

APPENDIX Y.

ANNUAL REPORT OF CAPTAIN CHARLES J. ALLEN, CORPS
OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30,
1879.

(For letter of transmittal see Appendix S.)

Y I.

IMPROVEMENT OF HARBOR AT DULUTH, MINNESOTA.

This work was in charge of Maj. F. U. Farquhar, Corps of Engineers, U. S. A., until July 15, 1878, when he was relieved of the charge by Capt. C. J. Allen, Corps of Engineers, in accordance with Special Orders No. 148, Adjutant-General's Office, Washington, D. C., July 10, 1878.

The early steps for the improvement of the harbor of Duluth were attended with many complications, arising from the cutting by the city of Duluth of a canal across Minnesota Point close to the present site of Duluth, and the resistance offered by the people of Superior City to this proceeding. A full account of the suit ensuing is given in the historical sketch hereto appended.

Since 1873 the appropriations have been mostly applied to dredging the inner harbor and keeping the piers in repair.

Congress, by act approved June 18, 1878, appropriated \$30,000 for the continuance of the improvement. On the 3d of August, 1878, bids were solicited for the work of dredging the inner harbor; at the opening of bids, August 23, Williams & Upham, of Duluth, being the lowest responsible bidders, the contract was awarded to them, and dredging commenced. Their price was 12 cents per cubic yard. The work was continued until November 5, when, the ice threatening, the dredges were withdrawn, and the contract extended to July 15, 1879. One hundred and eight thousand three hundred and fifty-nine yards of material were removed up to November 5, 1878.

On the 5th of May, 1879, work was resumed, and continued until the 23d day of June, when, the allotment being exhausted, dredging ceased. Subsequently, however, the contract was further extended to August 25 in order to meet the immediate demands of commerce, utilizing for that purpose a reserve fund held to meet the effects of storms upon the piers. The appropriation of \$25,000 by act approved March 3, 1879, had not then been declared available for use.

During the fiscal year ending June 30, 1879, 158,179 cubic yards had been removed from the harbor.

During the season of 1878, 250 linear feet of crib-work at the bay end of the north side of the canal were entirely renewed; this work was done by hired labor and purchase of materials in open market.

The present plan for the improvement of the harbor of Duluth consists in dredging the inner harbor so as to afford 16 feet depth at low-water, and in the repairs and maintenance of the piers. The dredging

extends to within 150 feet of private docks and eastwardly along lines parallel to the axis of the canal, and through the cut in the north end of the dike where necessary, giving 10 feet depth through the latter. The area that has been dredged over since the commencement of work by the United States is extensive, but on account of the movable nature of the bottom, and the effect upon it of waves beating through the canal, areas have to be frequently retouched. The location of the canal is certainly an unfortunate one so far as the usefulness of the harbor is concerned. The condition of the harbor and approaches may be thus stated: 1,210 linear feet of canal leading from the inner harbor to deep water of the lake, bordered by a total of 2,424 linear feet of crib-work; the canal mainly 250 feet in width, and the crib-work 20 feet in width, excepting at the lake ends, where the pier-heads are 40 feet wide. Good depth of water obtains throughout the canal; the crib-work will need extensive repairs, if the present plan of harbor be adhered to. The dike across the bay constructed by the city of Duluth in 1871-'72 is entirely out of sight and no longer serves the purpose for which it was constructed, viz, to maintain the discharge of the Saint Louis River through the natural entry, although, as a drowned dam, it doubtless has some small effect upon the flow. The outer harbor has been abandoned. To maintain the usefulness of the present harbor, constant dredging is required, for which annual appropriations of at least \$50,000 should be made. To keep the piers in repair and to meet the effects of unusually severe storms, a fund of not less than \$10,000 should be held in reserve.

Congress, by second section of act approved March 3, 1879, having ordered a survey of the Bay of Superior to determine the best plan of harbor improvement of the bay, steps were taken toward the organization of a party to take the field as soon as the funds necessary should be declared available for use.

By first section act of Congress approved March 3, 1879, the sum of \$25,000 was appropriated for further improvement of the harbor. With this sum, and the balance on hand, it is proposed to continue the work of dredging by contract in the inner harbor, and to make repairs to the piers when and where absolutely necessary, no other repairs being deemed expedient pending the survey ordered; the repairs to piers to be made by hired labor and purchase of materials in open market, it being impossible to predict amount of either required.

The original estimate of cost of dredging the inner harbor and keeping the canal open as per present plan was \$269,739.25, of which \$118,784.26 has been expended to date. The total cost to the United States of the piers, not counting small repairs, has been \$41,469.09.

Mr. Thomas Shiels, overseer, has been in local charge of the improvement during the year, and has conducted the work with zeal, fidelity, and economy.

This work is in the collection-district of Duluth. Duluth, Minn., is the nearest port of entry.

The collections at this port for the fiscal year ending June 30, 1879, were \$7,764.51.

Money statement.

July 1, 1878, amount available.....	\$33,634 04	
Amount appropriated by act approved March 3, 1879.....	25,000 00	
		\$58,634 04
July 1, 1879, amount expended during fiscal year.....	21,007 94	
July 1, 1879, outstanding liabilities.....	5,361 16	
		26,369 10
July 1, 1879, amount available.....		32,264 94

Amount (estimated) required for completion of existing project.....	\$159,293 18
Amount that can be profitably expended in fiscal year ending June 30, 1881:	
For dredging.....	\$50,000 00
For repair of piers.....	15,000 00
	<u>65,000 00</u>

Abstract of appropriations made for the harbor of Duluth, Minn., how expended, &c.

Appropriations.	Construction of breakwater.	Repairs of piers, &c.	Dredging inside harbor, &c.	Unexpended July 1, 1879.	Total.
By act approved March 3, 1871.	\$60,000 00				\$60,000 00
By act approved June 10, 1872.	50,000 00				50,000 00
<i>Allotted from appropriations.</i>					
Act approved March 3, 1873.....		\$32,723 59	\$3,325 61		36,049 20
Act approved June 23, 1874.....		1,879 54	8,120 46		10,000 00
Act approved March 3, 1875.....			35,000 00		35,000 00
Act approved August 14, 1876.....		6,000 00	9,000 00	{[*\$3,634.04 unexpended July 15, 1878]}	15,000 00
Act approved June 18, 1878.....		{[*\$3,634.04 and 865.96]}	21,869 10	7,264 94	30,000 00
Act approved March 3, 1879.....				25,000 00	25,000 00
	110,000 00	41,469 09	77,315 17	32,264 94	261,049 20

Abstract of proposals for dredging the inside harbor of Duluth, Minn., opened August 23, 1878.

Number.	Name and residence of bidders.	Name and residence of sureties.	For dredging per cubic yd.
1	Willard Johnson, Fulton, N. Y....	G. M. Case and Thomas Kieler, Fulton, N. Y.....	\$0 17½
2	R. R. Dodge, Volney, N. Y.....	James Caldwell and F. D. Wagoner, Volney, N. Y.....	16
3	C. H. Starke.....	Henry Starke and Tully H. Smith, Milwaukee, Wis.....	13½
4	Williams & Upham, Duluth, Minn.....	Henry G. Noble and Coll P. McDougal, Duluth, Minn.....	12

Contractors, Williams & Upham.

COMMERCIAL STATISTICS.

Arrivals from January 1 to December 18, 1878.

Vessels.	Schooners.	Screw-steamers.	Paddle-steamers.	Tons.	No. of men.
American vessels from American ports.....	58	225	1	195,398	5,697
Foreign vessels from foreign ports.....		80	37	71,311	3,241
Total.....	58	305	38	266,709	8,938

Clearances from January 1 to December 18, 1878.

Vessels.	Schoon- ers.	Screw- steamers.	Paddle- steamers.	Tons.	No. of men.
American vessels to American ports.....	58	224	1	195,789	5,753
Foreign vessels to foreign ports.....		80	37	71,311	3,242
Total.....	58	304	38	267,100	8,995

Freight forwarded and received during year 1878.

Articles forwarded and received.	By Saint Paul and Duluth Railroad.	By Northern Pacific Rail- road.	Total.
FORWARDED.			
Lumber.....pounds.....		18,093,170	18,093,170
Salt.....barrels.....	51,162	8,972	60,134
Do.....pounds.....	15,348,900	2,691,606	18,040,506
Coal.....do.....	36,592,860	13,439,970	50,032,830
Railroad and pig iron.....do.....	6,136,150	6,776,465	12,912,615
Merchandise.....do.....	30,195,964	13,101,373	43,297,337
Total.....pounds.....	88,273,874	54,102,578	142,376,452
RECEIVED.			
Flour.....barrels.....	350,071	5,800	355,871
Do.....pounds.....	70,014,200	1,160,000	78,174,200
Merchandise.....do.....	17,028,752	3,212,122	20,240,874
Wheat.....do.....	52,550,770	68,632,265	121,183,035
Total.....pounds.....	139,593,722	73,004,387	212,598,109

Y 2.

IMPROVEMENT OF SUPERIOR BAY, WISCONSIN.

This work was in charge of Maj. F. U. Farquhar, Corps of Engineers, until the 15th of July, when he was relieved of the charge by Capt. C. J. Allen, Corps of Engineers, in accordance with Special Orders No. 148, Adjutant-General's Office, Washington, D. C., July 10, 1878.

Congress, by act approved June 18, 1878, appropriated \$3,000 for the continuance of the improvement of this harbor.

The work of improvement during the season consisted in repairs to the outer cribs of both piers, and in the protection of Minnesota Point from the action of wind and waves by a wall of brush and stone extending along the point from the inner end of the protection crib-work. The breach through Minnesota Point, known as the "opening," was also closed with brush and stone.

The following spring about 3,000 plants, mostly willows, were set out upon the beach between the old light-house and the end of the pier on Minnesota Point, it being thought that by this means the drifting of the sand would be arrested more economically than in any other way. The cost was less than \$50. The plants thrive well. All this work was done by hired labor and purchase of materials in open market.

About the middle of June, 1879, dredging to a depth of 10 feet commenced on a line passing in front of Rice's and Connor's Points, and connecting the harbor with that of Duluth. This excavation was done

by the contractors for the Duluth Harbor dredging, and at the same price as for the latter, viz, 12 cents per cubic yard.

By the close of the fiscal year 4,103 cubic yards had been removed from this line, a few days' work only remaining to be done.

The condition of the harbor may be stated as follows: Two lines of piers jutting out into deep water of the lake from Minnesota and Wisconsin Points respectively. The Minnesota Point pier is 2,856 feet in length, and the Wisconsin pier 2,656 feet long. The distance between the piers averages 350 feet. These piers are in fair condition, although some of the planking and filling should be renewed.

The channel leading from the entry to Quebec wharf is not known to have materially changed.

The protection crib-work, beach protection wall, and work at the "opening," all in good condition. Some further protection is required at the shore angle of the Wisconsin Point pier.

Congress, by act approved March 3, 1879, further appropriated \$5,000 for the work.

With the funds available, it is proposed, during the coming year, to make such repairs to the piers and other works as may become necessary from time to time, it not being thought advisable to undertake any extensive repairs or renewal of any of the pier work, in view of a survey of the bay having been ordered by act of Congress approved March 3, last, "to determine the best and most economical plan for harbor improvement for the head of Lake Superior." In addition several thousand dollars should be held in reserve with which to meet the effect upon the work of heavy storms.

It is estimated that \$10,000 can be profitably employed during the fiscal year in maintenance and repairs of piers, beach protection, &c.

Superior City is in the collection-district of Superior. Marquette, Mich., is the port of entry, at which place there was collected the sum of \$10,331.95 during the fiscal year ending June 30, 1879.

Original estimate for construction of piers.....	\$309,716
Original estimate for dredging.....	25,000
	334,716

Money statement.

July 1, 1878, amount available.....	\$4,505 27
Amount appropriated by act approved March 3, 1879.....	5,000 00
	\$9,505 27
July 1, 1879, amount expended during fiscal year.....	1,713 87
July 1, 1879, amount available.....	7,791 40
	7,791 40
Amount that can be profitably expended in fiscal year ending June 30, 1881, to be used in maintenance and repairs of piers and beach protection.....	\$10,000 00

Abstract of appropriations made for improving Superior Harbor, Wisconsin—how expended or to be expended.

Appropriations.	For use in repairs and beach protection, and not included in original estimate.	Construction and repairs of piers.	Expended in dredging.	Total.	Available July 1, 1879.
By act approved March 3, 1867		\$63,000 00		\$63,000 00	
Allotted from act approved April 10, 1869		45,000 00		45,000 00	
Allotted from act approved July 7, 1870		40,000 00		40,000 00	
Allotted from act approved March 3, 1871		60,000 00		60,000 00	
Allotted from act approved June 10, 1872		50,000 00		50,000 00	
Allotted from act approved March 3, 1873		41,322 64	\$22,628 16	63,950 80	
Allotted from appropriation "repairs of harbors on Northern lakes"	\$5,433 00			5,433 00	
By act approved August 14, 1876	3,000 00			3,000 00	}\$2,791 40
By act approved June 18, 1878	3,000 00			3,000 00	
By act approved March 3, 1879		5,000 00		5,000 00	5,000 00
Total	11,433 00	304,322 64	22,628 16	338,383 80	7,791 40

*\$2,000 of this amount to be expended in dredging in the Bay of Superior on a line connecting the harbors of Duluth and Superior.

COMMERCIAL STATISTICS.

SUPERIOR, WIS., April 12, 1879.

DEAR SIR: Your favor of 9th instant is received. The "estimated value, in general terms and in round numbers, of the trade and commerce of Superior City for the year 1878" is as follows:

EXPORTS.

Fish, salt and fresh	\$5,000
Furs and hides, and wool	5,000
Lumber and shingles	50,000
Cattle, sheep, and horses	3,000
Hay, wheat, oats, potatoes, &c.	5,000
Butter, eggs, small fruits, maple sugar	2,000
Cord-wood, telegraph poles, fence posts, railroad ties	10,000

\$80,000

IMPORTS.

Merchandise, such as dry goods, groceries, flour, feed, agricultural machinery, mill machinery, &c., \$100,000.

In the foregoing I have not included a large amount of saw-logs which were cut on land south and west of Superior and floated through the Bay of Superior to a market in Duluth. I estimate the value of such at \$50,000.

In the imports is included the value of camp supplies for several lumbering firms which operate on the Saint Croix and its tributaries in the southern part of Douglas County and receive their supplies through this place.

Very respectfully, yours,

CHAS. J. ALLEN,
Captain of Engineers, U. S. A.

JAMES BARDON.

HISTORICAL SKETCH OF THE WORKS EXECUTED BY THE UNITED STATES GOVERNMENT IN THE HARBORS OF SUPERIOR CITY, WISCONSIN, AND DULUTH, MINNESOTA; BY JOS. P. FRIZELL, ASSISTANT ENGINEER.

The outline of Lake Superior is approximately a triangle, the north-westerly shore running nearly due northeast and southwest; the south-westerly, nearly east and west. Near the westerly extremity of the lake, where

these shores are about 9 miles apart, two spits make out from the opposite shores and approach very near each other, their evident tendency to unite being prevented by the water of the Saint Louis and Nemadji Rivers, which, previous to the opening of the Duluth Canal, found an outlet between them. They thus form an almost continuous false beach, or *cordon littorale*, running almost in a straight line, nearly at right angles to the north-westerly shore, and dividing the lake from the broad and shallow bay called the Bay of Superior.

The spit which makes out from the northwest, or Minnesota shore, is called Minnesota Point. It is about 6 miles long. That from the south, or Wisconsin shore, is about 3 miles long, and is called Wisconsin Point. The opening between the points is called the entry, or natural entrance, to the Bay of Superior. On the lake-survey chart of 1861, before any works of improvement had been undertaken, this channel appears as rather narrow and crooked, with a minimum depth of 10 feet. Farther westward are two similar peninsulas, called Rice's Point and Conner's Point, which separate the Bay of Superior from the Bay of Saint Louis. The channel of the Saint Louis River forms, for a distance of some 20 miles from the entry, the boundary line between the States of Minnesota and Wisconsin. These curious formations undoubtedly owe their existence to the action of waves, which at this point have, in easterly and northeasterly winds, a fetch of over 300 miles in water of 1,000 feet depth, and break with a violence comparable to those of the Atlantic. The formation of a littoral cordon uniting, or tending to unite, the headlands of deep and narrow bays or indentations is no anomalous feature of shore topography. The tendency of all beaches composed of shifting materials is to arrange themselves in gentle curves, avoiding abrupt changes of direction, whence they do not conform to sharp indentations of the coast. Such a cordon undoubtedly once existed on the line of Rice's and Conner's Points, and might, under slightly different conditions, have formed the present shore. The relations between the depth of water, fetch of waves, and prevailing winds determined a line of breakers which, by arresting the seaward and shoreward movement of gravel, laid the foundation, so to speak, of the present outer beach.

The situation of this harbor, at the western extremity of the great chain of Northern lakes, offering the most accessible shipping point for the products of the vast region lying to the west, northwest, and southwest, marks it as prospectively one of the most important of the lake harbors.

The village of Superior, or Superior City, nearly opposite the entry, has been in existence something over 20 years. Duluth, at the north-west extremity of the Bay of Superior, is a more recent settlement.

The act of Congress of March 2, 1867, appropriated \$63,000 for the improvement of the harbor of Superior City. Under this appropriation a system of piers or jetties was commenced at the entry by Maj. J. B. Wheeler, of the Corps of Engineers, designed to aid the natural tendency of the waters of the bay and the currents due to the oscillations of the lake to maintain and deepen the channel. The plan was to construct two piers, consisting of cribs of timber filled with stone, surmounted by a continuous superstructure of the same materials, contracting the channel to a width of 300 or 350 feet, and extending to 18 feet depth of water in the lake. This was estimated to require a length of 1,664 feet for the pier on the Wisconsin side and 2,240 feet on the Minnesota side. (Report of Chief of Engineers, 1868, p. 80.) It may be observed here that the piers actually attained a considerably greater length than the above