

after consultation between this office and that of the Light-House Board, in this city, for the following reasons:

1. It passes the lower end of the flats nearly where the old channel existed and where, therefore, a certain stability and permanence of improvement are to be looked for.

2. It makes the least angle with the normal currents of the river consistent with obtaining a site for the range lights within any practicable distance, and is in fact on the whole coincident with them. Their natural and daily action will, therefore, aid both in constructing and maintaining a channel on this line.

3. It avoids probable disturbance from the outflow of Christiana Creek, especially during the freshets, by passing at a considerable distance from its mouth.

4. It meets the range line below (that of the Deep Water Point lights) in mid-channel, consequently vessels can alter their course in good water and with a wide margin of safety, and after turning will be guided up the middle of the river past the flats and left on the western shore with good water to Chester.

The project, therefore, for the improvement of the Delaware River in the vicinity of Cherry Island Flats is as follows, viz:

To connect the 24-foot curve in the channel west of the flats with the corresponding curve below by a straight cut 900 feet in width and 24 feet deep at mean low-water, having for its axis the line shown on the accompanying tracing.

This line is 3,620 yards long, and the least water upon it is 17 feet, but it crosses the 18-foot curve 100 yards either side this sounding. Its average depth for the whole length is 19.8 feet.

The average depth on the east side of the proposed cut is 19.1 feet and on the west side 20.5 feet. The entire amount of material to be removed is 1,520,000 cubic yards, and at 20 cents per yard, the total cost of the improvement will be \$304,000.

In this estimate, however, no account is taken of the certain auxiliary action of the natural flow when the cut shall have once been opened, nor of the additional assistance to be derived from the churning of the deep screws of heavy steamers. The material being principally a soft mud, it is probable that the total cost of securing the desired channel will be reduced through these agencies by from 10 to 15 per cent.

Should funds be appropriated for this improvement it is proposed to effect it gradually, making at first a cut 100 yards wide completely through the shoal to the full depth. This would cost \$100,000, which could be profitably expended in one season.

The second season's operations would double the width of the channel by increasing it 50 yards on either side, and the total saving due to other agencies would be gained for the third season's operations, so that the total expense would be reduced to \$280,000 or less.

Very respectfully, your obedient servant,

J. N. MACOMB,
Colonel of Engineers.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A.

E 9.

ICE-HARBOR AT NEW CASTLE, DELAWARE.

The original design of this harbor dates back to colonial times, and, like that of others now existing on the Delaware River, was suggested by the necessity of providing a place of refuge for vessels during the prevalence of ice.

The United States first appropriated for its extension in 1803, and the wooden piers marked "A," "B," "C," and "D" on the accompanying chart were constructed. In 1827 some additions were made, which, later, being found injurious, were removed.

In 1835 the low-water mark had advanced about 200 feet from the extension of the wharves, so as to envelop the original piers, and the construction of piers H and H' was begun. It was completed in 1837, but H' having been left unfinished from want of funds was subsequently removed so as to provide for an enlargement of the harbor. At the same time B and C were cut down to low-water and rebuilt with stone.

In 1853 the wooden crib "I" was built; twenty years later was cut down and rebuilt of stone.

In 1874 "K" was constructed on the plan that has since been followed, viz, a crib foundation to about low-water of spring tides and stone above.

A large coal-wharf, built by the Philadelphia, Wilmington and Baltimore Railroad Company in 1863, caused a rapid accumulation of mud and silt in the harbor, and 108 running feet of it were removed in 1875. Pier "L" was completed during the same year.

In 1877, 110 feet additional of the coal-wharf were removed, and the crib foundation of "M" constructed, and during the fiscal year just closed this pier was finished. A survey was also made of the harbor to ascertain its available depth and determine the amount of dredging required to develop its full usefulness.

Since the removal of the coal-wharf the tides course freely through the harbor, and if once deepened there is every reason to suppose the depth will maintain itself.

The establishment in 1874 of a Harbor Commissioner's line for wharfage forbids further encroachment upon the sheltered space.

In its present condition the harbor consists of 2 piers on the lower line, 3 on the upper, and 1 on the outside near the upper end, inclosing a protected area about 900 feet by 300 feet, the inner portion of which needs dredging. An additional pier is required to perfect the harbor, viz, one similar in all respects to "M," and in a position symmetrical therewith on the lower side of the axis. It is shown upon the chart and marked N.

During the last winter the ice in the Delaware was extraordinarily heavy, and the harbor was crowded with vessels of all dimensions, large steamers frequently availing themselves of its shelter. Their numbers cannot be given, as no means existed of ascertaining them with accuracy.

It is proposed with the existing balance of \$757, together with the \$5,500 appropriated by act of March 3, 1879, making in all \$6,257, to make slight needed repairs and increase the facilities for mooring by putting up additional mooring-posts, to protect the foundations of the exterior pier from scour with riprap, and to dredge the inner part of the harbor to 18 feet at mean low-water.

During the year ending June 30, 1881, should funds be available, it is

proposed to do such additional dredging as may be necessary and construct the additional pier "N," which will complete the harbor on the present design.

New Castle Harbor, since that at Reedy Island, 10 miles below, has become useless, is the first reached by vessels coming from the sea. It is therefore of great importance to the commerce of the Delaware River, which, in 1878, aggregated nearly 3,000,000 tons.

New Castle is in the collection-district of Delaware, Wilmington being the nearest port of entry.

The amount of revenue collected there during the fiscal year ending June 30, 1879, was \$21,821.71.

Fort Delaware is the nearest fort, and the Bulkhead Shoals range-light the nearest light-house.

The work has been under the direct supervision of Assistant John J. Lee.

Total amount appropriated under present plan of construction \$107,000 00
 Total amount expended 100,742 44

Money statement.

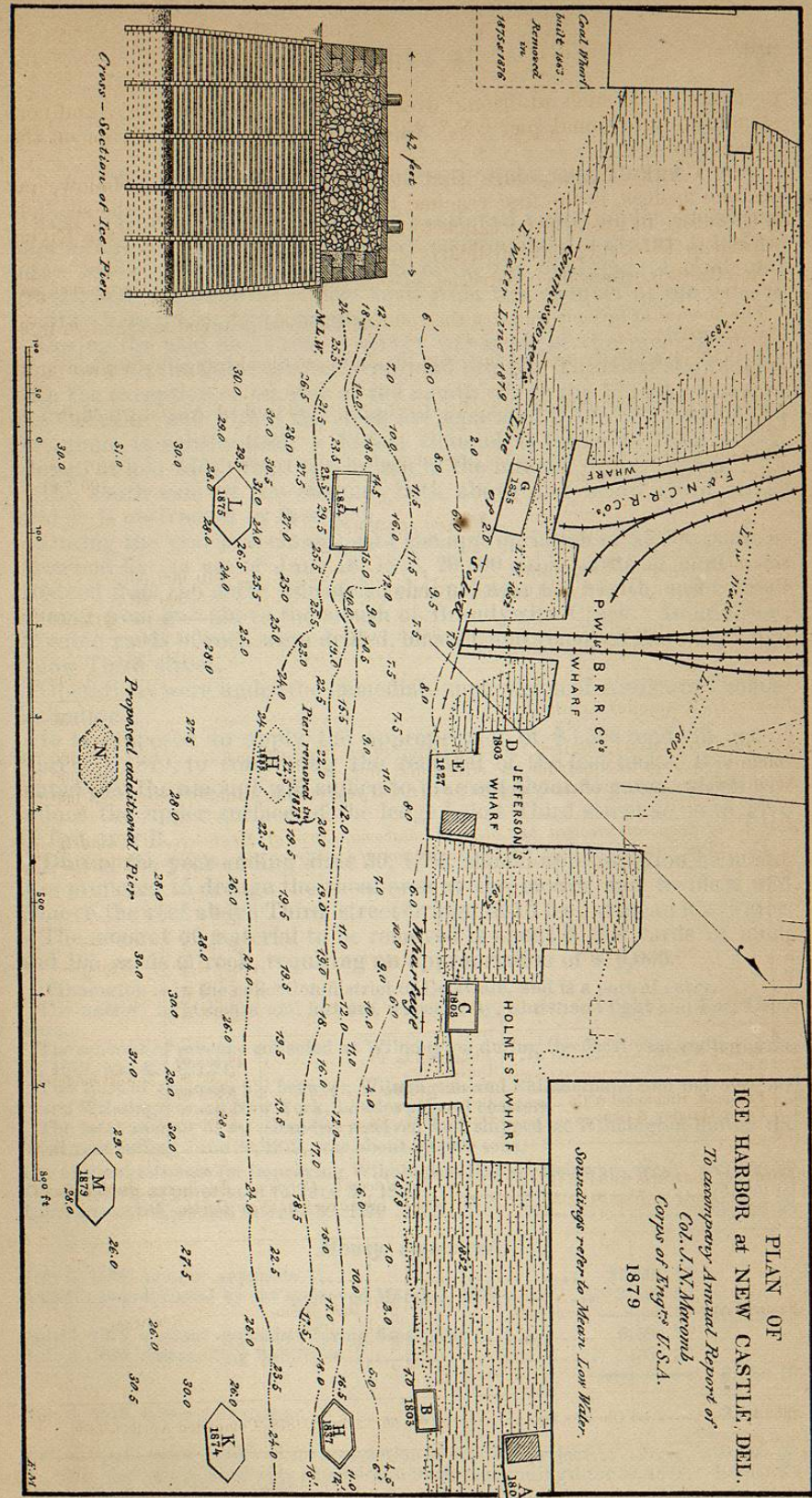
July 1, 1878, amount available.....	\$10,000 00
Amount appropriated by act approved March 3, 1879	5,500 00
	<hr/>
July 1, 1879, amount expended during fiscal year.....	9,092 44
July 1, 1879, outstanding liabilities	150 00
	<hr/>
	9,242 44
	<hr/>
July 1, 1879, amount available	6,257 56
	<hr/>
Amount (estimated) required for completion of existing project	3,000 00
Amount required to construct one additional pier.....	20,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	23,000 00

Abstract of proposals received by Col. J. N. Macomb, Corps of Engineers, at Philadelphia, Pa., 12 m., August 5, 1878, for the completion of ice-harbor pier, at New Castle, Del.

No. of bid.	Name of bidder.	Residence.	Amount of bid for furnishing stone and completing pier.	Remarks.
1.	Bitting & Dyer	Philadelphia, Pa.....	\$9,595 00	Lowest bidders.
2.	Leiper & Lewis.....	Chester, Pa.....	8,000 00	
3.	Pierce, Rowe & Co.....	Frankfort, Me.....	9,974 00	
4.	Freeman, Richmond & Co.....	Boston, Mass.....	9,474 00	
5.	Philip Quigley & Son.....	Philadelphia, Pa.....	8,475 00	

Abstract of contracts entered into by Col. J. N. Macomb, Corps of Engineers, during fiscal year ending June 30, 1879, for pier of ice-harbor at New Castle, Del.

Name of contractor.	Residence.	Furnishing stone and completing pier. Amount of contract.	Date of contract.	Remarks.
Leiper & Lewis.....	Chester, Pa.....	\$8,000 00	Aug. 22, 1878	Completed April 26, 1879.



E 10.

IMPROVEMENT OF WILMINGTON HARBOR, DELAWARE.

This work was begun in 1871, and continued yearly under successive appropriations. The original project contemplated securing a 12-foot mean low-water navigation; and involved the dredging of mud and gravel, and the removal of fast rock from the channel at the various points where a less depth existed.

During the past fiscal year a survey was made of the creek from its junction with the Delaware to the railroad bridge. The chart shows that, with the exception of an area at the mouth where the 12-foot curves in the Delaware and within the creek are separated by an interval of 600 feet, there is substantially a 12-foot channel as far up as Third street, though of less width than is required in the interest of navigation.

The south side of the channel, both above and below Third street bridge, is obstructed by fast rock.

During the year just closed, with the appropriation of \$7,000 made in river and harbor act of June 18, 1878, 29,000 cubic yards of mud were dredged from the north side of the channel near the mouth, and a small amount from just above the mouth of Brandywine Creek. In addition, 92 cubic yards of rock were drilled, blasted, and removed from the ledge below Third street.

Operations were under the immediate supervision of Assistant Thomas Valentine.

It is proposed to apply the appropriation of \$3,500 made in act of March 3, 1879, to continuing the removal of the fast rock. It is estimated that the amount will suffice to take out about 85 yards, which will reduce the upper surface of the ledge below Third street so as to give 12 feet over it.

During the year ending June 30, 1881, should appropriation be made, it is proposed to dredge the shoal area at the mouth, and to blast and remove the reef above Third street bridge to 13 feet at mean low-water.

The amount of material to be removed is about 30,000 yards of mud, and 105 yards of rock, requiring an appropriation of \$10,000.

Wilmington is in the collection-district of Delaware, and is a port of entry.

The nearest light-house and fort are, respectively, Christiana light and Fort Delaware.

The amount of revenue collected at Wilmington during the fiscal year ending June 30, 1879, was \$21,821.71.

Two lines of steamers ply between Wilmington and Philadelphia, and one line between Wilmington and New York, besides several coasters.

The total amount of merchandise received and shipped at Wilmington during the fiscal year ending June 30, 1879, was about 300,000 tons.

The original estimate for improving Wilmington Harbor, Delaware, was ..	\$83,000 00
Total amount appropriated to June 30, 1879	73,500 00
Total amount expended to June 30, 1879	69,956 95

Money statement.

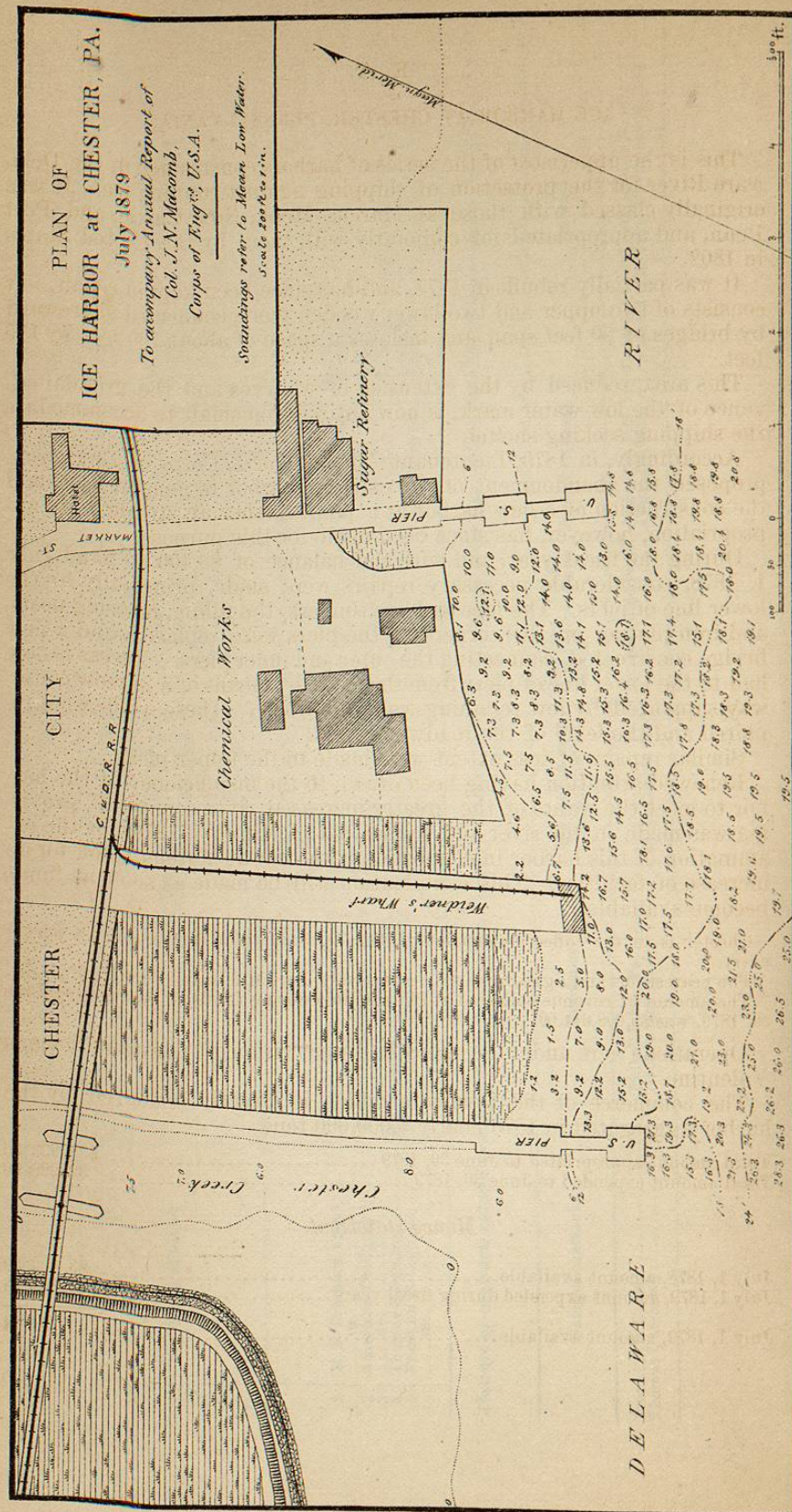
July 1, 1878, amount available	\$7,001 15	
Amount appropriated by act approved March 3, 1879	3,500 00	
		\$10,501 15
July 1, 1879, amount expended during fiscal year	6,599 78	
July 1, 1879, outstanding liabilities	358 32	
		6,958 10
July 1, 1879, amount available	3,543 05	
Amount (estimated) required for completion of existing project	10,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881 ..	10,000 00	

Abstract of proposals received by Col. J. N. Macomb, Corps of Engineers, U. S. A., at Philadelphia, 12 m. August 8, 1878, for improving harbor at Wilmington, Del., dredging channel of Christiana River, and removing rock.

No. of bid.	Name of bidder.	Residence.	Removal of rock, 68 cubic yards.		Dredging mud from the north side of the channel just above the buoy depot of Light-House Establishment, 12,000 cubic yards.		Dredging mud from the channel opposite the mouth of Brandywine Creek, 12,000 cubic yards.		Dredging mud—total of material to be removed, 24,000 cubic yards.		Total.	Remarks.
			Rate.	Amount.	Rate.	Amount.	Rate.	Amount.	Rate.	Amount.		
1	M. F. Brainard, agent	Albany, N. Y.	\$47 50	\$3,230 00							\$3,230 00	
2	do	do							\$0 11 1/4	\$2,820 00	2,820 00	
3	American Dredging Co.	Philadelphia, Pa.	38 50	2,618 00							2,618 00	
4	do	do			\$0 10	\$1,200 00	\$0 13	\$1,500 00			2,700 00	
5	Thomas Cumming	Hackensack, N. J.	35 00	2,380 00							2,380 00	Lowest bidder for removing rock.
	Franklin B. Colton	Philadelphia, Pa.	36 00	2,448 00							2,448 00	Lowest bidder for dredging.
	do	do							9 1/2	2,280 00	2,280 00	

Abstract of contracts entered into by Col. J. N. Macomb, Corps of Engineers, U. S. A., during fiscal year ending June 30, 1879, for improving harbor at Wilmington, Del.

Name of contractor.	Residence.	Removal of rock, 68 cubic yards.	Dredging channel of Christiana River.	Date of contract.	Remarks.
Franklin B. Colton	Philadelphia, Pa.			August 20, 1878...	Contract completed October 26, 1878.
Thomas Cumming	Hackensack, N. J.	\$35 per cubic yard.	9 1/2 c. per cubic yard.	August 23, 1878...	Contract completed November 23, 1878.



E II.

ICE HARBOR AT CHESTER, PENNSYLVANIA.

This is the uppermost of the series of harbors constructed in the Delaware River for the protection of shipping against running ice. It was originally classed with those at Marcus Hook, New Castle, and Port Penn, and appropriated for conjointly with them by the United States in 1802.

It was partially rebuilt in 1877, and has since been kept in repair. It consists of two upper and two lower wooden piers, connected shoreward by bridges of 50 feet span, and incloses a space of about 700 feet by 150 feet.

This area, reduced by the extension of wharves and the gradual advance of the low-water mark, is now entirely too small to accommodate the shipping seeking shelter.

Accordingly, in 1870, Lieutenant-Colonel Kurtz, Corps of Engineers, proposed the abandonment of the existing harbor to general uses, and the construction of a new harbor at a point farther up stream. No appropriation, however, has since been made for this purpose.

During the fiscal year, and with the balance of \$3,400 on hand July 1, 1878, considerable necessary repairs were made, principally to the lower line of piers. The face and cap timbers, the filling, mooring-posts, and iron plating on the corners of the piers were replaced, and a new bridge constructed, connecting the outer and inner piers. Access is now had to the lower line of piers from the shore by means of a narrow causeway supported by low retaining walls of rubble. These walls were repaired and the level of the roadway raised.

Similar repairs of less extent were made to the upper piers.

Renewed attention having been drawn to the insufficiency of the harbor to meet the wants of the greatly increased river commerce, provision was made in the river and harbor act of March 3, 1879, for the examination of this harbor in connection with that at Marcus Hook for an increase of facilities. This examination will be made as soon as funds become available.

Chester is in the collection-district of Philadelphia, which is the nearest port of entry.

The nearest fort and light-house are, respectively, Fort Mifflin and Fort Mifflin light. The amount of revenue collected at Philadelphia during the fiscal year ending June 30, 1879, was \$9,008,611.09.

Operations were under the immediate supervision of Assistant Thomas Valentine.

The commerce of the Delaware which is directly benefited by the harbor aggregated in 1878 nearly 3,000,000 tons.

Total amount appropriated to June 30, 1879	\$32,933 00
Total amount expended to June 30, 1879	32,228 26

Money statement.

July 1, 1878, amount available	\$3,400 00
July 1, 1879, amount expended during fiscal year	2,695 26
July 1, 1879, amount available	704 74

E 12.

ICE HARBOR AT MARCUS HOOK, PENNSYLVANIA.

The construction of this harbor, in accordance with the present design, was begun in 1867 and completed in 1871. It consists of 2 landing piers of wood and 4 detached piers of stone, with crib and rubble foundations to low-water, inclosing an area of about 600 feet by 250 feet.

The harbor has proved itself extremely serviceable to the commerce of the Delaware, and is yearly thronged to the limit of its capacity during the prevalence of heavy ice.

With the \$5,000 available July 1, 1878, considerable repairs have been made to the two landing piers during the fiscal year. The upper 3 courses of timber were almost entirely rebuilt, the filling restored, and the ties, fenders, and mooring-posts replaced. The two bridges connecting the landing piers with the shore, one 30 feet in length, the other 50 feet, were entirely rebuilt, and the inner half of the harbor was deepened to 18 feet at mean low-water by the dredging and removal of 11,000 cubic yards of material.

The present dimensions of the harbor are inadequate to meet the demands of navigation, and the act of March 3, 1879, provides for an examination of this and the harbor at Chester, with the view of increasing their usefulness to commerce. This examination will be made so soon as the necessary funds shall become available.

Marcus Hook is in the collection-district of Philadelphia, which is the nearest port of entry.

The nearest light-house and fort are, respectively, Christiana light and Fort Mifflin. The amount of revenue collected at Philadelphia during the fiscal year ending June 30, 1879, was \$9,008, 611.09.

Operations were under the immediate supervision of Assistant Thomas Valentine.

The commerce of the Delaware, which is directly benefited by this harbor, aggregated in 1878 nearly 3,000,000 tons.

Total amount appropriated to June 30, 1879.....	\$104, 000 00
Total amount expended to June 30, 1879.....	103, 642 04

Money statement.

July 1, 1878, amount available.....	\$5, 021 76
July 1, 1879, amount expended during fiscal year.....	4, 663 80
July 1, 1879, amount available.....	357 96

E 13.

ICE HARBOR AT REEDY ISLAND, DELAWARE RIVER.

This work, situated on the east or channel side of Reedy Island, which lies in the Delaware River near the head of Delaware Bay, was begun in 1852 with an appropriation of \$51,000, but the amount being insufficient, it was built in a temporary manner of wood, and little more than half completed.

In 1867 a survey of the island and harbor was made, and in 1871 an estimate for its re-establishment was submitted by Lieutenant-Colonel

