

Money statement.

| | | |
|---|-------------|-------------|
| July 1, 1878, amount available..... | \$15,000 74 | |
| Amount appropriated by act approved March 3, 1879 | 10,000 00 | |
| | | \$25,000 74 |
| July 1, 1879, amount expended during fiscal year | 6,512 87 | |
| July 1, 1879, outstanding liabilities..... | 5,107 93 | |
| | | 11,620 80 |
| July 1, 1879, amount available | | 13,379 94 |
| Amount (estimated) required for completion of existing project | 51,771 00 | |
| Amount that can be profitably expended in fiscal year ending June 30, 1881. | 30,000 00 | |

Abstract of proposals received and opened July 26, 1878, for furnishing the requisite materials, &c., for continuing improvement at Manistee 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 25 | 02 1/2 | \$0 04 | \$5 95 | \$3 00 | \$25 00 | \$9,179 86 |
| Hervey S. Dale | Chicago, Ill. | 19 | 19 | 2 1/2 | 3 1/2 | 7 00 | 2 00 | 5 00 | 9,376 89 |
| Chicago Dredging and Dock Company. | do | 28 | 35 | 3 | 4 1/2 | 7 00 | 2 00 | 10 00 | 11,609 19 |
| Robert M. Steele | Saint John's, Mich. | 22 | 30 | 2 1/2 | 3 1/2 | 7 50 | 9 00 | 10 00 | 10,456 51 |
| James McArthur | Chicago, Ill. | 28 | 40 | 4 | 8 | 8 00 | 8 00 | 12 00 | 12,578 56 |
| Thomas Keeler | Fulton, N. Y. | 20 | 30 | 3 | 4 1/2 | 9 00 | 2 50 | 12 00 | 11,011 77 |
| Albert Conro | Milwaukee, Wis. | 24 | 30 | 3 | 5 | 10 00 | 4 00 | 7 50 | 12,578 56 |

* Lowest. Contract awarded to N. Stanton Gere.

D D 4.

IMPROVEMENT OF LUDINGTON HARBOR, MICHIGAN.

The contractor, Mr. N. Stanton Gere, of Geddes, N. Y., under contract of August 7, 1878, commenced building cribs August 29. At the close of November the following-named work had been completed under this contract.

Two cribs, each 50 feet by 24 feet, framed 16 courses high, intended for north pier extension, and one crib, 50 feet by 30 feet, framed 18 courses high, for south pier extension. In needed repairs, &c., the contractor used:

793.6 cubic feet pine timber.
20 cubic feet oak timber.
621.9 pounds drift-bolts and spikes.
230.9 pounds screw-bolts and washers.
128.6 cords stone.
25.6 cords brush.
10 piles.

Owing to the gales of the fall, the contractor found himself unable to place the cribs in position prior to 1st of December, as required by the terms of the contract. Upon application, authority was given him to cease work for the season, and to complete the whole work of his contract by the 30th June, 1879.

In August repairs were made to the United States dredging apparatus, and in the first week of September (5th) dredging began with a view to obtaining a depth in channel of 15 feet.

Prevailing stormy weather impeded the progress of dredging in Octo-

ber; nevertheless, up to 26th November the total number of cubic yards of sand, &c., removed amounted to 18,720, leaving a water-way in mid channel of about 16 feet. The cost of this dredging was 11.72 cents per cubic yard. The dredging apparatus was laid up at this harbor for the winter.

The latter part of April, this year, Mr. Gere resumed the work of his contract. When completed (July 20) it will cover the extension of the north pier 100 feet (2 cribs, each 50 feet by 24 feet by 22 1/2 feet) and the extension of south pier 50 feet (1 crib, 50 feet by 30 feet by 24 1/2 feet), and also the repairs before mentioned.

WORK CONSTRUCTED FROM JULY 1, 1867, TO JUNE 30, 1879.

| | Crib-work. | Pile-work. |
|--|------------|------------|
| | Feet. | Feet. |
| North side of channel and extensions | 843 | 704 |
| South side of channel and extensions | 1,019 | 704 |
| Total | 1,862 | 704 |

The south pier farther advanced by 50 feet than the north pier. The depth of water available for navigation at the present time (June 30) is good, 13 feet at very lowest stages.

Annual reports carry recommendations for pier extension. An unappropriated balance of \$6,000 remains for this purpose. In 1875 it was stated that a channel-way of 14 feet was required to conform to the necessities of the trade, and to obtain and maintain such a depth, a pier extension of 150 feet to each pier was recommended, at an estimated cost of \$36,000. The length of piers, as recommended, is now reached, but for the vessels now seeking that port the depth should be placed at 16 feet. In such case, this can be accomplished by extending piers, using therefor the balance unappropriated, viz, \$6,000, and adding to it the money of the estimate (\$36,000) made in 1875, used in dredging, repairs, &c., which amounts to \$11,602.07; total, \$17,602.07. This amount could be profitably expended in pier extension in the fiscal year ending June 30, 1881.

| | |
|--|--------------|
| Original estimate (1866) amended (1879)..... | \$213,787 07 |
| Appropriated and allotted (1866-79) | 196,185 00 |
| Unappropriated balance | 17,602 07 |

OPERATIONS CONTEMPLATED IN YEAR 1879-'80.

Extension of north pier by one crib, 50 feet by 24 feet by 22 1/2 feet.
Extension of south pier by one crib, 50 feet by 30 feet by 24 1/2 feet.

To be done under contract after advertising the proposals in the usual way.

This work is situated in the Michigan collection-district, Michigan. The nearest port of entry is Grand Haven, Mich. The nearest light-house is at Grande Point au Sable. A light is shown near head of south pier.

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

| | |
|---------------|--------|
| Entered: | 559 |
| Number | 91,949 |
| Tonnage..... | |
| Cleared: | 561 |
| Number | 92,282 |
| Tonnage | |

HISTORY OF THE WORK.

Survey of 1866, prior to improvement of this harbor by the government, shows that the depths of water across channel entrance were 7 to 8 feet, increasing in depth toward the little lake with channel from 7 to 13 feet. Plan of improvement adopted in 1867: to build a south pier, extending from shore a distance of 640 feet; to extend north pier (from end of slab-pier) a distance of 450 feet; to remove slab-pier on south side of channel; to remodel north slab-work; to close-pile south side; to dredge channel to 12 feet depth if necessary. Direction of piers to be 3° west, and the channel 200 feet wide. Estimated cost, \$270,682.16.

First appropriation (March 2, 1867) gave \$50,000 for the improvement of this harbor.

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

1874-1875.—The displaced crib was restored to place in south pier; the remaining portion of south slab-pier was removed, and south bank dredged away, and a channel-way along north pier wide enough for vessel-passage was dredged to a depth of 11 feet; also the protection to south side of channel was given by the completion of 560 feet of revetment, 14 feet wide.

1875-'76.—The south pier was extended 100 feet (2 cribs); and certain necessary repairs were also made. In addition, the United States dredge removed 31,750 cubic yards of sand from channel, leaving a water-way through center of 14 feet, on the 1st of July, 1876.

1876-'77.—December 8, 1876, the crib at outer end of south pier was forced by a severe gale from its place in the pier, and carried upon the beach 400 feet south of the harbor. The mean depth in channel remained at 12 feet; the water during 1877 being about 15 inches lower than in 1876, however.

1877, '78.—2 cribs (100 feet) were placed in extension of south pier; and also certain repairs—releveling, refilling, ballasting, &c.—to pier were made. The United States dredge commenced work October 22, and up to November 17, 1877, removed 6,000 cubic yards of sand, &c., from channel, leaving available a water-way of 13 feet. In June, 1878, the channel-way held good 12 feet of water.

| | | | |
|---------------------------|----------|---------------------------|---------|
| Appropriation, 1867 | \$50,000 | Appropriation, 1875 | 10,000 |
| Allotted, 1869 | 31,185 | Appropriation, 1876 | 10,000 |
| Appropriation, 1870 | 10,000 | Appropriation, 1878 | 15,000 |
| Appropriation, 1871 | 10,000 | Appropriation, 1879 | 5,000 |
| Appropriation, 1872 | 10,000 | | |
| Appropriation, 1873 | 25,000 | Total | 196,185 |
| Appropriation, 1874 | 20,000 | | |

Money statement.

| | | |
|---|-------------|-------------|
| July 1, 1878, amount available | \$15,717 26 | |
| Amount appropriated by act approved March 3, 1879 | 5,000 00 | |
| | | \$20,717 26 |
| July 1, 1879, amount expended during fiscal year | 10,491 63 | |
| July 1, 1879, outstanding liabilities | 1,344 15 | |
| | | 11,835 78 |
| July 1, 1879, amount available | 8,881 48 | |
| Amount (estimated) required for completion of existing project | 17,602 07 | |
| Amount that can be profitably expended in fiscal year ending June 30, 1881 .. | 17,602 07 | |

Abstract of proposals received and opened July 26, 1878, for furnishing the requisite materials, &c., for continuing improvements at Ludington 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. |
|---|-----------------------|-----------------------|----------------------|-------------------------|-------------------------|------------------|------------------|--------------|-------------|
| Corlett & Huston | Ludington, Mich | \$0 22 | \$0 25 | \$0 02 $\frac{1}{2}$ | \$0 04 | \$5 25 | \$2 00 | \$5 00 | \$10,237 02 |
| Hervey S. Dale | Chicago, Ill | 19 | 19 | 2 $\frac{1}{2}$ | 3 $\frac{1}{2}$ | 7 00 | 2 00 | 5 00 | 8,810 21 |
| Thomas Keeler | Fulton, N. Y | 21 | 30 | 3 | 4 $\frac{1}{2}$ | 8 50 | 2 50 | 12 00 | 10,290 05 |
| James McArthur | Chicago, Ill | 28 | 40 | 4 | 5 | 8 00 | 3 00 | 12 00 | 11,947 08 |
| R. M. Steel | Saint John's, Mich .. | 20 | 30 | 2 $\frac{1}{2}$ | 3 $\frac{1}{2}$ | 7 25 | 1 50 | 8 00 | 9,233 38 |
| Duncan Dewar | Ludington, Mich | 20 | 35 | 2 $\frac{1}{2}$ | 3 | 7 50 | 2 00 | 4 00 | 9,252 92 |
| Chicago Dredging and Dock Company, N. Stanton Gere* | Geddes, N. Y. | 28 | 35 | 3 | 4 $\frac{1}{2}$ | 7 00 | 2 00 | 10 00 | 10,865 75 |
| | | 20 | 24 | 2 $\frac{1}{2}$ | 4 $\frac{1}{2}$ | 6 00 | 2 00 | 20 00 | 8,572 16 |

* Lowest bidder (contract awarded to), N. Stanton Gere.

DD 5.

IMPROVEMENT OF PENTWATER HARBOR, MICHIGAN.

Contract was entered into August 7, 1878, with Squier & White, of Grand Haven, Mich., for doing the work of dredging and removing slab-piers, building pile revetment, and repairs.

Work commenced early in August, and continued through September, October, November, and part of December (to 10th), with fair progress. It covered the following:

- Dredging 18,022 cubic yards sand.
- Removing 4,284 cubic yards slabs.
- Framing, 3,497 cubic feet pine.
- Framing, 646 linear feet 10 by 12 inch rock elm.
- Framing, 618 linear feet 4 by 8 inch rock elm.
- Driving 6,511 linear feet piles.
- Filling in work, 880 cords edgings.
- Ballasting work, 38 $\frac{1}{2}$ cords stone.

Messrs. Squier & White resumed work the 3d of May, 1879, and completed their contract June 28. The addition to the north revetment by this contract is 600 linear feet. The work of repairs was in the way of refilling and placing edgings in and about the revetments to render them impervious to passage of sand into channel.

About the latter part of April (under authority of the Chief of Engineers) a tug was employed to make a temporary channel between piers, a bar having formed across the channel with but 8 feet water on it, not sufficient for the large barges running to this port.

Work constructed from July 1, 1867, to June 30, 1879.

| | Crib-work. | Pile-work. |
|--|------------|------------|
| North side of channel and extensions | 290 | 1,482 |
| South side of channel and extensions | 608 | 1,137 |
| Total | 898 | 2,619 |

The north pier farther advanced by 130 feet than the south pier.
The depth of water available for navigation June 30, 1879, 9½ feet.
Channel narrow.

An unappropriated balance of \$23,200 remains of the estimate of 1873. This amount can be profitably expended in the fiscal year ending June 30, 1881, in extending piers.

| | |
|--|-----------|
| Original estimate (1866) amended (1873)..... | \$192,020 |
| Appropriated and allotted (1866-79)..... | 168,820 |
| Unappropriated balance..... | 23,200 |

OPERATIONS CONTEMPLATED FOR YEAR 1879-'80.

Complete revetment through to little lake, about 350 feet pile revetment, 14 feet wide, in continuation of work on north side, and dredging 4,600 cubic yards sand and removing 5,400 cubic yards slabs in line of work—about 10,000 cubic yards of material. To be carried on by contract, after inviting proposals in the usual way.

The work is located in the Michigan collection-district, Michigan. The nearest port of entry is Grand Haven, Mich. The nearest light-house is at Petites Point au Sable. A light is shown near head of south pier.

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

| | |
|--------------|--------|
| Entered: | |
| Number..... | 199 |
| Tonnage..... | 21,385 |
| Cleared: | |
| Number..... | 175 |
| Tonnage..... | 18,532 |

HISTORY OF THE WORK.

Survey of 1866 shows the outlet from Lake Pentwater to Lake Michigan to have been 1,440 feet in length, with an average width of 75 feet, protected by slab-piers on both sides. The depth of entrance was from 3 to 5 feet; available water in channel, 4 feet.

Plan adopted (1867) to improve this harbor was, to increase width of outlet to 150 feet and dredge to a depth of 12 feet its entire length. The sides to be close piled (2,120 running feet), and continued out into lake with 2,560 running feet pier-works, 1,280 feet on each side.

First appropriation was given March 2, 1867, \$55,000.

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

In 1874-'75, a few minor repairs were made to piers, and the United States appropriation removed from channel 3,190 cubic yards of sand which had worked into channel under the influence of severe gales.

In 1875-'76, certain breaks in piers, caused by collision of vessels with the piers, were repaired.

In the spring of 1876 the channel was found to be barred for a length of 300 feet, over which there was only 8 feet water. Subsequent high water rendered the bar, for the time, unobjectionable.

In 1876-'77, the United States dredge removed 7,230 cubic yards from the shoal, and the piers alongside, through which the sand found its way, were overhauled and reballasted. A few slight repairs to piers were also made.

In 1877-'78, the north pile revetment was extended 552 feet in an easterly direction. The amount of slabs removed from line of works was

4,937 cubic yards, and the sand excavated from in and about channel was 15,901 cubic yards, a water-way to the depth of 12 feet having been dredged through the middle of channel (November 16, 1877). Slight repairs, &c., were also made to pier, viz, filling in brush, slabs, and stone. In spring of 1879, the shoalest water was 9 feet for a short distance near the shore line.

| | | | |
|-------------------------|----------|---------------------|----------|
| Appropriated, 1867..... | \$55,000 | Allotted, 1876..... | \$10,000 |
| Allotted, 1869..... | 17,820 | Allotted, 1878..... | 10,000 |
| Allotted, 1870..... | 10,000 | Allotted, 1879..... | 6,000 |
| Allotted, 1871..... | 10,000 | | |
| Allotted, 1872..... | 30,000 | Total..... | 168,820 |
| Allotted, 1873..... | 20,000 | | |

Money statement.

| | | |
|---|-------------|-------------|
| July 1, 1878, amount available..... | \$10,744 75 | |
| Amount appropriated by act approved March 3, 1879..... | 6,000 00 | \$16,744 75 |
| July 1, 1879, amount expended during fiscal year..... | 9,899 91 | |
| July 1 1879, outstanding liabilities..... | 250 00 | 10,149 91 |
| July 1, 1879, amount available..... | 6,594 84 | |
| Amount (estimated) required for completion of existing project..... | 23,200 00 | |
| Amount that can be profitably expended in fiscal year ending June 30, 1881..... | 23,200 00 | |

Abstract of proposals received and opened July 26, 1878, for furnishing the requisite materials, &c., and doing the work of improving harbor at Pentwater, Michigan.

| Bidders. | | Aggregate. |
|-----------------------------------|--------------------------------------|------------|
| Names. | Residences. | |
| N. Stanton Gere | Geddes, N. Y. | \$8,388 87 |
| Squier & White | Grand Haven, Mich. | 7,447 77 |
| Chicago Dredging and Dock Company | Chicago, Ill. | 9,697 73 |
| Carlin, Stiekney & Cram | East Saginaw, Mich. | 10,476 11 |
| Albert Conro | Milwaukee, Wis. | 9,560 72 |
| James McArthur | Chicago, Ill. | 11,694 72 |
| O. B. Green | do | 12,551 86 |
| | Pine, per cubic foot. | \$0 20 |
| | Elm, 10 by 12 inch, per linear foot. | \$0 30 |
| | Elm, 4 by 8 inch, per lin. car foot. | \$0 10 |
| | Drift-bolts, per pound. | \$0 02 1/2 |
| | Screw-bolts, per pound. | \$0 04 |
| | Oak piles, per foot. | \$0 15 |
| | Pine piles, per foot. | \$0 10 |
| | Stone, per cord. | \$6 00 |
| | Edgings, per cord. | \$2 50 |
| | Driving piles, per foot. | \$0 10 |
| | Removing slabs, per yard. | \$0 25 |
| | Dredging sand, per yard. | \$0 12 |

Contract awarded to Squier & White.

DD 6.

IMPROVEMENT OF WHITE RIVER HARBOR, MICHIGAN.

The work done at this harbor in the year was covered by the terms of two contracts, viz:

1. August 7, 1878, with James Corlett, of Ludington, Mich., for pier extension, one crib on south pier, and repairs.

2. August 9, 1878, with Chicago Dredging and Dock Company, of Chicago, for overhauling and refilling piers.

Under the first-named contract the crib (50 feet by 24 feet and 13 courses high) was sunk in extension of the south pier August 29, and secured by riprap (14 3/4 cords stone) in beginning of September. During October and November Mr. Corlett built an additional course of timber on south pile-pier from shore-line to east end of crib-work, a distance of 400 feet, replaced some rotten and broken timber on both piers, laid plank walks where necessary, and commenced to level up new crib. The stormy weather prevented continuation of work on crib during the rest of the season. This contract with Mr. Corlett was closed June 23, 1879, after the completion of 6 courses of superstructure over old and new cribs at end of south pier.

Under the second-named contract the work began immediately in August and was completed November 30, 1878. It consisted of removing the old filling from 398 3/4 linear feet of pier and placing new filling in the space thus cleared, viz, brush mattresses, edgings, and stone. The materials used in this manner amounted to 354,653 cords of brush, 111,170 cords of edgings, and 126,646 cords of stone, at a total cost of \$4,097.61.

The United States dredging apparatus commenced work May 5, 1879, and to include May 31, removed from channel 9,150 cubic yards of sand, &c., leaving a water-way of 12 feet, 70 feet wide.

Work constructed from July 1, 1867, to June 30, 1879.

| | Crib-work. | | Pile-work. | |
|--------------------------------------|------------|-------|------------|-------|
| | Feet. | Feet. | Feet. | Feet. |
| North side of channel and extensions | 200 | 1,685 | | |
| South side of channel and extensions | | | 200 | 2,070 |
| Total | 200 | 3,755 | | |

The south pier the longer by 100 feet.

The unappropriated balance of estimate rendered, viz, \$12,391.56 for pier extension and \$5,000 for dredging, or \$17,391.56, can be profitably expended in the fiscal year ending June 30, 1881, in continuing improvements here.

| | |
|---|--------------|
| Original estimate (1866) amended (1873) | \$220,441 56 |
| Appropriated and allotted (1866-'79) | 203,050 00 |
| Unappropriated balance | 17,391 56 |

OPERATIONS CONTEMPLATED FOR YEAR 1879-'80.

Two cribs, each 50 feet by 24 feet by 20 1/2 feet, will be placed in extension of south pier, and the north pier will be overhauled and refilled.

The crib-work to be done by contract after advertising for proposals in the usual way, the overhauling and refilling to be done by hired labor and purchase of materials in open market.

The work is located in the Michigan collection-district, Michigan. It is situated at the White River light-house. 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..... | 759 |
| Tonnage..... | 97,927 |
| Cleared: | |
| Number..... | 768 |
| Tonnage..... | 100,126 |

HISTORY OF THE WORK.

Sketch of survey made October 6-19, 1866, shows that entrance to this harbor was then 3,550 feet north of the present outlet, and that depth of water in the old outlet was but 5 feet.

Plan of improvement adopted (1867) was to cut a channel 12 feet deep and 200 feet wide across the neck of land (distant about 1,200 yards south of original outlet) dividing Lake Michigan from White Lake, giving the channel a direction due west, the cut to be protected by sheath-piling.

From extremity of cut parallel piers (crib-work) to be extended out into Lake Michigan to 12 feet depth of water. Estimate: 1,100 running feet piling, 1,400 running feet crib-work, and removal of 91,632 cubic yards of sand and earth; cost, \$170,530.80.

First appropriation, \$57,000, given March 2, 1867.

In July, 1867, dredging began, the communication between lake and lake being made June 6, 1868, the current on May 1, 1868, washing out a channel of 4 feet.

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

In spring of 1875 the available water found between piers was but 7½ feet. The government dredge moved from channel 13,750 of sand, leaving channel 70 feet wide and 12 feet deep. In November, 1875, the south pier was extended 150 feet (3 cribs, each 50 feet by 24 feet).

In spring of 1876 the available water-way for distance of 400 feet inward was but 8 feet. The United States dredge deepened the channel here in the fall of 1876, and at the same time removed wreck of vessel which had drifted into the channel the previous winter.

Sundry repairs were found necessary—refilling, &c.—and were made in 1872-73-74-75-76-77.

In the spring of 1877 the channel alongside south pile-pier, east of crib-work, shoaled to 8½ and 9 feet for length of 200 feet. The United States dredge opened channel of 10 feet through this shoal in July, and again in September dredged available water-way of 11 feet through channel.

In the spring of 1878, available depth in channel and on bar, 10 feet.

| | | | |
|--------------------------|----------|--------------------------|----------|
| Appropriation, 1867..... | \$57,000 | Appropriation, 1875..... | \$10,000 |
| Appropriation, 1869..... | 44,550 | Appropriation, 1876..... | 5,000 |
| Appropriation, 1870..... | 20,000 | Appropriation, 1878..... | 12,000 |
| Appropriation, 1871..... | 20,000 | Appropriation, 1879..... | 7,500 |
| Appropriation, 1872..... | 10,000 | | |
| Appropriation, 1873..... | 7,000 | | |
| Appropriation, 1874..... | 10,000 | Total..... | 203,050 |

Money statement.

| | | |
|---|-------------|-------------|
| July 1, 1878, amount available..... | \$12,127 65 | |
| Amount appropriated by act approved March 3, 1879..... | 7,500 00 | \$19,627 65 |
| July 1, 1879, amount expended during fiscal year..... | 9,359 14 | |
| July 1, 1879, outstanding liabilities..... | 2,124 68 | 11,483 82 |
| July 1, 1879, amount available..... | | 8,143 83 |
| Amount (estimated) required for completion of existing project..... | | 17,391 56 |
| Amount that can be profitably expended in fiscal year ending June 30, 1881..... | | 17,391 56 |

Abstract of proposals received and opened July 26, 1878, for continuing improvements at White River Harbor, Michigan (overhauling piers).

| Bidders. | | Brush, per cord. | Edgings, per cord. | Stone, per cord. | Removing filling, per linear foot of pier. | Aggregate. |
|--|------------------------|------------------|--------------------|------------------|--|------------|
| Names. | Residences. | | | | | |
| James Whelan..... | White River, Mich..... | \$8 00 | \$2 00 | \$10 00 | \$1 25 | \$6,520 50 |
| Chicago Dredging and Dock Company..... | Chicago, Ill..... | 6 00 | 2 00 | 7 50 | 2 00 | 5,434 50 |
| W. E. Hutchinson..... | Saugatuck, Mich..... | 7 85 | 1 50 | 7 50 | 1 00 | 5,729 50 |
| James McArthur..... | Chicago, Ill..... | 10 00 | 3 50 | 8 00 | 8 00 | 10,059 00 |
| James Corlett..... | Ludington, Mich..... | 8 00 | 2 00 | 8 25 | 2 00 | 6,466 75 |
| R. Kauters & Son..... | Holland, Mich..... | 8 25 | 1 75 | 8 10 | 1 20 | 6,165 43 |

Contract awarded to Chicago Dredging and Dock Company.

Abstract of proposals received and opened July 26, 1878, for continuing improvements at White River Harbor, Michigan (crib-work).

| 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 | \$2,960 51 |
| U. Culbert & Co..... | Muskegon, Mich..... | 30 | 30 | 03 | 05 | 7 00 | 4 00 | 12 00 | 3,104 04 |
| James McArthur..... | Chicago, Ill..... | 30 | 40 | 04 | 08 | 8 00 | 8 00 | 12 00 | 3,384 48 |
| James Corlett..... | Ludington, Mich..... | 23½ | 25 | 03 | 04 | 8 25 | 2 00 | 5 00 | 2,870 93 |

Contract awarded to James Corlett.

DD 7.

IMPROVEMENT OF MUSKEGON HARBOR, MICHIGAN.

Under contract of August 7, 1878, with Robert M. Steel, of Saint John's, Mich., the work progressed slowly, owing to the stormy weather. The contract was closed November 30, at which date the following work was completed:

- Framing superstructure over outer crib and over part of adjoining crib of north pier and filling superstructure with stone.
- Replacing some broken timbers and adding stone filling to south pier.

The stone filling protected by plank decking. Materials used in this work were 3,533 cubic feet pine timber; 3,106 pounds drift-bolts and spikes; 439 pounds screw-bolts and washers; 6 piles, furnished and placed; 127.14 cords stone, at a total cost of \$1,861.95.

The piers and revetments are in good condition. The filling has settled in a few places, and it is estimated 40 cords of stone will fill the piers flush.

The south pier is now 862 feet out from shore-line, and its head rests in 24 feet water, and 300 feet in advance of the north pier. The north pier is 632 feet out from shore-line, and has 15½ feet water at its head. This at a time when the level of the lake is low.

Comparing recent soundings with soundings made a year ago, we find that considerable shoaling has occurred just north of the harbor mouth, and this shoal threatens to encroach upon the channel under the influence of northwest winds. I therefore recommend an extension of the north pier; 250 feet will cost \$19,901.75.

Work constructed from July 1, 1867, to June 30, 1879.

| | Crib-work. | Pile-work. |
|---|------------|--------------|
| | Feet. | Feet. |
| North side of channel and extensions | 589 | 385 |
| South side of channel and extensions | 530 | 384 |
| Total | 1,119 | 769 |
| Original estimate (1866) amended (1879) | | \$168,901 75 |
| Appropriated and allotted (1866-79) | | 149,000 00 |
| Unappropriated balance | | 19,901 75 |

OPERATIONS CONTEMPLATED FOR YEAR 1879-'80.

The work to be done is the building and placing of one crib 50 by 30 by 22½ feet in extension of the north pier, and necessary repairs, such as refilling piers, &c. To be carried on by contract after inviting proposals in the usual way.

The work is located in the Michigan collection-district, Michigan. It is situated at the Muskegon light-house. 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 | 2,563 |
| Tonnage | 507,229 |
| Cleared: | |
| Number | 2,623 |
| Tonnage | 529,082 |

HISTORY OF THE WORK.

In 1849, the soundings indicated 2 to 8 feet water at mouth of river; 520 feet out, in Lake Michigan, in prolonged direction of river water-way of 7 feet inside, through to Lake Muskegon, available channel of 11 feet.

In 1866, a north slab-pier is shown 1,450 feet long, pier-end resting in 11 feet water, 420 feet out from shore-line; the south pier is shown 2,070 feet long, pier-end in 10 feet water, at a distance of 550 feet from south

shore-line. Depth across from north pier-end to south pier-end varied from 11 to 13 feet, through river to Lake Muskegon available way of 13 feet. The bar opposite mouth of outlet, 700 feet out, had 7 to 12 feet water on it.

PLAN OF IMPROVEMENT RECOMMENDED IN 1866.

That an extension of the piers be made in a line of direction parallel to the inner face of south pier (south 61° 31' west), commencing at present extremities, until a depth of 17 feet is reached.

Requiring 700 feet pier-work, estimated cost \$58,450. First appropriation \$59,000, given March 2, 1867.

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

1875-'76. South pier extended 150 feet (3 cribs, each 50 by 30 feet), superstructure completed and decked, and cribs protected with oak fenders.

Available water-way between piers, in 1876, good 14 feet.

1876-'77. Necessary repairs—new timber added, plank decking, and rebalasting with stone—were made to piers.

Available water between government piers about 13 feet in 1877.

1877-'78. South pier extended 100 feet (2 cribs, each 50 by 30 feet); several defective places in both piers repaired and refilled, and a gap (88 feet long) in old piers of slab was closed by new work. In the spring of 1878 available water between piers was 14 feet.

| | | | |
|---------------------------|----------|---------------------------|----------|
| Appropriation, 1867 | \$59,000 | Appropriation, 1875 | \$25,000 |
| Appropriation, 1870 | 10,000 | Appropriation, 1876 | 15,000 |
| Appropriation, 1871 | 15,000 | Appropriation, 1879 | 5,000 |
| Appropriation, 1872 | 10,000 | | |
| Appropriation, 1874 | 10,000 | Total | 149,000 |

Money statement.

| | |
|---|------------|
| July 1, 1878, amount available | \$4,393 46 |
| Amount appropriated by act approved March 3, 1879 | 5,000 00 |
| | \$9,393 46 |
| July 1, 1879, amount expended during fiscal year | 2,091 07 |
| July 1, 1879, outstanding liabilities | 160 00 |
| | 2,251 07 |
| | 7,142 39 |
| July 1, 1879, amount available | 19,901 75 |
| Amount (estimated) required for completion of existing project | 19,901 75 |
| Amount that can be profitably expended in fiscal year ending June 30, 1881 .. | 19,901 75 |

Abstract of proposals received and opened July 26, 1878, for furnishing the materials and doing work of continuing improvements at Muskegon 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. | | | | | | | | |
| U. Culbert & Co. | Muskegon, Mich. | \$0 36 | \$0 46 | \$0 03 | \$0 05 | \$6 75 | \$3 00 | \$8 00 | \$1,836 36 |
| James McArthur | Chicago, Ill. | 35 | 50 | 05 | 10 | 10 00 | 10 00 | 15 00 | 2,358 40 |
| Robert M. Steel | Saint John's, Mich. | 20 | 30 | 04 | 04 | 7 50 | 2 00 | 10 00 | 1,477 22 |

Contract awarded to Robert M. Steel.