

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 31 422 27
July 1, 1879, amount available.....	4,036 04
Amount that can be profitably expended on repairs in fiscal year ending June 30, 1881.....	1,000 00

(See Appendix Z 3.)

4. *Improvement of Menomonee Harbor, Michigan and Wisconsin.*—Superstructures were built over the 5 cribs sunk in 1877; 3 new cribs were placed in extension of the north pier, and 1,588 cubic yards of sand were removed from the bar at the entrance to the harbor.

Three cribs will be sunk this season in extension of the piers and superstructures placed over the 3 cribs recently placed.

Further pier extension is contemplated during the next fiscal year.

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, as revised in this office.....	30,000 00

(See Appendix Z 4.)

5. *Improvement of Green Bay Harbor, Wisconsin.*—The operations during the fiscal year consisted of dredging in the direction of previous work on the channel leading from the mouth of Fox River to the deep water of the bay, 19,335 cubic yards of sand being removed, at a cost of 22 cents per cubic yard.

Continuation of the dredging is proposed for the present fiscal year, as also for the next.

The position of this work at the entrance to the Fox River improvement sufficiently attests its importance to the general commerce of the Northwest.

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 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.....	18,000 00

(See Appendix Z 5.)

6. *Harbor of Refuge at entrance to Sturgeon Bay Canal, Wisconsin.*—After four years' intermission work was recommenced on the pier extension, 4 cribs being placed in the fall of 1878, and 10 more now in course of construction, which will probably be all placed during the present working-season, as also the superstructures on the cribs sunk earliest, and some repairs to the old pile-piers. Superstructures will be placed on all the cribs early next year. This comprises all but 50 feet on each pier of the pier-work projected. The dredging of the harbor cannot be attempted until the canal is put in such a condition as to prevent the washing down of its banks into the harbor by the strong current which has already been observed throughout its course.

The officer in charge believes that the harbor work is progressing quite as rapidly as the progress of the canal will justify, and appends the reports of the committee on State affairs of the last Wisconsin assembly in reference to the prosecution of the canal-work by the corporation having the same in charge under the grant by the United States of 200,000 acres of land for this purpose.

The operations contemplated during the next fiscal year are the building of pier-heads, or the extension of the piers, as may then seem best, and dredging out the harbor formed thereby.

July 1, 1878, amount available.....	\$30,141 17
Amount appropriated by act approved March 3, 1879.....	30,000 00
July 1, 1879, amount expended during fiscal year.....	\$60,141 17 6,275 28
July 1, 1879, outstanding liabilities due on contracts.....	546 65
	6,821 93

July 1, 1879, amount available.....	53,319 24
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Amount (estimated) required for completion of existing project.....	70,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	40,000 00

(See Appendix Z 6.)

7. *Improvement of Ahnapee Harbor, Wisconsin.*—The work of drilling and blasting was resumed in June, 1878, and continued to the end of the season. The rock already broken will be removed by the United States dredge during the present season, and, with any unexpended balance, the work of drilling and blasting will be continued.

A continuation of the rock removal is contemplated during the next fiscal year, with such repairs as may be necessary for the preservation of the piers.

July 1, 1878, amount available.....	\$9,257 14
Amount appropriated by act approved March 3, 1879.....	7,000 00
July 1, 1879, amount expended during fiscal year.....	\$16,257 14 7,744 13

July 1, 1879, amount available.....	8,513 01
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Amount (estimated) required for completion of existing project.....	72,000 00
Amount that can profitably be expended in fiscal year ending June 30, 1881, as revised in this office.....	20,000 00

(See Appendix Z 7.)

8. *Improvement of Two Rivers Harbor, Wisconsin.*—A sand-proof lining to the old pile piers was commenced and is still in course of construction. Seven hundred and forty linear feet of double and 562 linear feet of single lining was built during the fiscal year, leaving about 500 linear feet to be done, which it is expected will be finished this season. A fence 354 feet long and 8 feet high was built to keep the drifting sand out of the channel, and 250 feet of the south pier was ripped up.

During the present season, besides the work of pier-lining, it is expected that the United States dredge will remove about 24,000 cubic yards of material from between the piers and that 10 additional cribs will be sunk in extension of the piers. For the next fiscal year the operations proposed are, the continuance of the pier extension and dredging.

It is important that the government work at this harbor should be pushed to an early completion, as the private pier is decaying and almost useless from the shoaling of the water around it.



July 1, 1878, amount available.....	\$10,017 88	
Amount appropriated by act approved March 3, 1879.....	20,000 00	\$30,017 88
July 1, 1879, amount expended during fiscal year.....		7,990 08
July 1, 1879, amount available.....		22,027 80
Amount (estimated) required for completion of existing project.....	125,588 80	
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	50,000 00	

(See Appendix Z 8.)

9. *Improvement of Manitowoc Harbor, Wisconsin.*—During the past year 6 cribs were sunk in extension of the piers. During the present year it is proposed to place superstructures on the 6 cribs already sunk, with such general repairs as the work may require.

During the next fiscal year it is contemplated to complete the pier extension to the 18-foot curve, and to make such repairs and do such dredging as may be necessary.

The value of this harbor to the general lake commerce justifies its completion at the earliest possible date.

July 1, 1878, amount available.....	\$15,069 29	
Amount appropriated by act approved March 3, 1879.....	6,500 00	\$21,569 29
July 1, 1879, amount expended during fiscal year.....		12,805 64
July 1, 1879, amount available.....		8,763 65
Amount (estimated) required for completion of existing project.....	15,362 54	
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	7,500 00	

(See Appendix Z 9.)

10. *Improvement of Sheboygan Harbor, Wisconsin.*—The construction of this harbor, in accordance with the original project, has been within the estimated cost, and the excess of appropriations over the estimate has been applied to repairs and maintenance. These repairs, except refilling the superstructure, are nearly finished, 358 linear feet of superstructure, varying in height from 4 to 6 courses, having been renewed during the past year.

During the present season the operations will consist of these repairs and refilling the cribs to the extent of available funds, together with necessary dredging on the inner bar.

During the next fiscal year it is proposed to continue refilling the cribs and to do such dredging as may be required.

July 1, 1878, amount available.....	\$4,011 58	
Amount appropriated by act approved March 3, 1879.....	3,000 00	\$7,011 58
July 1, 1879, amount expended during fiscal year.....		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	

(See Appendix Z 10.)

11. *Improvement of Port Washington Harbor, Wisconsin.*—The excavation of the inner or north basin was continued, together with limited dredging in the outer harbor, 58,393 cubic yards of material being handled by the United States dredge, at a cost of 11.17 cents per cubic yard; and the dredge was placed in thorough repair.

During the present season two cribs will be sunk in the extension of

the south pier and such repairs and dredging done as available funds will permit.

The extension of the piers, with dredging in the inner and outer harbor, is the work contemplated during the next fiscal year.

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 the 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, as revised in this office.....	25,000 00	

(See Appendix Z 11.)

## EXAMINATIONS AND SURVEYS FOR IMPROVEMENT.

To comply with the provisions of the river and harbor act of March 3, 1879, Major Robert has been charged with and is now engaged upon examinations and surveys of the following localities, the results of which will be duly submitted when received:

1. *Harbor of Refuge at entrance to Portage Lake and Lake Superior Ship-Canal.*
2. *Bayfield Harbor, Wisconsin.*
3. *Ashland Harbor, Wisconsin.*
4. *Morristique River, Michigan.*

## IMPROVEMENT OF HARBORS OF MILWAUKEE, RACINE, AND KENOSHA, LAKE MICHIGAN, AND OF FOX AND WISCONSIN RIVERS.

Officer in charge, Maj. D. C. Houston, Corps of Engineers, with Lieut. F. A. Hinman, Corps of Engineers, under his immediate orders.

1. *Improvement of Milwaukee Harbor, Wisconsin.*—During the year 393 feet of the old timber superstructure of the north pier has been replaced with stone, including the pavement, the pavement being of concrete instead of stone, as put in formerly. This completes the renewal of old superstructure at present contemplated.

The appropriation of March 3, 1879, of \$7,500, will be applied to deepening the channel, repairing the work connecting the inner ends of the piers with private docks, and to general repairs.

The estimate for the fiscal year ending June 30, 1881, is intended for the general maintenance of the harbor.

July 1, 1878, amount available.....	\$17,089 42	
Amount appropriated by act approved March 3, 1879.....	7,500 00	\$24,589 42
July 1, 1879, amount expended during fiscal year.....		14,572 51
July 1, 1879, amount available.....		10,016 91
Amount (estimated) required for completion of existing project.....	10,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	10,000 00	

(See Appendix A A 1.)

2. *Improvement of Racine Harbor, Wisconsin.*—During the year one crib 50 feet long by 30 feet wide, without superstructure, has been placed in extension of the north pier. Seventeen thousand cubic yards of material was also dredged from the channel between the piers.



The appropriation of March 3, 1879, of \$6,000 will be applied to the further extension of the north pier and to such dredging as may be required.

The estimate for the fiscal year ending June 30, 1881, is for the further extension of the north pier and the maintenance of the harbor.

July 1, 1878, amount available .....	\$10,865 09	
Amount appropriated by act approved March 3, 1879.....	6,000 00	\$16,865 09
July 1, 1879, amount expended during fiscal year .....		6,699 98
July 1, 1879, amount available.....		10,165 11
Amount (estimated) required for completion of existing project.....		14,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.		14,000 00

(See Appendix A A 2.)

3. *Improvement of Kenosha Harbor, Wisconsin.*—During the year two cribs, each 50 feet long and 24 feet wide, without superstructure, have been placed in extension of the north pier.

The appropriation of March 3, 1879, of \$5,000, will be applied to the further extension of the north pier.

The estimate for the fiscal year ending June 30, 1881, is intended for the further extension of the north pier and the maintenance of the harbor, as explained in the appendix.

July 1, 1878, amount available.....	\$8,938 25	
Amount appropriated by act approved March 3, 1879.....	5,000 00	\$13,938 25
July 1, 1879, amount expended during fiscal year .....		6,854 43
July 1, 1879, amount available.....		7,083 82
Amount (estimated) required for completion of existing project.....		67,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.		14,000 00

(See Appendix A A 3.)

4. *Improvement of Fox and Wisconsin Rivers.*—The improvement of these rivers is being carried on in accordance with the plan heretofore reported, and the results are given in detail in the accompanying reports in the appendix.

The appropriation of March 3, 1879, of \$150,000, will be applied in the further prosecution of the work.

July 1, 1878, amount available.....	\$283,727 77	
Tolls received and deposited to credit of appropriation.....	2,996 01	
Miscellaneous receipts.....	53 00	
Amount appropriated by act approved March 3, 1879.....	150,000 00	\$436,776 78
July 1, 1879, amount expended during fiscal year .....		179,084 04
July 1, 1879, amount available .....		257,692 74
Amount (estimated) required for completion of existing project.....		2,575,663 00
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office .....		500,000 00

(See Appendix A A 4.)

#### EXAMINATIONS AND SURVEYS FOR IMPROVEMENT.

To comply with the provisions of the river and harbor act of June 18, 1878, Major Houston was charged with examination of *Wolf River, from Lake Poygan to Red River, Wisconsin*, the results of which were transmitted to Congress in January last, and printed as Senate Ex. Doc. No. 23, Forty-fifth Congress, third session. (See also Appendix A A 5.)

And to comply with the 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. *Waukegan Harbor, Illinois.*
2. *Wolf River, Wisconsin (continued).*
3. *Oconto River, Wisconsin.*

#### IMPROVEMENT OF HARBORS OF CHICAGO AND CALUMET, LAKE MICHIGAN, AND OF ILLINOIS RIVER.

Officer in charge, Capt. J. G. Lydecker, Corps of Engineers.

1. *Improvement of Chicago Harbor, Illinois.*—The river and harbor act of June 18, 1878, appropriated \$75,000 for the improvement of this harbor in pursuance of the plan adopted in 1870. Of this amount about \$15,000 was allotted for dredging a wide channel through the outer harbor, and the work was executed, by contract, between September 3 and December 12. The total amount excavated was 88,758 cubic yards, at the contract price of 16 cents per yard, making the total cost \$14,201.28.

Reserving \$5,000 for general repairs of existing works, it was proposed to apply the balance (\$55,000) to constructing the pier or breakwater to cover the harbor against southeasterly storms. Before commencing work, however, it was deemed advisable to submit the question of modifying the original plan to the consideration of a Board of Engineers. After careful deliberation the Board recommended the adoption of a modified plan to meet the requirements of the commercial interest centered at this important harbor. This plan changes the position and direction of the southerly breakwater, thereby giving increased harbor room and a better entrance. The necessity for an exterior breakwater to cover a safe anchorage in deep water where vessels may obtain shelter during the severest storms, and find good holding ground, was also shown, and its construction was recommended. The recommendations were concurred in and approved by the honorable Secretary of War. For the details of this project, in the report of the Board and accompanying papers, see appendix.

The work of building the southerly breakwater was commenced in April, 1879, and up to the close of the fiscal year 800 linear feet of crib work had been sunk in position; its total length when completed will be 3,000 feet, most if not all of which will be built with the present appropriation.

It is proposed to apply the money appropriated by the act of March 3, 1879, as follows:

For breakwater construction.....	\$70,000 00
For dredging.....	5,000 00

For the next fiscal year, the officer in charge of the work recommends an appropriation of \$200,000, to be applied to the construction of the exterior breakwater, and \$50,000 to dredging the harbor. The valuable commerce of the port and the safety of vessels driven by storms to the south end of the lake make it important that the exterior breakwater be finished as soon as practicable; at the same time the ultimate cost of the work will be reduced considerably if appropriations are sufficient to complete it in two, or at most three, seasons.

Until the outer harbor is dredged so that vessels of all drafts can anchor at any point, those of the largest and most valuable class can derive little or no advantage from it.

It is therefore urged by the officer in charge that the total appropria-



tion for this harbor for the fiscal year ending June 30, 1881, be not less than the sum of the above amounts, viz, \$250,000.

July 1, 1878, amount available.....	\$75,304 22	
Amount appropriated by act approved March 3, 1879.....	75,000 00	\$150,304 22
July 1, 1879, amount expended during fiscal year.....	42,840 22	
July 1, 1879, outstanding liabilities.....	8,113 36	
		50,953 58

July 1, 1879, amount available.....	99,350 64
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Amount (estimated) required for completion of existing project.....	725,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	250,000 00

(See Appendix B B 1.)

2. *Improvement of Calumet Harbor, Illinois.*—Work at this harbor was confined to extending the north pier 200 feet. A portion of the last appropriation was set aside for dredging a channel through the bar at the harbor entrance, but it was deemed best to delay this part of the work until the covering pier could be still further extended, without which any dredged channel would soon fill up again. The sum appropriated by the act of March 3, 1879, will be applied mainly to this extension, and will suffice for building 200 or possibly 250 feet of pier. But even this extension will not carry the pier far enough to maintain a channel of the requisite depth. To accomplish this, the end of the pier must reach to a depth of between 18 and 20 feet, and as soon as that is done the channel may be dredged with reasonable expectation of its permanence. This extension will increase the amount heretofore estimated for completion.

It is recommended by the officer in charge that an appropriation of \$30,000 be made for the year ending June 30, 1881, to be applied as follows:

For pier construction.....	\$20,000
And for dredging.....	10,000

In addition to extending the north pier, the officer in charge reports an extension of the south pier *inland* will probably be necessary within the next year in order to prevent the sea making a clear breach into the harbor around the west end of this pier.

July 1, 1878, amount available.....	\$16,030 04
Amount appropriated by act approved March 3, 1879.....	12,000 00

July 1, 1879, amount expended during fiscal year.....	\$28,030 04
	13,224 37

July 1, 1879, amount available.....	14,805 67
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Amount (estimated) required for completion of existing project.....	63,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	20,000 00

(See Appendix B B 2.)

3. *Improvement of Illinois River, Illinois.*—Active operations on this river were suspended during the summer and fall of 1878, pending the preparation and consideration of a project for its radical improvement. The officer in charge of the work submitted his report thereon, under date of August 30, 1878, and it was subsequently laid before Congress and printed as House Ex. Doc. No. 81, Forty-fifth Congress, third session. His report closes with the following conclusions:

1st. That the slackwater system is the one on which the improvement of the river should be completed.

2d. That the completion of this system, aided by dredging, should be undertaken by the *general government* at once, or as soon as practicable.

3d. While it is believed that a radical improvement can be effected by dredging, its cost would exceed that of the slackwater system, the improvement would be less certain, and would require considerable annual expenditure for maintenance.

4th. That all dredging can be better and much more economically done by machinery owned and operated by the government.

5th. The work already done may form a component part of either of the above-mentioned plans.

And he recommends:

1st. That an appropriation of at least \$400,000 be urged, to be applied to building one lock and dam, and such dredging as may be necessary to obtain the required depth after the dam is constructed.

2d. That from the appropriation now available there be purchased or built an outfit with which to carry on future dredging operations; said outfit to consist of one first-class dredge, two dump-scows, two deck-scows, and one tow-boat, the total cost of which would probably be about \$30,000. This outfit would be required for *either* system of improvement. For extensive dredging operations, the outfit should be increased to number at least three dredges, with scows, &c., complete.

3d. That no more dredging be done until next season, unless it should be found necessary to do a little work for the restoration of channels and for maintaining navigation during extreme low water; and that such work, if any is called for, may be done by hired labor and machinery and purchases in open market; but that the engineering party be employed in careful examinations and surveys, in order to show what changes have taken place in the various dredged channels since their improvement, amend existing maps to correspond to the present condition of the river from Copperas Creek to Grafton, and supply all the data needed for future operations, whether for the construction of locks and dams or dredging.

Notwithstanding the correctness of these conclusions, until the question of continuing the slackwater system below the locks already built by the State of Illinois is sanctioned by Congress, expenditures of present appropriations can only be applied, as heretofore, to the continuation of the plan of dredging and wing-dams.

The work was therefore limited to the construction of a new quarter and office boat, and the establishment of water-gauges at intervals along that section of the river which remains to be improved, and to local surveys of several of the worst bars.

An outfit for dredging channels and constructing dams has been built, consisting of one dredge, two dump-scows, two deck-scows, a quarter-boat, a tow-boat, and a steam-scow.

It is proposed to apply the balance of the old appropriation, and all of the new, to operating the above machinery, and to the construction of brush and stone dams. It is also proposed to build an additional dredge, after careful test of that just finished shall have shown that it is properly adapted to a rapid and economical prosecution of the work.

For continuing work on the *present* plan an appropriation of \$100,000 will be required.

July 1, 1878, amount available.....	\$78,133 42
Amount appropriated by act approved March 3, 1879.....	40,000 00

July 1, 1879, amount expended during fiscal year.....	35,517 45
July 1, 1879, outstanding liabilities.....	12,325 65
	47,843 10

July 1, 1879, amount available.....	70,290 32
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Amount (estimated) required for completion of existing project.....	250,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	75,000 00

(See Appendix B B 3.)



## EXAMINATIONS AND SURVEYS FOR IMPROVEMENT.

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

1. *Resurvey of the outlet to Wolf Lake in Lake County, Indiana.*
2. *Illinois River.*

## IMPROVEMENT OF THE HARBOR OF MICHIGAN CITY AND NEW BUFFALO, LAKE MICHIGAN.

Officer in charge Maj. J. A. Smith, Corps of Engineers.

1. *Improvement of Michigan City Harbor, Indiana.—Outer Harbor.*—This locality, from its exposed position and yielding bottom, presenting unusual difficulties, the question of the most suitable plan of construction to be followed in future was referred to a board of engineer officers, and upon its recommendation the plan of sinking cribs upon bearing piles recently carried out at Calumet Harbor was adopted, as also a new design for the cribs, submitted by the officer in charge.

During the fiscal year the damages to the breakwater were all repaired, and the superstructure completed to its full height of 8 feet above water for a distance of 550 feet.

Four cribs were constructed according to the new designs; piles were driven for foundations of two cribs, and one of them was placed in position, and filled with stone, at the east end of the completed part of the breakwater.

With the appropriation of March 3, 1879, it is proposed to place in position 7 more cribs, 50 feet long by 30 wide, resting on piles in a depth of about 19 feet of water; to complete the repairs to crib No. 1, and to finish the superstructure over No. 1 and over No. 13 to 20 inclusive; the balance remaining will be applied to repairing the east and west piers.

The estimate submitted by the officer in charge for the year ending June 30, 1881, contemplates completing the breakwater, extending the east pier, repairing both east and west piers, and dredging.

July 1, 1878, amount available.....	\$50,000 00	
Miscellaneous receipts.....	1,024 54	
Amount appropriated by act approved March 3, 1879.....	40,000 00	
		\$91,024 54
July 1, 1879, amount expended during fiscal year.....	43,862 70	
July 1, 1879, outstanding liabilities.....	4,923 30	
		48,786 00

July 1, 1879, amount available.....	42,238 54	
Amount (estimated) required for completion of existing project.....	126,175 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881, as revised in this office.....	75,000 00	

*Inner Harbor.*—An appropriation of \$25,000 was made in the river and harbor act of June 18, 1878, for this improvement. To enlarge this part of the harbor sufficiently to meet the wants of commerce it is proposed to extend it up Trail Creek by dredging for a distance of 2,700 feet, and a width of 120 feet and depth of 15 feet. The total cost of this is estimated by the officer in charge at \$50,000.

The work of dredging is in progress. During the fiscal year the amount of material removed was 45,440 cubic yards.

Storms of the autumn and spring formed extensive bars between the

piers at the entrance, which have been removed, the total amount dredged being 18,679 cubic yards.

July 1, 1878, amount available.....	\$25,000 00
July 1, 1879, amount expended during fiscal year.....	\$6,144 42
July 1, 1879, outstanding liabilities.....	2,477 23
	8,621 65

July 1, 1879, amount available..... 16,378 35  
(See Appendix C C 1.)

2. *Improvement of New Buffalo Harbor, Michigan.*—There was no work done here during the fiscal year.

There has been no appropriation for the harbor since 1872, and none is now recommended.

July 1, 1878, amount available.....	\$5,000 00
July 1, 1879, amount available.....	5,000 00

(See Appendix C C 2.)

## IMPROVEMENT OF HARBORS ON THE EASTERN SHORE OF LAKE MICHIGAN.

Officer in charge, Maj. S. M. Mansfield, Corps of Engineers.

1. *Improvement of Charlevoix Harbor, Michigan.*—Three cribs (each 50' x 20') have been added to the north pier and two to the south pier. The superstructure thereon will at once be placed. On the south side of the channel a brush protection 140 feet long has been added for holding the bank against the action of the waves.

The channel has shoaled near the shore-line to 7 feet at the present stage of water, the level of the lake being 14 inches lower than usual.

The appropriation of March 3, 1879, will be expended in extending the piers and widening and deepening the channel. Contracts have been made for this purpose.

The officer in charge estimates that \$30,000 can be profitably expended in the fiscal year ending June 30, 1881, in pier extension, and widening and deepening the channel.

July 1, 1878, amount available.....	\$12,021 05
Amount appropriated by act approved March 3, 1879.....	9,000 00
	\$21,021 05
July 1, 1879, amount expended during fiscal year.....	6,022 06
July 1, 1879, outstanding liabilities.....	11,572 06
	17,594 12

July 1, 1879, amount available..... 3,426 93

Amount (estimated) required for completion of existing project.....	155,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	30,000 00

(See Appendix D D 1.)

2. *Improvement of Frankfort Harbor, Michigan.*—One crib (50 by 20 feet) was added to the north pier, and one (50 by 30 feet) to the south pier during the year and some slight repairs made.

The depth of water available for navigation is 9 feet.

The appropriation of March 3, 1879, will be expended in extending the south pier 50 feet.

The officer in charge recommends additional pier extension, which increases the estimate for completion of existing project as presented in the last annual report; and it is suggested that \$20,000 could be profitably expended in the fiscal year ending June 30, 1881, for continuing the extension of the piers.