

## DD 8.

## IMPROVEMENT OF GRAND HAVEN HARBOR, MICHIGAN.

The contract with Mr. Hervey S. Dale, of Chicago, dated August 7, 1878, which provided for the building and placing of 3 cribs, without superstructure, in extension of the north pier, was completed and contract closed December 16, 1878. The work was left in secure condition for the winter.

The first crib was placed November 9; the second crib November 23; and the third and last crib December 7, 1878 (each crib 50 by 30 by 18½ feet, in an average depth of 16½ feet water).

In August, a small quantity of brush, 4½ cords, was placed in north pier at the shore-line, such work being necessary to stop an impending break in the work. The material (including handling stone) was furnished in the work for \$2.50 per cord.

On December 15, the work of overhauling and tightening revetment near shore-line on north side was completed. In doing this work, 87 cords shingle-shavings (ballasted with a few cords of stone from inner work) were used.

During October the winds were very severe, 7 vessels going upon the beach within a week, 1 south and 6 north of the harbor.

In the winter months, the cribs put in by Mr. Dale settled out of line considerably, but the general line is not bad. The superstructure has not been placed as yet, no funds being available for that purpose.

A troublesome bar formed again in the fall, directly across the mouth of the harbor. This was so far removed by means of propellers that vessels continued to make the port, during the winter months, drawing 13½ to 14 feet.

The piers are in bad condition, but if the funds appropriated for fiscal year 1879-'80 can be made available, they can be put in good shape this season.

Soundings taken June 28 show 14 feet as the best water over the bar, and this on the approach north of the range-lights.

Large quantities of sand have drifted into the river from the sand ridges opposite to and above the town, and to this fact I cannot help but attribute in some measure the existence of the bar outside the harbor.

Assistant Engineer Mower has addressed a letter to the city council, calling the attention of that body to this drifting of sand, and suggesting the propriety of planting willows on the lake side of the bluffs, beginning near the crest of the beach.

Willows have been planted on the north side at and near the beach, where sand is drifting over the revetment, as follows:

Cuttings from the basket-willow, golden willow, and sand or scrub willow, which latter grows abundantly on this shore—about 6,500 cuttings—have been placed in rows so as to cover, say, 2 acres. All of these which were planted deep enough to reach the wet sand show active growth. *Moist* sand will not do; they must go down to *wet* soil.

About 1,500 roots of the basket-willow have also been set out. These are all growing well, and by another season will form a complete hedge.

The rows run at right angles, or very nearly so, to the sweep of north-west winds.

The work was begun on the 3d of June, and continued from time to time, the action of each kind being noted as to its probable success in

growth. The work was done by hired labor under the direction of Inspector John Macfie, whose report on the subject is forwarded herewith.

The new railroad from Allegan has secured a landing at the river front, and I learn that freighting will be commenced across the lake in connection with this road this coming winter.

The large traffic of the Detroit, Grand Haven and Milwaukee Railroad in the winter being augmented by the new line, or its demands increasing as they will, renders it necessary that this harbor should be made safe and reliable at all times for the heavy class of steamers in the service of the lines interested, as well as for stranger vessels making use of it as a harbor of refuge.

The water in the great lakes is very low at this time, being now along this shore about 16 inches lower than it was a year ago. This fact, of course, augments the difficulties arising from the bars already formed.

## WORK CONSTRUCTED FROM JULY, 1866, TO JUNE 30, 1879.

	Crib-work.	Pile-work.
	Feet.	Feet.
North side of channel and extensions .....	*600	2,108
South side of channel and extensions .....	424	3,035
Total .....	1,024	5,143

\* One hundred and fifty feet without superstructure.

The north pier the longer by 200 feet.

There remains unappropriated of the estimates made heretofore for the improvement of this harbor the sum of \$20,148.96, which sum can be profitably expended in the fiscal year ending June 30, 1881, in pier-extension.

Original estimate (1866) amended (187 ) .....	\$322,015 11
Appropriated and allotted (1866-'79) .....	301,866 15

Unappropriated balance .....	20,148 96
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## OPERATIONS CONTEMPLATED FOR YEAR 1879-'80.

1. To build superstructure (6 courses high) over the 3 cribs sunk last season in north pier extension.

2. Refill and ballast portions of 300 feet of pile-pier next east from crib-work on south side.

3. Tighten revetments at several points on both sides of channel.

4. Extend south pier by 1 crib 50 by 30 by 26½ feet.

Items 1 and 4 to be done under contract, after advertising for proposals in the usual way.

Items 2 and 3 to be done by hired labor, and purchase of materials in open market.

The work is located in the Michigan collection district, Michigan; Grand Haven is the port of entry. It is situated at the Grand Haven lights.

## STATEMENT OF VESSELS ENTERED AND CLEARED FROM JUNE 1, 1878, TO JUNE 1, 1879.

Entered:		
Number .....		947
Tonnage .....		419,212
Cleared:		
Number .....		850
Tonnage .....		384,939

## HISTORY OF THE WORK.

Available water at entrance and approaches to river was, in 1844, about 12 feet.

In 1849 available water was 9 feet.

In 1856, from 12-foot curve to entrance, the water-way available was about 9 feet; from entrance up to wharves at Grand Haven, about 18 feet could be carried.

The plan of improvement adopted in 1866 was to build parallel piers into the lake.

Continuation of history, begun and published in report of Chief of Engineers for 1876, as follows:

1874-'75, north pier built; 900 feet revetment, 14 feet wide; 600 feet close piling, 14 feet wide; 608 feet pile-pier, 20 feet wide; total, 2,108 feet. In addition, 300 feet crib-work (6, each 50 feet long) were added to north pier, and on south side 500 feet were added, continuing pile revetment eastward of work of 1872-'73, cutting off point where water-way was contracted some 75 feet.

In 1874-'75 the depth of water developed outside the pier showed a water-way averaging 350 feet in width, in which not less than 20 feet depth was found.

In December, 1875, the continuous severe northeast seas formed a bar extending from the north pier almost directly across the mouth of the harbor, there being a width of way available of only about 100 feet between the head of south pier and the extreme southern point of the bar.

The steamer Leviathan was chartered to remove sand with her wheel. Final soundings showed the reduction of bar so as to leave 14½ feet of water, with safe width of way.

In spring of 1876 the harbor was reported in excellent condition, the whole channel way between the piers being available for any class of vessels plying the lakes.

1877-'78 the north pier received extension of 150 feet (3 cribs, each 50 by 30 feet); on south side 85 cords of stone were placed as riprap.

In October, 1877, another bar had formed off the entrance, which gradually increased till the necessity for its removal became so great that, for want of funds for the purpose, it was dredged away by the steamboat company, and a channel left about 200 feet wide, with 14½ feet water.

In the spring of 1878 the deepest water on the bar was 15½ feet.

Appropriation, 1866 .....	\$65,000 00	Allotted, 1874 .....	50,000 00
Appropriation, 1867 .....	40,000 00	Allotted, 1876 .....	15,000 00
Allotted, 1869 .....	1,866 15	Allotted, 1878 .....	15,000 00
Allotted, 1870 .....	10,000 00	Allotted, 1879 .....	9,000 00
Allotted, 1871 .....	6,000 00		
Allotted, 1872 .....	15,000 00		
Allotted, 1873 .....	75,000 00	Total .....	301,866 15

## Money statement.

July 1, 1878, amount available .....	\$15,000 21
Amount appropriated by act approved March 3, 1879 .....	9,000 00
July 1, 1879, amount expended during fiscal year .....	\$24,000 21
July 1, 1879, amount available .....	21,094 78
July 1, 1879, amount available .....	2,905 43
Amount (estimated) required for completion of existing project .....	20,148 96
Amount that can be profitably expended in fiscal year ending June 30, 1881 .....	20,148 96

Abstract of proposals received and opened July 26, 1878, for furnishing the materials, &c., for continuing improvements at Grand Haven Harbor, Michigan.

Bidders.		Pine, per cubic foot.	Oak, per cubic foot.	Drift-bolts, per pound.	Screw-bolts, per pound.	Stone, per cord.	Brush, per cord.	Piles, each.	Aggregate.
Names.	Residences.								
Chicago Dredging and Dock Company.	Chicago, Ill. ....	\$0 28	\$0 35	\$0 03	\$0 04½	\$7 00	\$2 00	\$10 00	\$9,885 17
Squier & White .....	Grand Haven, Mich.	20½	30	2½	3½	6 50	2 00	7 00	7,975 19
U. Culbert & Co .....	Muskegon, Mich. . .	24	30	3	4	6 75	3 00	10 00	8,979 99
Robert M. Steel .....	Saint John's, Mich.	22½	30	2½	3½	7 75	2 00	9 00	8,995 02
Thomas Keeler .....	Fulton, N. Y. ....	20	30	3	4½	8 00	3 00	8 00	8,743 40
James Caldwell .....	do .....	22	30	3½	10	8 50	3 00	10 00	9,540 64
James McArthur .....	Chicago, Ill. ....	30	40	5	10	8 00	8 00	12 00	11,443 10
Mechanics' Dry Dock Company.	Grand Haven, Mich.	20	33	4	8	8 50	3 00	6 00	9,202 31
Hervey S. Dale .....	Chicago, Ill. ....	19	19	2½	3½	7 00	2 00	5 00	7,882 74
N. Stanton Gere .....	Geddes, N. Y. ....	20	24	2½	3½	6 50	3 00	20 00	8,087 52

Contract awarded to Hervey S. Dale.

## REPORT OF MR. JOHN MACFIE, INSPECTOR.

SIR: During the past winter and spring the sand has washed ashore to the northward of the harbor in great quantities. Under the action of prevailing northwesterly winds this sand has drifted upon and across the revetment to such an extent as to threaten the formation of a bar in the channel. Acting under your instructions an attempt has been made to remedy this state of things as far as possible by covering the loose sand north of pier with vegetation.

To accomplish this a large quantity of willow cuttings and willow roots of several varieties have been planted. Among these are the common osier or basket willow, the golden willow, which grows rapidly to large trees in the light sandy soils of this vicinity, and also a variety known as the sand willow, which is indigenous to the locality and is found on the sand dunes both north and south of the harbor. Very few of the golden willows show signs of growth, nor does the sand willow either from cuttings or when transplanted. The basket willow, however, is evidently proving a success, a great many of the cuttings having already put out rootlets of from 3 to 4 inches in length, though some which were not planted deep enough to reach *wet sand* are drying up.

To insure a wind-break over at least a part of the ground 1,500 roots of the basket willow variety were planted, all of which show signs of vigorous growth. They were planted at intervals in rows parallel with revetment. These roots had originally been planted for commercial purposes, and repeated crops had been taken from them by cutting in the fall, new branches shooting out in the spring, until each root became the base of a clump of willows. In planting on the beach all, except 1 or 2, of these branches were pruned off, and the whole clump (having but one tap root) was planted without dividing it, and from present appearances there is little doubt that another season will show these rows forming compact hedges, which will not only break the force of the wind but continue to spread and grow as the sand fills up around them.

About two acres have been covered by these rows, and a considerable quantity of cuttings extend farther to northward. A large number of these are dead, though there is reason to believe that all would have lived had they been planted deeper or else been planted earlier in the season.

I have the honor to be, sir, your most obedient servant,

JOHN MACFIE,  
Inspector.

Mr. S. C. MOWER,  
Assistant Engineer

## DD 9.

## IMPROVEMENT OF BLACK LAKE HARBOR, MICHIGAN.

The contractor, Mr. N. Stanton Gere, of Geddes, N. Y. (under contract of August 7, 1878), met with much impediment in the delivery of his materials by reason of the extremely rough weather, and in consequence work progressed very slowly.

At the close of the season (November 30) Mr. Gere had 2 cribs almost framed, and had completed in addition the following named works:

On the south side at the shore-line, a space had been left in which was only stone, and this had been so worked by the action of the seas through the piles as to have become of no particular value as a revetment or pier. To render serviceable this part of the work, timbers were bolted in the spaces between piles, and the inside of the work sheeted up with plank; the work was then filled with brush and shingle-trimmings.

On the north side slight repairs in the way of filling shingle-trimmings behind the revetment were made.

In this work, so overhauled and repaired, a small quantity of stone (taken from old work where it could be spared) was placed to complete and secure it.

Materials for the completion of the cribs were on hand, and the work of framing the cribs proceeded during the winter.

Mr. Gere's contract will probably be completed by the end of August.

It was found upon examination early in the spring that there was not a sufficient amount of water to float an ordinary light-draught vessel. Upon representation of the necessity for immediate relief, the funds appropriated by act of March 3, 1879, were released and authority granted for dredging the channel. The United States dredging apparatus being employed elsewhere, a dredge was engaged of Messrs. Squier and White to do the work at 25 cents per yard. This was the only available machinery on Lake Michigan, all others being employed at large rates.

The dredge began operations on the 9th of May, and up to end of June one cut was made (being partly filled in by heavy seas leveling down the slopes was made again) and another cut nearly completed. Thus far, 15,000 cubic yards of sand have been removed, and the work will probably be finished early in July.

The contractor hopes to get his cribs down by the middle of July.

Early in May, a system (which had been tried before in a limited way, and found to answer the purpose) was adopted for making the revetments absolutely tight against sand. A trench 6 feet wide at the bottom was dug behind the work well below the water-line; in fact, entirely uncovering the old Dutch dike-work which constituted the piers built here by the colonists in the early history of this place. This trench was filled with shingle trimmings, which rested upon the old brush-work at the bottom to a depth of 2 feet on the back side and rising toward the rear of the revetment to the bottom of the superstructure timbers, giving the mass a slope of about 30°. On top of this a good ballasting of stone was placed (the stone being recovered from off the old dike-work), and then sand was covered upon the lower portion of the slope.

Work constructed from August, 1867, to June 30, 1879.

	Crib-work.	Pile-work.
	Feet.	Feet.
North side of channel and extensions.....	598	1,095
South side of channel and extensions.....	748	920
Total.....	1,346	2,015

The depth of water available for navigation June 30, 11 feet.

Recommendations and estimates of former years are here renewed. The unappropriated balance of estimates rendered, \$16,000, will not be sufficient to complete the extension of piers as required; therefore a new estimate is made, with reasons for excess of cost, in the following manner:

Original estimate, 1866 .....	\$106,238 04
Original appropriation, 1866-'67 .....	106,615 31
Estimates of 1869 amended to 1877.....	119,000 00
Appropriated to 1876 .....	87,000 00
Leaving for 400 feet pier-extension.....	32,000 00
Of this estimate, viz, \$32,000, for crib extension on each pier to 15 foot water, there has been expended—	
For dredging channel in 1877 .....	\$5,724 00
For refilling piers, &c., in 1877, 1878, 1879.....	431 50
For overhauling and repairing revetments, 1877-'79 .....	6,391 82
Total .....	12,547 32
This amount, added to \$32,000, would make.....	44,547 32
And appropriated (1877-'79) .....	16,000 00
Leaving to complete piers as designed .....	28,547 32

To reach the 15 feet curve, it will be necessary to extend the piers with 400 feet of crib-work, by adding to the north pier 150 feet and to the south pier 250 feet.

Taking the figures of Messrs. Squier and White's contract of 1877 (very fair, and approximating the present prices), it would cost to make the extension \$28,160, viz:

For 8 cribs, 50 feet by 24 feet, 22½ feet each, \$3,200.....	\$25,600 00
For contingencies, &c., 10 per cent.....	2,560 00
Total .....	28,160 00
In addition, the superstructure over north pier (built in former years) for a length of 500 feet needs replacing.	
Estimated cost.....	\$3,819 00
And repairs to be made to revetments .....	975 00
And dredging in channel .....	4,000 00
	8,794 00
Contingencies, &c., 10 per cent .....	879 40
Add pier extension, 400 feet .....	28,160 00
Making amended estimate .....	37,833 40

This amount can be profitably expended in the fiscal year ending June 30, 1881, in extending piers, making repairs, &c., as estimated for.

The work is located in the Michigan collection district, Michigan. It is situated at the Holland light (pier-head light, near head of south pier). The nearest port of entry is Grand Haven, Mich.

STATEMENT OF VESSELS ENTERED AND CLEARED FROM JUNE 1, 1878, TO JUNE 1, 1879

Entered:	
Number.....	162
Tonnage.....	11,710
Cleared:	
Number.....	152
Tonnage.....	11,379

HISTORY OF THE WORK.

Continuation of history from 1875. (See Report Chief of Engineers for 1876.)

Plan proposed for improvement was to let old piers remain and make them permanent by protection of sheath-piles; to extend north pier about 250 feet and south pier 275 feet to bring pier-ends into 12 foot water; and then from entrance to Black Lake the channel to be close-piled for 1,125 feet on north side and 425 feet on south side, and channel-way dredged (175 feet wide) to a depth of 12 feet.

Estimate rendered, \$106,238.04.	
Original depth at entrance (1866) about 5½ feet.	
Appropriation of June 23, 1866, amounted to .....	\$55,615 31
Appropriation of March 3, 1867, amounted to .....	51,000 00
	106,615 31

1875.—Pier-extension made—100 feet (2 cribs) to south pier; 50 feet (1 crib) to north pier. In mid-channel depth of water was reduced to 7½ feet, with pier-ends resting in 11 feet water.

1876.—Pier-extension made—100 feet (2 cribs) to north pier; 50 feet (1 crib) to south pier.

The depth of water in channel during season of 1876 varied from 6½ to 7½ feet, with pier-ends resting in 11 feet.

1877-78.—South pier extended 50 feet (1 crib); channel dredged to 10½ feet; 701 feet revetment cleared of old filling, and to water-surface filled anew with brush-mattress work, and a few minor repairs made.

Soundings of November 19, 1877, show an available water-way of 9 feet in channel. In spring of 1878 the channel shoaled in one place to 8 feet.

Appropriation, 1866.....	\$55,615 31	Appropriation, 1875.....	15,000 00
Appropriation, 1867.....	51,000 00	Appropriation, 1876.....	15,000 00
Appropriation, 1870.....	10,000 00	Appropriation, 1878.....	10,000 00
Appropriation, 1871.....	10,000 00	Appropriation, 1879.....	6,000 00
Appropriation, 1872.....	10,000 00		
Appropriation, 1873.....	12,000 00		209,615 31
Appropriation, 1874.....	15,000 00		

Appropriated by act August 30, 1852, \$8,000.

Money statement.

July 1, 1878, amount available.....	\$10,702 58	
Amount appropriated by act approved March 3, 1879.....	6,000 00	
	\$16,702 58	
July 1, 1879, amount expended during fiscal year .....	4,723 32	
July 1, 1879, outstanding liabilities .....	7,785 62	
	12,508 94	
July 1, 1879, amount available.....	4,193 64	
Amount (estimated) required for completion of existing project.....	37,833 40	
Amount that can be profitably expended in fiscal year ending June 30, 1881.	37,833 40	

Abstract of proposals received and opened July 26, 1878, for furnishing the materials, &c., for continuing improvements at Black Lake Harbor, Michigan.

Bidders.		Pine, per cubic foot.	Oak, per cubic foot.	Drift bolts, per pound.	Screw bolts, per pound.	Stone, per cord.	Brush, per cord.	Piles, each.	Aggregate.
Names.	Residences.								
N. Stanton Gere.....	Geddes, N. Y.....	\$0 20	\$0 24	\$0 03	\$0 04	\$6 50	\$3 00	\$15 00	\$7,109 61
Robert M. Steel.....	Saint John's, Mich..	23	30	02½	03½	7 50	2 00	10 00	7,939 23
James McArthur.....	Chicago, Ill.....	30	40	04	08	8 00	8 00	12 00	9,923 06
Thomas Keeler.....	Fulton, N. Y.....	22	30	03	04½	8 50	2 50	10 00	8,247 96
Hervey S. Dale.....	Chicago, Ill.....	21	21	02½	03½	7 00	2 00	5 00	7,294 75
Chicago Dredging and Dock Company.	.....do.....	28	35	03	04½	7 00	2 00	10 00	8,691 88

Contract awarded to N. Stanton Gere.

DD 10.

IMPROVEMENT OF SAUGATUCK HARBOR, MICHIGAN.

With the funds of the appropriation of June 18, 1878, and in accordance with approved project, the work of overhauling and refilling north pier and making slight repairs to south pier was commenced July 6, and was completed August 31, leaving both piers in excellent condition.

The work entire consisted of—  
Thoroughly overhauling the south pier and refilling it with slabs and stone.

Cleaning out the north pier for a distance of 330 feet and placing in the space thus cleared a new filling of brush made into mattresses heavily weighted with stone, and planking over a small portion of the north pier-head.

The work was done by hired labor and the materials were purchased in open market.

MATERIALS USED.

Brush, 166 cords; slabs, 290 cords; stone, 70 cords; pine plank, 2,400 feet, board measure; spikes, 130 pounds; rope, 244 pounds; stakes and rods, 5,200; labor, \$766.25; scow and towing, \$43.50; total cost, \$2,247.91.

During the fall the sands were swept around the north pier and barred across the channel, making it necessary for vessels to make a sharp turn at the end of the south pier in order to get in or out. A break also occurred in the filling of the south pier at the shore line, causing the formation of quite a sand bank against the south pier in the channel. The spring currents tended to cut away the bar across the mouth, but during the month of June steamers drawing only 8 feet could navigate the channel.

The work constructed from August, 1869, to June 30, 1879, was—  
Protecting south slab pier with piles, 620 feet of pier.  
And building on—

	Pile-pier.	Pile-revetment.
	Feet.	Feet.
North side of channel and extensions.....	400	335
South side of channel and extensions.....	280	2,770
Total .....	680	3,105

The south pier is 300 feet longer than the north pier.

The unappropriated balance of the existing estimate for the completion of the work (pier extension) is \$30,958.74. To this should be added the expenditures made since 1876, viz: appropriations of 1876 and 1878, \$5,500, and the amount necessary to make repairs under the appropriation of March 3, 1879, estimated at \$800, and dredging, \$1,800.

The amount required for pier extension, \$39,058.74, could be profitably expended in the fiscal year ending June 30, 1881.

Original estimate (1867) amended (1879).....	\$144,497 74
Appropriated and allotted (1868-'79).....	105,439 00
Unappropriated balance .....	39,058 74

OPERATIONS CONTEMPLATED IN YEAR 1879-'80.

1. Extend south pier 50 feet—1 crib 24 feet wide.
2. Repair south pier—refill and ballast with brush-mats and stone.
3. Dredge the channel.

Crib-work to be done under contract after inviting proposals in the usual way; repairs to be done by hired labor and purchase of materials in open market; dredging to be done by the government dredge.

The lumber interest is reduced to a very small item here as compared with 10 years ago, but the country tributary or adjacent to the Kalamazoo River at Saugatuck is being turned to fruit culture, and is already a region of no small pretension in that industry.

This work is located in the Michigan collection-district, Michigan. It is situated at the Kalamazoo light. The nearest port of entry is Grand Haven, Michigan.

STATEMENT OF VESSELS ENTERED AND CLEARED FROM JUNE 1, 1878, TO JUNE 1, 1879.

Entered:	
Number .....	178
Tonnage .....	33,899
Cleared:	
Number .....	175
Tonnage .....	33,606

HISTORY OF THE WORK.

The plan and estimate of 1866 was modified in 1869 as follows:

South shore revetment, 2,700 feet pile-work .....	\$27,097 58
North shore revetment, 1,660 feet pile-work .....	} 59,300 98
North pier revetment, 770 feet pile-work .....	
North pier revetment, 192 feet cribs .....	
Including 60,470 cubic yards dredging .....	86,398 56
First allotment made July 25, 1868 .....	23,900 00

Continuation of history begun and published in Report of Chief of Engineers for 1876, as follows:

1875-'76.—Work of repairs was prosecuted (resulting from the report of a Board of Engineers convened by Special Order 72, May 31, 1875), in the bend of the river, the old work being torn away and replaced with 290 feet pile-revetment, faced with bush-mats and a heavy apron of large stone, 420 cords slabs and edging, and 20 cords stone were refilled in piers. Also 335 feet of 14 foot pile-revetment was built on north side.

1876-'77.—The outer 110 feet of south pier was refilled and partly

decked over; the revetment in bend of river refilled; the outer end of north pier also refilled for distance of 56 feet.

1877-'78.—A few cords of stone were transferred from south to north pier, used as ballast at outer end of north pier.

In fall of 1877 the channel shoaled from the north pier-head, leaving a narrow passage of 50 feet.

The available water in and about channel for vessels remained at from 9 to 10 feet depth.

Allotted, 1868 .....	\$23,900	Appropriated, 1875.....	10,000
Allotted, 1869 .....	6,039	Appropriated, 1876.....	3,000
Appropriated, 1870.....	10,000	Appropriated, 1878.....	2,500
Appropriated, 1871.....	10,000	Appropriated, 1879.....	5,000
Appropriated, 1872.....	15,000		
Appropriated, 1873.....	10,000		105,439
Appropriated, 1874.....	10,000		

Money statement.

July 1, 1878, amount available.....	\$2,505 33	
Amount appropriated by act approved March 3, 1879 .....	5,000 00	\$7,505 33
July 1, 1879, amount expended during fiscal year.....	2,301 93	
July 1, 1879, outstanding liabilities .....	26 85	
		2,328 78
July 1, 1879, amount available.....		5,176 55
Amount (estimated) required for completion of existing project.....		39,058 74
Amount that can be profitably expended in fiscal year ending June 30, 1881.		39,058 74

DD II.

IMPROVEMENT OF SOUTH HAVEN HARBOR, MICHIGAN.

Dredging was commenced (contract of August 7, 1878, with N. Stanton Gere, of Geddes, N. Y.), on the 19th of August, the work being in the channel, beginning at a point 50 feet north and 100 feet east from the outer end of south pier, and extending east.

On December 7 work was suspended on account of the bad weather, the contractor leaving the work in good condition for the winter.

Up to that date repairs had been put upon the piers in the way of overhauling and refilling them with brush and stone, replacing broken timbers, &c., and planking over a part of the north pier.

MATERIALS USED.

Pine, 3,660½ cubic feet; hemlock, 106 cubic feet; stone, 220 cords; brush, 95½ cords; spikes, 2,722 pounds.	Cubic yards.
	9,360
Dredging in channel.....	19,167
Dredging in bank .....	
Total .....	28,527

At this time entrance and channel between piers had a depth of about 9 feet; a vessel entering the harbor in heavy seas drawing 8 feet 4 inches, the captain reporting plenty of water for him.

This spring work was resumed, and by the 20th of June the whole work contracted for was completed. The additional dredging necessary to permit of placing the revetment amounted to 5,327 cubic yards. The