oak or Norway pine.....linear feet..	480	12	14	11
Iron drift-bolts, 1½ inch square.....pounds..	8,000	02½	03	02½
Iron screw-bolts, N. & W.....do.....	1,500	04	05	04
Spikes, wrought.....do.....	100	04	05	04
Stone.....cords..	200	6 25	5 50	6 75
Piles, driven.....	20	4 50	5 00	3 00
Total approximate value.....		3,525 10	3,438 70	3,211 80

COMMERCIAL STATISTICS, 1878.

Name of harbor, Port Washington, Wis.; collection-district, Milwaukee, Wis.; nearest light-house, Port Washington, Wis.

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

	Arrivals.			Departures.		
	Num-ber.	Tonnage.	Crews.	Num-ber.	Tonnage.	Crews.
Steamers.....	393	120,393	8,253	393	120,393	8,253
Sailing-vessels.....	130	7,150	390	130	7,150	390
Total.....	523	127,543	8,643	523	127,543	8,643

Exports for the year ending December 31, 1878.

Beer.....barrels..	2,500	Lime.....barrels..	120,000
Butter.....tons..	12	Malt.....bushels..	50,000
Castings.....do..	430	Oats.....do.....	5,000
Cattle.....number..	500	Plows.....number..	200
Eggs.....barrels..	150	Pork-barrels.....do.....	4,500
Fish.....packages..	2,000	Smut-machines.....do.....	95
Flour.....barrels..	3,800	Wheat.....bushels..	64,949
Hides.....number..	3,000	General merchandise.....tons..	125

Imports for the year ending December 31, 1878.

Coal.....tons..	709	Pig iron.....tons..	475
Coke.....do..	160	Reapers.....number..	250
Laths.....M..	1,003,500	Seeders.....do.....	250
Sand-plaster.....tons..	120	Shingles.....M.....	5,370,000
Lumber.....feet, b. m..	4,108,973	General merchandise.....tons..	120

The above information was obtained from the merchants.

APPENDIX A A.

ANNUAL REPORT OF MAJOR D. C. HOUSTON, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,
Milwaukee, Wis., July 12, 1879.

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

I am, general, very respectfully, your obedient servant,

D. C. HOUSTON,
Major of Engineers.

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

A A 1

IMPROVEMENT OF MILWAUKEE HARBOR, WISCONSIN.

HISTORY OF WORK.

A survey of this harbor was made in 1836 by Lieutenants Center and Rose of the Army. The Milwaukee River for a distance of 3,000 feet above and north of its mouth was separated from the lake by a sand-spit. At this upper point, the river approached the lake from the westward, and was only separated from it by a low strip of sand about 200 feet across. Two plans presented themselves—

1st. To improve the mouth of the river.

2d. To make a cut at the point above mentioned.

The second plan was recommended as giving more direct access to the business center, and avoiding the improvement of the lower stretch of the river. It was not until 1843 that an appropriation of \$15,000 was made by Congress for the improvement of the harbor. This was followed in 1845 by an appropriation of \$20,000. These sums were applied to the first plan, the improvement of the river mouth. In 1854 an appropriation of \$15,000 was made for the improvement of Milwaukee Harbor, and directed to be applied to the second plan, known as the "straight cut." This sum was inadequate, even to the commencement of the work, and the importance of the harbor was so pressing that the city undertook the work, which was carried out in the years 1855, 1856, and 1857 at an ultimate cost to the city of \$445,971.20. A channel was dredged from the river to the lake for a depth of 12 feet, sufficient for the then requirements of the lake commerce, and two substantial piers, each 1,120 feet in length, built for its protection.

A complete harbor was thus made at this the second port in importance on Lake Michigan, at the expense of the city with very slight as-